Selection of Investment in Fixed Asset Deflator

A deflator for investment in fixed assets is only available since 1991. For the years 1953 through 1995 an alternative deflator is the implicit deflator of gross fixed capital formation in the expenditure approach to the calculation of GDP in the national income (and product) accounts.

The investment in fixed asset price index is collected by the urban survey team of the National Bureau of Statistics (NBS), originally annually, based on 600 enterprises. Starting in 1997, the survey is conducted annually and semiannually, since 1999 covering 4500 enterprises. The coverage comprises the output value of construction enterprises, the prices of the main materials used in construction (such as steel, wood, cement, bricks, paint), the cost of labor, various kinds of fees, and the purchasing price of equipment. The investment in fixed asset price index is supposed to capture all types of investment, across all investment sizes, by units in all types of ownership forms, across all economic sectors.[1]

According to the *GDP Manual* (2001), pp. 92-5, 106f., gross fixed capital formation in the expenditure approach to the calculation of GDP comprises (i) "total society investment in fixed assets," (ii) value-added created in the sale of real estate, (iii) fixed assets created in the prospecting for mineral resources (*kuangcang kantan*), calculated as costs incurred in the prospecting for mineral resources times 75%, and (iv) fixed assets created in the improvement of land (unless already included in total investment of society), less three items.[2] The three items to be subtracted are (a) the purchase of old structures (*jianzhuwu*), old equipment (*shebei*), and land, (b) other items in "other costs" (*qita feiyong*) which do not constitute fixed asset investment, and (c) investment in afforestation (unless these numbers are very small and not easy to obtain, in which case they can be ignored).[3] The nominal values of gross fixed capital formation are to be deflated using the investment in fixed assets price index.[4]

Since the urban survey teams were set up only in the mid-1980s, it is unclear how gross fixed capital formation is officially deflated in earlier years. Whatever procedure was used in the mid-1990s in the retrospective calculation of expenditure approach GDP and its

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[1] See Liu Chengxiang et al. (2000), pp. 114-7.

[2] An alternative compendium on the compilation of GDP, NBS (1997) provides instructions on what to include in gross fixed capital formation that stretch over several pages (pp. 162-71). In order to deflate the nominal values (p. 180), gross fixed capital formation is split into three categories (which routinely appear in the investment in fixed asset statistics): construction and installation, purchase of equipment and instruments, and others. Price indices for these three categories according to the source are reported by the urban survey teams. Each category is deflated individually, and the three constant price values are then combined. This does not constitute a substantive difference to the *GDP Manual* since the investment in fixed assets price index is reported in the *Statistical Yearbook* with a breakdown into exactly these three categories.

[3] For the three items to be deducted, they must have been included in one of the four components of gross fixed capital formation in the first place. Presumably this is total society investment in fixed assets, but the source refers to total society investment in fixed assets only for item b ("other items in other costs"). The source provides further details on components (i) and (ii).

[4] The data show that in the period 1980 (the first year with data on total society investment in fixed assets) through 2003, a significant difference of 44.69% in favor of gross fixed capital formation in 1980 (see figure in the paper) diminished rapidly to reach and stay at approximately unity in the years after 1985 (also see Figure 1 in the paper). The differences in 1980 through 1985, since they are so large, are unlikely to be fully attributable to items (ii) through (iv).

components during the pre-reform period, it presumably tried to come close to an investment in fixed asset deflator, as used in later years. Table 1 shows the implicit deflator of gross fixed capital formation to be very much in line with the investment in fixed assets price index in the years for which both are available.

Table 1 also presents data on three other price indices that could potentially come close to an investment in fixed assets price index: the ex-factory price index of industrial goods, its subcategory the ex-factory price index of industrial producer goods, and the implicit deflator of construction value-added in the national income accounts. The first two, in contrast to the investment in fixed asset price index, do not include construction; the first one, furthermore, includes consumer goods. The third one, obviously, is limited to construction.[5]

Figure 1, for the period 1952-1985, shows that while the gross fixed capital formation deflator and the construction deflator both move in step in the long run, such as over the period 1952 through 1978, in the short run they may diverge significantly. Gregory Chow (1994), p. 199, assumes "that the price index for accumulation goods [measure of gross fixed capital formation in the Material Product System] between 1952 and 1983 remained constant." Figure 1 shows that the cumulative deflator for gross fixed capital formation is indeed only about 15% higher in 1983 than in 1952; however, this ignores significant fluctuations in the 1950s and 60s which matter if accumulation data are added up (they should be deflated using the year-specific cumulative deflator).[6]

Since the gross fixed capital formation deflator is the more comprehensive measure, it is preferred over the construction deflator. Figure 2 and Figure 3 show the development of the various price indices and deflators in the reform period. Except for the late 1990s, when the construction deflator diverges on the upper side, the different price indices and deflators move in step. Since the investment in fixed assets price index has the most appropriate coverage, it is used in the following for the years since 1991, supplemented by the gross fixed capital formation deflator in earlier years.

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[5] A combination of the ex-factory price index of industrial producer goods and the implicit deflator of construction value-added might come close to the investment in fixed assets price index. However, for example in 1993, the relative annual changes in the ex-factory price index of producer goods and in the implicit construction deflator are both above the relative annual change in the investment in fixed assets price index. In 1991, the reverse is true.

[6] Authors such as Chen Kuan et al. (1988) or Gary Jefferson et al. (1992, 1996, 2000) have constructed their own deflators for the years prior to 1991, apparently unawares of the existence of the implicit gross fixed capital formation deflator for the years through 1990 (which may not have been publicly available before the publication of all except the last paper). Alwyn Young (2003) dislikes the implicit gross fixed capital formation deflator, but I doubt that his calculations yield more reliable results; his calculations accumulate the potential errors across several real and nominal series in his derived deflator. Wang Yan and Yao Yudong (2003) are also distrustful of the quality of the deflator derived by Alwyn Young (2003) and also opt for the implicit gross fixed capital formation deflator.

Table 1. Investment in Fixed Assets Price Indices and Deflators (Previous Year = 100)

	Ex-factory price index of industrial products	Ex-factory price index of ind. producer goods	Investment in fixed assets price index	Implicit deflator of gross fixed capital formation	Implicit deflator of construction value-added
1953				98.807	96.641
1954				99.384	96.353
1955				95.727	100.884
1956				99.717	106.262
1957				95.741	88.456
1958				100.347	100.000
1959				108.372	105.618
1960				99.678	102.476
1961				98.176	96.713
1962				107.365	102.155
1963				104.827	98.439
1964				97.940	99.364
1965				96.689	96.123
1966				98.064	99.944
1967				100.335	100.044
1968				96.574	100.117
1969				97.695	99.672
1970				99.983	102.367
1971				101.072	102.000
1972				101.265	100.143
1973				100.098	103.099
1974				100.128	101.576
1975				101.226	101.800
1976				100.663	101.265
1977				101.493	101.393
1978	100.1			100.551	101.678
1979	101.5			102.154	102.043
1980	100.5			103.071	107.264
1981	100.2			103.187	102.687
1982	99.8			102.296	103.041
1983	99.9			102.479	104.736
1984	101.4			104.046	105.574
1985	108.7			107.175	107.982
1986	103.8			106.401	108.565
1987	107.9			105.254	107.445
1988	115.0	113.7		113.523	112.658
1989	118.6	118.9		108.487	107.067
1990	104.1	104.4		105.483	106.965
1991	106.2	108.0	109.5	108.493	107.809
1992	106.8	109.3	115.3	113.000	115.176
1993	124.0	133.7	126.6	125.044	136.833
1994	119.5	116.7	110.4	110.371	115.998
1995	114.9	113.6	105.9	105.977	112.803
1996	102.9	103.5	104.0	103.936	109.316
1997	99.7	99.7	101.7	101.690	103.469
1998	95.9	95.4	99.8	98.076	99.750
1999	97.6	98.3	99.6	101.596	100.286
2000	102.8	105.1	101.1	101.079	101.826

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2001	98.7	98.8	100.4	100.393	101.378
2002	97.8	97.7	100.2	100.216	100.991
2003	102.3	103.6	102.2		104.184

The ex-factory price index for industrial goods has two components, producer and consumer goods; the producer goods component is the second price index in the table.

Investment in fixed assets: official investment in fixed assets price index.

Gross fixed capital formation: implicit values from nominal data in the expenditure approach to the calculation of GDP and real growth rates. Also sometimes labeled "accumulation."

Construction: implicit values from nominal data in the production approach to the calculation of GDP and real growth rates.

Sources: ex-factory price index for industrial goods: *Market Statistical Yearbook 1993*, p. 466 (for 1978 and 1979); *Statistical Yearbook 1998*, p. 317; *2004*, p. 323; ex-factory price index for industrial producer goods: *Statistical Yearbook 1993*, p. 268 (for 1988-91); *1998*, p. 317; *2004*, p. 344; investment in fixed assets price index: *Statistical Yearbook 2004*, p. 323; gross fixed capital formation: calculated from *GDP 1952-95*, pp. 50, 51, and *GDP 1996-2002*, pp. 27f.; construction: calculated from *GDP 1952-95*, pp. 27, 33, and *Statistical Yearbook 2004*, p. 53.
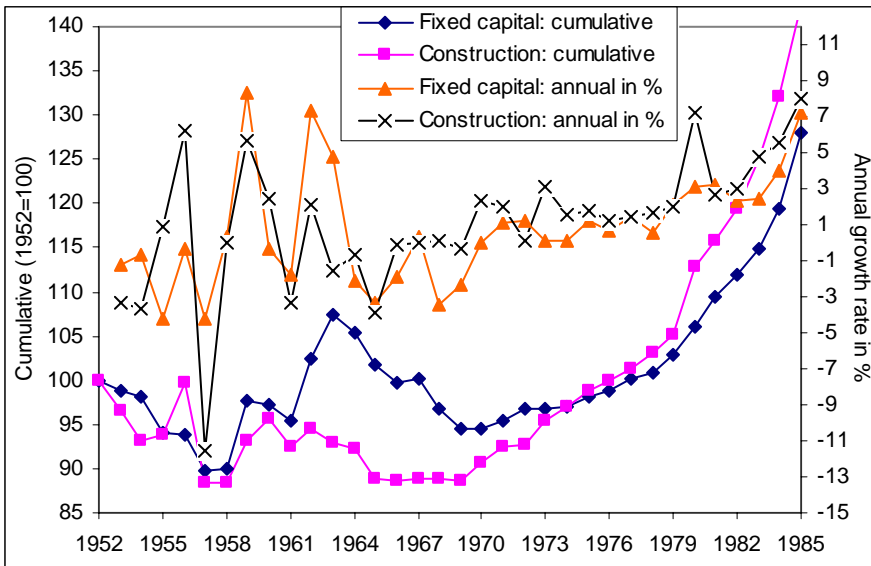
Fixed capital: gross fixed capital formation in the expenditure approach to the calculation of GDP.
Construction: construction sector value-added in the production approach to the calculation of GDP.
Annual growth rates in % are covered on the right-hand scale; the first two series in the legend are
    cumulative and covered on the left-hand scale.
Sources: see Table 1.

Figure 1.   Fixed Asset Deflators 1952-1985, Cumulative and Annual
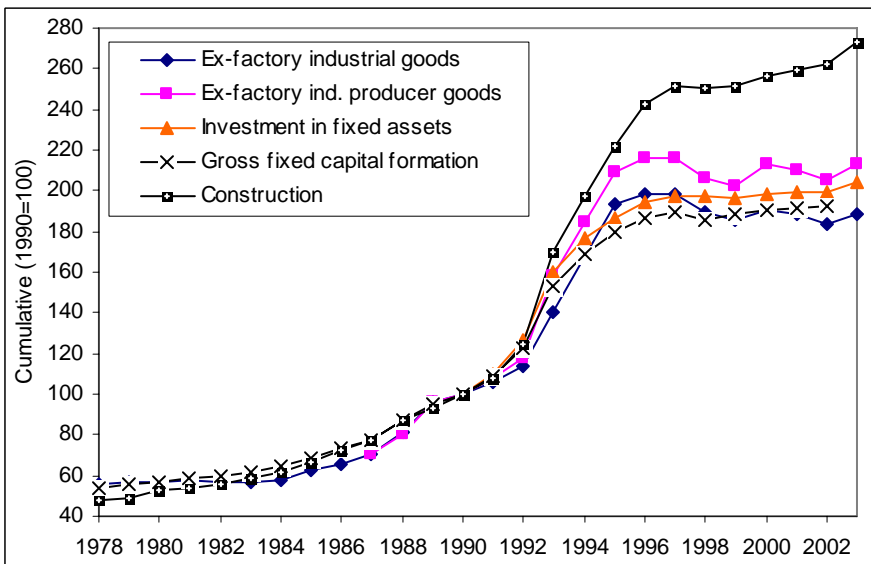
Each deflator is set equal to 100 in 1990.
Sources: see Table 1.

Figure 2.   Fixed Asset Deflators 1978-2003 (Cumulative), 1990=100
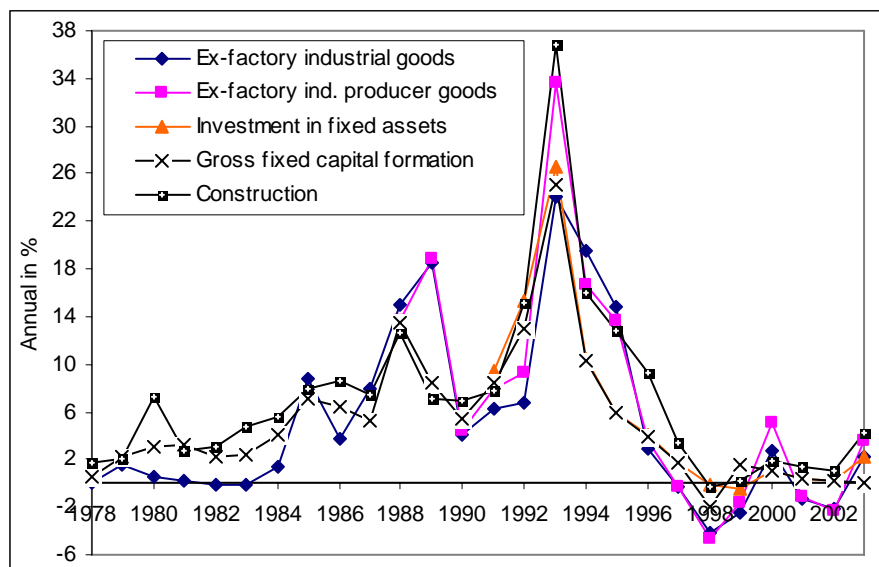
Sources: see Table 1.

Figure 3. Fixed Assets Deflators 1978-2003 (Annual relative change in %)

References

Liu Chengxiang, Liu Ke, and Jin Zhaofeng. *Ruhe shiyong tongji nianjian* (How to Use the Statistical Yearbook). Beijing: Zhongguo tongji chubanshe, 2000.

Chow, Gregory. *Understanding China's Economy*. Singapore: World Scientific Publishing Company, 1994.

GDP 1996-2002. *Zhongguo guonei shengchan zongzhi hesuan lishi ziliao* (Historical Data on China's Gross Domestic Product 1996-2002). Beijing: Zhongguo tongji chubanshe, 2003.

GDP Manual. *Zhongguo guonei shengchan zongzhi hesuan shouce* (Manual for the calculation of GDP in China). Compiled by the NBS National Income Accounting Division, 2001.

Market Statistical Yearbook 1993. *Zhongguo shichang tongji nianjian 1993* (China Market Statistical Yearbook 1993). Beijing: Zhongguo tongji chubanshe, 1993.

NBS (National Bureau of Statistics) 1997. *Zhongguo niandu guonei shengchan zongzhi jisuan fangfa* (Method of calculating China's annual GDP). Issued by the NBS National Income Accounts Division. Beijing: Zhongguo tongji chubanshe, 1997.

Statistical Yearbook. *Zhongguo tongji nianjian* (Statistical Yearbook of China). Beijing: Zhongguo tongji chubanshe, various years.