
Appendix A: Estimating Output for the United States

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WE BEGIN WITH the National Income and Product Accounts (NIPA) as our primary source data. The data correspond to the most recent benchmark revision published by the Bureau of Economic Analysis (BEA) on October 29, 1999. The data provide measures of investment and consumption, in both current and chained 1996 dollars. The framework developed by Christensen and Jorgenson (1973), however, calls for a somewhat broader treatment of output than that of the national accounts. Most important, consumers' durable goods are treated symmetrically with investment goods, since both are long-lived assets that are accumulated and provide a flow of services over their lifetime. We use a rental price to impute a flow of consumers' durables services included in both consumption output and capital input. We also employ a rental price to make relatively small imputations for the service flows from owner-occupied housing and institutional equipment.

Table A.1 presents the time series of total output in current dollars and the corresponding price index for 1959-98. The table also includes the current dollar value and price index for information technology output components — computer investment, software investment, communications investments, computer and software consumption, and the imputed service flow of computer and software consumer durables — as described in Equation (4) of Chapter 2.

| Year | Private Domestic Output | | Computer Investment | | Software Investment | | Communications Investment | | Computer and Software Consumption | | Computer and Software Consumption Services | |
|------|-------------------------|-------|---------------------|--------|---------------------|-------|---------------------------|-------|-----------------------------------|-------|--|-------|
| | Value | Price | Value | Price | Value | Price | Value | Price | Value | Price | Value | Price |
| 1959 | 484.1 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 1.80 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1960 | 472.8 | 0.24 | 0.20 | 697.30 | 0.10 | 0.61 | 2.30 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1961 | 490.1 | 0.24 | 0.30 | 522.97 | 0.20 | 0.62 | 2.70 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1962 | 527.1 | 0.25 | 0.30 | 369.16 | 0.20 | 0.63 | 3.00 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1963 | 562.1 | 0.25 | 0.70 | 276.29 | 0.40 | 0.63 | 2.90 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1964 | 606.4 | 0.26 | 0.90 | 229.60 | 0.50 | 0.64 | 3.00 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1965 | 664.2 | 0.26 | 1.20 | 188.74 | 0.70 | 0.65 | 3.50 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1966 | 728.9 | 0.27 | 1.70 | 132.70 | 1.00 | 0.66 | 4.00 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1967 | 763.1 | 0.28 | 1.90 | 107.71 | 1.20 | 0.67 | 4.20 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1968 | 811.0 | 0.28 | 1.90 | 92.00 | 1.30 | 0.68 | 4.70 | 0.51 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1969 | 877.7 | 0.29 | 2.40 | 83.26 | 1.80 | 0.70 | 5.80 | 0.54 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1970 | 937.9 | 0.31 | 2.70 | 74.81 | 2.30 | 0.73 | 6.70 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1971 | 991.5 | 0.32 | 2.80 | 56.98 | 2.40 | 0.73 | 6.80 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1972 | 1,102.9 | 0.33 | 3.50 | 45.93 | 2.80 | 0.73 | 6.80 | 0.62 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1973 | 1,255.0 | 0.36 | 3.50 | 43.53 | 3.20 | 0.75 | 8.40 | 0.64 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1974 | 1,345.9 | 0.38 | 3.90 | 35.55 | 3.90 | 0.80 | 9.40 | 0.69 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1975 | 1,472.7 | 0.42 | 3.60 | 32.89 | 4.80 | 0.85 | 9.70 | 0.76 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1976 | 1,643.0 | 0.44 | 4.40 | 27.47 | 5.20 | 0.87 | 11.10 | 0.80 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1977 | 1,828.1 | 0.47 | 5.70 | 23.90 | 5.50 | 0.89 | 14.40 | 0.78 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1978 | 2,080.4 | 0.50 | 7.60 | 16.17 | 6.60 | 0.90 | 17.70 | 0.81 | 0.10 | 33.68 | 0.02 | 17.84 |
| 1979 | 2,377.8 | 0.56 | 10.20 | 13.40 | 8.70 | 0.95 | 21.40 | 0.83 | 0.10 | 32.81 | 0.07 | 19.01 |

| Table A.1 (cont'd) | | | | | | | | | | | | |
|---------------------------|--------------------------------|--------------|----------------------------|--------------|----------------------------|--------------|----------------------------------|--------------|--|--------------|---|--------------|
| | Private Domestic Output | | Computer Investment | | Software Investment | | Communications Investment | | Computer and Software Consumption | | Computer and Software Consumption Services | |
| Year | Value | Price | Value | Price | Value | Price | Value | Price | Value | Price | Value | Price |
| 1980 | 2,525.9 | 0.59 | 12.50 | 10.46 | 10.70 | 1.01 | 25.70 | 0.88 | 0.20 | 22.11 | 0.20 | 25.93 |
| 1981 | 2,825.6 | 0.65 | 17.10 | 9.19 | 12.90 | 1.07 | 29.00 | 0.96 | 0.40 | 18.79 | 0.25 | 13.90 |
| 1982 | 2,953.5 | 0.69 | 18.90 | 8.22 | 15.40 | 1.12 | 31.10 | 1.01 | 1.40 | 15.12 | 0.74 | 11.96 |
| 1983 | 3,207.7 | 0.72 | 23.90 | 6.86 | 18.00 | 1.13 | 31.90 | 1.03 | 2.90 | 10.71 | 2.07 | 10.39 |
| 1984 | 3,610.3 | 0.75 | 31.60 | 5.55 | 22.10 | 1.14 | 36.60 | 1.07 | 3.00 | 9.41 | 2.37 | 6.07 |
| 1985 | 3,844.1 | 0.76 | 33.70 | 4.72 | 25.60 | 1.13 | 39.90 | 1.09 | 2.90 | 8.68 | 2.70 | 4.93 |
| 1986 | 3,967.4 | 0.76 | 33.40 | 4.06 | 27.80 | 1.12 | 42.10 | 1.10 | 5.20 | 6.54 | 4.84 | 5.61 |
| 1987 | 4,310.8 | 0.79 | 35.80 | 3.46 | 31.40 | 1.12 | 42.10 | 1.10 | 6.20 | 5.91 | 4.91 | 3.54 |
| 1988 | 4,766.1 | 0.84 | 38.00 | 3.21 | 36.70 | 1.14 | 46.70 | 1.10 | 8.20 | 5.41 | 6.65 | 3.24 |
| 1989 | 5,070.5 | 0.86 | 43.10 | 3.00 | 44.40 | 1.11 | 46.90 | 1.10 | 8.30 | 5.02 | 7.89 | 2.85 |
| 1990 | 5,346.8 | 0.89 | 38.60 | 2.72 | 50.20 | 1.09 | 47.50 | 1.11 | 8.90 | 4.22 | 10.46 | 2.97 |
| 1991 | 5,427.2 | 0.91 | 37.70 | 2.45 | 56.60 | 1.10 | 45.70 | 1.11 | 11.90 | 3.53 | 11.66 | 2.44 |
| 1992 | 5,672.4 | 0.92 | 43.60 | 2.09 | 60.80 | 1.04 | 47.80 | 1.10 | 12.10 | 2.68 | 14.96 | 2.25 |
| 1993 | 5,901.8 | 0.93 | 47.20 | 1.78 | 69.40 | 1.04 | 48.20 | 1.09 | 14.50 | 2.07 | 16.26 | 1.71 |
| 1994 | 6,374.4 | 0.96 | 51.30 | 1.57 | 75.50 | 1.02 | 54.70 | 1.07 | 18.00 | 1.81 | 16.14 | 1.17 |
| 1995 | 6,674.4 | 0.97 | 64.60 | 1.31 | 83.50 | 1.02 | 60.00 | 1.03 | 21.00 | 1.44 | 22.64 | 1.13 |
| 1996 | 7,161.2 | 1.00 | 70.90 | 1.00 | 95.10 | 1.00 | 65.60 | 1.00 | 23.60 | 1.00 | 30.19 | 1.00 |
| 1997 | 7,701.8 | 1.02 | 76.70 | 0.78 | 106.60 | 0.97 | 73.00 | 0.99 | 26.20 | 0.69 | 33.68 | 0.71 |
| 1998 | 8,013.3 | 1.01 | 88.51 | 0.57 | 123.41 | 0.96 | 83.60 | 0.97 | 30.40 | 0.48 | 36.53 | 0.48 |

Notes: Values are in billions of current dollars. All price indexes are normalized to 1.0 in 1996.

