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# Appendix

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## *Notations and Definitions*

- Let  $O$  = real output (gross product in 1954 dollars)  
 $E$  = employment (persons engaged in production)  
 $M$  = man-hours  
 $C$  = total labor compensation  
 $L$  = labor input (adjusted for hours and quality)  
 $Y$  = gross product in current dollars  
 $T$  = total factor input in real terms  
 $K$  = capital input  
 $\alpha$  = labor's share of output  
 $\beta$  = capital's share of output  
 $A$  = a family of productivity measures

$\bar{O}, \bar{E}, \bar{M}$ , etc. = annual rates of change of  $O, E, M$ , etc.

Subscript  $i$  = industry  $i$

- $a$  = all industries  
 $t$  = terminal-year values  
 $o$  = initial-year values  
 $g$  = goods sector  
 $s$  = service sector

- $\bar{A}_1 = \bar{O} - \bar{E}$  = output per man  
 $\bar{A}_2 = \bar{O} - \bar{M}$  = output per man-hour  
 $\bar{A}_3 = \bar{O} - \bar{L}$  = output per unit of labor input  
 $\bar{A}_4 = \bar{O} - \bar{T}$  = output per unit of total factor input  
 $\bar{A}_5 = \bar{O} - (\alpha\bar{L} + \beta\bar{K})$  = output per unit of labor and capital combined

Appendix

$$(1) \quad \bar{L}_t - \bar{L}_a = \frac{\overline{C_{tt}}}{C_{ot}} \div \frac{C_{ta}}{C_{oa}}$$

$$(2) \quad \bar{T}_t - \bar{T}_a = \frac{\overline{Y_{tt}}}{Y_{ot}} \div \frac{Y_{ta}}{Y_{oa}}$$

$$(3) \quad \bar{A}_{sg} - \bar{A}_{sa} = (\bar{O}_g - \bar{O}_a) - [\alpha(\bar{L}_g - \bar{L}_a) + \beta(\bar{K}_g - \bar{K}_a)]$$

## Productivity Trends in Goods and Service Sectors

TABLE A-1  
SELECTED MEASURES OF OUTPUT AND INPUT BY SECTOR AND INDUSTRY,  
1929, 1947, AND 1961

	Current-Dollar GNP (billion)			Constant (1954) Dollar GNP (billion)			Employment (million)		
	1929 (1)	1947 (2)	1961 (3)	1929 (4)	1947 (5)	1961 (6)	1929 (7)	1947 (8)	1961 (9)
All industries	104.5	233.5	515.3	183.2	286.2	442.7	46.2	57.6	67.1
Goods	54.2	126.9	250.9	93.1	150.5	225.5	27.6	31.3	30.9
Service	50.3	106.6	264.4	90.1	135.7	217.2	18.7	26.3	36.2
Goods*	44.1	103.0	222.8	74.8	129.5	197.7	17.9	23.6	24.9
Service*	28.5	67.3	147.5	55.7	81.9	124.5	12.3	16.8	21.7
Agriculture, forestry, and fisheries	9.1	21.3	22.5	16.5	17.7	22.7	9.2	7.0	5.0
Mining	3.1	6.3	11.5	7.2	8.5	11.0	1.0	1.0	.7
Contract construction	4.1	9.0	24.3	9.8	12.2	18.5	2.3	3.0	4.2
Manufacturing	24.8	66.6	140.2	45.5	83.1	121.9	10.6	15.4	16.1
Transportation	8.0	13.8	22.2	8.2	17.3	21.5	3.0	3.0	2.6
Communications and public utilities	4.1	7.3	24.6	4.1	8.4	24.8	1.0	1.2	1.5
Government enterprise	1.0	2.6	5.6	1.8	3.3	5.1	.4	.7	.9
Trade	16.7	46.5	91.6	34.4	53.7	78.1	7.8	11.0	13.5
Finance, insurance, real estate, and services	29.3	43.4	122.0	45.3	59.2	103.4	8.1	9.3	13.0
(Finance, insurance, and services excluding households and institutions)	(11.8)	(20.8)	(55.9)	(21.3)	(28.2)	(46.4)	(4.5)	(5.8)	(8.2)
General government	4.3	16.7	50.8	10.4	22.8	35.7	2.8	6.1	9.7

(continued)

Appendix

TABLE A-1 (concluded)

	Man-Hours (billion)		Labor Compensation (billion)	
	1929 (10)	1947 (11)	1961 (12)	1961 (15)
All industries	111.2	120.8	131.6	340.4
Goods	63.3	65.6	60.8	168.7
Service	48.0	55.2	70.7	171.7
Goods*	40.4	48.5	48.3	153.9
Service*	33.7	37.5	45.4	105.9
Agriculture, forestry, and fisheries	22.0	15.8	10.8	9.2
Mining	2.1	1.9	1.3	3.2
Contract construction	4.9	6.0	8.0	8.9
Manufacturing	23.3	31.0	31.0	25.2
Transportation	7.6	7.2	5.1	45.1
Communications and public utilities	2.4	2.4	2.9	16.9
Government enterprise	.9	1.2	1.7	9.6
Trade	22.1	25.4	29.4	2.0
Finance, insurance, real estate, and services	20.7	19.3	25.2	12.5
(Finance, insurance, and service excluding households and institutions)	(11.7)	(12.1)	(16.0)	(7.7)
General government	5.2	10.6	16.2	4.3
				16.7
				50.8
				64.5
				56.4
				(41.3)

## *Productivity Trends in Goods and Service Sectors*

### NOTES TO TABLE A-1

Unless otherwise indicated, the source is Office of Business Economics, National Income Division: 1929, *National Income, 1954 Edition*; 1947, *U. S. Income and Output*; 1961, *Survey of Current Business*, July 1963.

*Gross Product in Current Dollars:* Data for 1961 from "GNP By Major Industries, 1958-62, Revised and Updated," *Survey of Current Business*, September 1963. Data for 1947 from Martin L. Marimont, "GNP By Major Industries," *Survey of Current Business*, October 1962. Data for 1929 estimated from the 1947 data by assuming the same rate of change between 1929 and 1947 for gross product as for national income originating by industry.

*Gross Product in Constant (1954) Dollars:* Data for 1947 and 1961 from the same source as the gross product in current dollars described in the preceding paragraph. The 1929 estimates were obtained by applying the 1929-47 rates of change of gross product by industry published in "GNP By Major Industries." The estimate for real estate was obtained by applying the ratio of GNP in real estate to GNP in housing services in 1957 to the 1929 GNP in housing services. The 1929 gross product for government enterprise was estimated from national income originating data and gross product for all government.

*Employment:* Office of Business Economics estimates of the number of persons engaged in production. Employment in households and institutions was estimated to be the sum of employment in private households plus the number of employees in educational services not elsewhere classified and in nonprofit organizations not elsewhere classified, plus a portion of employment in medical and health services, estimated in the following manner. The compensation of the other employees in the households and institutions sector was subtracted from total compensation of employees in households and institutions. This difference represents compensation of employees in the medical and health industry that are included in the households and institutions sector. The ratio of this compensation to total compensation for all medical and health service employees was applied to the number of full-time equivalent employees in medical and health services to obtain the number that are in the households and institutions sector, on the assumption that the average compensation per employee was the same in both sectors. It was further assumed that all self-employed in the medical and health service industry are not in households or institutions.

*Man-Hours:* Man-hours were estimated from the employment series mentioned in the previous paragraph multiplied by average weekly hours taken from Kendrick, *Productivity Trends*, Table A-IX for 1929, 1948, and 1957. The 1929-47 annual rate of change was assumed to be equal to that for 1929-48. The 1947-57 rates were assumed equal to the 1948-57 rate. Rates of change of hours beyond 1957 were obtained partly from the National Bureau of Economic Research 42nd Annual Report, p. 40, or based on extrapolation of trends through 1957. Man-hours per year were estimated by assuming fifty weeks of actual work in all industries.

*Labor Compensation:* Office of Business Economics estimates of labor compensation per employee were used, and it was assumed that the self-employed in each industry group received the same compensation as the employees in that group. The sector totals were obtained as the sum of the estimates for each industry group in the sector.

Appendix

TABLE A-2  
ANNUAL RATES OF CHANGE OF OUTPUT AND INPUT MEASURES BY SECTOR AND INDUSTRY,  
1929-47, 1947-61, AND 1929-61  
(per cent)

	Current-Dollar GNP			Constant (1954)-Dollar GNP			Employment		
	1929-47 (1)	1947-61 (2)	1929-61 (3)	1929-47 (4)	1947-61 (5)	1929-61 (6)	1929-47 (7)	1947-61 (8)	1929-61 (9)
All industries	4.57	5.82	5.11	2.51	3.17	2.79	1.23	1.09	1.17
Goods	4.84	4.99	4.90	2.70	2.93	2.80	.72	-1.10	.36
Service	4.26	6.70	5.32	2.30	3.42	2.79	1.93	2.30	2.09
Goods*	4.83	5.67	5.19	3.10	3.07	3.08	1.54	.38	1.03
Service*	4.89	5.77	5.27	2.16	3.04	2.54	1.72	1.87	1.79
Agriculture, forestry, and fisheries	4.84	.42	2.87	.39	1.79	1.00	-1.48	-2.35	-1.86
Mining	4.02	4.39	4.18	.93	1.86	1.33	-.24	-2.43	-1.21
Contract construction	4.46	7.35	5.72	1.23	3.01	2.00	1.49	2.33	1.85
Manufacturing	5.64	5.46	5.56	3.40	2.78	3.13	2.12	.30	1.32
Transportation	3.08	3.45	3.24	4.24	1.56	3.06	.02	-1.25	-.54
Communications and public utilities	3.25	9.07	5.76	4.07	8.04	5.79	.78	1.47	1.08
Government enterprise	5.45	5.63	5.53	3.42	3.16	3.31	2.73	2.53	2.64
Trade	5.85	4.96	5.46	2.52	2.71	2.59	1.92	1.48	1.72
Finance, insurance, real estate, and services	2.21	7.66	4.56	1.50	4.05	2.61	.77	2.47	1.51
(Finance, insurance, and services excluding households and institutions)	(3.20)	(7.32)	(4.98)	(1.57)	(3.60)	(2.45)	(1.39)	(2.56)	(1.90)
General government	7.83	8.27	8.02	4.46	3.26	3.93	4.44	3.40	3.99

(continued)

*Productivity Trends in Goods and Service Sectors*

TABLE A-2 (concluded)

	Man-Hours			Labor Compensation		
	1929-47 (10)	1947-61 (11)	1929-61 (12)	1929-47 (13)	1947-61 (14)	1929-61 (15)
All industries	.43	.61	.53	5.15	6.06	5.55
Goods	.20	-.53	-.12	5.19	5.28	5.23
Service	.74	1.79	1.22	5.11	6.93	5.90
Goods*	.97	-.03	.56	5.19	5.68	5.40
Service*	.60	1.37	.94	4.53	6.33	5.31
Agriculture, forestry, and fisheries	-1.82	-2.71	-2.20	5.18	.09	2.92
Mining	-.57	-2.68	-1.50	3.98	2.45	3.31
Contract construction	1.14	2.04	1.53	4.38	7.71	5.97
Manufacturing	1.59	.01	.89	5.76	5.68	5.73
Transportation	-.33	-2.39	-1.23	3.98	3.65	3.83
Communications and public utilities	.00	1.35	.59	4.78	7.29	5.87
Government enterprise	1.65	2.45	2.01	5.41	7.74	6.42
Trade	.79	1.03	.90	4.94	5.65	5.25
Finance, insurance, real estate, and services	-.40	1.94	.61	3.81	7.45	5.39
(Finance, insurance, and services excluding households and institutions)	(.20)	(2.03)	(1.00)	(3.78)	(7.53)	(5.41)
General government	4.02	3.10	3.62	7.77	8.28	7.99

Source: See notes to Table A-1.