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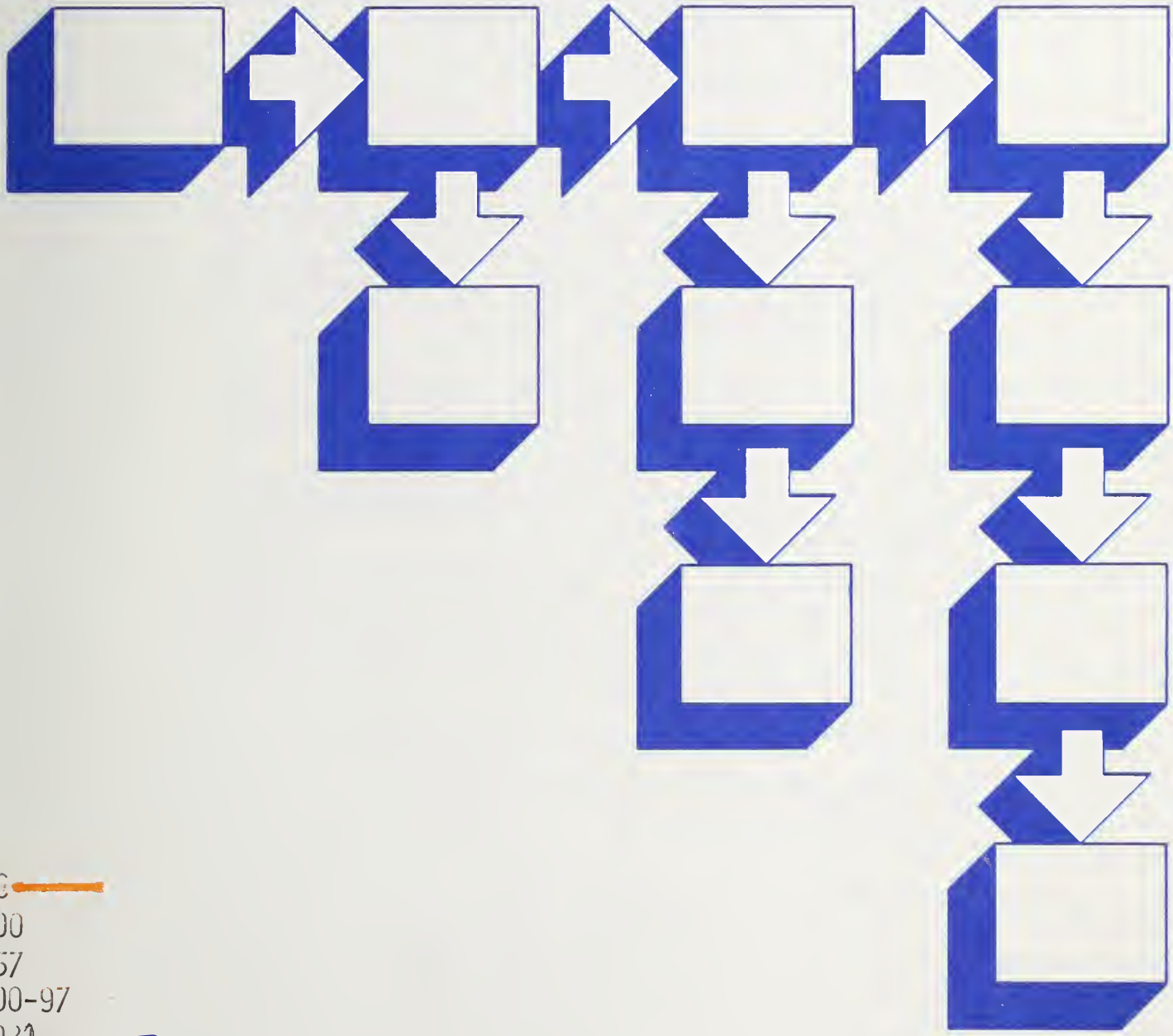
Computer Science and Technology

NBS Special Publication 500-97

Federal ADP Equipment: A Compilation of Statistics — 1981



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[2]Some divisions within the center are located at Boulder, CO 80303.

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Federal ADP Equipment: A Compilation of Statistics — 1981

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U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Bureau of Standards
Ernest Ambler, Director

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Reports on Computer Science and Technology

The National Bureau of Standards has a special responsibility within the Federal Government for computer science and technology activities. The programs of the NBS Institute for Computer Sciences and Technology are designed to provide ADP standards, guidelines, and technical advisory services to improve the effectiveness of computer utilization in the Federal sector, and to perform appropriate research and development efforts as foundation for such activities and programs. This publication series will report these NBS efforts to the Federal computer community as well as to interested specialists in the academic and private sectors. Those wishing to receive notices of publications in this series should complete and return the form at the end of this publication.

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ABSTRACT

This report presents data on the status of computer technology in the Federal Government. The report contains a combination of existing statistics from Federal Government and computer industry sources and original analyses and statistics based on these sources. Data is included on CPUs, disk units, magnetic tape units, I/O controllers, terminals, printers, plotters, and other related ADP equipment. Analyses are included on the acquisition dates of CPUs, equipment installed by agencies, the purchase-price ranges of equipment, and the type and size class of general purpose computers in the Federal Government compared with the United States. The report is based on Federal Government data from 1971 through December 31, 1981 and industry data from 1972 through 1980.

Key words: disk units; Federal Government computers; Federal minicomputers; Federal statistics; general purpose computers; magnetic tape units; terminals.

ACKNOWLEDGMENTS

The author acknowledges the professional expertise and the extensive assistance provided by ICST staff members Mr. E. Edward Bortner III and Miss Diane E. Barnes in the analysis, formulation, and preparation of the data, graphs, and charts in this report. The author also wishes to thank Mrs. Jackie Jones and Mrs. Mary Ellen Crane for their assistance in the manuscript preparation.

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Foreword

The Institute for Computer Sciences and Technology (ICST) provides information and develops methodologies to obtain information needed for the planning and evaluation of the Institute's products, i.e., standards, guidelines, and technical advisory services to improve the use of ADP in the Federal Government. To that end, ICST collects information related to product utilization, develops new methods for cost benefit analyses, develops technology forecasts, and provides statistical analyses of the Federal ADP inventory.

While most of these products are intended for internal purposes, products which are also of general interest are made more widely available through publication. Two recent general-interest products are:

Gray, Martha M., An Assessment and Forecast ADP in the Federal Government, National Bureau of Standards, Washington, D.C., NBS Special Publication 500-79, August 1981, 151 p. Available from the Superintendent of Documents, Washington, D. C. 20402. Stock number SN 003-003-02368-0. $5.50.

Arthur D. Little, Inc. and General Systems Group Inc., (under subcontract to Aurora Associates, Inc.) The Effects of Future Information Processing Technology on the Federal Government ADP Situation, NBSGCR-81-342, September 1981, 98 p. Available from the National Technical Information Service, Springfield, VA 22161. Stock number PB 82-138181. $12.00.

Comments, suggestions, and inquiries are welcome and should be addressed to:

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Section 1. Introduction

1.1 Background

The Institute for Computer Sciences and Technology (ICST) serves as a focal point for computer technology activities in the Federal Government. The Institute's programs are designed to provide standards, guidelines, and technical advisory services to improve the effectiveness of computers and computer applications in the Federal Government. Appropriate research provides the foundation for these activities.

In the process of conducting its program, the Institute regularly collects data from a variety of sources on the status of computer technology, the extent of computer use in the government and private sectors, and the projected trends in the technology and applications areas. This data is analyzed from a number of points of view in order to support ICST efforts in the development of standards and guidelines and in providing technical advisory services.

In order to make the data and resulting analyses easily accessible to others, ICST prepared "Computers in the Federal Government: A Compilation of Statistics," (NBS SP 500-7) published in June 1977 and "Computers in the Federal Government: A Compilation of Statistics - 1978" (NBS SP 500-46), issued in April 1979. Since that time, further data has been collected to support the ICST program. The GSA MIS inventory data base for October 1980 and December 31, 1981 was obtained and prepared for use on the ICST experimental computing facility. For the first time, this allowed on-line access to the data for manipulation and analyses. Because of the response to the earlier publications, ICST decided to make available the statistical analyses made possible by this new capability. This version of the compilation of data on computers in the Federal Government will, it is believed, be of general interest within and outside the Federal Government computer community.

1.2 Data Sources

The main source of information on computers installed in the Federal Government is the General Services Administration. Routinely, GSA makes some information available in its publications, "Inventory of Automatic Data Processing Equipment in The United States Government for Fiscal Year 19xx" and "Summary of Federal ADP Activities in The United States Government as of the end of Fiscal Year 19xx."

In order to make possible a more detailed comparison between the Federal computer inventory and computers in the U.S. as a whole, data was obtained from GSA for Federal computers on a calendar (rather than fiscal) year basis. Since these figures are not part of GSA's published statistics, and have therefore not received the same amount of scrutiny as the fiscal year figures,

they are to be considered as estimates of the year-end installed computers in the Federal Government.

The source of statistics on computers in the United States, used in this report, is International Data Corporation (IDC). In the Annual Review and Forecast issue of the "EDP Industry Report" IDC publishes a census of computer models in the U.S. and the total number of computers for past, present, and future years. Other U.S. figures in this report were obtained from IDC by special request or taken from IDC special reports.

1.3 Structure of the Report

Section 2 of this report contains a detailed analysis of the components of the Federal ADP inventory including CPUs, disk units, magnetic tape units, terminals, I/O controllers, etc. This section relied on an automated data file based entirely on the GSA files which include data for year-end 1980 and 1981 as well as some historical data from 1971 through 1981.

Section 3 contains a comparative analysis by type and size class of the computers in the Federal Government and in the United States as a whole. This section draws on three information sources: GSA data files, IDC data, and a model by model analysis performed by ICST. Section 3 includes data from 1972 through 1980.

Due to the fact that the section 3 information, which includes the model-by-model census, draws on three sources, the reported numbers of CPUs differ somewhat from those reported in section 2. Because the section 3 material was compiled manually, the results could not easily be transferred to the automated data file used for section 2. Thus, the discrepancies were allowed to remain in this edition of the report. The nature of the differences are detailed in section 3.1.

1.4 Definitions*

In this report, the terms "CPU" and "computer" are used synonymously. The term "computer system" includes both the CPU and any peripheral equipment attached to it. Note that GSA defines "CPU" as "a unit of a computer system that includes the circuits for controlling the interpretation and execution of instructions". (1)

*Certain commercial products are identified in this section in order to cite relevant examples. In no case does such identification imply recommendation or endorsement by the Institute for Computer Sciences and Technology or the National Bureau of Standards.

The second section of this report utilizes the GSA ADPE Component Class Codes and refers to equipment as specified by these codes. GSA does not provide definitions for all of the terms used but some definitions are provided in the GSA MIS Glossary (Appendix).

The third section of this report classifies computers by three categories and six size classes. The definitions of these categories and size classes are those of The International Data Corporation. They were utilized in this third section to allow comparisons of trends in U.S. and Federal computers.

International Data Corporation divides computer systems into four categories, general purpose computers, minicomputers, small business computers, and desktop computers. The definitions of these categories are as follows:

General Purpose Computers

"General purpose computers - as characterized by IBM's System 3, System 38, 370, 4300, 303X, and 3081, and competitors - are designed for use in a wide variety of applications. They are character or byte oriented and programmed in higher level languages." The general purpose computers are divided into six size classes, size classes two through seven. "Instead of being defined by shifting average purchase or rental values, size classes are based on IBM products and other manufacturers' models that compete with them, e.g., a computer in size class 7 would compete with an IBM 3033."(2)

As was mentioned above, the general purpose computers are divided into six size classes, size class two through seven. (Size class one computers were moved to the small business computers category in 1977, and size class one was eliminated.) Because the size classes are based on one manufacturer's product line and not elaborate definitions of price or memory size, no attempt will be made to define the size classes other than to say that size class two is the smallest of the general purpose computers and usually considered entry level machines while size class seven is the largest of the machines. Readers interested in specific models may refer to "General Purpose Computer Census" given in the EDP Industry Report.(3) The size class is listed for each model in the census.

Minicomputers

"IDC categorizes certain computers as minicomputers based primarily on the perceived marketplace for these products. By definition, minis are general purpose in design, but are sold as tools as well as solutions; are available from makers in configurations ranging from board only to complete systems; are available to OEMs and are usually discounted in volume buys; are part of a family with low end products generally in the $1,000 - $25,000 price range; and have at least 4K RAM. Minicomputers range in size class from Microminis (M) which compete with high

end microcomputers to traditional Minis (T) to Superminis (S), which frequently compete with small General Purpose Computers in interactive commercial applications."(4)

Small Business Computers

"The categorization of certain computers as 'small business computers' is based on marketplace definitions as perceived by IDC. SBCs are those small general purpose computers marketed to smaller businesses, first-time users, and increasingly to small units of large organizations. They include offerings from the major mainframers (such as IBM's System/32 and 34); products such as DEC's Datasystem 1300 from the minimakers but aimed at commercial first-time users; equipment from firms (such as Qantel) that manufacture only SBCs; and products from companies that market systems assembled from others' minicomputers (i.e., systems houses)."(5)

Desktop Computers

"The Desktop Computer Census counts those computers which typically are small enough to be used on a desktop, and are found in a variety of end-user environments including business, home, hobby, personal, educational and scientific. By IDC definition the Desktop Computer is microprocessor based, includes its own power supply and enclosure, has the capability for attaching output peripherals-video screen and/or printer - and can also attach storage devices such as floppy diskettes, tape cassettes, or in some cases fixed disks. The computer is programmable in BASIC or equivalent level language, and costs from less than $1,000 up to $15,000 in a basic configuration. Microcomputer boards and bits are not counted here."(6)

Special Computers

After reviewing the Federal inventory using the categories established by IDC, we determined that there were certain computers which did not fit into any of these categories. For this reason, and to make this research consistent with available historical data, we have utilized a "special" category. This category contains: communications processors, data entry machines, process control computers, special government designed computers, graphics systems, and machines designed wholly for military use.

References

1. Automatic Data Processing Equipment Inventory in the United States Government as of the end of Fiscal Year 1981, General Services Administration, Washington, D. C., February 1982, 629 p.

2. EDP Industry Report, Vol. 17, No. 3, 4, June 26, 1981, p. 14.

3. "General Purpose Computer Census" in EDP Industry Report, Vol. 17, No. 3, 4, June 26, 1981, pp. 14-16.

4. EDP Industry Report, Vol. 17, No. 3, 4, June 26, 1981, p. 6.

5. EDP Industry Report, Vol. 17, No. 2, June 3, 1981, p. 6

6. Ibid, p. 10.

Section 2. Analysis of the Federal Inventory

The detailed analysis presented in this section was made possible, for the first time, by the automation of the GSA MIS inventory at the ICST experimental computer facility. The automation was accomplished on the Digital Equipment Corporation VAX 11/780, using Datatrieve software supplemented by subroutines developed by Edward Bortner of ICST's Information Processes Group. The availability of the inventory data base for on-line searches permitted the analysis of all of the equipment in the inventory including CPUs, magnetic tape units, disk units, I/O devices, printers, plotters, and terminals.

The reader should be aware that the responsibility for the assignment of equipment, e.g. whether or not a disk unit is given the code as a disk unit, rests with the individuals filling out the GSA reporting forms. No effort was made to verify the validity of the over-300,000 items in the inventory. The statistical analysis was made on the data as provided by the agencies to GSA.

2.1 Overview of the Inventory

The December 31, 1981 GSA MIS inventory reports ADP equipment (over 300,000 machines) from 4,434 installations controlled by 61 defense and civilian agencies within the Executive branch. The equipment is physically located both overseas and in the United States, either in Federally-run installations or at Federal contractors' facilities. It may be either owned outright or leased by the Federal government. Overall, 71 percent of the inventory is owned by the government (71 percent when analyzed either by the number of machines or the total purchase price).

The ADP equipment listed in this inventory is only listed for non-classified installations. No classified equipment is included. Both stand-alone equipment and equipment which is part of an ADP system are included. There are 13,068 ADP systems listed. CPUs from 275 manufacturers, costing from less than $5,000 to over $9 million dollars, are included. In addition to CPUs, the inventory contains equipment such as keypunches, modems, multiplexors, terminals, tape drives, disk drives, and I/O controllers. The inventory contains equipment with acquisition dates from the 1950s through 1981.

The rest of section 2.1 includes a description of the 13,068 systems, analyzing them by type of system and by agency, and an analysis of agencies' total machines.

2.1.1 Systems by Type and Agency

Table 1 is a by-agency list of installed computer systems. GSA defines computer system as: "A configuration of ADP equipment

TABLE 1

Installed Computer Systems

AGENCY	SYSTEM TYPE A #	B #	C #	D #	E #	F #	G #	H #	I #	TOTAL SYSTEMS
ACTION	20									20
ADMINISTRATIVE OFFICE of the US COURTS	2									2
AGENCY for INTERNATIONAL DEV.	1				1					2
CIVIL AERONAUTICS BOARD		1								1
COMMODITY FUTURES TRADING COMMISSION	2									2
COMMUNITY SERVICES ADMIN.	1									1
DEFENSE COMMUNICATIONS AGENCY	12	2	2			2			2	20
DEFENSE CONTRACT AUDIT AGENCY	1									1
DEFENSE INTELLIGENCE AGENCY	1	6								7
DEFENSE INVESTIGATIVE SERVICE		1								1
DEFENSE LOGISTICS AGENCY	56	86	1		2			9		154
DEFENSE MAPPING AGENCY	73	4	4	3	3	1		1		89
DEFENSE NUCLEAR AGENCY	15	4								19
DEPARTMENT of AGRICULTURE	174	27	8	2	3					214
DEPARTMENT of COMMERCE	429	36	5		5		1	1		477
DEPARTMENT of EDUCATION	3									3
DEPARTMENT of ENERGY	3,073	56	123	36	74	19	6	2	4	3,393
DEPARTMENT of HEALTH AND HUMAN SERVICES	227	77	7	2	4	3		1	1	322
DEPARTMENT of HOUSING AND URBAN DEV.		6	1							7
DEPARTMENT of JUSTICE	27	6			1					34
DEPARTMENT of LABOR	8	25								33
DEPARTMENT of STATE	9	36			7		1			53
DEPARTMENT of TRANSPORTATION	164	62	2		1	39				268
DEPARTMENT of the AIR FORCE	1,258	457	183	2	46	18	1	2	1	1,968
DEPARTMENT of the ARMY	1,187	311	68	21		32	3	2		1,624
DEPARTMENT of the INTERIOR	192	15	3	1	11		2		1	225
DEPARTMENT of the NAVY	1,373	171	69	88	38	6	9			1,754
DEPARTMENT of the TREASURY	83	84	1	4	12					194
ENVIRONMENT PROTECTION AGENCY	161	9			3					173
EQUAL EMPLOYMENT OPPORTUNITY COMMISSION	1									1
EXPORT-IMPORT BANK of the US	1									1
FEDERAL COMMUNICATIONS COMMISSION	3					1				4
FEDERAL DEPOSIT INSURANCE CORPORATION			1							1
FEDERAL EMERGENCY MANAGEMENT AGENCY	8	6								14
FEDERAL HOME LOAN BANK BOARD		2								2
FEDERAL MEDIATION AND CONCILIATION SERVICE										
FEDERAL RESERVE SYSTEM	1									1
FEDERAL TRADE COMMISSION										
GENERAL ACCOUNTING OFFICE		1								1
GENERAL SERVICES ADMIN.	36	4			2					42
GOVERNMENT PRINTING OFFICE	3	1			1					5
INTERNATIONAL COMMUNICATION AGENCY	1									1
INTERSTATE COMMERCE COMMISSION	1									1
LIBRARY of CONGRESS				1						1

TABLE 1--Continued

Installed Computer Systems

AGENCY	SYSTEM TYPE A #	B #	C #	D #	E #	F #	G #	H #	I #	TOTAL SYSTEMS
NATIONAL AERONAUTICS and SPACE ADMIN.	279	35	59	79	34	10	24	17	33	570
NATIONAL LABOR RELATIONS BOARD	1									1
NATIONAL SCIENCE FOUNDATION	59	2	15	3						79
NUCLEAR REGULATORY COMMISSION		9								9
OFFICE of ADMINISTRATION		2			2					4
OFFICE of PERSONNEL MANAGEMENT	26				1					27
OFFICE of THE SECRETARY OF DEFENSE		5								5
OFFICE of THE US TRADE REPRESENTATIVE	3									3
PANAMA CANAL COMMISSION	1								1	2
RAILROAD RETIREMENT BOARD	3									3
SECURITIES and EXCHANGE COMMISSION		1								1
SELECTIVE SERVICE SYSTEM	2	1		1						4
SMALL BUSINESS ADMIN.	1		2							3
SMITHSONIAN INSTITUTION										
TENNESSEE VALLEY AUTHORITY	636	1							1	638
US INTERNATIONAL TRADE COMMISSION		1								1
VETERANS ADMIN.	533	45	4							582
TOTAL	10,151	1,598	568	243	251	131	47	35	44	13,068

which includes one or more CPU's. A system can include CPU's by more than one manufacturer." GSA also classifies the computer systems into 9 types as follows:(1)

Type A - One CPU and no remote equipment.

Type B - One CPU and remote equipment.

Type C - One CPU as the main processor and one or more other CPU's (and their associated machines) as full-time peripherals or input/output (I/O) processors.

Type D - One CPU as the main processor and one or more other CPU's (and their associated machines) as part-time peripherals and as part-time independent computer systems.

Type E - Cable-connected CPU's as independent processors with shared memory and peripherals.

Type F - Cable-connected CPU's as independent processors and other remote CPU's (with their associated machines) as full-time peripherals or I/O processors.

Type G - Cable-connected CPU's as independent processors, with remote CPU's (and their associated machines) as part-time peripherals and as part-time independent systems.

Type H - Two or more computer systems with one system as the main system and with the other one or more separate systems as I/O processors, all under the direction of a single operational manager.

Type I - Two or more computer systems physically separate but functioning as an entity under a single operational manager, with unified input, job flows, dispatch, and control.

As table 1 shows, the largest number of systems are Type A systems, with over 10,000 installed. Type A systems represent almost 78 percent of all of the computer systems. The next largest number are Type B systems. These represent about 12 percent of total computer systems. These two types, the systems which have single CPUs, represent almost 90 percent of the total computer systems. Generally, the number of the systems decreases as the complexity of the configuration increases.

The agencies with the largest number of systems are Energy, Air Force, Navy and Army. Energy has 26 percent of the total number of systems, Air Force 15 percent, Navy 13 percent, and Army 12 percent. Together they have 67 percent of the total computer systems. NASA has the largest number of larger, more complex systems, Types G, H and I.

One other note is worth mentioning on the configurations of the multiple CPU systems, Types C through I. If the 11,749 single CPU system types are subtracted from the total number of 17,723 CPUs reported in the inventory, it is evident that 5,974 CPUs are included in the multiple-CPU systems--or an average of 4.5 CPUs per multiple-CPU system. One common multiple-CPU system configuration is a large, general purpose or scientific computer with one or more minicomputers attached. Another common configuration is a system comprised of several minicomputers.

2.1.2 Machines by Agency

There are over 300,000 machines in the Federal Government for a total purchase price of almost $6 billion. Table 2 is a listing of the total number of all machines (including CPUs, disk units, tape units, terminals, keypunches, etc.) in each agency and the total purchase price of each agency's machines. In other words, this listing shows the total number of pieces of ADP equipment in each agency and the total value of that ADP equipment. The specific kinds of equipment are discussed in the rest of section 2. Figures 1 and 2 are bar-graphs showing the agencies with the largest number of machines and the largest total purchase prices. Agencies which have over 5,000 machines are shown in figure 1 and over $100 million for total purchase price of equipment in figure 2.

The Air Force has both the largest number of machines and the largest total purchase price, with 22 percent of the total number of machines and 21 percent of the total purchase price. Energy follows with 17 percent of the number of machines and 15 percent of the total dollar value. Army is next with 13 percent both by number and purchase price. The Navy and NASA follow although their ranked order is reversed depending on the measure used. Navy has nine percent of the number of machines and 10 percent of the total purchase price. NASA has eight percent of the number of machines and 11 percent of the total purchase price. These five agencies represent 69 percent of the total number of installed ADP equipment and 70 percent of the total purchase price.

2.2 Analysis by GSA Machine Codes

For purposes of analysis in this section, the equipment reported in the GSA MIS inventory of Federal computers was sorted and summarized according to the GSA codes, as shown in Table 3. This sort and summary enabled the analysis of 1980 and 1981 data.

A summary of the 1980 and 1981 computer inventories, sorted by GSA codes is given in table 4. This table is divided into three sections: the first section refers to total units in the inventory; the second section refers to purchase price; the third section displays the percentage of total purchase price spent on the components of each GSA code category. Each section shows delta changes between the two years.

TABLE 2

ADP Machines by Agency

AGENCY	#	PURCHASE PRICE
ACTION	111	$1,330,447
Administrative Office of the US Courts	69	$2,220,679
Agency for International Dev.	175	$3,789,349
Civil Aeronautics Board	145	$1,508,404
Commodity Futures Trading Commission	26	$734,904
Community Services Admin.	59	$866,593
Defense Communications Agency	1,621	$44,794,892
Defense Contract Audit Agency	21	$367
Defense Intelligence Agency	297	$68,167,157
Defense Investigative Service	92	$1,502,031
Defense Logistics Agency	6,488	$108,848,936
Defense Mapping Agency	1,295	$29,343,765
Defense Nuclear Agency	368	$5,631,788
Department of Agriculture	7,752	$80,031,032
Department of Commerce	5,791	$126,724,957
Department of Education	8	$195,473
Department of Energy	53,924	$837,686,135
Department of Health and Human Services	15,066	$271,756,280
Department of Housing and Urban Dev.	266	$13,472,495
Department of Justice	2,893	$25,910,778
Department of Labor	930	$21,139,662
Department of State	1,624	$31,698,953
Department of Transportation	5,361	$233,074,496
Department of the Air Force	70,394	$1,188,532,750
Department of the Army	41,177	$710,740,627
Department of the Interior	8,522	$119,131,241
Department of the Navy	29,005	$581,400,973
Department of the Treasury	19,906	$171,048,139
Environment Protection Agency	1,799	$20,231,466
Equal Employment Opportunity Commission	1	$290,670
Export-Import Bank of the US	25	$744,412
Federal Communications Commission	54	$964,995
Federal Deposit Insurance Corporation	60	$3,124,730
Federal Emergency Management Agency	551	$9,159,448
Federal Home Loan Bank Board	51	$2,189,286
Federal Mediation and Conciliation Service	11	$87,080
Federal Reserve System	76	$9,527,771
Federal Trade Commission	51	$313,820
General Accounting Office	1	$33,585
General Services Admin.	2,147	$43,931,054
Government Printing Office	395	$8,577,648
International Communication Agency	28	$809,164
Interstate Commerce Commission	104	$1,012,230
Library of Congress	2	$ 0
National Aeronautics and Space Admin.	24,970	$606,890,974
National Labor Relations Board	16	$343,283

TABLE 2--Continued

ADP Machines by Agency

AGENCY	#	PURCHASE PRICE
National Science Foundation	1,323	$29,153,406
Nuclear Regulatory Commission	246	$1,129,574
Office of Administration	150	$3,385,793
Office of Personnel Management	559	$15,964,378
Office of the Secretary of Defense	91	$520,185
Office of the US Trade Representative	34	$201,417
Panama Canal Commission	197	$1,796,441
Railroad Retirement Board	181	$3,718,513
Securities and Exchange Commission	168	$1,183,416
Selective Service System	132	$2,067,407
Small Business Admin.	107	$5,127,376
Smithsonian Institution	7	$26,946
Tennessee Valley Authority	2,072	$39,710,262
US International Trade Commission	31	$71,797
Veterans Admin.	9,839	$97,128,955
	318,865	$5,590,700,785

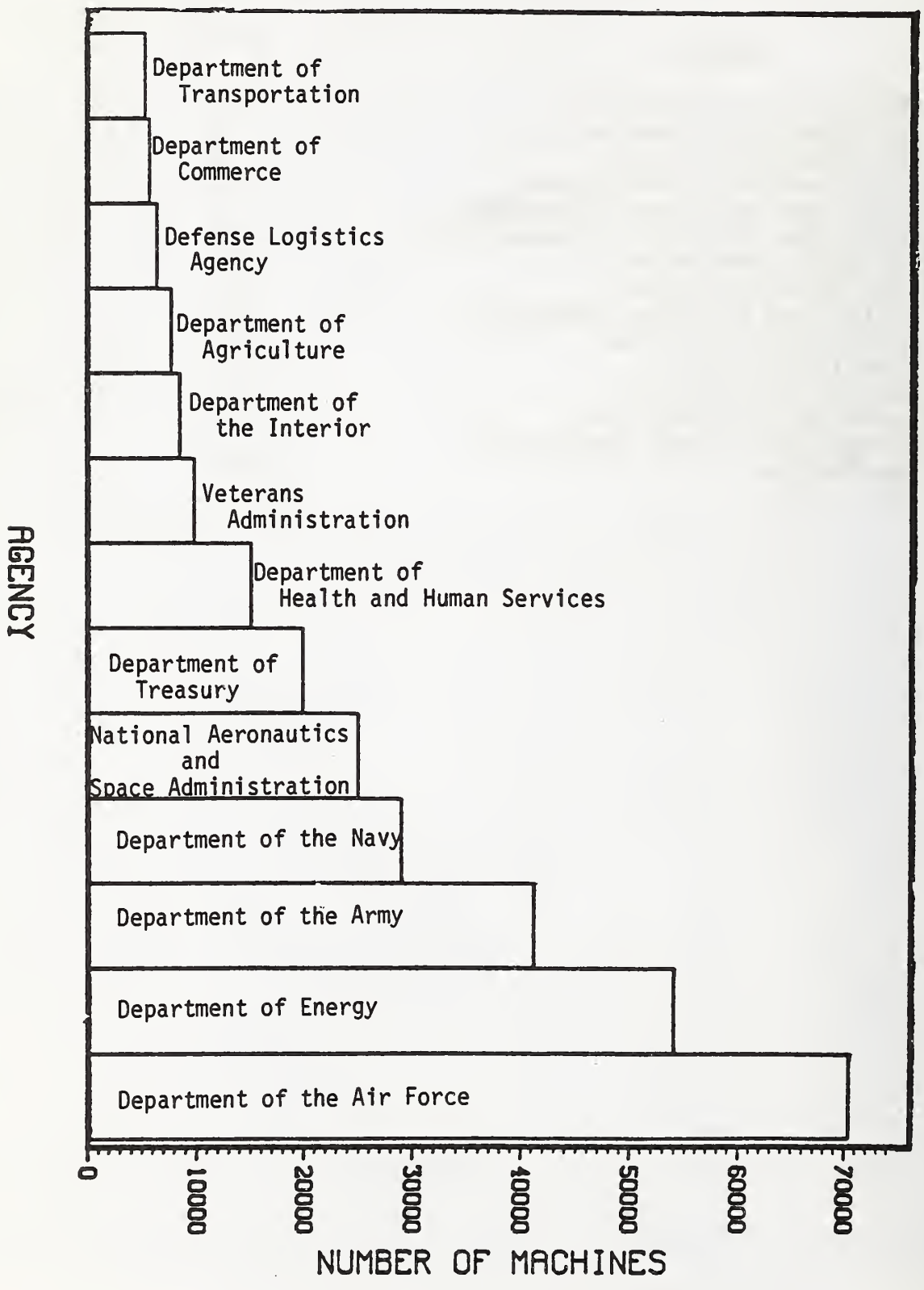
NUMBER OF MACHINES BY AGENCY
AGENCY
Department of Transportation
Department of Commerce
Defense Logistics Agency
Department of Agriculture
Department of the Interior
Veterans Administration
Department of Health and Human Services
Department of Treasury
National Aeronautics and Space Administration
Department of the Navy
Department of the Army
Department of Energy
Department of the Air Force
0
10000
20000
30000
40000
50000
60000
70000
NUMBER OF MACHINES

Figure 1

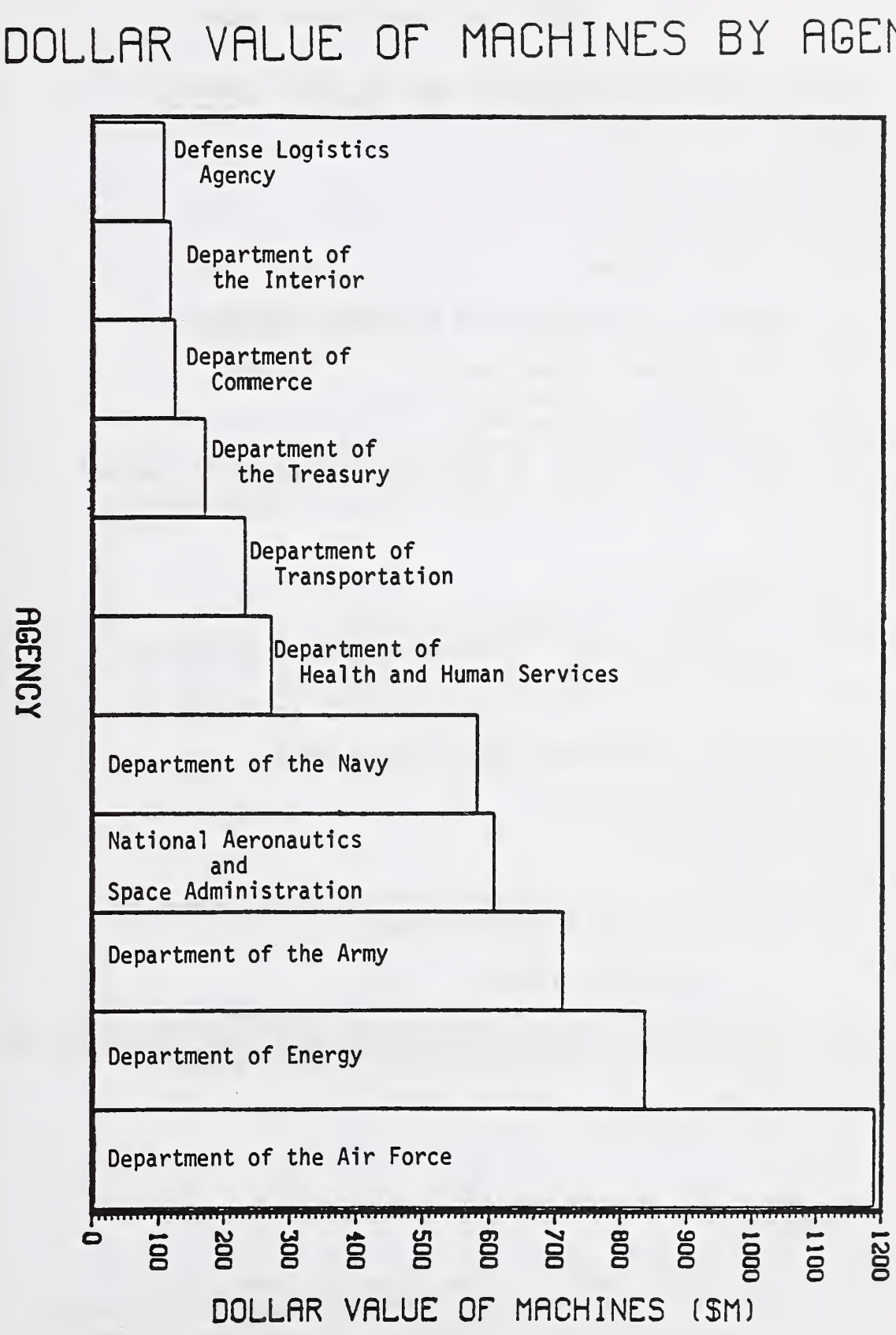
DOLLAR VALUE OF MACHINES BY AGENCY
Defense Logistics Agency
Department of the Interior
Department of Commerce
Department of the Treasury
Department of Transportation
Department of Health and Human Services
Department of the Navy
National Aeronautics and Space Administration
Department of the Army
Department of Energy
Department of the Air Force
AGENCY
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
DOLLAR VALUE OF MACHINES ($M)

Figure 2

TABLE 3

ADPE Component Class Codes

CENTRAL PROCESSORS, STORAGE AND RELATED CONTROLS	CLASS CODES
Central Processor	01
Magnetic Tape Unit	02
Magnetic Core Unit	03
Magnetic Drum Unit	04
Magnetic Disk Unit	05
Other Storage Units	06
Multipurpose Control	07
EDPE SYSTEM INPUT/OUTPUT AND RELATED CONTROLS	
Card Reader and/or Punch	20
Paper Tape Reader and/or Punch	21
Optical Character Recognition Unit	22
Magnetic Data Recording Unit	23
Magnetic Ink Character Recognition Unit	24
Data Converter (Analog to Digital, Digital to Analog)	25
Media Converter (Card to Tape, Tape to Card, etc.)	26
Plotter	27
Printer	28
Image Handling Unit	29
Display Unit	30
Operator Console and Inquiry Station	31
Control for Multiple I/O Channels; Multiplexor and Channel Selector	32
Other System Input/Output and Related Controls	33
COMMUNICATION TERMINALS AND RELATED UNITS	
Card Terminal	50
Magnetic Tape Terminal	51
Paper Tape Terminal	52
Printer Terminal	53
Input Console	54
Multiplexor, Control, Distributor, Buffer, Adapter	55
Other Terminals and Related Units	56
EDPE NOT CATEGORIZED ABOVE	60
PCAM, OTHER DIGITAL DATA PREPARATION/RECODING EQUIPMENT AND EDPE COMPONENTS NOT PERIPHERAL TO AN EDPE SYSTEM	
Card Punch	70
Card Verifier	71
Tape Punch/Verifier	72
Sorter	73
Collator	74
Reproducer and Gang Punch	75
Interpreter	76
Accounting Machine	77
Media Converter (card to Tape, Tape to Card, etc.)	78
Other PCAM and Data Preparation/Recording Equipment and EDPE Components not Peripheral to an EDPE System	79

TABLE 4

ADP Equipment by Number of Units, Purchase Price, and Percent of Total Inventory Purchase Price

Machine	#Units 1980	#Units 1981		$ Purchase Price 1980	$ Purchase Price 1981		%Total Purchase Price 1980	%Total Purchase Price 1981	
CPUs	15154	17723	17%	$1,932,214,585	$2,054,699,110	6%	34.69	36.75	6%
Mag Tape Units	24381	23388	- 4%	$ 458,848,596	$ 421,051,420	8%	8.24	7.53	- 9%
Disk Units	23279	24139	4%	$ 573,564,369	$ 587,089,808	2%	10.30	10.50	2%
Core Units	7758	7554	- 3%	$ 560,478,080	$ 498,359,011	11%	10.06	8.91	-11%
Drum Units	888	783	- 12%	$ 44,624,180	$ 38,032,629	-15%	.80	.68	-30%
Misc. Storage	1654	1741	5%	$ 60,504,591	$ 65,391,011	8%	1.09	1.17	7%
Subtotal: Memory Units	57960	57605	- 1%	$1,698,019,816	$1,609,923,879	- 5%	30.49	28.80	- 6%
Multi-purpose control	4995	5135	3%	$ 141,937,031	$ 148,741,546	5%	2.55	2.66	4%
Control for I/O channels	6149	6015	- 2%	$ 196,569,116	$ 196,937,767	0%	3.53	3.52	0%
Misc. System I/O controls	14725	14523	- 1%	$ 197,869,080	$ 191,888,983	- 3%	3.55	3.43	- 3%
Multiplexor,control,etc.	12460	13155	6%	$ 100,538,209	$ 106,927,896	6%	1.81	1.91	6%
Subtotal: Control Units	38329	38828	1%	$ 636,913,436	$ 644,496,192	1%	11.44	11.53	1%
Card reader/punch	7904	7564	- 4%	$ 89,831,899	$ 81,581,406	9%	1.61	1.46	- 9%
Papertape reader/punch	3780	3465	- 8%	$ 18,032,404	$ 15,395,700	15%	.32	.28	-13%
Subtotal: Readers/Punches	11684	11029	- 6%	$ 107,864,303	$ 96,977,106	10%	1.93	1.73	-10%
Plotter	2107	2234	6%	$ 23,743,351	$ 23,615,325	- 1%	.43	.42	- 2%
Printer	11942	13026	9%	$ 181,278,980	$ 197,984,260	9%	3.25	3.54	9%
Subtotal: Print-Plotters	14049	15260	9%	$ 205,022,331	$ 221,599,585	8%	3.68	3.96	8%
Image Handling unit	740	671	- 9%	$ 20,576,544	$ 19,597,273	- 5%	.37	.35	- 5%
Display unit	13973	16324	17%	$ 108,828,626	$ 116,095,645	- 7%	1.95	2.08	7%
Operator console	10413	10951	5%	$ 71,104,102	$ 71,787,830	1%	1.28	1.28	0%
Card terminal	2338	2690	15%	$ 13,048,689	$ 13,689,203	5%	.23	.25	9%
Mag tape terminal	1139	1158	2%	$ 7,797,819	$ 7,589,119	- 3%	.14	.14	0%
Papertape terminal	600	595	- 1%	$ 2,030,069	$ 1,953,213	- 4%	.04	.03	-25%
Printer terminal	17409	22426	29%	$ 80,953,649	$ 91,091,493	13%	1.45	1.63	12%
Input console	15036	22291	48%	$ 129,122,792	$ 58,021,202	-55%	2.32	1.04	-55%
Misc.terminals & rel. units	31330	39161	25%	$ 153,727,814	$ 195,606,469	27%	2.76	3.50	27%
Subtotal: Terminals	92978	116267	25%	$ 587,190,104	$ 575,431,447	- 2%	10.54	10.29	- 2%

TABLE 4--Continued

ADP Equipment by Number of Units, Purchase Price, and Percent of Total Inventory Purchase Price

Machine	#Units 1980	#Units 1981		$ Purchase Price 1980	$ Purchase Price 1981		%Total Purchase Price 1980	%Total Purchase Price 1981	
OCR units	304	349	15%	$ 10,004,793	$ 9,974,698	0%	.18	.18	0%
Mag data recording unit	3441	2718	- 21%	$ 11,179,032	$ 7,538,776	-33%	.20	.13	-35%
Mag ink char. recog. unit	21	20	- 5%	$ 338,918	$ 347,861	3%	.01	.01	0%
Subtotal: OCR-MICR	3766	3087	- 18%	$ 21,522,743	$ 17,861,335	-17%	.39	.32	-18%
Data converter	1996	1787	- 10%	$ 31,063,800	$ 20,778,775	-33%	.56	.37	-34%
Media converter (code 26)	204	200	- 2%	$ 4,307,586	$ 4,483,855	4%	.08	.08	0%
Media converter (code 78)	1129	1159	3%	$ 14,421,721	$ 15,318,403	6%	.26	.27	4%
Subtotal: Converters	3329	3146	- 5%	$ 49,793,107	$ 40,581,033	-19%	.90	.73	-19%
Card punch	24245	23372	- 4%	$ 72,734,320	$ 66,725,136	- 8%	1.31	1.19	- 9%
Card verifier	1902	1717	- 10%	$ 4,919,770	$ 4,433,188	-10%	.09	.08	-11%
Tape punch/verifier	279	260	- 7%	$ 1,077,851	$ 934,948	-13%	.02	.02	0%
Sorter	1213	2156	78%	$ 10,487,484	$ 9,615,238	- 8%	.19	.17	-11%
Collator	777	721	- 7%	$ 9,345,393	$ 8,614,377	- 8%	.17	.15	-12%
Reproducer/gang punch	795	728	- 8%	$ 3,446,667	$ 3,223,878	- 6%	.06	.06	0%
Interpreter	1636	1544	- 6%	$ 8,168,345	$ 7,569,921	- 7%	.15	.13	-13%
Subtotal: Keypunch Dev.	31947	30498	- 5%	$ 110,179,830	$ 101,116,686	- 8%	1.99	1.81	- 9%
EDPE	9094	8566	- 6%	$ 77,677,834	$ 74,226,294	- 4%	1.39	1.33	- 4%
Misc. PCAM or EDPE	15491	16474	6%	$ 136,245,393	$ 148,076,328	- 9%	2.45	2.65	8%
Subtotal: EDPE-PCAM	24585	25040	2%	$ 213,923,227	$ 222,302,622	4%	3.84	3.98	4%
Accounting machines	381	382	0%	$ 6,029,609	$ 5,711,790	- 5%	.11	.10	- 9%
TOTAL	294162	318865	8%	$5,568,673,091	$5,590,700,785	0%	100.00	100.00	0%

The 1981 data is presented graphically in figure 3. CPUs constituted nearly 37 percent of the total dollar value of the inventory and represented the largest segment of the inventory by dollar value in 1981. From 1980 to 1981 there was an increase of over 2,500 CPUs for a 17 percent increase in the number of units while the purchase price of the CPUs only increased six percent. Thus the CPUs added to the inventory were less expensive than the previous year's.

Memory units represented the next largest segment of the inventory both in 1980 and 1981. For the first time, in 1981, the number of disks units was larger than the number of tape units. The number of disk units increased by four percent while the number of tapes units decreased by four percent. Disk units now represent over 10 percent of the inventory by dollar value while magnetic tape units equal less than eight percent. Memory units overall decreased as a percent of the total inventory from 1980 to 1981 and now represent less than 29 percent of the total inventory. The total number of memory units and the total purchase prices of all memory units also decreased because of the decreases in magnetic tape units, core units and drum units. These will probably continue to decrease while the number of disk units should continue to increase. Added together, the memory units and CPUs represent over 65 percent of the inventory's total dollar value.

I/O channels and other controllers formed the next highest category in 1981, with over 11 percent of total purchase price, followed by terminals with over 10 percent. The number and dollar value of the control units increased slightly from 1980 to 1981. The total number of terminals has increased by 25 percent but the dollar value has decreased, with the percent of purchase price of the total inventory for terminals dropping slightly.

However, even with this increase in the reported number of terminals, it appears to the author that the terminal category is seriously understated.

An analysis of a few of the large installations indicates that a great number of the terminals are not reported in the inventory. The architecture of many of the large computers in these installations is such that optimum utilization is in an on-line environment. However, very few terminals were reported in these installations. Most of the ones which were reported were in the computer room itself with few or none reported in remote sites. Therefore, it is extremely likely that the reported number of remote terminals greatly under-represents the actual number of remote terminals in use in the Federal Government.

All of the other categories of equipment are a small segment of the inventory by percent of dollar value. Some of the changes in these categories which occurred from 1980 to 1981, however, are worth comment. A number of machines which relate to card processing, card punches, card verifiers, reproducers, collators, card readers, and interpreters decreased both in number of units

SUMMARY OF THE FEDERAL INVENTORY

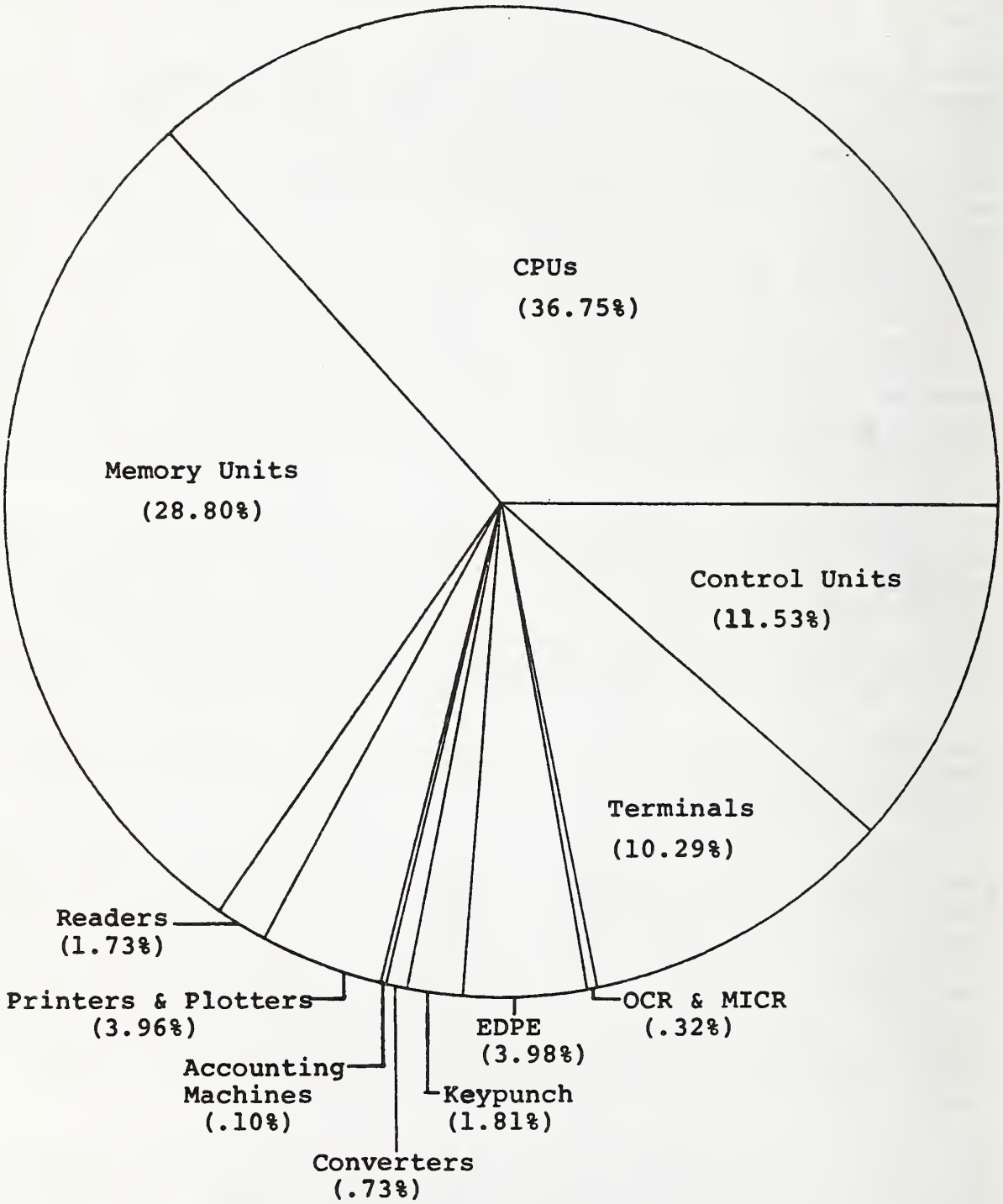

Figure 3

and in total purchase price. This is to be expected as the CPUs in the Government increasingly operate in an interactive rather than batch mode. These machines should continue to decrease in the future. Papertape readers/punches have also decreased and should continue to decrease in the future as newer technologies replace papertape usage.

Overall, the total inventory has increased both in number of machines and total dollar value. At year-end 1981 the inventory had over 300,000 machines and a total dollar value (total purchase prices) of almost $5.6 billion. As more smaller computers enter the inventory, the total number of machines should continue to increase. But because the hardware costs of ADP equipment have declined in the past and are expected to continue to decline, the total dollar value should not increase at the same rate as the number of units.

2.2.1 Average Price of Devices

Also calculated is the average price of each unit in the inventory for 1980 and 1981 (table 5). Of all the units, CPUs had the highest average price in both 1980 and 1981. In 1980 the average price for a CPU was $127,000. The average price dropped nine percent in 1981 to $116,000. Thus the CPUs which were added to the inventory in 1981 were less expensive than in previous years.

The total average purchase price of memory units reported in the inventory dropped four percent between 1980 and 1981. Core units, the memory units with the highest average price, showed the most significant decrease--down about nine percent from $72,000 in 1980 to $66,000 in 1981. The next highest average price was associated with drum units which dropped three percent to an average of $49,000 in 1981. Miscellaneous storage units, the third highest-average-price item, were the only memory units showing a price increase in 1981--up three percent over 1980 to about $38,000 per unit. Disk units were down 1 percent to $24,000 and magnetic tapes were down four percent to $18,000.

The average price of the control unit category increased slightly (about one percent) in 1981. This was the only significant category showing an increase over 1980.*

The "Control for I/O Channels" category has the highest average price at almost $33,000 while "Multi-purpose Controls" follows at $28,000. "Miscellaneous systems I/O controls" have decreased in average price while "multiplexors", the cheapest of the control units at $8,000, increased slightly.

*The average price of EDPE, comprising only four percent of the reported inventory, was up about two percent--the only other category with an average price increase.

TABLE 5

1980 and 1981 ADP Equipment by Number of Units
and Average Purchase Price

Machine	#Units 1980	#Units 1981	Average Price 1980	Average Price 1981	%Change in average
CPUs	15154	17723	$127,505	$115,934	- 9%
Mag Tape Units	24381	23388	$ 18,820	$ 18,003	- 4%
Disk Units	23279	24139	$ 24,639	$ 24,321	- 1%
Core Units	7758	7554	$ 72,245	$ 65,793	- 9%
Drum Units	888	783	$ 50,252	$ 48,573	- 3%
Misc. Storage	1654	1741	$ 36,580	$ 37,559	3%
Subtotal: Memory Units	57960	57605			
Multi-purpose control	4995	5135	$ 28,416	$ 28,966	2%
Control for I/O channels	6149	6015	$ 31,968	$ 32,741	2%
Misc.System I/O controls	14725	14523	$ 13,438	$ 13,213	- 2%
Multiplexor,control,etc.	12460	13155	$ 8,069	$ 8,128	1%
Subtotal: Control Units	38329	38828			
Card reader/punch	7904	7564	$ 11,365	$ 10,785	- 5%
Papertape reader/punch	3780	3465	$ 4,770	$ 4,443	- 7%
Subtotal: Readers/Punches	11684	11029			
Plotter	2107	2234	$ 11,269	$ 10,571	- 6%
Printer	11942	13026	$ 15,180	$ 15,199	0%
Subtotal: Print-Plotter	14049	15260			
Image Handling unit	740	671	$ 27,806	$ 29,206	5%
Display unit	13973	16324	$ 7,788	$ 7,112	- 9%
Operator console	10413	10951	$ 6,828	$ 6,555	- 4%
Card terminal	2338	2690	$ 5,581	$ 5,089	- 9%
Mag tape terminal	1139	1158	$ 6,846	$ 6,554	- 4%
Papertape terminal	600	595	$ 3,383	$ 3,283	- 3%
Printer terminal	17409	22426	$ 4,650	$ 4,062	-13%
*Input console	15036	22291	$ 8,588	$ 2,603	-70%
Misc.terminals & related units	31330	39161	$ 4,907	$ 4,995	2%
Subtotal: Terminals	92978	116267			

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*1980 and 1981 data for "Input consoles" are non-comparable because of adjustments in 1981.

TABLE 5--Continued

1980 and 1981 ADP Equipment by Number of Units and Average Purchase Price

Machine	#Units 1980	#Units 1981	Average Price 1980	Average Price 1981	%Change in average
OCR units	304	349	$ 32,911	$ 28,581	-13%
Mag data recording unit	3441	2718	$ 3,249	$ 2,774	-15%
Mag ink char. recog. unit	21	20	$ 16,138	$ 17,393	16%
Subtotal: OCR-MICR	3766	3087			
Data converter	1996	1787	$ 15,563	$ 11,627	-25%
Media converter (code 26)	204	200	$ 21,116	$ 22,419	6%
Media converter (code 78)	1129	1159	$ 12,774	$ 13,217	3%
Subtotal: Converters	3329	3146			
Card punch	24245	23372	$ 2,999	$ 2,855	- 5%
Card verifier	1902	1717	$ 2,587	$ 2,582	- 1%
Tape punch/verifier	279	260	$ 3,863	$ 3,596	- 7%
Sorter	1213	2156	$ 4,534	$ 4,460	- 2%
Collator	777	721	$ 12,027	$ 11,948	- 1%
Reproducer/gang punch	795	728	$ 4,335	$ 4,428	2%
Interpreter	1636	1544	$ 4,993	$ 4,903	- 2%
Subtotal: Keypunch Devices	31947	30498			
EDPE	9094	8566	$ 8,542	$ 8,665	1%
Misc. PCAM or EDPE	15491	16474	$ 8,795	$ 8,988	2%
Subtotal: EDPE-PCAM	24585	25040			
Accounting machines	381	382	$ 15,826	$ 14,952	- 6%
TOTAL	294162	318865			

The total average price of terminals decreased nine percent in 1981. The major reason for this exceptionally large decrease appears to be caused by a correction of error in the 1980 reported inventory of input consoles. In 1980, some input consoles were listed as having purchase prices of over $1 million. Those listings were not included in the 1981 inventory. However, even if the input console category is removed from the calculations, the average price of terminals still shows a decline--albeit a slight one percent. The most expensive of the terminals were image handlers, which showed an average price rise of five percent over 1980 to $29,000 from $27,000. Terminals with the lowest average purchase price in 1981 were papertape terminals at $3,300 and input consoles at $2,600.

Overall, about two-thirds of the 39 categories listed showed a decrease in average price, reflecting the continuing decrease in computer hardware costs.

2.2.2 Average Configuration

If all of the inventory is considered on a number-of-units basis and all of the peripheral devices divided by the number of CPUs, then an average configuration can be developed for these CPUs. Please note that this configuration analysis is based on a number-of-units basis alone with no weighting factors added based on the type of CPU. These calculations were completed for 1980 and 1981 and are presented in table 6.

According to the figures for 1981, each CPU would have between three and four memory units attached, including at least one tape unit, one disk unit and probably a core unit. The CPU would probably have between two and three control units including one in the "Miscellaneous System I/O Control" category and one in the "Multiplexor Control, Etc." category.

There is a high probability that there would be a printer attached and between six and seven terminals of one type or another. There is a good probability that there would be at least one card punch (key punch) somewhere at the facility and one other type of device not included in the other categories but attached to the CPU. On the average there were almost 17 devices per CPU listed in the inventory.

The average number of devices per CPU decreased from over 19 devices per CPU in 1980 to less than 17 devices per CPU in 1981. With the exception of terminals, all of the groupings, i.e., memory units, control units, readers/punches, printers and plotters, OCR-MICR, converters, keypunch devices, EDPE-PCAM, and accounting machines decreased relative to the number of CPUs. This does not imply that the absolute number of peripheral devices actually decreased. For example, the number of disk units increased from 23,279 units in 1980 to 24,139 in 1981 for an increase of 860 disk units. However, since the number of CPUs increased from 15,154 to 17,723, an increase of 2,569 units, the

TABLE 6

1980 and 1981 ADP Equipment by Average Number Per CPU

Machine	#per CPU 1980	#per CPU 1981	%Change per CPU
CPUs			
Mag Tape Units	1.61	1.32	-18%
Disk Units	1.54	1.36	-11%
Core Units	.51	.41	-20%
Drum Units	.06	.04	-33%
Misc. Storage	.11	.10	- 9%
Subtotal: Memory Units	3.82	3.25	-15%
Multi-purpose control	.33	.29	-12%
Control for I/O channels	.41	.34	-17%
Misc.System I/O controls	.97	.82	-15%
Multiplexor,control,etc.	.82	.74	-19%
Subtotal: Control Units	2.53	2.19	-13%
Card reader/punch	.52	.43	-17%
Papertape reader/punch	.25	.20	-20%
Subtotal: Readers/Punches	.77	.63	-18%
Plotter	.14	.13	- 7%
Printer	.79	.73	- 8%
Subtotal: Print-Plotter	.92	.86	- 6%
Image Handling unit	.05	.04	-20%
Display unit	.92	.92	0%
Operator console	.69	.62	-10%
Card terminal	.15	.15	0%
Mag tape terminal	.08	.07	-13%
Papertape terminal	.04	.03	-25%
Printer terminal	1.15	1.27	10%
Input console	.99	1.26	27%
Misc.terminals & relat. units	2.07	2.21	7%
Subtotal: Terminals	6.13	6.57	7%
OCR units	.02	.02	0%
Mag data recording unit	.23	.15	-35%

TABLE 6--Continued

1980 and 1981 ADP Equipment by Average Number Per CPU

Machine	#per CPU 1980	1981	%Change per CPU
Mag ink char. recog. unit	.00	.00	0%
Subtotal: OCR-MICR	.25	.17	-32%
Data converter	.13	.10	-23%
Media converter (code 26)	.01	.10	0%
Media converter (code 78)	.07	.07	0%
Subtotal: Converters	.22	.18	-18%
Card punch	1.60	1.32	-18%
Card verifier	.13	.10	-23%
Tape punch/verifier	.02	.01	-50%
Sorter	.15	.12	-20%
Collator	.05	.04	-20%
Reproducer/gang punch	.05	.04	-20%
Interpreter	.11	.09	-18%
Subtotal: Keypunch Devices	2.11	1.72	-18%
EDPE	.60	.48	-20%
Misc. PCAM or EDPE	1.02	.93	- 8%
Subtotal: EDPE-PCAM	1.62	1.14	-30%
Accounting machines	.03	.02	-33%
TOTAL	18.41	16.99	- 8%

number of disk units per CPU actually decreased from 1980 to 1981. In 1980 there were 1.54 disk units per CPU and in 1981 1.36 disk units.

These figures seem to imply that the CPUs either were added to the inventory in 1981 with less peripheral equipment (other than terminals) than in the past or that the CPUs were added without the peripherals being listed separately. More data from other years is needed to see if this indicates a trend. Certainly, the number of units per CPU should continue to decrease for the card oriented kinds of equipment since the use of cards is decreasing on the newer CPUs. However the future of the categories for memory units, control units, printers and plotters, and OCR-MICR relative to the number of CPUs is more difficult to predict. The author would expect that at least the number of memory units would increase as the number of CPUs increases.

2.3 Federal CPUs

For the most part, the ensuing analysis of Federal CPUs is based on the GSA December 31, 1981 data base--the latest available information. As noted in section 2.1, that data base lists 17,723 installed CPUs with a total purchase price of over $2 billion. However, parts of the analysis (appearing in section 2.3.1) involve comparisons between the Federal inventory and CPUs in the United States as a whole. Because 1981 data for the United States is not yet available, those parts of the analysis are based on the 1980 GSA MIS inventory, which listed 15,154 CPUs with a total purchase price of somewhat less than $2 billion. Using the older report permitted comparisons between comparable data. Where the 1980 data is used, it is so marked in the text.

In this section of the report we looked at the number and dollar value of the CPUs in each agency, the acquisition date of the CPUs, the purchase price of the CPUs, and the CPUs installed by manufacturer. Since the age of the Federal computers seems to be of major interest, this subject will be addressed first.

2.3.1 Age of Federal Computers

In recent years the age of the computers in the Federal inventory and the current state of Federal computer technology have been matters of increasing concern. To determine the actual status of the technology of Federal computers one would have to analyze each CPU and system, determine when it was first marketed, what its architectural design is, what upgrades it might have had, what level of operating system is currently running, and many other features. This data would be extremely difficult and time consuming to obtain. Thus, many other approaches have been used in the past to look at the problems.

The General Accounting Office, in the report Continued Use of Costly, Outmoded Computers in Federal Agencies Can be Avoided(2) tried "to determine if the Federal computer inventory is outmoded, and if so, how this situation arose, what types of

costs and problems obsolescence has imposed, what should be done to resolve these problems, and how to prevent this situation from recurring." GAO's area of interest was medium- and large-scale computers with a central processing unit purchase price of more than $250,000 or a leasing price of over $10,000 per month. The conclusions were: "The Federal inventory of medium- and large-scale computers is outmoded. Of the 1,366 such processors included in the April 1979 inventory, over half were technologically of the 1971 era or earlier. Almost a third of them were technologically 15 years old or older. Only 2 percent use the technology of 1975 or later."(3)

When we analyzed the December 1981 GSA MIS inventory file, we identified 1,382 computers (CPUs) having a purchase price greater than $250,000. A frequency distribution of the computers' acquisition dates is presented in figure 4. Based on the acquisition dates, 33 percent were 10 years or older, 32 percent five years or newer. However, it is by no means certain that any given CPU was acquired in the year that it was fist placed on the market. In a report prepared for ICST by Arthur D. Little and General Systems Group (4) the authors estimate that the average CPUs in this price range were acquired by the Federal government at least two years after the machines were announced by their manufacturers. Based on that assumption, only 20 percent of the Federal computers priced at $250,000 or more represent technology made available in 1976 or later. The authors of the Arthur D. Little and General Systems Group report analyzed specifically the IBM product line to compare the Federal IBM inventory with the IBM computers in the United States as a whole. At the end of fiscal year 1979 they counted, using GSA figures, "437 installations of IBM System/360 computers and 89 installations of IBM System/370 computers; the ratio of 360s to 370s is 4.9 to 1. According to IDC, at the end of calendar 1979 the populations of these machines in the entire United States were 3,732 installations of System/360 computers and 11,170 installations of System/370 computers; the U.S.-wide ratio of 360s to 370s is 0.33 to 1. This kind of relationship is important because it indicates that users in the Federal Government have been left behind."

Using this approach, we counted 457 IBM System/360 computers in the inventory for October 1980 and 117 IBM System/370 computers; the ratio of 360s to 370s is 3.9 to 1. (The October 1980 file had to be used because the year-end 1981 data was not available from IDC for comparison with the December 1981 GSA file.) According to IDC, at the end of calendar year 1980 there were 2,824 IBM System/360s and 10,349 IBM System/370s; the U.S.-wide ratio of 360s to 370s is .27 to 1. (For these calculations and those of Arthur D. Little and General Systems Group, the IBM 303x family installations are included with the IBM System/370s.) Thus the ratio is improving both for the Federal Government and for the United States. Obviously, the Federal Government still has proportionally a great many more of the older, 360 family.

Number of CPUs Valued Over $250,000
Installed as of December 1981

ACQ YEAR	No.	Cumulative Percentile	
NONE*	44		XXXXXXXXXXXXXXXX
1950	0		
1951	0		
1952	0		
1953	0		
1954	0		
1955	0		
1956	0		
1957	0		
1958	0		
1959	5		XX
1960	1		
1961	4		XX
1962	26		XXXXXXXXXX
1963	14		XXXXX
1964	13		XXXXX
1965	13		XXXXX
1966	34		XXXXXXXXXXXX
1967	41		XXXXXXXXXXXXXX
1968	65		XXXXXXXXXXXXXXXXXXXXXX
1969	54		XXXXXXXXXXXXXXXXXX
1970	63		XXXXXXXXXXXXXXXXXXXX
1971	80	27%	XXXXXXXXXXXXXXXXXXXXXXXXXX
1972	94	33%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1973	118	40%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1974	96	48%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1975	107	55%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1976	76	63%	XXXXXXXXXXXXXXXXXXXXXXX
1977	64	69%	XXXXXXXXXXXXXXXXXXX
1978	105	73%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1979	95	81%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1980	117	88%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1981	53	96%	XXXXXXXXXXXXXXXX
1982	0	100%	
	1382		

* These have no specified acquisition date. Prior to June 30, 1971, data on acquisition date was not required, but was entered into the data base on a voluntary basis.

Figure 4

Since this number of medium- to large-scale computers represents such a small percent (eight percent) of the Federal computers by number (even though they represent over $1 billion in purchase price or 66 percent of the total purchase price values of the CPUs in the inventory), we decided to look at the whole inventory. Over 50 percent of the inventory is composed of minicomputers and represents a different picture than the IBM family of 360s and 370s. In addition to looking at the whole inventory we wanted to look at the age of the computers by agency to make comparisons among agencies.

Table 7 shows all of the CPUs listed by year of acquisition for all agencies. To create a comparison figure, we totalled the number of computers acquired from 1977 through 1981 (five years) for each agency and determined what percent of that agency's inventory this represented. This allowed us to compare one agency with another. It should be noted that the 1981 figure for most agencies is very low compared with the number of computers for other recent years. This occurs because there is a delay from the time the paperwork is cut for a computer and the time it is purchased, installed, tested, and reported in the inventory. The delay is generally at least one year. Since the low figures are consistent for all agencies, the figures can still be used for comparisons. Thus, the 5 year percent figure shows what percent of an agency's computers were purchased in the last five years. This percent is given in the right hand column of table 7. Table 8 lists the agencies in descending order of this percent (the highest percent of current computers first) and presents these figures again. It is evident from these two tables that certain agencies have a much higher number of older computers than others. In the civilian agencies the Department of Justice, the Department of Transportation, Department of Commerce, Environmental Protection Agency, and the Treasury Department indicate the smallest percent of current computers. ACTION, the Tennessee Valley Authority, State Department, and the Department of Interior have the highest percent of current computers. (ACTION obviously is a special case.)

In the Department of Defense, the Navy Department shows the smallest percent of current computers while other Defense and Defense Logistics show the highest percent. Overall, the Defense Department has older computers than do the civilian agencies.

A frequency distribution of the total number of Federal computers by year of acquisition is presented in figure 5. This shows that 16 percent of the inventory represents computers that have acquisition dates prior to 1972, and 43 percent have acquisition dates from 1977 to 1981.

To take an additional look at the inventory, we isolated the large computers, those costing over $500,000 and ran the frequency distribution program on the acquisition dates. The frequency distribution of these 661 computers is presented in figure 6. It shows that of these large computers, 27 percent

TABLE 7

CPUs by Agency and Year of Acquisition

Agency	1959	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	NO DATE	TOTAL	5yr%
Energy			1	5	7	7	10	22	36	66	71	136	185	227	279	322	376	357	413	517	442	433	197	297	4406	45%
Agri.		1			3	3	2	4	4	1	5	7	8	10	8	9	11	23	15	14	22	56	19		225	56%
Comm.							1	3		4	6	4	26	43	32	105	70	45	19	19	24	4		39	444	15%
OPM													1			2	12	2	1	1	4	4	2		29	41%
EPA											2	3	1	14	13	11	73	11	17	8	4	13	6		176	27%
HHS								3	6	3	12	19	9	18	20	24	38	76	54	148	40	39	13	1	523	56%
Interior										2	5	2	3	10	18	10	18	20	27	55	87	25	8	1	291	69%
Justice								1			1	1	1	5		1	4	20	1						35	3%
Labor													1	1		1	1	16	12	4	1			1	38	45%
NASA			1	4	4	23	39	36	19	36	42	78	66	106	98	115	195	251	201	607	158	285	36	4	2404	54%
NSF										2	2		9	11	8	11	7	8	9	18	8			14	107	33%
State								2	2				3		4	1	1	5	5	9	10	21	5		68	74%
Trans.				1		5		2	3	22	11	12	52	74	42	31	24	21	21	3	4	4	1	45	378	9%
Treas.				2		3	5	4	1	4	11	6	9	4	26	24	28	49	5	4	15	19		17	236	18%
VA							2	1	2	2	2	8	13	37	23	52	43	56	46	65	124	64	24	25	589	55%
GSA													1		2	4		1	6		11	1		18	44	41%
ACTION																					20				20	100%
TVA				1									2	4	8	20	46	20	34	47	50	61	341	13	647	82%
Other Civ.									3			2	3	6	4	2	9	8	24	3	5	17	12	2	100	61%
TOTAL CIV		1	2	13	14	41	59	78	76	142	170	278	393	570	585	745	956	989	910	1522	1029	1046	664	477	10760	48%
Def.Log.						1	1	1		3	1	7	2	7	11	9	17	4	12	35	18	21	9	5	164	58%
Def.Comm.												1	3	2	3	1	11	3	5	8	3	2			42	43%
Def.Map.							2		1	2	2	1	3	3	18	8	12	17	18	26	9	4	1	10	137	42%
Army		1	5	11	19	37	7	16	21	63	63	108	73	99	155	130	155	130	107	229	145	100	84		1758	38%
Air Force	4		16	14	19	9	52	96	53	49	92	120	136	137	136	172	292	218	203	275	242	194	86	47	2662	38%
Navy	1	6	13	36	23	35	31	63	60	89	109	105	126	159	175	177	201	254	201	114	91	22		2	2093	20%
Oth.Def.											3		2	4	4	4	3	1	1	4	5	70	5	1	107	79%
TOTAL DEF	5	7	34	61	61	82	93	176	135	206	270	342	345	411	502	501	691	627	547	691	513	413	185	65	6963	34%
TOTAL	5	8	36	74	75	123	152	254	211	348	440	620	738	981	1087	1246	1647	1616	1457	2213	1542	1459	849	542	17723	42%

TABLE 8

Number of CPUs by Percent of Recent Agency CPU Acquisitions

AGENCY	TOTAL 81	RECENT (1977-1981)	PERCENT 81
ACTION	20	20	100%
TVA	647	533	82%
Other Def.	107	85	79%
State	68	50	74%
Interior	291	202	69%
Other Civ	100	63	61%
Def. Log.	164	95	58%
Agriculture	225	126	56%
HHS	523	294	56%
VA	589	323	55%
NASA	2404	1287	54%
Energy	4406	2002	45%
Labor	38	17	45%
Def. Comm.	42	18	43%
Def. Map.	137	58	42%
GSA	44	18	41%
OPM	29	12	41%
Air Force	2662	1000	38%
Army	1758	665	38%
NSF	107	35	33%
EPA	176	48	27%
Navy	2093	428	20%
Treasury	236	43	18%
Commerce	444	66	15%
Trans.	378	33	9%
Justice	35	1	3%
TOTAL	17723	7502	42%

Number of CPUs
Installed as of December 1981

ACQ YEAR	No.	Cumulative Percentile	
NONE*	542		XXXXXXXXXXX
1950	0		
1951	0		
1952	0		
1953	0		
1954	0		
1955	0		
1956	0		
1957	0		
1958	0		
1959	5		
1960	8		
1961	36		X
1962	74		XX
1963	75		XX
1964	123		XXX
1965	152		XXX
1966	254		XXXXX
1967	211		XXXX
1968	348		XXXXXXX
1969	440		XXXXXXXXX
1970	620		XXXXXXXXXXXXX
1971	738	16%	XXXXXXXXXXXXXXX
1972	981	20%	XXXXXXXXXXXXXXXXXXX
1973	1087	26%	XXXXXXXXXXXXXXXXXXXXX
1974	1246	32%	XXXXXXXXXXXXXXXXXXXXXXXX
1975	1647	39%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1976	1616	48%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1977	1457	58%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1978	2213	66%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1979	1542	78%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1980	1459	87%	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1981	849	95%	XXXXXXXXXXXXXXXX
1982	0	100%	
	17723		

* These have no specified acquisition date. Prior to June 30, 1971, data on acquisition date was not required, but was entered into the data base on a voluntary basis.

Figure 5

Number of CPUs Valued Over $500,000
Installed as of December 1981

ACQ YEAR	No.	Cumulative Percentile	
NONE*	13		XXXXXXXX
1950	0		
1951	0		
1952	0		
1953	0		
1954	0		
1955	0		
1956	0		
1957	0		
1958	0		
1959	3		XX
1960	1		X
1961	2		X
1962	9		XXXXXX
1963	1		X
1964	2		X
1965	3		XX
1966	16		XXXXXXXXXX
1967	21		XXXXXXXXXXXXX
1968	34		XXXXXXXXXXXXXXXXXXXX
1969	25		XXXXXXXXXXXXXX
1970	23		XXXXXXXXXXXXXX
1971	32	23%	XXXXXXXXXXXXXXXXXXX
1972	42	28%	XXXXXXXXXXXXXXXXXXXXXXXX
1973	69	34%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1974	57	45%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1975	54	53%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1976	44	62%	XXXXXXXXXXXXXXXXXXXXXXXX
1977	24	68%	XXXXXXXXXXXXXX
1978	61	72%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1979	51	81%	XXXXXXXXXXXXXXXXXXXXXXXXXX
1980	59	89%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1981	15	98%	XXXXXXXXX
1982	0	100%	
	661		

* These have no specified acquisition date. Prior to June 30, 1971, data on acquisition date was not required, but was entered into the data base on a voluntary basis.

Figure 6

have acquisition dates of 10 years or older while 32 percent have acquisition dates of five years or newer. Thus these large computers appear to be less current than the rest of the computers in the inventory.

In general, our current statistics indicate that the situation of obsolescence is not as bad as portrayed in the General Accounting Office report, but there is still a large number of older computers in the Federal inventory. Our analysis suggests that certain agencies, particularly the Navy Department, Department of Justice, Department of Commerce, and the Department of Transportation, should analyze their computer inventories to see if upgrading their state of computer technology is in order.

2.3.2 Installed CPUs by Agency

Table 9 shows the number and dollar value (total purchase price) of all of the CPUs in the inventory listed by agency. Figures 7 and 8 are bar graphs which illustrate the 10 agencies having the largest number of CPUs and the largest total purchase price. The Department of Energy has the largest number of CPUs with 4,406 installed or almost 25 percent of the total number of CPUs in the inventory. Energy is followed by the Air Force with 2,662 CPUs (15 percent of the inventory), NASA with 2,404 CPUs (14 percent of the inventory), Navy with 2,003 CPUs (12 percent) and Army with 1,758 CPUs (10 percent). These top five agencies represent over 75 percent of the total number of CPUs installed. If the top 10 agencies are added together they total almost 90 percent of the total number of CPUs installed.

When these CPUs are analyzed by total purchase price or dollar value, Energy has the largest total purchase price with $408,355,758 (20 percent of the inventory's total purchase price), followed by the Air Force with $388,816,013 (19 percent), NASA with $274,680,818 (13 percent), Navy with $209,738,942 (10 percent) and Army with $205,736,728 (10 percent). These top five agencies total over 72 percent of the total dollar value of the inventory. The top 10 agencies combined equal almost 88 percent of the total inventory by dollar value.

Figure 9 shows the percentage of total CPUs that each agency has and compares these percentages with 1970 GSA figures. Since the older figures had the Department of Defense CPUs added together and presented as one number, the 1980 Defense Department figures have also been totaled. The major change over these 10 years was that the Department of Defense had over 60 percent of the computers in the Government in 1970 and had less than 45 percent in 1980. This means that the civilian agencies have gained almost 20 percent of the inventory over this time period. The Department of Energy has shown the largest increase as a percent of the total inventory going from less than 15 percent in 1970 to almost 25 percent of the total CPUs in 1980. Overall, figure 9 illustrates that seven agencies and the summation of the other civilian agencies show an increase in percentage while three civilian agencies, Treasury, NASA, GSA, as well as DoD show a

TABLE 9

Number and Dollar Value of CPUs by Agency

AGENCY	NUMBER	PURCHASE PRICE
Department of Energy	4,406	$408,355,758
Department of Agriculture	225	$21,092,451
Administrative Office of the US Courts	2	$606,958
Office of Admin.	6	$1,724,112
Civil Aeronautics Board	1	$762,768
Commodity Futures Trading Commission	2	$121,040
Department of Commerce	444	$63,932,962
Office of Personnel Management	29	$6,684,164
Department of the Army	1,758	$205,736,728
Defense Mapping Agency	137	$17,835,413
Office of the Secretary of Defense	79	$490,965
Department of the Air Force	2,662	$388,816,013
Defense Nuclear Agency	19	$2,025,223
Defense Communications Agency	42	$12,066,635
Defense Intelligence Agency	7	$5,908,068
Department of the Navy	2,093	$209,738,942
Defense Contract Audit Agency	1	$ 0
Defense Logistics Agency	164	$23,701,989
Defense Investigative Service	1	$245,000
Department of Education	3	$123,368
Equal Employment Opportunity Commission	1	$290,670
Export-Import Bank of the US	1	$347,015
Environment Protection Agency	176	$7,857,008
Federal Emergency Management Agency	14	$1,573,759
Federal Communications Commission	4	$801,312
Federal Deposit Insurance Corporation	1	$2,025,000
Federal Home Loan Bank Board	3	$717,856
Federal Reserve System	2	$6,887,122
General Accounting Office	1	$33,585
Government Printing Office	6	$4,964,072
General Services Administration	44	$20,046,724
Department of Health and Human Service	523	$88,449,221
Department of Housing and Urban Dev.	8	$5,665,371
Interstate Commerce Commission	1	$67,142
Department of the Interior	291	$48,586,198
Department of Justice	35	$8,809,049
Department of Labor	38	$6,431,443
Library of Congress	2	$ 0
National Aeronautics and Space Admin.	2,404	$274,680,818
National Labor Relations Board	1	$115,920
Nuclear Regulatory Commission	9	$357,046
National Science Foundation	107	$18,487,269
Community Services Admin.	1	$469,633
Panama Canal Commission	5	$513,539
Railroad Retirement Board	3	$864,905
Small Business Admin.	5	$1,900,824
Securities and Exchange Commission	1	$654,000
Selective Service System	5	$203,438

TABLE 9--Continued

Number and Dollar Value of CPUs by Agency

AGENCY	NUMBER	PURCHASE PRICE
Department of State	68	$6,894,924
Agency of International Dev.	3	$1,771,841
ACTION	20	$731,720
Department of Transportation	378	$58,083,516
Department of the Treasury	236	$39,086,698
Office of the US Trade Representative	3	$74,802
Tennessee Valley Authority	647	$24,414,793
International Communication Agency	1	$331,000
US International Trade Commission	5	$16,340
Veterans Administration	589	$51,524,980
TOTAL	17,723	$2,054,699,110

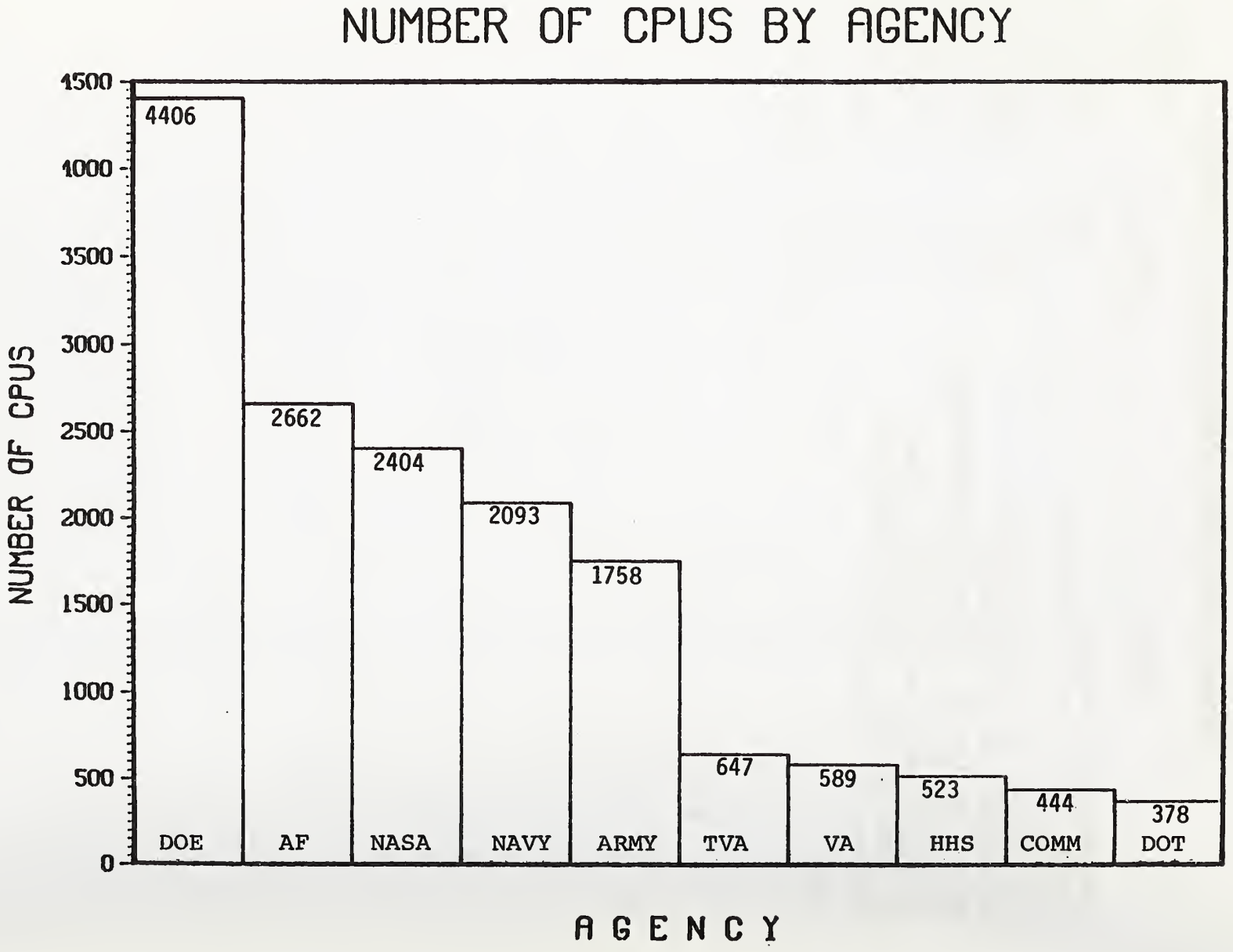
NUMBER OF CPUS BY AGENCY
NUMBER OF CPUS
1500
1000
3500
3000
2500
2000
1500
1000
500
0
4406
2662
2404
2093
1758
647
589
523
444
378
DOE
AF
NASA
NAVY
ARMY
TVA
VA
HHS
COMM
DOT
AGENCY

Figure 7

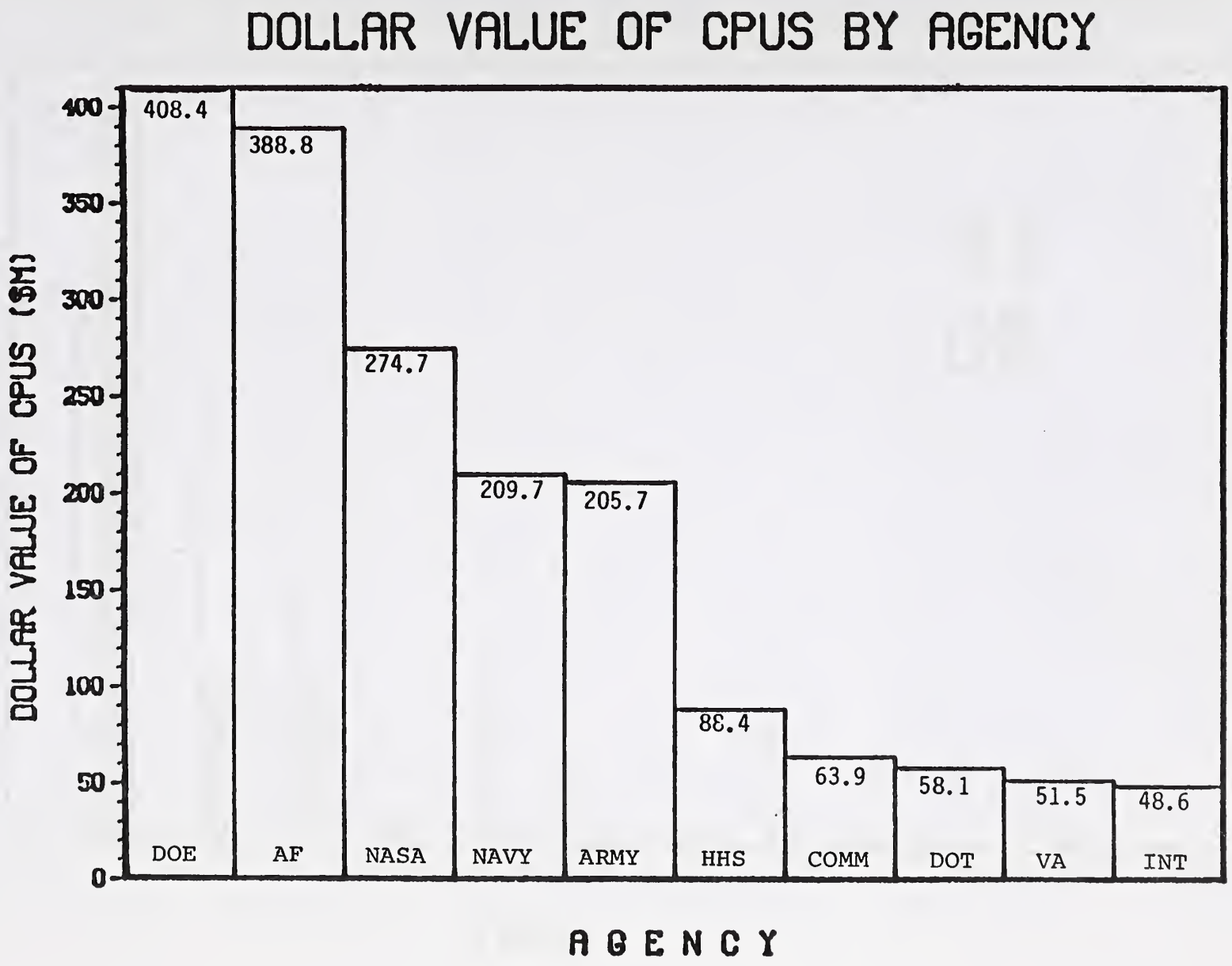
DOLLAR VALUE OF CPUS BY AGENCY
DOLLAR VALUE OF CPUS ($M)
400
350
300
250
200
150
100
50
0
408.4
388.8
274.7
209.7
205.7
88.4
63.9
58.1
51.5
48.6
DOE
AF
NASA
NAVY
ARMY
HHS
COMM
DOT
VA
INT
AGENCY

Figure 8

AGENCY SHARE OF INSTALLED CPUS

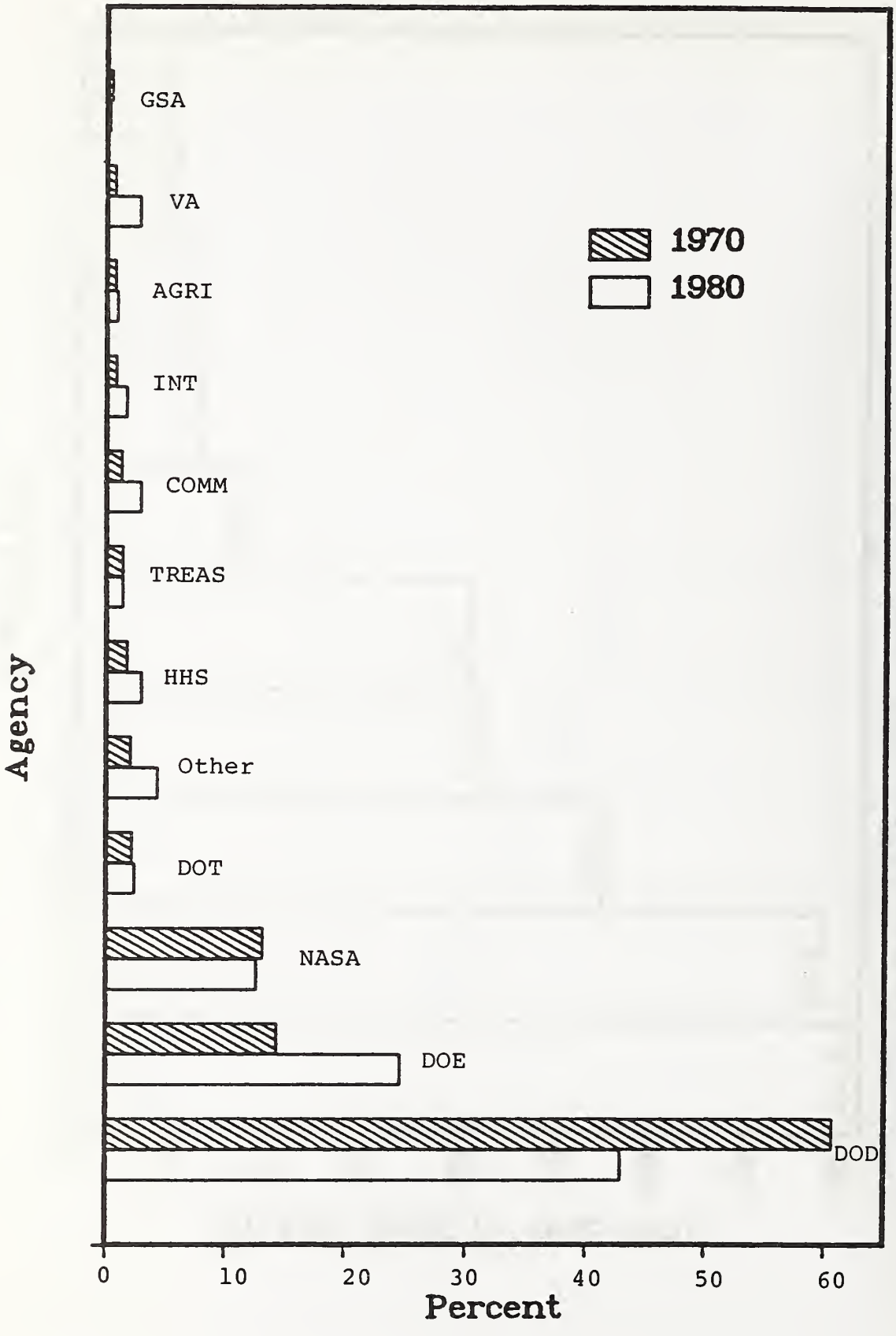

Figure 9

decrease. Please note that this does not imply that the number of computers in each agency declined over 10 years. The number of CPUs within those agencies showed an absolute increase, but their CPUs as a percentage of the total inventory declined.

2.3.3 Installed CPUs by Price Range

As another approach to analyzing the sizes of the computers in the Federal inventory, we totaled the number and dollar value of the CPUs for various purchase price ranges. Note that this analysis was for CPUs alone and not computer systems (CPUs plus peripherals). The results of this analysis are given in figures 10 and 11. As figure 10 shows, the largest number of CPUs are CPUs with a purchase price of between $10,000 and $20,000 ($10-20K range). The next two highest ranges are $20-40K and $5-10K. These three ranges, or from $5,000 to $40,000 represent almost 53 percent of the number of CPUs in the inventory.

We mentioned in section 2.1 that the average purchase price of CPUs dropped from 1980 to 1981. One reason for this was the increase in the number of CPUs in the $0-5K range. In 1980 there were 1,149 CPUS in the $0-5K range. In 1981 the number of CPUs in this category increased 51 percent to 1,736. This range showed the largest growth rate of all of the ranges. In addition to this increase in the cheapest of the CPUs, the number of CPUs in the $300-500K range and the over $500K range decreased from 1980 to 1981 also causing the overall average price to decrease.

By dollar value, the largest range is the purchase price greater than $500K (figure 11). This purchase price range represents over $1 billion and over 54 percent of the total dollar value of the CPUS in the inventory. The next largest ranges are the $100-200K range with a total purchase price of over $264,000 and the $300-500K range with a total purchase price of over $178,000.

If the ranges are grouped together, 63 percent of the number of CPUs are in the purchase price ranges of less than $40,000. By dollar value or total purchase price, the CPUs with a purchase price range of over $300,000 represent 63 percent of the total purchase price of the CPUs in the inventory. Thus by number the less expensive computers represent the largest portion of the inventory's CPUs while by total purchase price the most expensive CPUs represent the largest portion.

As was given in section 2.1, there are a total of 17,723 CPUs for a total purchase price of $2,054,699,110. This means that the average purchase price for all of the CPUs was $115,934. We analyzed the total figures by purchase price range but felt that one other analysis might also be interesting, i.e., the average price of CPUs by year of acquisition in the current inventory. The results of this analysis are given in figure 12. It should be stressed here that the CPUs are only those listed in the 1981 inventory. Thus the average purchase price for 1965 is based on

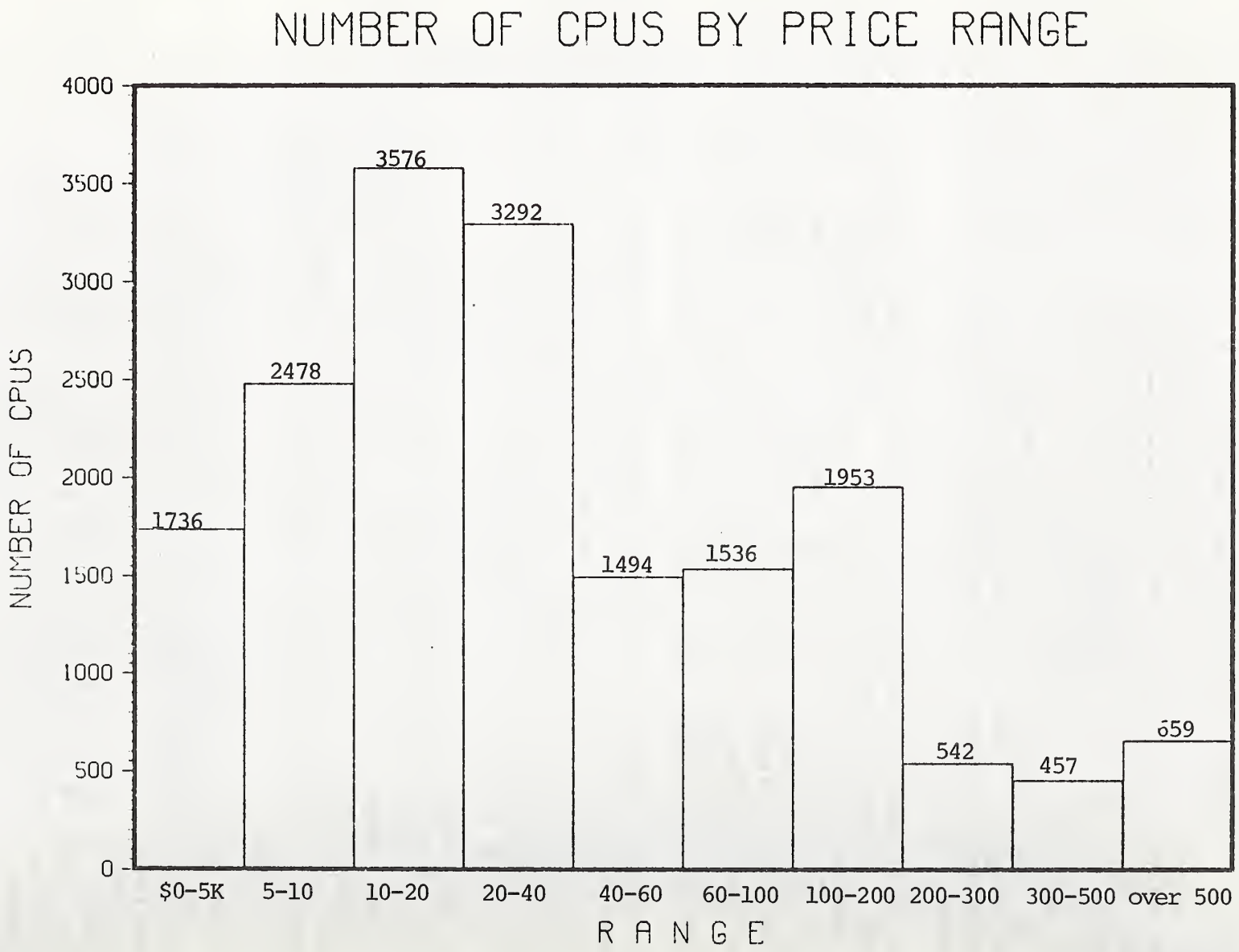
NUMBER OF CPUS BY PRICE RANGE
NUMBER OF CPUS
4000
3500
3000
2500
2000
1500
1000
500
0
1736
2478
3576
3292
1494
1536
1953
542
457
659
$0-5K
5-10
10-20
20-40
40-60
60-100
100-200
200-300
300-500
over 500
RANGE

Figure 10

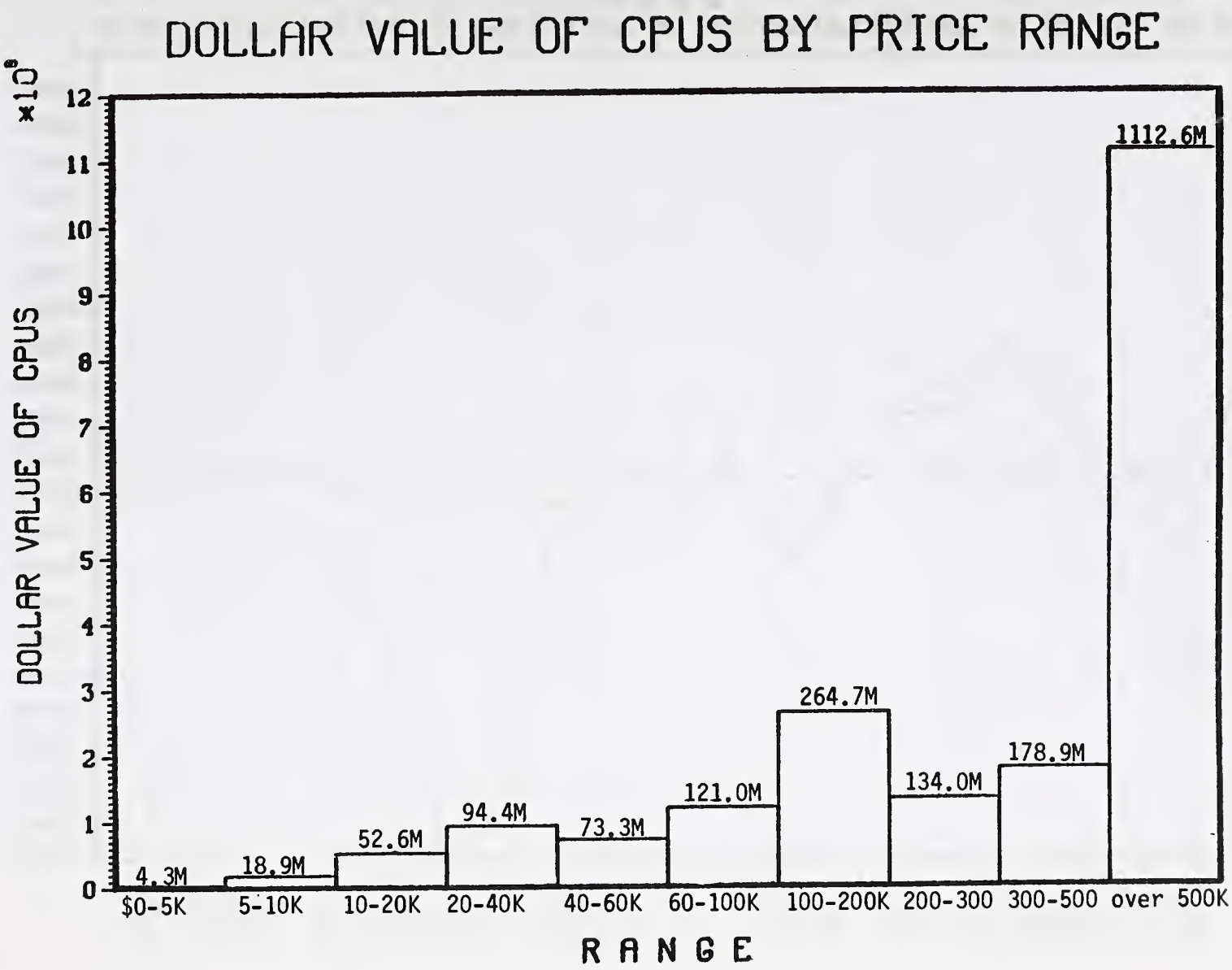
DOLLAR VALUE OF CPUS BY PRICE RANGE
DOLLAR VALUE OF CPUS
×10⁸
0
1
2
3
4
5
6
7
8
9
10
11
12
4.3M
18.9M
52.6M
94.4M
73.3M
121.0M
264.7M
134.0M
178.9M
1112.6M
$0-5K
5-10K
10-20K
20-40K
40-60K
60-100K
100-200K
200-300
300-500
over 500K
RANGE

Figure 11

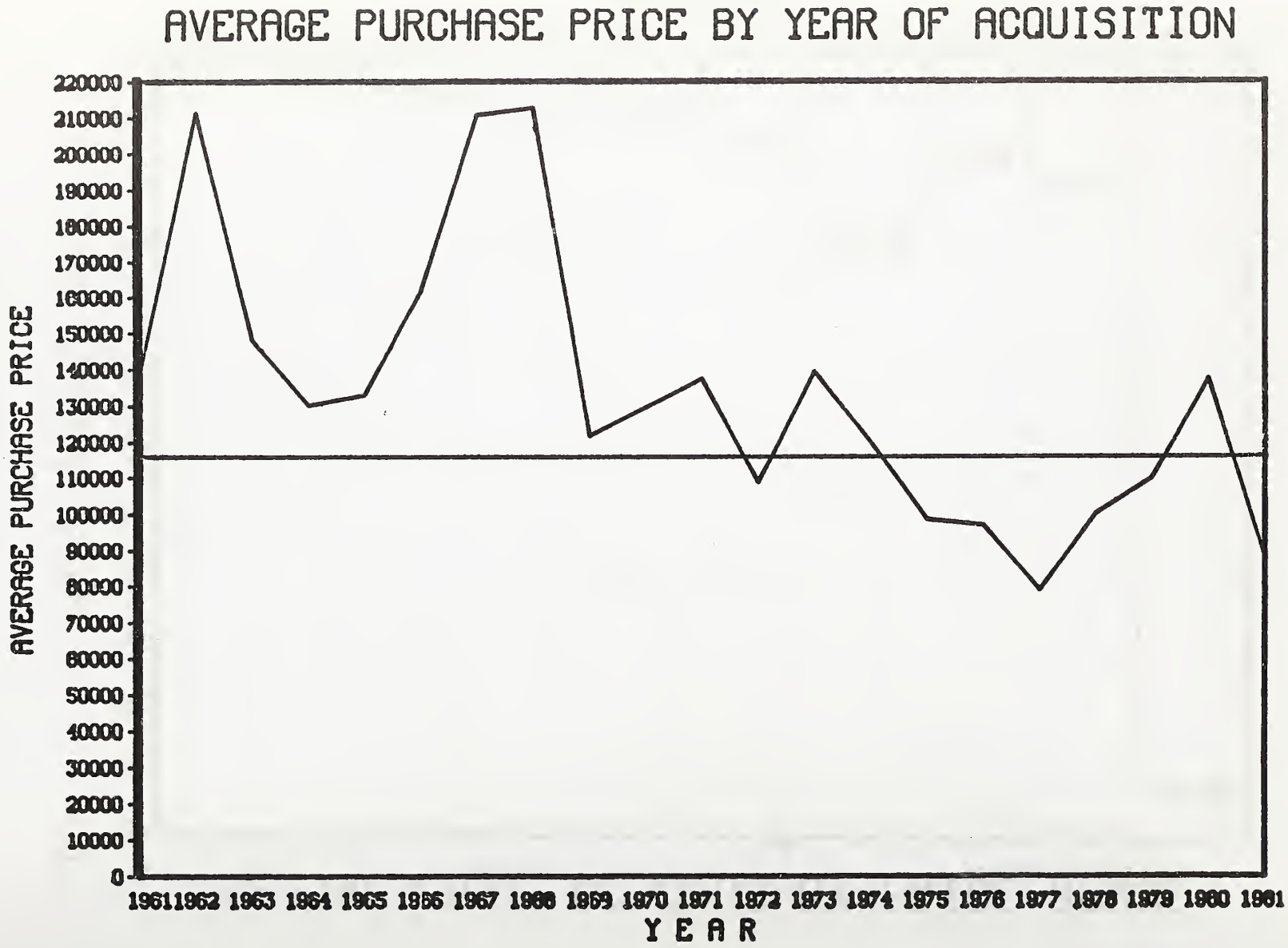
AVERAGE PURCHASE PRICE BY YEAR OF ACQUISITION
AVERAGE PURCHASE PRICE
220000
210000
200000
190000
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981
YEAR

Figure 12

the purchase prices of the 152 CPUs which were included in the 1981 inventory, not based on all of the CPUs with an acquisition date of 1965 which were ever in the inventory. (In the 1972 inventory there were 379 CPUs with an acquisition date of 1965.)

The results of this analysis show that the average purchase price of CPUs in the 1981 inventory having an acquisition date of 1970 or newer seem to be lower than those CPUs with acquisition dates in the 1960s. The exception to this seems to be the CPUs with an acquisition date of 1980. In the 1981 file there were 1,459 CPUs listed with an acquisition date of 1980 and a total purchase price of $200,565,654. Thus the average purchase price for the 1980 CPUs was $137,467.89. There were 849 CPUs with an acquisition date of 1981 for a total purchase price of $74,414,255 or an average purchase price of $87,649.30. Thus the average purchase price of the 1980 CPUs is significantly higher than the 1981 figure and the other figures from the 1970s--a fact which we are unable to explain.

Even though this 1980 figure is high, the author still feels that in general the average purchase prices of CPUs will continue to decline as more minicomputers and microcomputers are entered into the inventory. These CPUs have a much lower purchase price than the older general purpose computers.

2.3.4 Installed CPUs by Manufacturer

There are 275 manufacturers listed for CPUs on the GSA MIS inventory. Figures 13 and 14 and table 10 show the manufacturers with the largest number of CPUs and the largest total dollar value (purchase price) of installed CPUs in the Federal government. The manufacturer with the largest number of installed CPUs is Digital Equipment Corporation with 26 percent of the total number of CPUs. Hewlett-Packard, IBM, Univac, Data General Corporation, Modular Computer Systems, and Honeywell all follow with between four and 10 percent of the total number of CPUs. Control Data Corp., Wang, Interdata, and Burroughs have between two and three percent each. Together, CPUs from these 11 manufacturers comprise 78 percent of the Federal inventory. The remaining 22 percent is supplied by 264 different manufacturers.

By dollar value, or percent of the total purchase price, IBM is the largest supplier with 24 percent of the total purchase price. Control Data Corporation follows with 17 percent and Digital Equipment Corporation with over 10 percent. Univac has 9.4 percent and Honeywell has nine percent. Modular Computer Systems, Cray, Burroughs, Hewlett-Packard, Data General, and Texas Instruments each have between one and five percent of the total dollar value. These 11 manufacturers supply CPUs comprising 84 percent of the total purchase price of the inventory. The remaining 16 percent is supplied by the other 264 manufacturers.

Table 10 shows the actual numbers and total purchase prices for all manufacturers having more than 100 CPUs installed or more than $10 million in total purchase price of the CPUs installed.

FEDERAL CPUS BY MANUFACTURER

PERCENT BY NUMBER

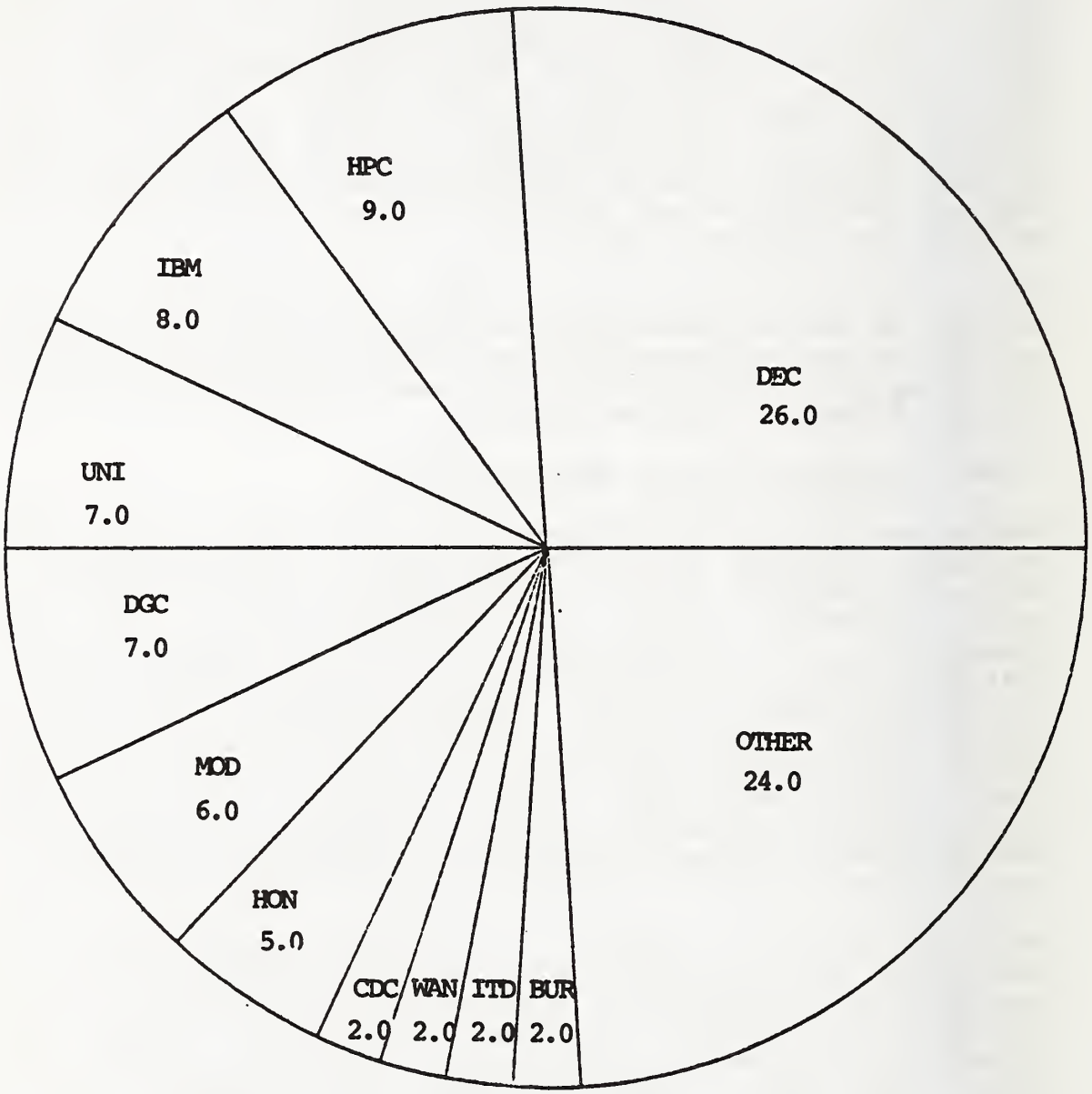

Figure 13

FEDERAL CPUS BY MANUFACTURER

PERCENT BY DOLLAR

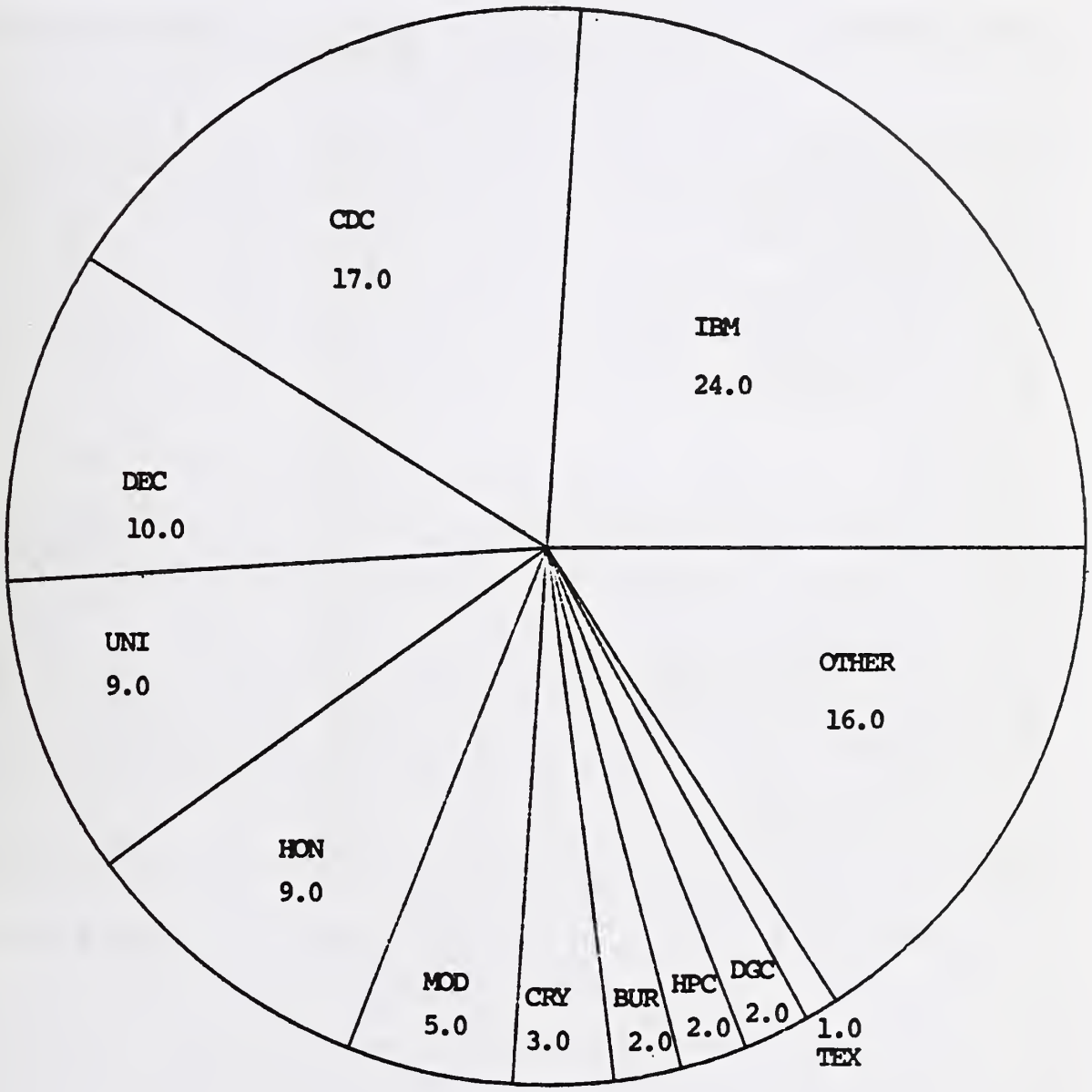

Figure 14

TABLE 10

CPUs by Manufacturer*
(listed alphabetically)

Manufacturer	Number of CPUs	Purchase Price
Amdahl	11	$ 25,105,508
Burroughs Corp.	336	44,175,074
Control Data Corp.	436	343,911,069
Cray Research, Inc.	10	71,502,251
Data General Corp.	1,181	33,168,909
Datapoint Corp.	142	1,483,074
Digital Equipment Corp.	4,640	215,183,849
Four Phase Systems, Inc.	195	7,954,468
General Electric	96	14,627,108
Harris Communications	146	6,419,748
Hewlett-Packard Co.	1,559	40,905,375
Honeywell	809	186,340,508
Hughes Aircraft Co.	12	12,897,347
Interdata	353	20,368,798
International Business Machines	1,405	483,866,938
Itel Corp.	24	13,940,458
Modular Computer Systems, Inc.	1,084	98,434,751
Motorola, Inc.	125	442,941
National Cash Reg. Co.	144	3,821,914
Scientific Data Systems, Inc.	83	12,902,285
Sperry Univac	1,253	193,556,397
Systems Eng. Labs., Inc.	268	22,973,195
Tektronix	159	2,865,947
Texas Instruments	198	26,275,623
Varian Data Machines	314	11,961,312
Wang	398	8,215,393
Xerox Data Systems	137	20,528,138
Total	15,518	1,923,828,378

*Manufacturers with more than 100 CPUs installed or over $10 million in total purchase price of CPUs installed.

These 27 manufacturers represent almost 88 percent of the total number of installed CPUs and over 93 percent of the total purchase price of all of the CPUs. Thus the remaining 248 manufacturers totalled only equal about 12 percent of the number of CPUs and less than seven percent of the total purchase price of all of the CPUs.

2.4 Federal Disk Units

As was shown earlier, there were 24,139 disk drives reported in the Federal Government as of December 1981, with a combined purchase price of $587,089,808. These disk drives equal over 10 percent of the inventory's total purchase prices. The average purchase price of the disk drives was $24,321, and there were an average of 1.36 disk drives per CPU in the inventory. The number of disks had increased four percent from 1980 to 1981 and for the first time in the inventory, actually outnumbered the magnetic tape units. The average purchase price of a disk unit had declined over $300 from $24,639 in 1980, indicating that less expensive disks were entering the inventory. To identify other attributes of the disk units, we analyzed them by acquisition date, purchase price, and agency for both the 1980 and the 1981 files.

2.4.1 Disk Units Installed by Acquisition Date

A frequency distribution showing the number of disk units by year of acquisition is given in figure 15. The disk units in the Federal inventory have mainly been purchased in the last 10 years with 50 percent in the last five years (having acquisition dates of 1977 to 1981). As is the case with the analysis of CPUs by date, the 1981 reported figure is lower than it should be. Since units in the Federal inventory are not reported until they have been physically installed, the actual number of disk drives having an acquisition date of 1981, will be much higher in the reported figures from the FY82 inventory.

As mentioned earlier, there were more disks installed in the 1981 inventory than there were magnetic tape units. The frequency distributions, figures 15 and 20, of the disks and tape units show that there were more disks listed for each year from 1974 to 1981 than there were tapes indicating a long-term trend that, by 1981, resulted in the number of disks in the total inventory exceeding the number of magnetic tape drives. Also, the acquisition dates of most disk units are more recent than the acquisition dates of most tape units; however, both memory units are still being purchased. In the United States as a whole, disk technology seems to be replacing magnetic tape technology more quickly than it is in the Federal Government.

One other note should be added about the frequency distribution on disks, figure 15. There are four disks which appeared in the 1981 file for the first time but have an acquisition date of 1950. These four are probably the result of erroneous data input

Number of Disk Drives Installed as of December 1981

ACQ YEAR	No.	Cumulative Percentile	
NONE*	200		XXX
1950	4		
1951	0		
1952	0		
1953	0		
1954	0		
1955	0		
1956	0		
1957	0		
1958	0		
1959	0		
1960	3		
1961	0		
1962	2		
1963	6		
1964	10		
1965	12		
1966	41		X
1967	94		X
1968	145		XX
1969	237		XXX
1970	354		XXXXX
1971	708	5%	XXXXXXXXXX
1972	906	8%	XXXXXXXXXXXXX
1973	1594	11%	XXXXXXXXXXXXXXXXXXXXXX
1974	2150	18%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1975	2494	27%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1976	2949	37%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1977	3006	49%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1978	3224	62%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1979	2571	75%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1980	2434	86%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1981	995	96%	XXXXXXXXXXXXXX
1982	0	100%	
	24139		

* These have no specified acquisition date. Prior to June 30, 1971, data on acquisition date was not required, but was entered into the data base on a voluntary basis.

Figure 15

but we could not identify them by model number or any other dates in the file in order to ascertain the correct acquisition date. Thus they have been left as they appear on the file.

2.4.2 Disk Units Installed by Price Range

We sorted the disk units into ranges of purchase prices to try to analyze the costs and probable sizes of the disk drives. This data is presented in figures 16 and 17. The largest number of disk units is in the $20K-$40K range followed by the $10-$20K range, the $0-5K range and the $5-10K range. Thus the number of disks ranging from $0-40K equals 21,177 units or almost 87 percent of total of the number disks installed. All of the disks with a purchase price greater than $40,000 only equal 12 percent by number of units. By dollar value, the disks costing less than $40,000 equal 51 percent of the total purchase price of all disks.

There were a number of major differences in the 1980 file and the 1981 file when disks were analyzed by purchase price range. In 1980 the largest category of number of disks by price range was the $10-20K range with 6,387 disks listed. In 1981 this category had 5,833 listed or a decrease of almost 9 percent. The next largest category in 1980 was the $20-40K range, with 5,099 disks listed. In 1981 this category became the largest with 6,031 disks listed or an 18 percent increase. The two categories of disks with a purchase price less than $10,000 increased slightly (between five and seven percent) but by far the largest increase was in the $20-40K range. The more expensive disks, those having a purchase price greater than $60,000, generally decreased slightly.

There does appear to be one major problem with this information on disks sorted by purchase price range. The range that is over $500K shows 16 disks with an average price of over $4 million each. When we analyzed these 16 disks it was apparent that none of the models should have cost over $3 million. Our best guess is that these entries actually represent several disk drives and controllers and are listed as one disk system. While we did not verify the data with each installation involved, we did not see what appeared to be any blatant typographical errors. We feel that these large dollar values probably statistically balance the entries which have a recorded dollar value of $1 or $2. This is the way that some disk systems were entered with one disk unit having a large dollar value and other disk units at the same location having a nominal dollar value. The overall figures, total numbers, dollars, and average price seem to be reasonable.

2.4.3 Disks Units Installed by Agency

We analyzed the number of disk units and the dollar value of disk units installed in each agency. The data from this analysis is presented in figures 18 and 19. (For those who are interested in comparing agencies which are disk oriented with those which are tape oriented, the same data vis a vis tapes is presented in

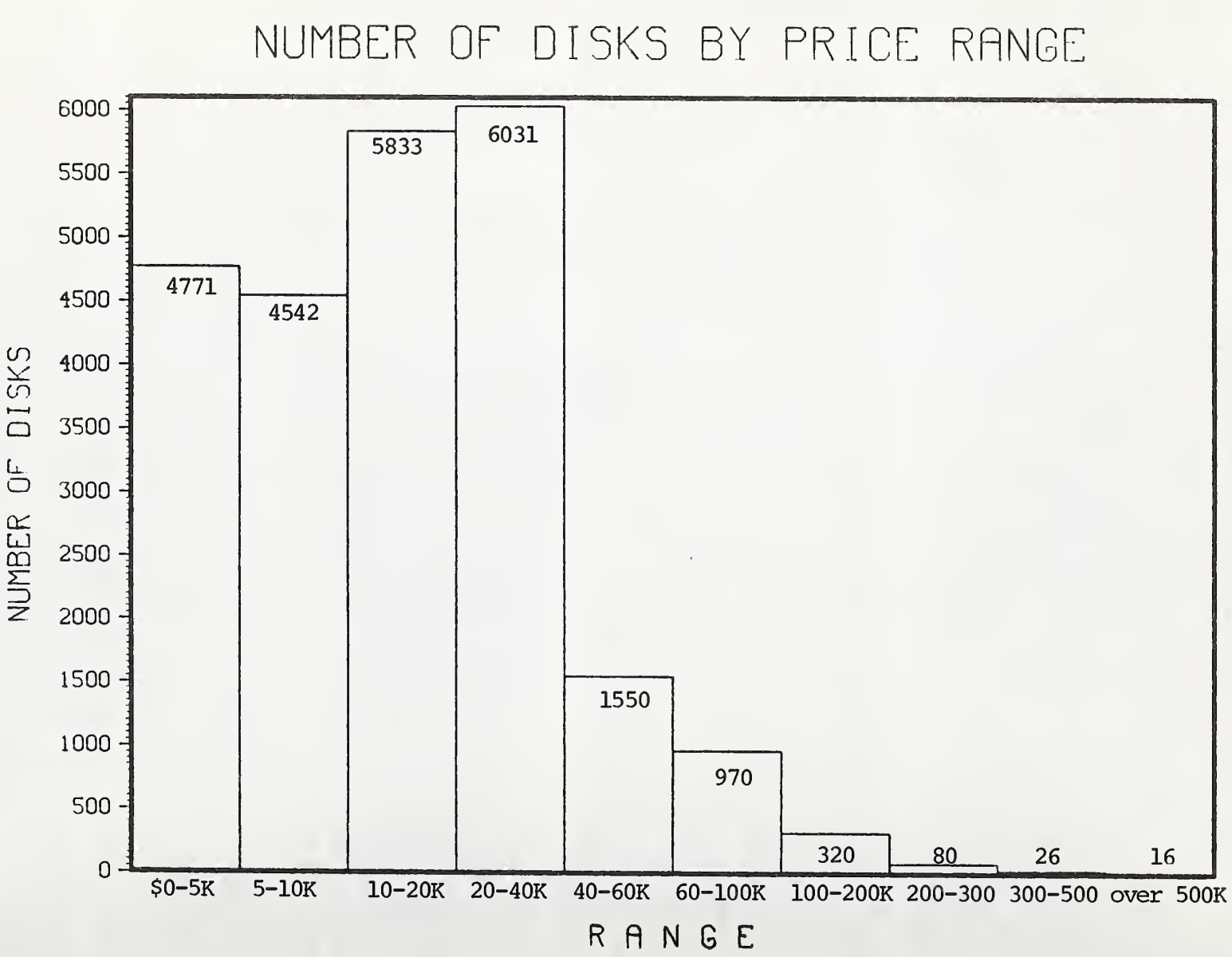
NUMBER OF DISKS BY PRICE RANGE
NUMBER OF DISKS
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4771
4542
5833
6031
1550
970
320
80
26
16
$0-5K
5-10K
10-20K
20-40K
40-60K
60-100K
100-200K
200-300
300-500
over 500K
RANGE

Figure 16

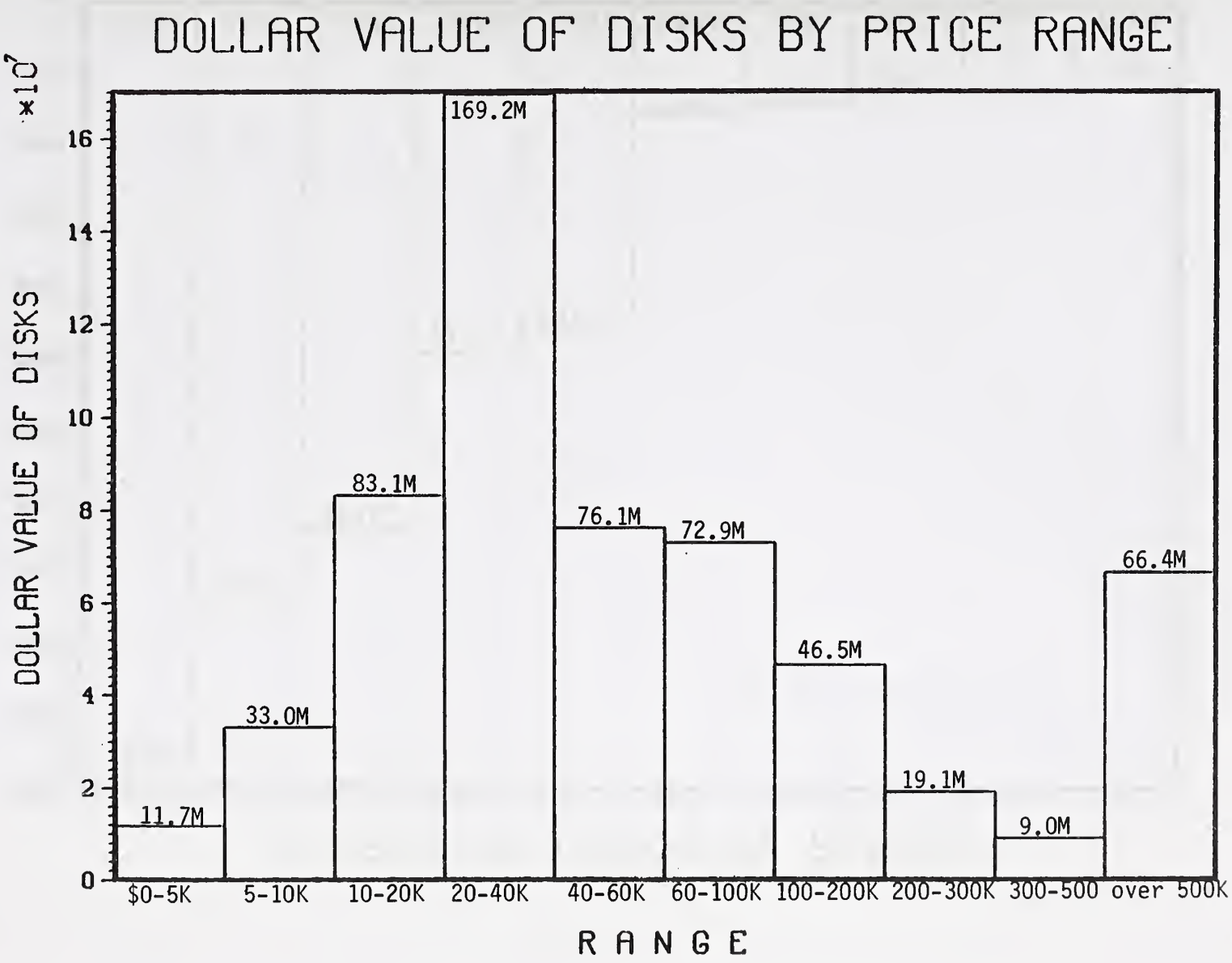
DOLLAR VALUE OF DISKS BY PRICE RANGE
DOLLAR VALUE OF DISKS
*10⁷
0
2
4
6
8
10
12
14
16
11.7M
33.0M
83.1M
169.2M
76.1M
72.9M
46.5M
19.1M
9.0M
66.4M
$0-5K
5-10K
10-20K
20-40K
40-60K
60-100K
100-200K
200-300K
300-500
over 500K
RANGE

Figure 17

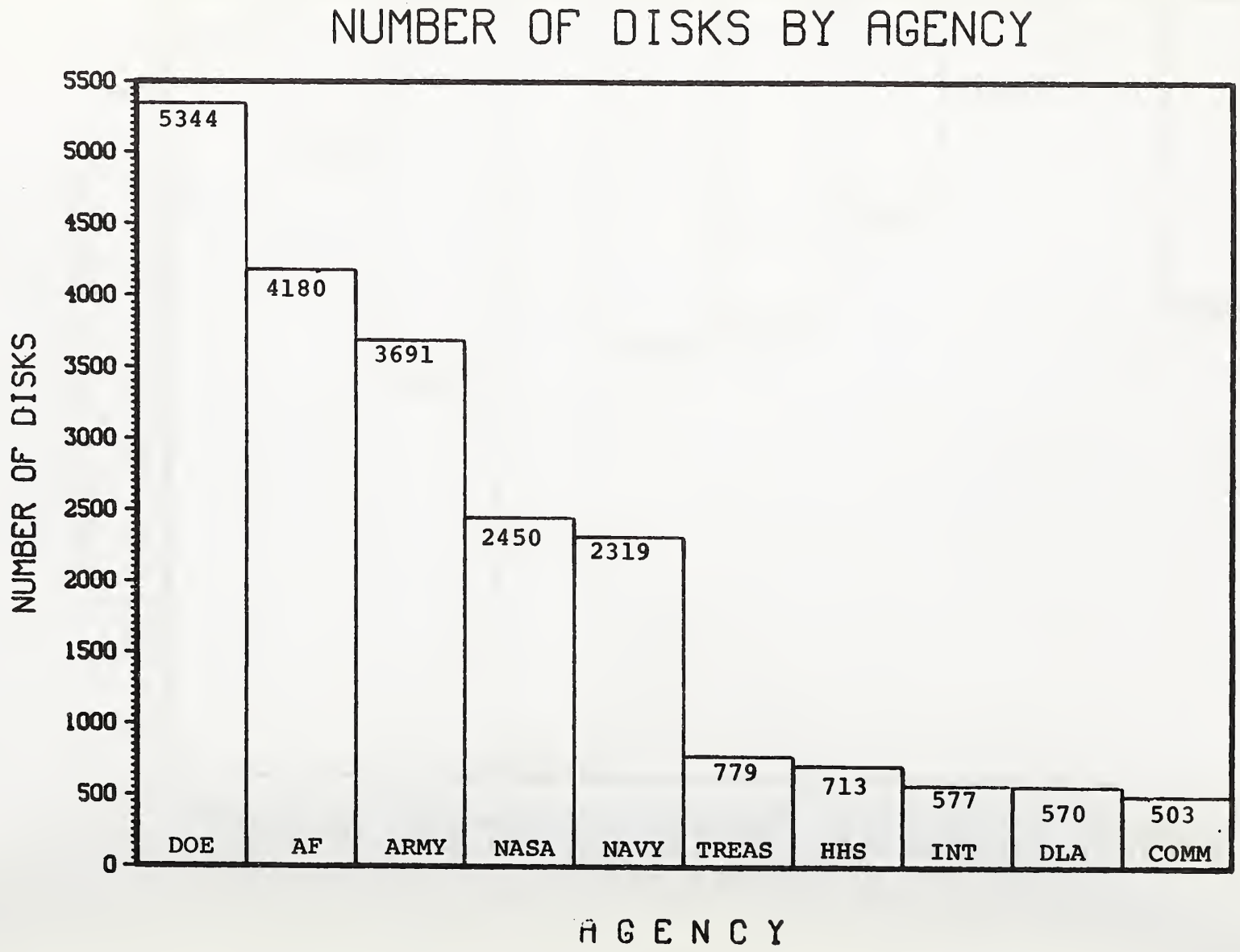
NUMBER OF DISKS BY AGENCY
NUMBER OF DISKS
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
5344
4180
3691
2450
2319
779
713
577
570
503
DOE
AF
ARMY
NASA
NAVY
TREAS
HHS
INT
DLA
COMM
AGENCY

Figure 18

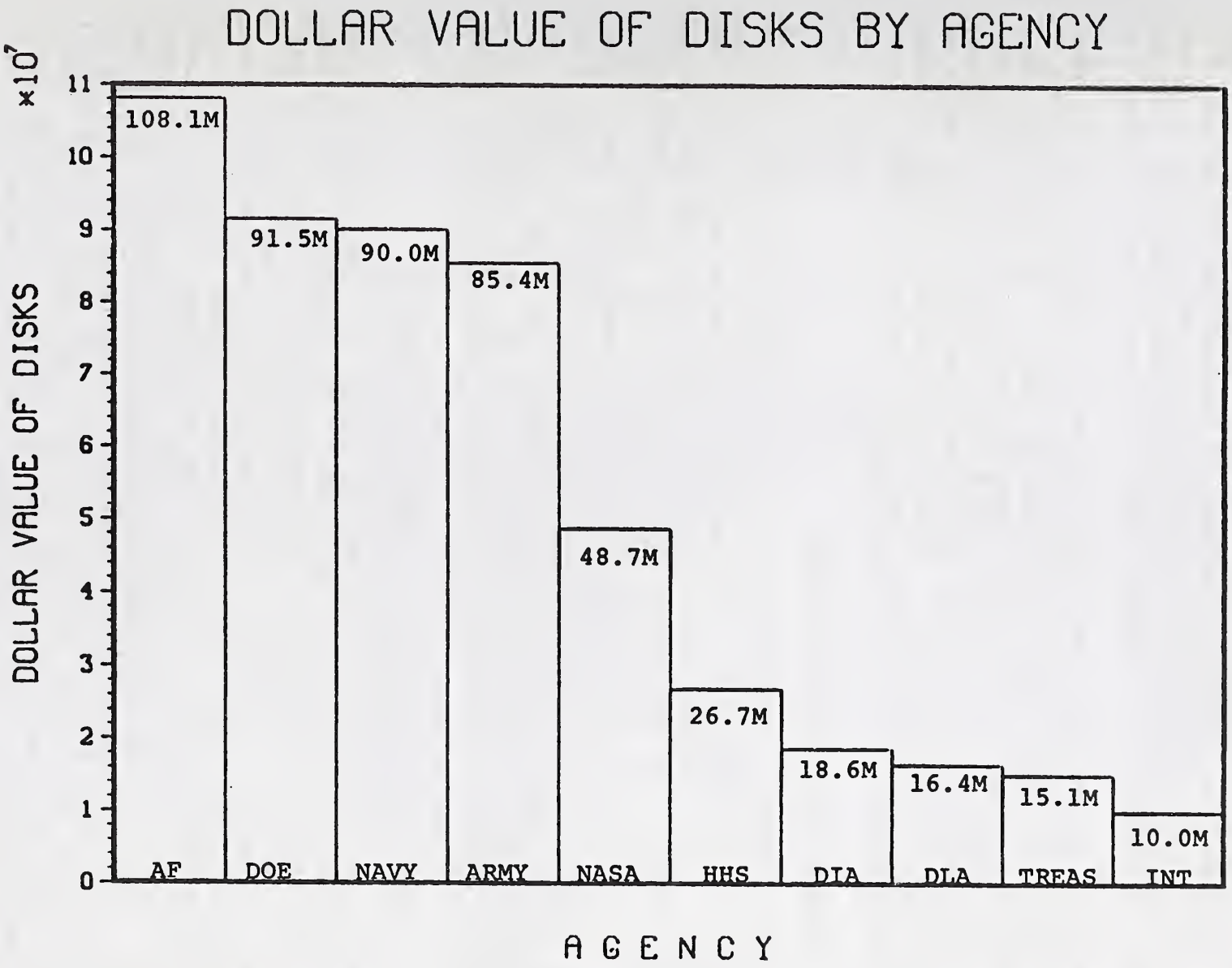
DOLLAR VALUE OF DISKS BY AGENCY
DOLLAR VALUE OF DISKS
×10⁷
11
10
9
8
7
6
5
4
3
2
1
0
108.1M
91.5M
90.0M
85.4M
48.7M
26.7M
18.6M
16.4M
15.1M
10.0M
AF
DOE
NAVY
ARMY
NASA
HHS
DIA
DLA
TREAS
INT
AGENCY

Figure 19

section 2.5.2, figures 21 and 22.) Five agencies have both the largest number of disks and the largest total purchase price, i.e., Energy, Air Force, Army, Navy, and NASA. These five agencies show a significantly larger number and dollar value of disk units than the next five agencies. The rank order of the agencies varies slightly, with Energy having the largest number of disks and the Air Force having the largest dollar values but the same five agencies remain at the top of both lists. These same five agencies are also the agencies which have the largest number of CPUs and the highest total purchase price for CPUs.

When this same analysis was completed on the 1980 file there were not many significant differences. However, the Navy decreased in the number of disks listed from 1980 to 1981. In 1980 the Navy listed 3,020 disks with a total purchase price of $111.1 million. In 1981 the Navy only listed 2,319 disks with a total purchase price of $90.0 million. Thus both the number and dollar value of the Navy's disks decreased. Three other agencies shown on these graphs also decreased in number and dollar value of disks, i.e. Defense Logistics, Interior, and Commerce.

2.5 Federal Magnetic Tape Units

As noted earlier, there were a total of 23,388 tape units in the Federal Government as of December 1981, with a total purchase price of $421,051,420. The average price of a tape unit was $18,003. The dollar value of these tape units equalled about eight percent of the dollar value of the total ADP inventory. When the number of tape units was divided by the number of CPUs, the result indicated that there were on average 1.32 tape units per CPU. Note that the number of magnetic tape units decreased from 1980 to 1981. 1981 was the first year that the number of disk units was greater than the number of tape units. To identify other attributes of the tape units, we analyzed the units by year of acquisition, by agency, and by purchase price range.

2.5.1 Tape Units Installed by Acquisition Date

A frequency distribution showing the number of tape units by year of acquisition is given in figure 20. The majority, 79 percent, of tape units in the Federal Government have an acquisition date later than 1971; however, only 32 percent of these units have been purchased in the last five years (having acquisition dates between 1977 and 1981). Thus, these units appear to be older than the Government's disk units. The peak years for tape unit acquisitions seemed to be 1973, 1974, and 1976 while the peak years for disk unit acquisitions seemed to be 1976, 1977, and 1978. Note however, that there still are a significant number of tape units being added to the inventory. In 1978, for example, 3,116 disk units were acquired versus 1,811 tape units. Thus, while there is a decrease in the number of tape units being added to the inventory, there still is a significant number of tape units with current acquisition dates.

Number of Tape Drives
Installed as of December 1981

ACQ YEAR	No.	Cumulative Percentile	
NONE*	1084		XXXXXXXXXXXXXXXXXXXXX
1950	0		
1951	0		
1952	0		
1953	0		
1954	0		
1955	0		
1956	0		
1957	0		
1958	0		
1959	0		
1960	44		X
1961	123		XXX
1962	183		XXXX
1963	336		XXXXXXX
1964	267		XXXXX
1965	317		XXXXXX
1966	372		XXXXXXXX
1967	374		XXXXXXXX
1968	609		XXXXXXXXXXXX
1969	593		XXXXXXXXXXXX
1970	742		XXXXXXXXXXXXXXX
1971	932	22%	XXXXXXXXXXXXXXXXXX
1972	1646	26%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1973	2211	33%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1974	2088	42%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1975	1999	51%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1976	2116	60%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1977	1424	69%	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1978	1752	75%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1979	1880	82%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1980	1495	90%	XXXXXXXXXXXXXXXXXXXXXXXXXXX
1981	801	97%	XXXXXXXXXXXXXXX
1982	0	100%	
	23388		

* These have no specified acquisition date. Prior to June 30, 1971, data on acquisition date was not required, but was entered into the data base on a voluntary basis.

Figure 20

2.5.2 Tape Units Installed by Agency

Bar graphs of the number and dollar value of tape units by agency are presented in figures 21 and 22. The five agencies showing both the largest number and dollar value of tape units installed are the Air Force, Army, Navy, Energy, and NASA. These are the same five agencies that also show the largest number of CPUs and the largest number of disks. The ranking of the agencies changes slightly when you analyze the units by number and by dollar value but the top five agencies are still the same. The next grouping of agencies varies slightly also with Commerce appearing in the top 10 if the analysis is by number and the Veterans Administration appearing if the analysis is by dollar value. Transportation is the only agency on the top 10 agencies for number of tapes that did not appear in the top 10 agencies for disks. Transportation and the Veterans Administration appear in the top 10 for dollar value of tapes but did not appear in the top 10 by dollar value of disks.

When we analyzed the 1980 data file both the overall number of tape units, and the total purchase price were higher than in 1981. Of the agencies listed in figures 21 and 22, two increased both the number of tape units and the total purchase price, i.e., the Air Force and Energy. Treasury increased the number of tape units listed but the total purchase price decreased. All of the other agencies showed a decrease in both the number of magnetic tape units installed and the total purchase price of the magnetic tape units installed.

2.5.3 Tape Unit Installed by Price Range

As mentioned above, the average purchase price of a magnetic tape unit was $18,003. To analyze the prices of all of the tape units, we totalled the number and dollar value of these units by purchase price range. The results are given in figures 23 and 24. The largest number of tape units are in the price range of $20-40K with the $10-20K range having the next highest number. The number of tape units costing less than $40,000 equals 97 percent of the total number of tape units. By dollar value these tape units costing less then $40,000 equal 83 percent of the total dollar value.

When this analysis for 1981 was compared with the data from 1980, the only price range which showed any increase from 1980 to 1981 was the $5-10K price range which rose from 3,770 units in 1980 to 3,897 units in 1981. All of the other price ranges showed a decrease.

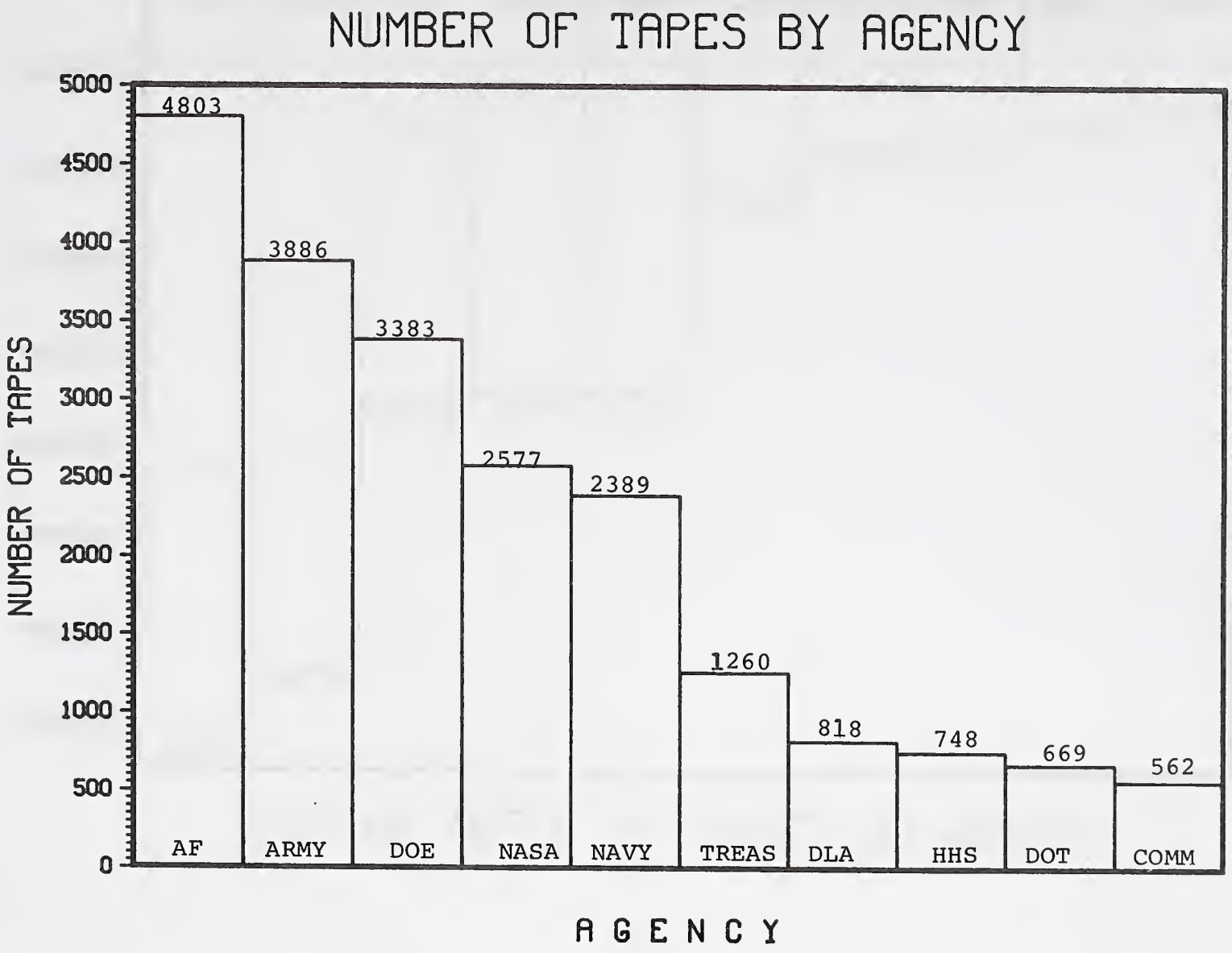
NUMBER OF TAPES BY AGENCY
NUMBER OF TAPES
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4803
3886
3383
2577
2389
1260
818
748
669
562
AF
ARMY
DOE
NASA
NAVY
TREAS
DLA
HHS
DOT
COMM
AGENCY

Figure 21

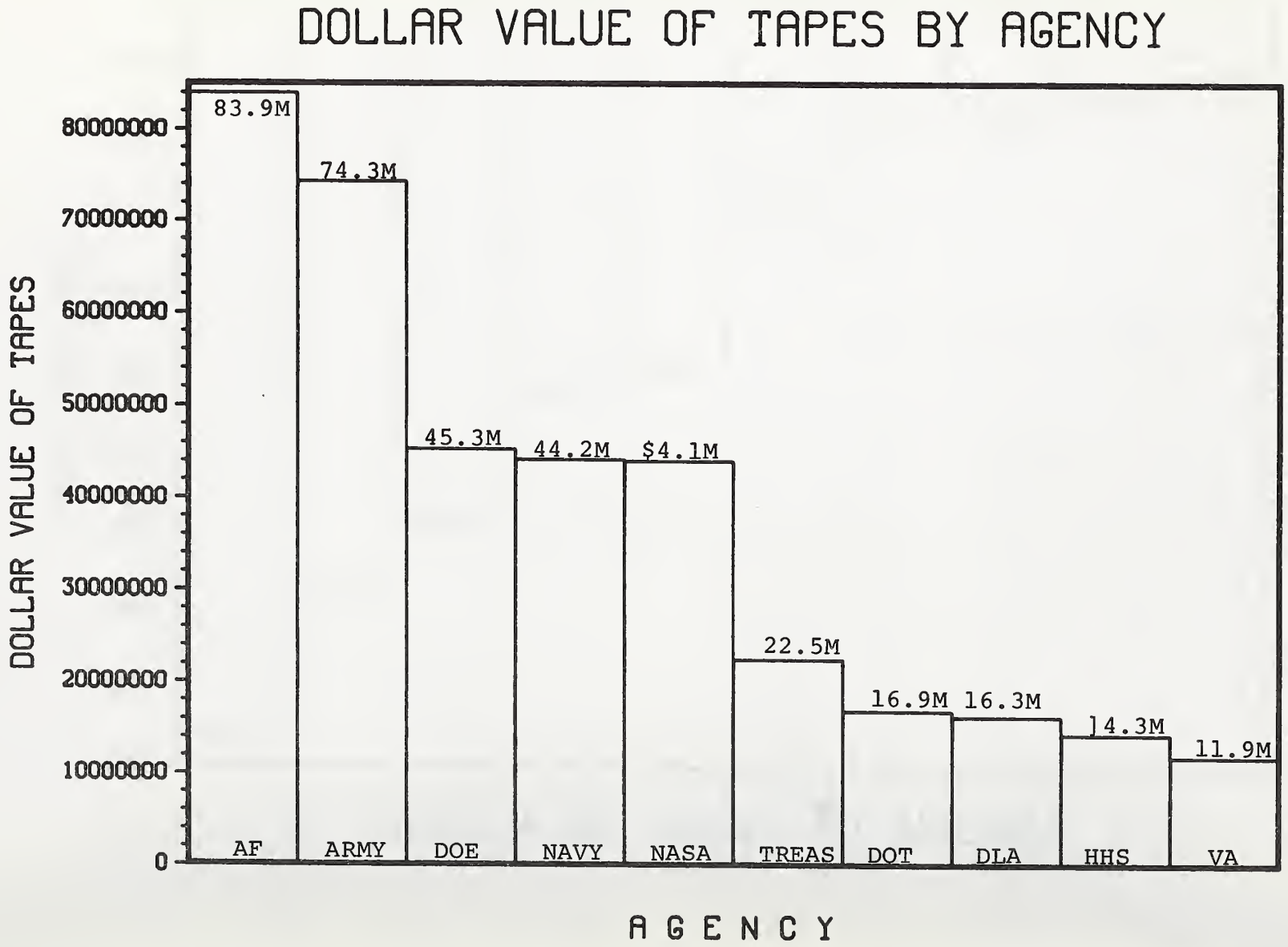
DOLLAR VALUE OF TAPES BY AGENCY
DOLLAR VALUE OF TAPES
80000000
70000000
60000000
50000000
40000000
30000000
20000000
10000000
0
83.9M
74.3M
45.3M
44.2M
$4.1M
22.5M
16.9M
16.3M
14.3M
11.9M
AF
ARMY
DOE
NAVY
NASA
TREAS
DOT
DLA
HHS
VA
AGENCY

Figure 22

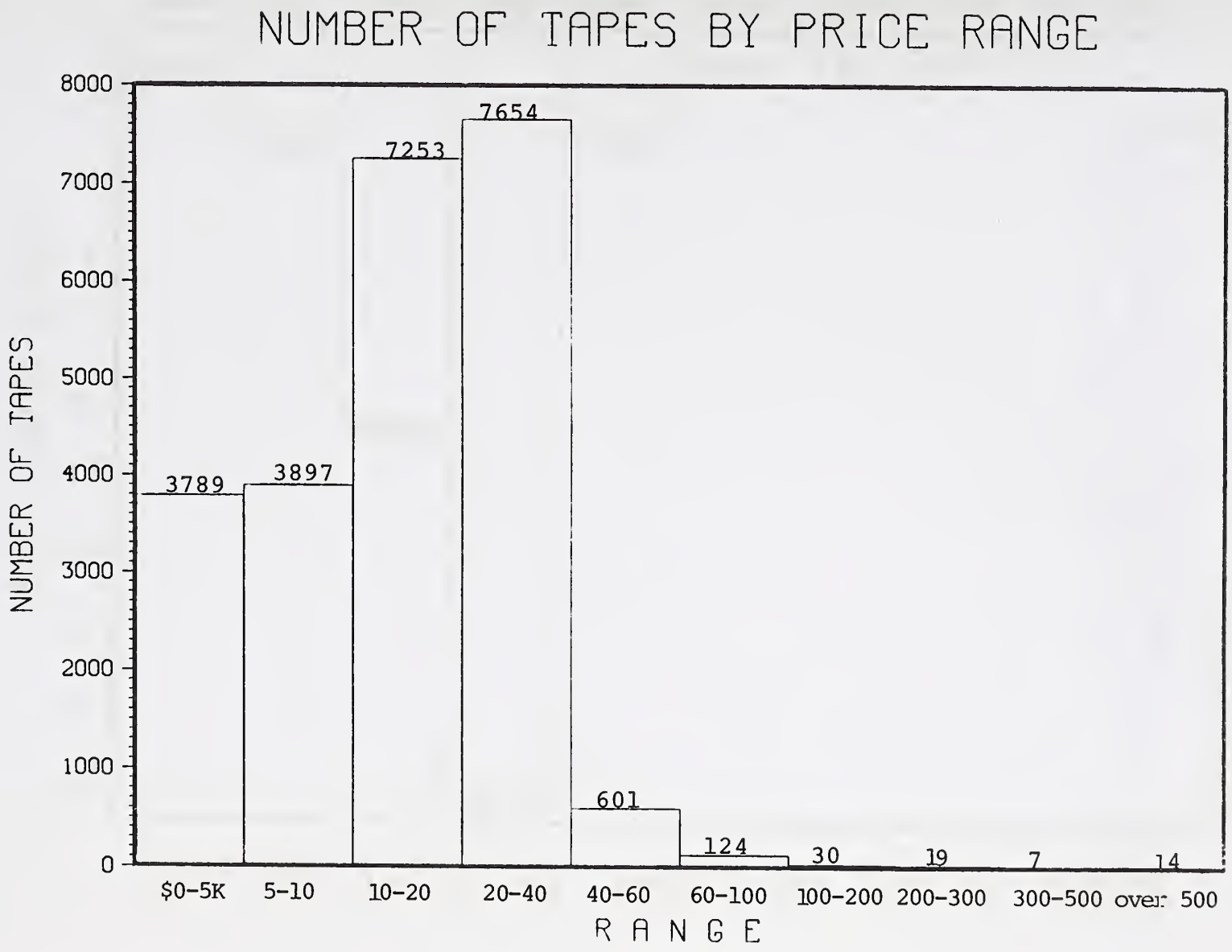
NUMBER OF TAPES BY PRICE RANGE
NUMBER OF TAPES
8000
7000
6000
5000
4000
3000
2000
1000
0
3789
3897
7253
7654
601
124
30
19
7
14
$0-5K
5-10
10-20
20-40
40-60
60-100
100-200
200-300
300-500
over 500
RANGE

Figure 23

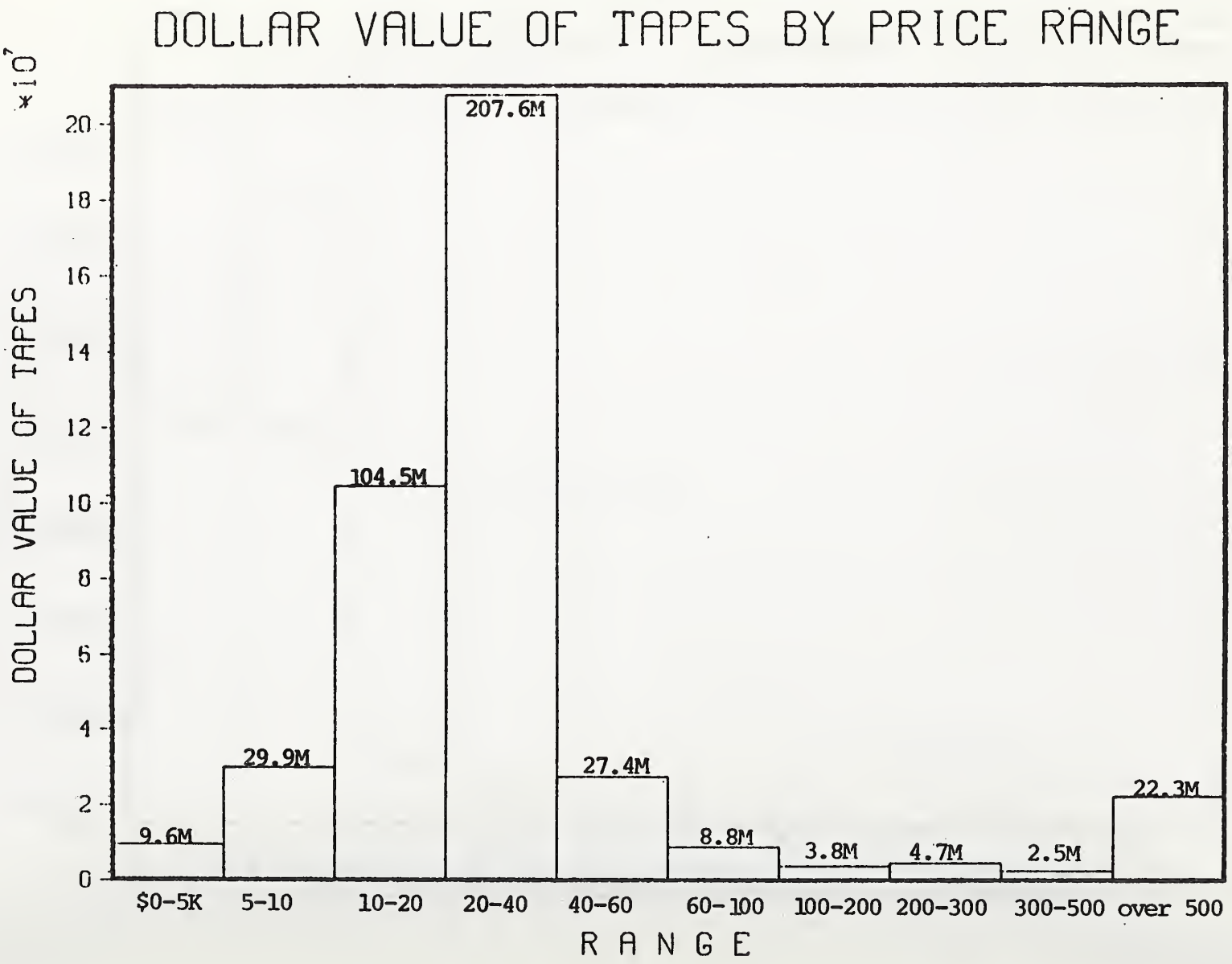
DOLLAR VALUE OF TAPES BY PRICE RANGE
DOLLAR VALUE OF TAPES
*10^7
20
18
16
14
12
10
8
6
4
2
0
9.6M
29.9M
104.5M
207.6M
27.4M
8.8M
3.8M
4.7M
2.5M
22.3M
$0-5K
5-10
10-20
20-40
40-60
60-100
100-200
200-300
300-500
over 500
RANGE

Figure 24

References

1. Automatic Data Processing Equipment Inventory in the United States Government as of the end of Fiscal Year 1981, General Services Administration, Washington, D. C., February 1982, p. 4.

2. Continued Use of Costly, Outmoded Computers in Federal Agencies Can Be Avoided, The Comptroller General, General Accounting Office, Report to the Congress of the United States, AFMD-81-9, December 15, 1980, 61 pp.

3. Ibid, p. 5.

Section 3. Federal Government Statistics Compared with U.S. Statistics

3.1 Introduction

Both in order to facilitate comparisons of Federal and U.S. computers and to prepare a detailed analysis of the Federal general purpose computers and minicomputers, a model-by-model census of Federal computers was developed. The census was developed by comparing IDC's model-by-model census of computers in the U.S. with printouts obtained from GSA. These printouts are from year-end 1972 through 1980. In some instances, models listed in the GSA inventory do not appear in the IDC census. In those cases, ICST assigned the models to the categories that were deemed apropriate. In other instances, models listed in the GSA inventory were not, strictly speaking, computers but, for example were add-on memory units, programmable calculators, intelligent terminals, and so on. ICST deleted those models for purposes of this analysis. Thus, in this section of the report, we consider only 14,761 computers rather than the 15,154 CPUs reported in the GSA MIS inventory for 1980.(1) Since the purpose of section 3 is to analyze trends in the general purpose computer and minicomputer segments of the Federal Government, the discrepancy between the numbers used here and those used in section 2 did not pose a problem. Because both the Federal census and the U.S. census were based on year-end figures, no extrapolation of data was necessary for yearly comparisons.

3.2 Federal Government Computers

Table 11 shows the results of the census development. The headings for microprocessors, small business computers, and word processors have been added not to indicate that these are the total number of these machines in the government, but to show that of the CPUs listed in the inventory, 419 fell into these categories and could not really be called anything else. Logic dictates that there are certainly more than 131 microprocessors in the Federal Government. The majority, however, have not been entered into the ADP inventory as CPUs. As the number of microprocessors increase in the government, more will probably be listed, but with the current reporting procedures for the inventory, the reported number will probably never equal the actual number in existence--nor will the reported number of word processors match their actual total.

As section 2 showed, the number of CPUs in the $0-5K range has grown from 1,149 in 1980 to 1,736 in 1981 reflecting a 51 percent increase. This would seem to indicate that when a model-by-model census analysis is completed on the 1981 data, the number of small computers, microprocessors, and word processors will increase. Nonetheless, the author feels that these numbers will never wholly reflect the actual increases in the numbers of small machines. Microprocessors can be built from storeroom parts and not purchased through the normal ADP procurement channels. Thus

TABLE 11

COMPUTERS IN THE FEDERAL GOVERNMENT BY CATEGORY AND SIZE

(Calendar Year)

Size and Category	1972	1973	1974	1975	1976	1977	1978	1979	1980
GENERAL PURPOSE									
Historical	52	42	28	21	13	6	6	0	0
Size Class 2	1135	1027	889	886	775	720	691	628	601
3	973	957	877	817	736	728	722	679	670
4	888	927	909	810	803	785	795	763	748
5	328	363	342	349	338	365	366	358	362
6	308	353	393	398	403	444	458	461	481
7	141	176	221	223	254	279	304	320	327
Total GEN. PURPOSE	3825	3845	3659	3504	3302	3327	3342	3209	3189
MINICOMPUTERS	1804	2256	3045	3842	4775	6079	6985	8574	9237
SPECIAL	1159	1227	1363	1465	1568	1693	1769	1839	1916
Micros*	0	0	1	14	18	33	50	108	131*
Small Business*	0	0	0	0	0	0	0	92	138*
Word Processors*	0	0	0	0	0	0	0	84	150*
TOTAL	6788	7328	8068	8828	9663	11132	12146	13906	14761

*These numbers represent the number of CPUs which were entered in the inventory as micros, small business computers, or word processors. They certainly do not represent the total installed base of micros, small business computers, or word processors in the Federal Government but only those which have been reported to the GSA inventory as CPUs.

the individual filling out the GSA MIS Inventory reporting forms may never know that the micros even exist.

When the dollar value of the inventory is analyzed for purposes of cost/benefit studies, impact assessments, etc., the impact of these small CPUs is small. In 1980 the reported number of CPUs in the $0-10K range was over 21 percent of the total number of CPUs in the inventory. By dollar value, however, the total purchase price of these CPUs was less than one percent of the total dollar value of the CPUs. Thus, for certain kinds of analyses, the important segments of the inventory are still the general purpose computer and the minicomputer segments since these have the largest dollar value. As mentioned in section 2, those CPUs which had a purchase price of over $500,000 represented over 55 percent of the dollar value of the total inventory. These expensive computers usually are found in size classes 5, 6 and 7 of the general purpose computers.

Thus, the analysis in this section will focus on the general purpose computer and minicomputer segments of the Federal inventory. The intent is to identify historical trends and to compare them with comparable trends in the United States as a whole.

Figures 25 and 26 graphically show the number of Federal computers (for the purposes of these graphs the microprocessors, small business computers, and word processors are included in the "special" category.) As is apparent, the increase in the number of Federal computers for the most part reflects the increase in the number of minicomputers. The number of minicomputers has increased from 27 percent of the total number of computers in 1972 to 63 percent of the total number in 1980. The number of minicomputers in 1980 did not increase as much as in the past (see section 3.5) but it still provided much of the growth in the Federal computer inventory.

The number of general purpose computers has shown a continuous decline over the nine years covered in this analysis. Overall, the number of general purpose computers in the Federal Government has shown a 17 percent decline since 1972. However, since 1978 the decline has been less than five percent. The number of general purpose computers is expected to remain fairly stable in the next five years, showing only a slight decline. As the number of smaller computers increase in the Government, the percentage of general purpose computers compared with the total number of computers will continue to decline. In 1972 the general purpose computers represented 56 percent of the total number of Federal computers, by 1980 the general purpose computers represented only 22 percent of the total -- a downward trend likely to continue.

The growth rate of the total number of Federal computers is shown in table 12. Over the last nine years the growth rate has averaged a little over 10 percent. The growth rate from 1979 to 1980 seems atypically low and is probably not indicative of a

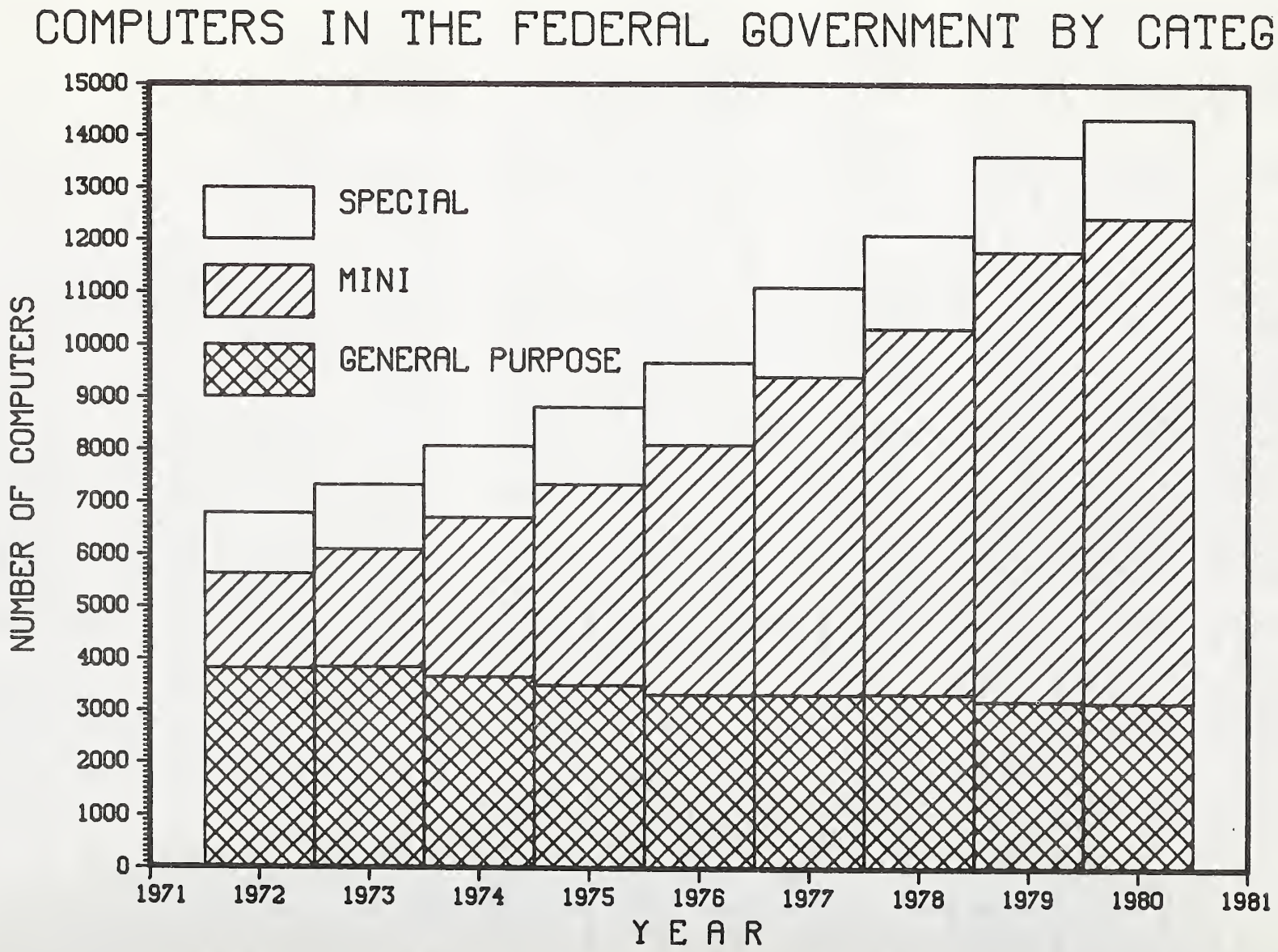
COMPUTERS IN THE FEDERAL GOVERNMENT BY CATEGORY
NUMBER OF COMPUTERS
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
SPECIAL
MINI
GENERAL PURPOSE
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
Y E A R

Figure 25

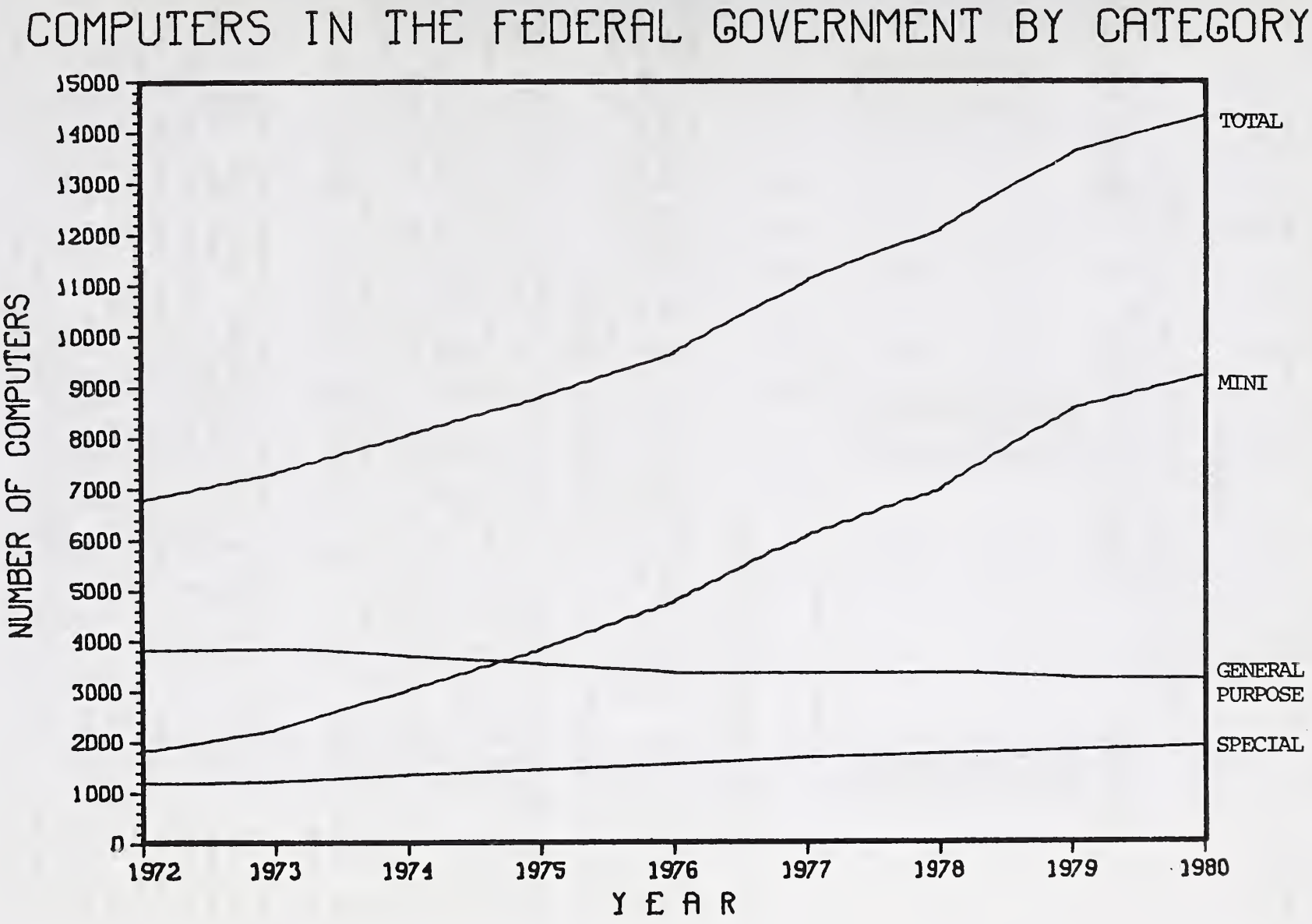
COMPUTERS IN THE FEDERAL GOVERNMENT BY CATEGORY
NUMBER OF COMPUTERS
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
TOTAL
MINI
GENERAL PURPOSE
SPECIAL

Figure 26

developing trend. The number of smaller computers should certainly increase more than six percent. If the 10+ percent growth rate is applied to the 1980 figure and for the next 10 years, by 1990 the Federal Government will have almost 40,000 computers.

TABLE 12

Federal Computer Growth Rate by Number

Year-end	Total No. of CPUs	Growth Rate (%)
1972	6,788	
1973	7,328	7.96
1974	8,068	10.10
1975	8,828	9.42
1976	9,663	9.46
1977	11,132	15.20
1978	12,146	9.11
1979	13,906	14.49
1980	14,761	6.15

Average Growth Rate = 10.24%

3.3 United States Computers

The number of computers installed in the United States presented in table 13 is the data which will be utilized in the rest of this section. All of the numbers are from the International Data Corporation. Most of these are from the "Annual Review and Forecast" issues of the EDP Industry Report.

The numbers of computers in the United States, counting desktop computers, has dramatically increased from 1972 to 1980 and has now reached the one million mark. If you calculate the number of people per computer in 1972 and 1980 based on Bureau of the Census figures, there were almost 2,029 people/computer in 1972 and 178 people/computer in 1980. Thus, the increase in the acceptance of the technology has been significant. These numbers do not imply that there is a computer in every household but they do show that there has certainly been a proliferation of computers.

For the purpose of this report we are interested more in the trends of the general purpose computer and the minicomputer segments than in the total numbers. Because the numbers presented in table 13 are not mutually exclusive we have not presented these number graphically. Since the number of desktop computers is greater than the number of general purpose computers and minicomputers added together, it would seem that these two segments of the total U.S. inventory are quite small. However, according to the EDP Industry Report, the general purpose computers represented $58.2 "billion value in use"(2) and the minicomputers $11.5 "billion value in use"(3). The desktop

TABLE 13

Computers in the United States by Category and Size

Size and Category	1972	1973	1974	1975	1976	1977	1978	1979	1980
GENERAL PURPOSE									
Size Class 2	23,594	27,110	28,636	28,704	24,726	20,717	18,835	14,810	12,924
3	11,345	13,234	12,720	13,214	14,905	16,501	16,904	16,652	20,099
4	9,488	11,077	12,474	12,334	11,639	11,532	11,370	10,284	10,830
5	3,213	3,790	4,179	4,022	4,037	4,688	5,186	4,891	5,100
6	2,209	2,623	2,704	2,957	3,191	3,450	4,033	4,641	5,113
7	351	466	737	896	1,077	1,278	1,607	1,965	2,449
Total General Purpose	50,200	58,300	61,450	62,097	59,505	58,078	57,960	53,243	56,515
MINICOMPUTERS	41,370	65,400	89,700	126,300	162,500	215,300	275,800	345,200	419,700
Other	12,430	9,550	15,950	22,203	33,335				
Small Business Computers				12,400	27,100	48,800	73,800	104,300	139,800
Desktop Computers				4,000	8,000	32,000	160,000	356,000	683,000
TOTAL*	104,000	133,250	167,100	207,100	255,540	355,120	563,550	849,560	1,283,750

*The total numbers are for general purpose computers, minicomputers, small business computers, desktop computers, and 'other' systems with adjustments to eliminate double counting. Because the minicomputer numbers and the small business computer numbers are not mutually exclusive, the sum of all of the numbers is greater than the total figure.

computers only represented $2.6 "billion value in use"(4) and the small business computers $6.4 "billion value in use"(5). Thus the general purpose computers and minicomputers represent the largest segments of the total computer population when dollar values are analyzed. Thus these segments are still important for comparisons with the Federal Government.

3.4 General Purpose Computers - Federal vs. U.S.

Figures 27 and 28 show all of the general purpose computers by size class for the United States and the Federal Government. In both figures it is apparent that there are two distinct groups of general purpose computers. Size classes 2, 3 and 4, the smaller general purpose computers, have generally been declining in both the United States and the Federal Government while size classes 5, 6 and 7, the larger size classes generally show an increase. The author believes that these trends will continue. As minicomputers and small business computers replace the small general purpose computers, the smaller size classes will continue to decline. The need for larger general purpose computers does not seem to be affected by the growth of the smaller computers. The individual size classes are discussed separately in following sections.

If the size classes are divided into three groups and the numbers from the United States and Federal Government compared (see figure 29) it becomes apparent that the major differences between the two installed bases is the decrease in the Federal Government of size classes 2 and 3 and the larger share of sizes classes 6 and 7. These differences will also probably continue in the future.

Overall, the total number of general purpose computers has been relatively constant for both the United States and the Federal Government. The growth rates are given in table 14. While the Federal Government shows a negative average growth rate of two percent, the United States shows a positive growth rate of only 1.5 percent. Over the last five years both the U.S. and Federal figures show an average growth rate of a negative two percent. Thus, the trends of the Federal general purpose computers seem consistent with those of the U.S. general purpose computers.

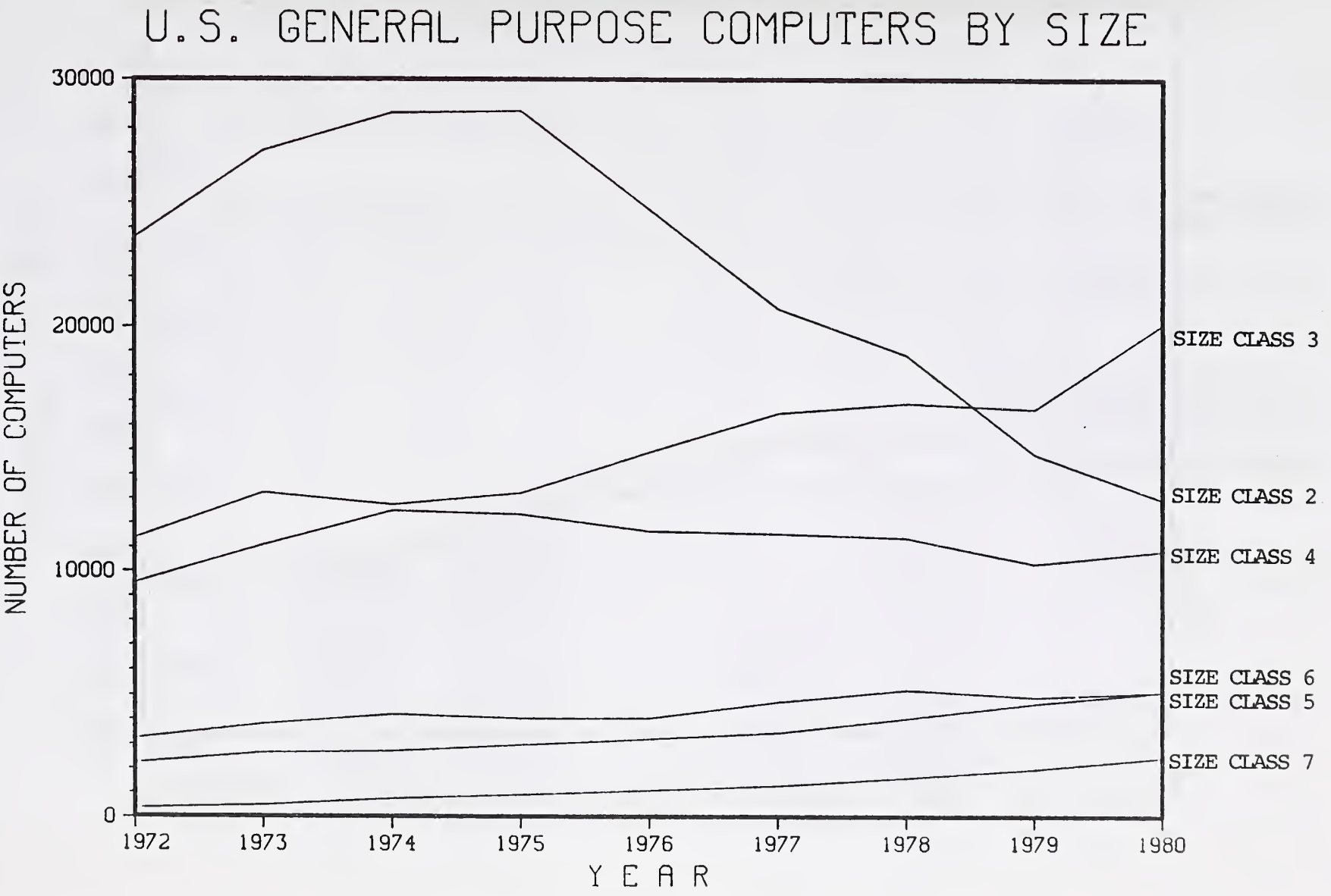
U.S. GENERAL PURPOSE COMPUTERS BY SIZE
NUMBER OF COMPUTERS
30000
20000
10000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
SIZE CLASS 3
SIZE CLASS 2
SIZE CLASS 4
SIZE CLASS 6
SIZE CLASS 5
SIZE CLASS 7

Figure 27

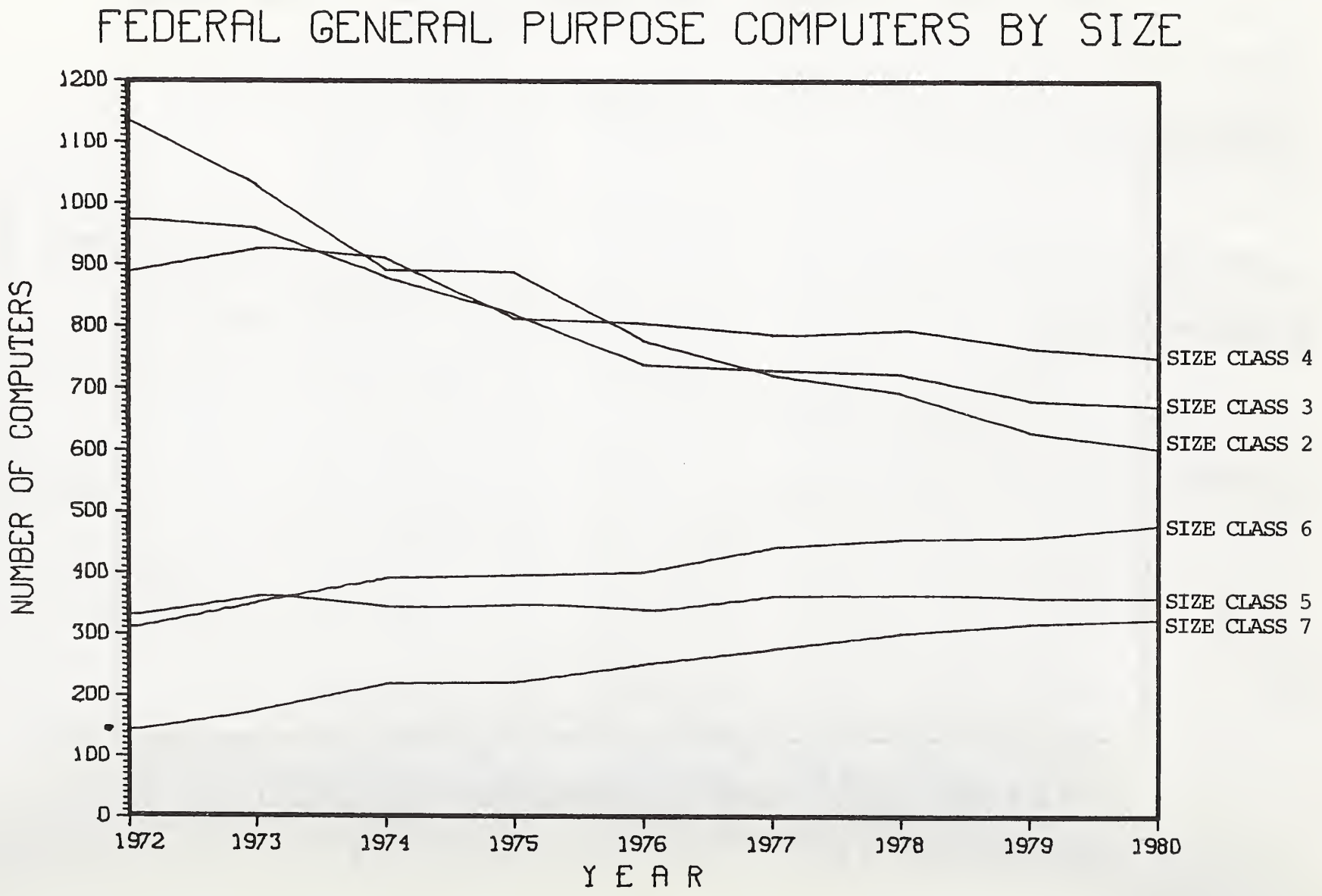
FEDERAL GENERAL PURPOSE COMPUTERS BY SIZE
NUMBER OF COMPUTERS
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
SIZE CLASS 4
SIZE CLASS 3
SIZE CLASS 2
SIZE CLASS 6
SIZE CLASS 5
SIZE CLASS 7

Figure 28

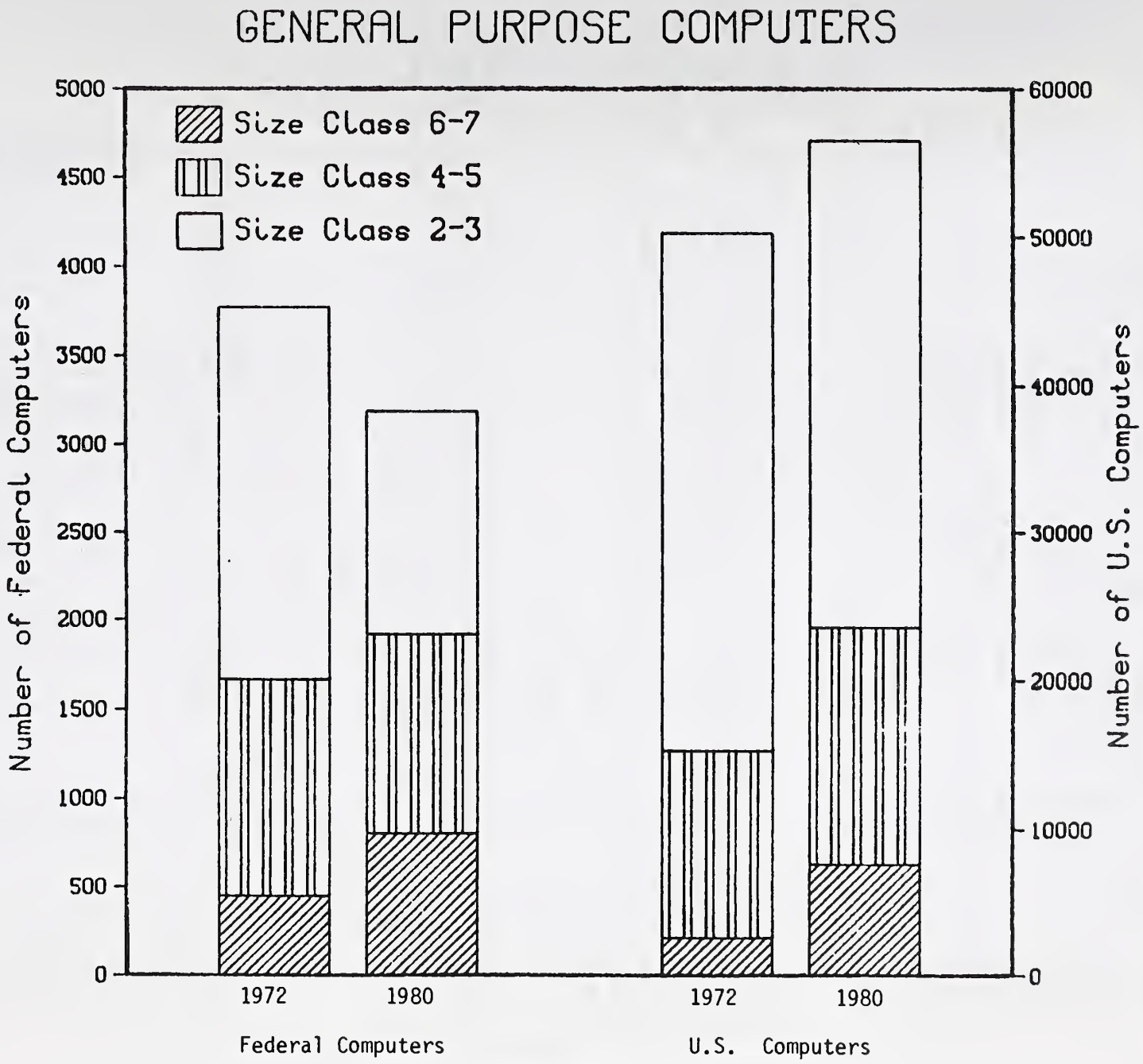
GENERAL PURPOSE COMPUTERS
Size Class 6-7
Size Class 4-5
Size Class 2-3
Number of Federal Computers
Number of U.S. Computers
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
60000
50000
40000
30000
20000
10000
0
1972
1980
1972
1980
Federal Computers
U.S. Computers

Figure 29

TABLE 14

Growth Rate of General Purpose Computers

Year	Federal No. of CPUs	Growth (%)	United States No. of Computers	Growth (%)
1972	3.825	-	50,200	
1973	3,845	-1	58,300	16
1974	3,654	-5	61,450	5
1975	3,498	-4	62,097	1
1976	3,285	-6	59,505	-4
1977	3,308	1	58,078	-2
1978	3,342	1	57,960	-2
1979	3,209	-4	53,243	-8
1980	3,189	-1	56,515	+6
	Average growth rate = -2%			Average = +1.5%

There is one other statistic which is quite interesting when comparing the Federal general purpose computers with the U.S. general purpose computers. In 1972 the number of Federal general purpose computers equalled 7.6 percent of the number of U.S. general purpose computers. Since 1973 that percent has remained almost constant at around six percent. This seems to verify that the trends in the Federal Government are consistent with those in the United States.

3.4.1 Size Class 2 Computers

Figure 30 shows the number of size class 2 computers in the Federal Government and the United States and illustrates that the number of computers in this size class is declining in both the United States and the Federal Government. Table 15 shows the actual growth rates for this size class.

TABLE 15

Growth Rate of Size Class 2 Computers

Year	Federal # of CPUs	Growth (%)	United States # of Computers	Growth (%)
1972	1,135		23,594	
1973	1,027	-10	27,110	15
1974	889	-13	28,636	6
1975	886	< 1	28,704	0
1976	755	-15	24,726	-14
1977	720	- 5	20,717	-16
1978	691	- 4	18,835	- 9
1979	628	- 9	14,810	-21
1980	601	- 4	12,924	-13
	Average growth rate = -7.5%		Average growth rate = -6.5%	

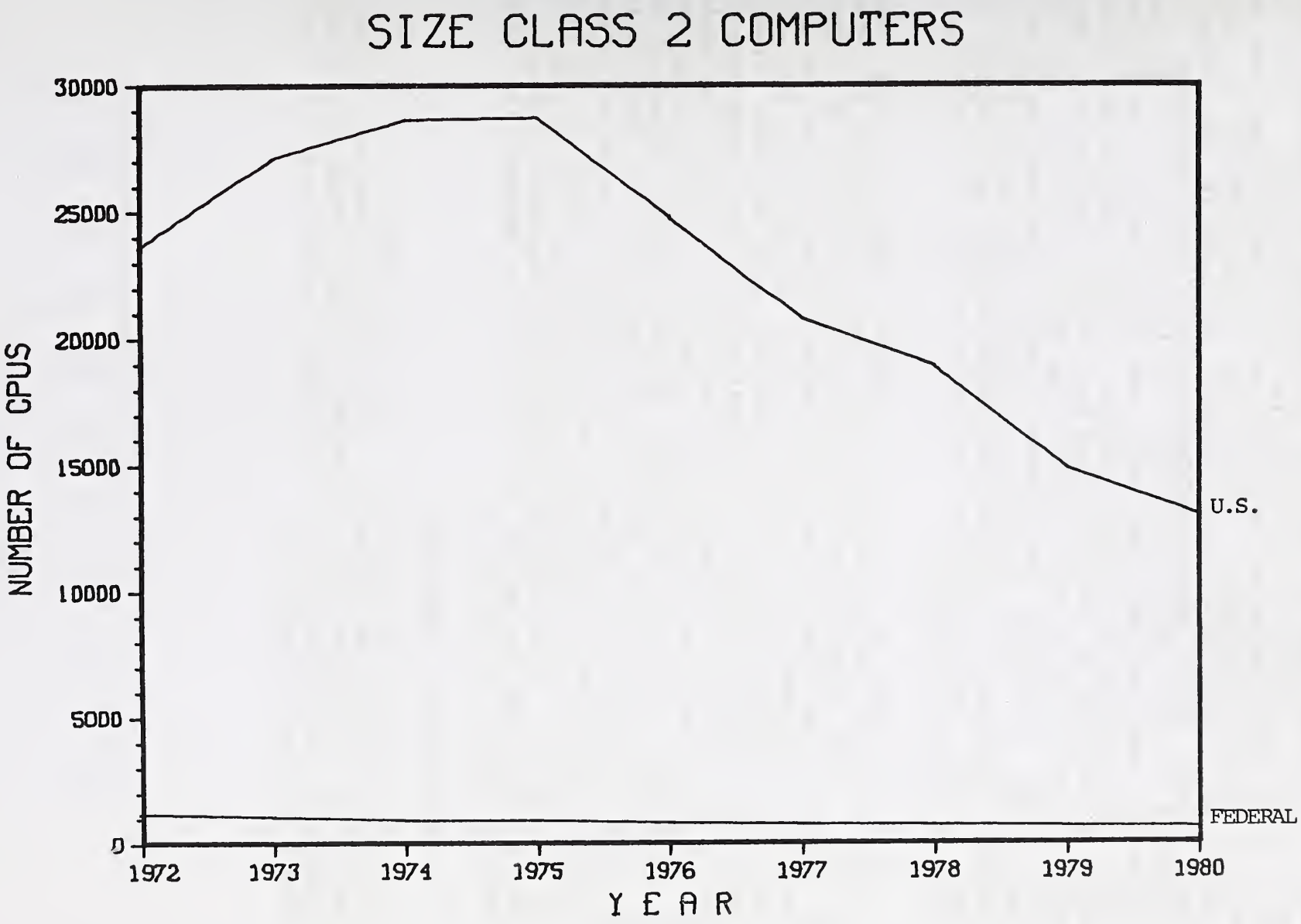
SIZE CLASS 2 COMPUTERS
NUMBER OF CPUS
30000
25000
20000
15000
10000
5000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 30

Size class 2 computers are the smallest of the general purpose category of computers. Historically, these have been considered entry level machines and usually represented the smallest member of a general purpose family or series of computers. IDC has felt that there were two main reasons for the fluctuations and decline in this category. Size class 2 computers had a large leased base and were therefore more susceptible to changes. Also, since these were considered entry level machines, IDC theorized that once the small systems were implemented, businesses realized that they could use computers for additional tasks and upgraded to larger systems. Other businesses are now aware of the uses of computers and buy larger systems to begin with. In addition to these reasons the author believes that this size class, and also size classes 3 and 4 have been impacted by the growth of small business computers, minicomputers, and desktop computers. Applications which seemed appropriate for these small, general purpose computers can now be handled by a different type of computer.

It is interesting to note that the average negative growth rate of both the U.S. and the Federal size class 2 computers is fairly similar, -6.5 percent and -7.5 percent respectively. The number of Federal size class 2 computers seemed to decline earlier than the U.S. computers but the number of U.S. computers in this size class has dramatically fallen in recent years and the overall trends for both the Federal Government size class 2 computers and the U.S. size class 2 computers are similar. In 1972, the number of Federal size class 2 computers represented almost 30 percent of the number of all of the Federal general purpose computers but by 1980 they represented less than 19 percent. In the United States they equalled 47 percent of the total U.S. general purpose category in 1972 and only 23 percent in 1980. Also, in 1972 the Federal size class 2 computers equalled almost five percent of the total U.S. size class 2 computers and the same percent in 1980. Thus, the trends for both the U.S. and Federal size class 2 computers are consistent.

3.4.2 Size Class 3 Computers

The graph showing the number of U.S. and Federal size class 3 computers is given in figure 31. This graph shows that the U.S. size class 3 computers have increased in number while the Federal Government's have decreased. The actual numbers and the growth rates are given in table 16.

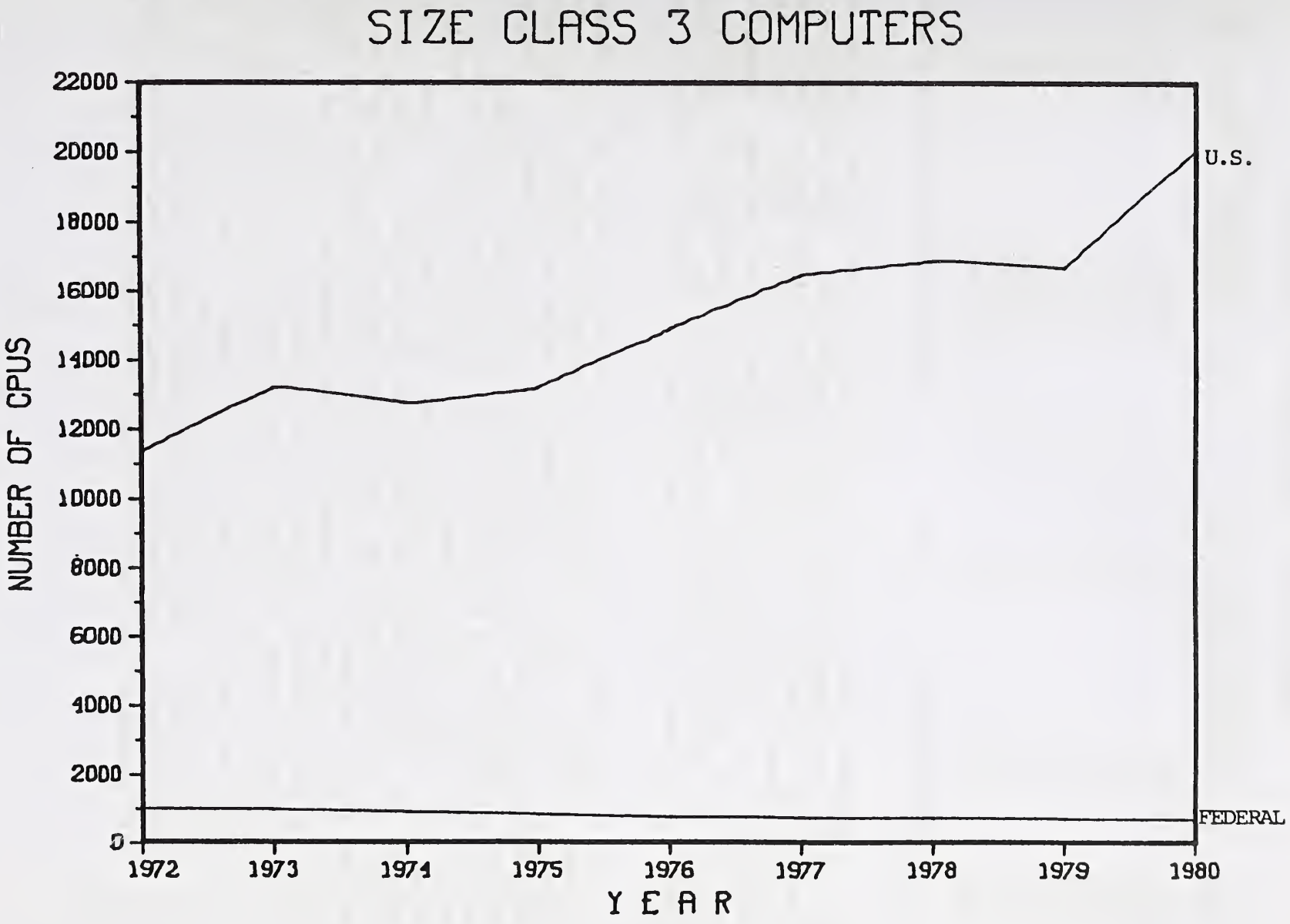
SIZE CLASS 3 COMPUTERS
NUMBER OF CPUS
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 31

TABLE 16

Growth Rate of Size Class 3 Computers

Year	Federal # of CPUs	Federal Growth (%)	United States # of Computers	United States Growth (%)
1972	973		11,345	
1973	957	-2	13,234	17
1974	872	-9	12,720	-4
1975	811	-7	13,214	4
1976	720	-11	14,905	13
1977	711	-1	16,501	11
1978	705	-1	16,904	2
1979	679	-4	16,652	-1
1980	670	-1	20,099	21
Average growth rate = -4.5%			Average growth rate = +7.9%	

It is apparent that there are some differences in the trends of the U.S. and Federal size class 3 computers. The figures show size class 3 computers increasing in the United States with an average growth rate of almost eight percent while they are declining in the Federal Government with an average negative growth rate of 4.5 percent. In 1972 the Federal size class 3 computers equalled almost nine percent of the total U.S. size class 3 computers and only equalled three percent of the total in 1980.

If the size class 3 computers are compared with the general purpose segment, the declines and increases become even more apparent. In 1972, the Federal size class 3 computers represented 25 percent of the total number of Federal general purpose computers. By 1980 they only equalled 21 percent. In the United States the 1972 size class 3 computers represented 23 percent of the total number of U.S. general purpose computers while the 1980 numbers represented 36 percent. Thus, that portion of general purpose computers represented by size class 3 computers is increasing in the United States but decreasing in the Federal Government. In 1980 size class 3 computers were the largest size class of general purpose computers in the United States and the second largest in the Federal Government. At this time we still have no sound explanations for the difference in the directions of the trends. The declining trend in the Federal Government is consistent for all nine years. The author does not expect this trend to continue. The figures for the United States are more sporadic, declining some years and increasing others. The author expects that the U.S. figures will follow the trends for size class 2 and 4 and not show the growth rate they did in 1980.

3.4.3 Size Class 4 Computers

The graph showing the number of size class 4 computers is presented in figure 32. Usually considered to be medium sized, general purpose computers, they quite often fall in the middle models of a family or series of computers. The graph shows that overall the number of Federal size class 4 computers has slightly declined while the number of U.S. size class 4 computers has fluctuated, increasing or decreasing from year to year. The actual growth rates are given below in table 17.

TABLE 17

Growth Rate of Size Class 4 Computers

Year	Federal # of CPUs	Federal Growth (%)	United States # of Computers	United States Growth (%)
1972	888		9,488	
1973	927	4	11,077	17
1974	909	-2	12,474	13
1975	811	-11	12,334	-1
1976	804	-1	11,639	-6
1977	790	-2	11,532	-1
1978	799	1	11,370	-1
1979	763	-5	10,284	-10
1980	748	-2	10,830	5
Average growth rate = -2.3%			Average growth rate = 2%	

In the Federal Government, size class 4 computers represented 23 percent of the general purpose computers in 1972 and still represented 23 percent in 1980. In the United States, the size class 4 computers represented 19 percent of the U.S. general purpose computers in 1972 and 19 percent in 1980. Thus, the position of the size class 4 computers has remained the same when compared with the respective general purpose computers. However, in 1972 the Federal size class 4 computers represented nine percent of the U.S. size class 4 computers but in 1980 the Federal segment only represented seven percent, reflecting the fact that the number of Federal size class 4 computers are declining and the U.S. size class 4 computers are showing a slight increase.

Even though the average growth rate of the Federal size class 4 computers is negative (-2.3%) while the U.S. average growth rate is positive (+2.0%) the difference between the two is not that significant. Compared with the other size classes these growth rates are both relatively flat. The author expects that there will be little change in growth rates of size class 4 computers either in the U.S. or the Federal Government. If there is any change, it would probably be that the U.S. figures will also start to show a slight decline.

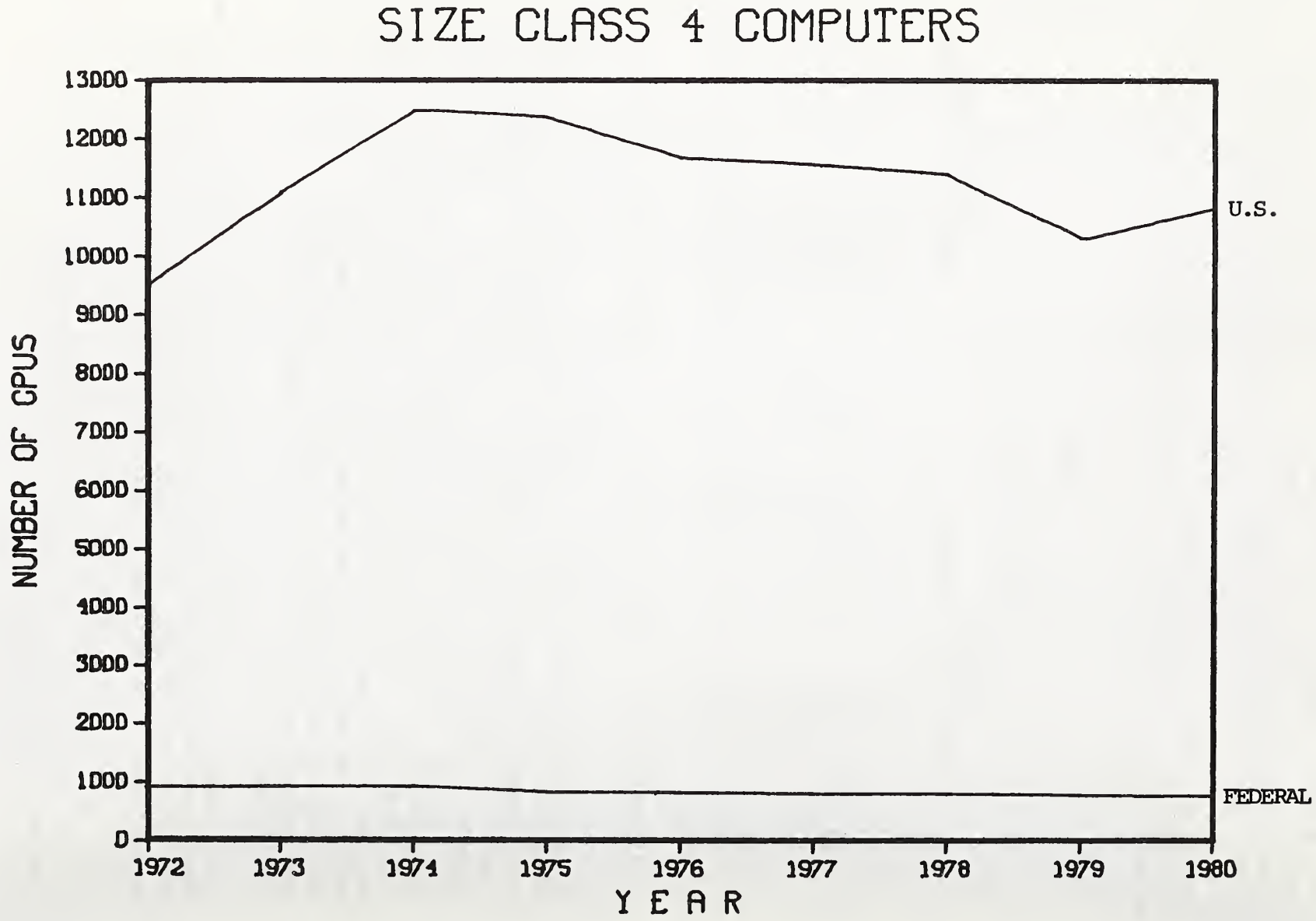
SIZE CLASS 4 COMPUTERS
NUMBER OF CPUS
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 32

3.4.4 Size Class 5 Computers

The graph for size class 5 computers, showing the U.S. and the Federal Government computers is given in figure 33. Size class 5 computers are also usually considered medium sized, general purpose computers. They also are often the models in the middle of a family or series of computer models. In general, this size class has a much smaller number of computers, about half of the numbers listed for size class 4. The graph shows that the number of U.S. size class 5 computers appears to be increasing while the Federal number appears almost unchanged. The actual growth rates are listed below in table 18.

TABLE 18

Growth Rate of Size Class 5 Computers

	Federal		United States	
Year	# of CPUs	Growth (%)	# of Computers	Growth (%)
1972	328		3,213	
1973	363	11	3,790	18
1974	342	-6	4,179	10
1975	348	2	4,022	+4
1976	337	-3	4,037	0
1977	364	8	4,688	16
1978	364	0	5,186	11
1979	358	-2	4,891	-6
1980	362	1	5,100	4
	Average growth rate = 1.4%		Average growth rate = 6.1%	

The average growth rate of both the Federal size class 5 computers and the U.S. size class 5 computers is positive but the U.S. figure is much larger than the Federal. This is illustrated by the fact that in 1972 the number of Federal size class 5 computers represented 10 percent of the total U.S. size class 5 computers while in 1980 it only represented seven percent. It should be noted that unlike the previously mentioned size classes (2-4), size class 5 shows positive growth in the Federal Government.

When each figure is compared with the other size classes, the increase is also apparent. In 1972 size class 5 computers represented less than nine percent of the total Federal Government general purpose computers and was over 11 percent in 1980. At the same time, the U.S. size class 5 computers represented over six percent of the U.S. general purpose computers and now represent over nine percent. Thus, in both the Federal Government and the United States, the proportion of the general purpose computers belonging to size class 5 has increased. The author believes that these trends should both continue. That is, that the number of Federal size class 5

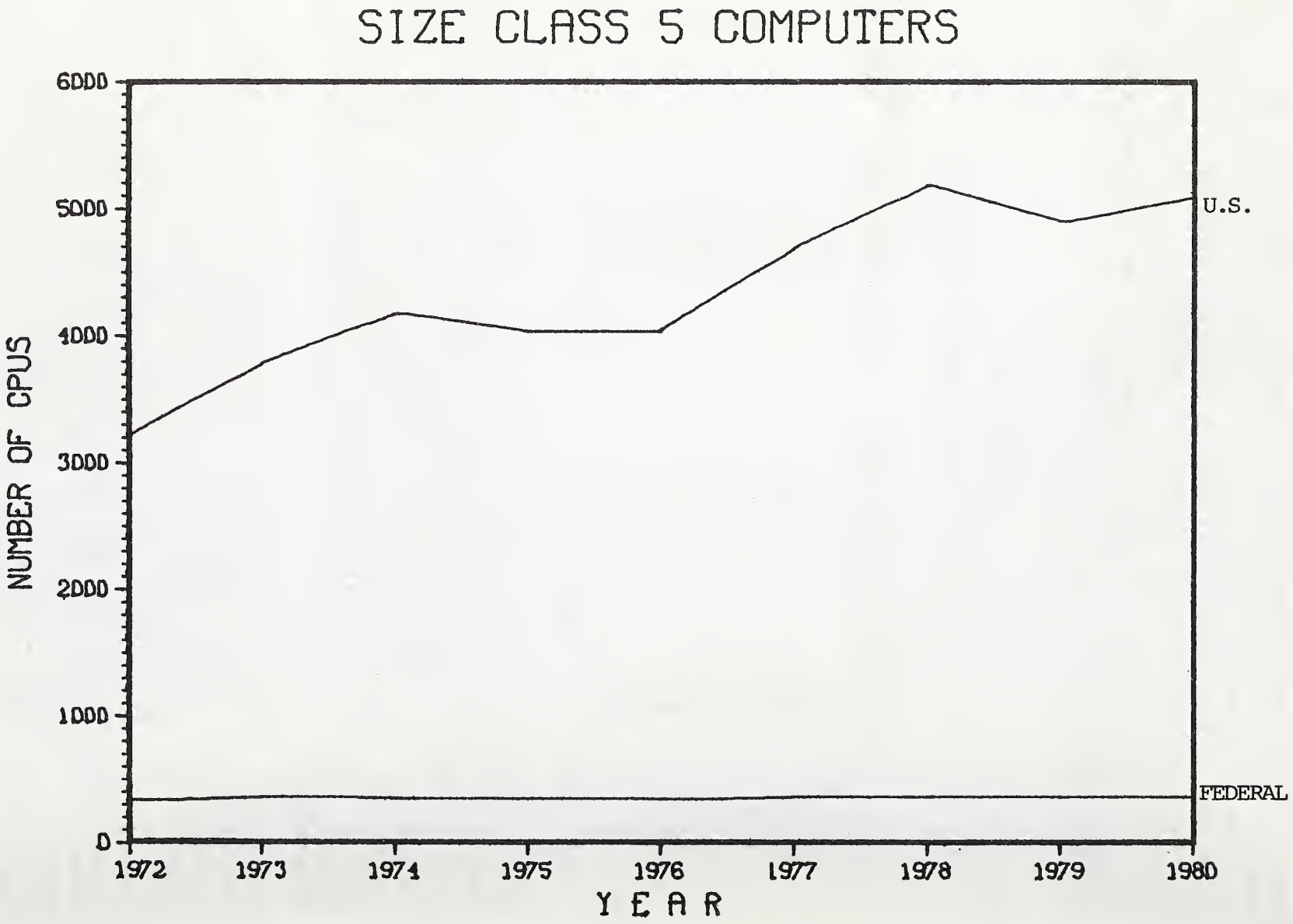
SIZE CLASS 5 COMPUTERS
6000
5000
4000
3000
2000
1000
0
NUMBER OF CPUS
U.S.
FEDERAL
1972
1973
1974
1975
1976
1977
1978
1979
1980
Y E A R

Figure 33

computers and the number of U.S. size class 5 computers will continue to increase with the U.S. showing a larger increase than the Federal Government.

3.4.5 Size Class 6 Computers

Generally, size classes 6 and 7 are considered to be large scale, general purpose computers. By number, these size classes are relatively small, but by dollar value (because of the costs of these computer models) these size classes are quite large. A graph showing the U.S. and Federal size class 6 computers is given in figure 34 while the actual numbers and the growth rates are given in table 19.

TABLE 19

Growth Rate of Size Class 6 Computers

	Federal		United States	
Year	# of CPUs	Growth (%)	# of Computers	Growth (%)
1972	308		2,209	
1973	353	15	2,623	19
1974	393	11	2,704	3
1975	398	1	2,957	9
1976	403	1	3,191	8
1977	440	9	3,450	8
1978	455	3	4,033	17
1979	461	1	4,641	15
1980	481	4	5,113	10
	Average growth rate = 5.6%		Average growth rate = 11.1%	

The number of size class 6 computers has increased in both the United States and the Federal Government. Also, this size class shows the largest growth rate noted so far (comparing size classes 2 through 5) for both the U.S. and the Federal Government computers. The growth of the Federal size class 6 computers is still smaller than that of the United States but both are significant and both have shown a steady increase for all of the nine years.

Because the growth rate in the United States is greater than that in the Federal Government, the percent of Federal size class 6 computers compared with the U.S. size class 6 computers, has declined, from 14 percent in 1972 to less than 10 percent in 1980. However, when each size class 6 is compared with their respective general purpose segment they have increased. The Federal size class 6 computers represented eight percent of the Federal general purpose computers in 1972 and 15 percent in 1980. In the United States, size class 6 computers represented four percent of the U.S. general purpose computers in 1972 and nine percent in 1980. Thus, this size class shows growing importance

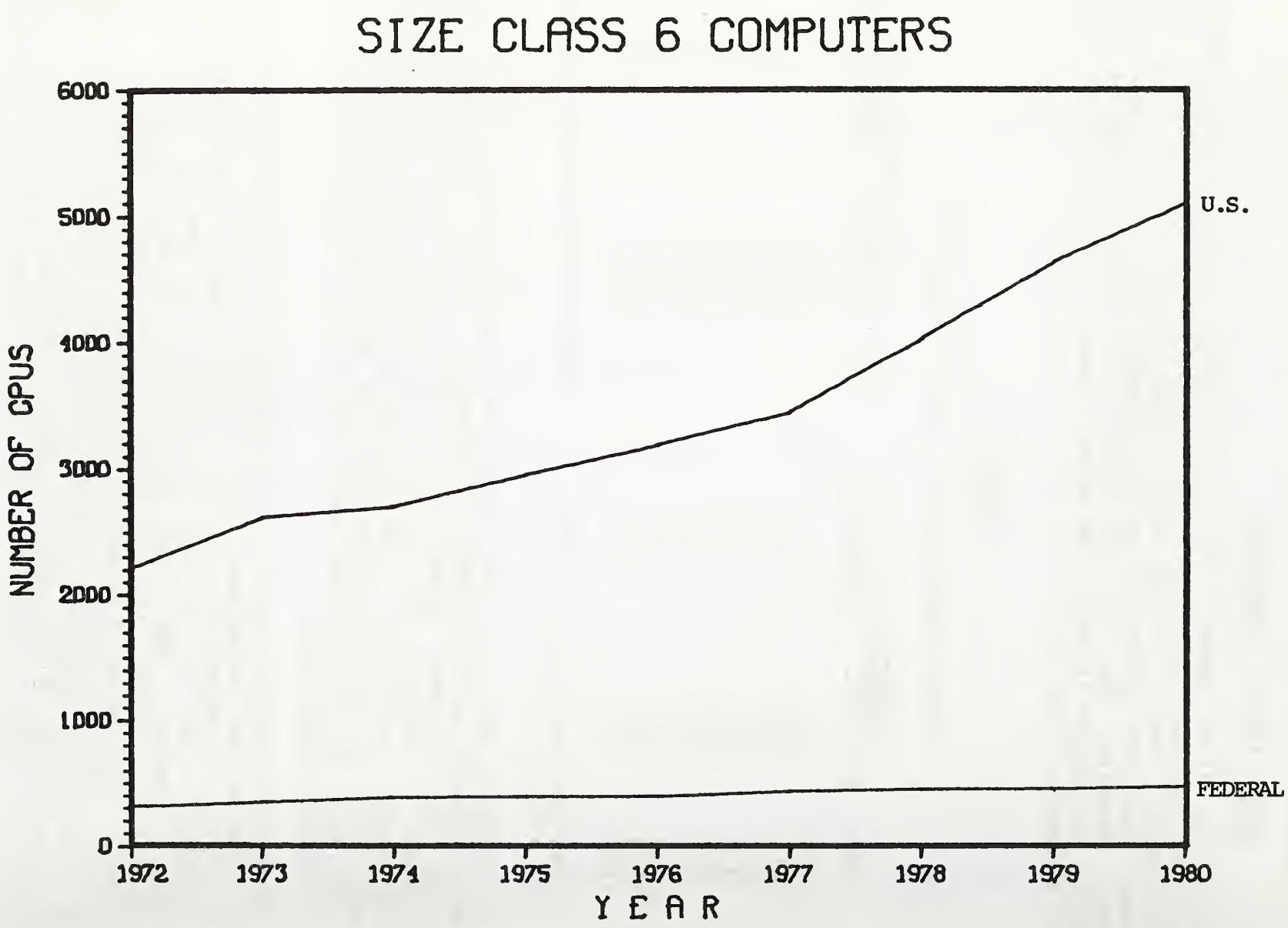
SIZE CLASS 6 COMPUTERS
NUMBER OF CPUS
6000
5000
4000
3000
2000
1000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 34

in the general purpose segment in both the United States and the Federal Government. This trend should continue.

3.4.6 Size Class 7 Computers*

Size chass 7 contains the largest, and generally most expensive models of the general purpose computers. Examples of this size class include: the Amdahl 470V/8; Burroughs 7700; Control Data Corporation Cyber 205 and Star 100; Cray 1A and 1S; Honeywell H-68/DPS; IBM 370/195 and 3081D; National Advanced Systems AS/9000; NCR 8670; and Sperry Univac 1100/84. The systems in this size class generally have an average purchase price between $2 million and $12 million. According to IDC, in 1980 size class 7 computers represented four percent of the number of general purpose computers and almost 29 percent of the total dollar value of the general purpose computers. IDC determined that the average system value of these size class 7 computers was almost $7 million. Thus, even though this size class is the smallest in number of computers it represents a large dollar value, and is therefore of considerable interest.

A graph showing the number of size class 7 computers in the United States and the Federal Government is presented in figure 35. The actual numbers and the growth rates are given below in table 20.

TABLE 20

Growth Rate of Size Class 7 Computers

	Federal		United States	
Year	# of CPUs	Growth (%)	# of Computers	Growth (%)
1972	141		351	
1973	176	25	466	33
1974	221	26	737	58
1975	223	1	896	22
1976	253	14	1,077	20
1977	277	10	1,278	19
1978	301	9	1,607	26
1979	320	6	1,965	22
1980	327	2	2,449	25
Average growth rate = 11.6%			Average growth rate = 28.1%	

*Certain commercial products are identified in this section in order to cite relevant examples. In no case does such identification imply recommendation or endorsement by the Institute for Computer Sciences and Technology or the National Bureau of Standards.

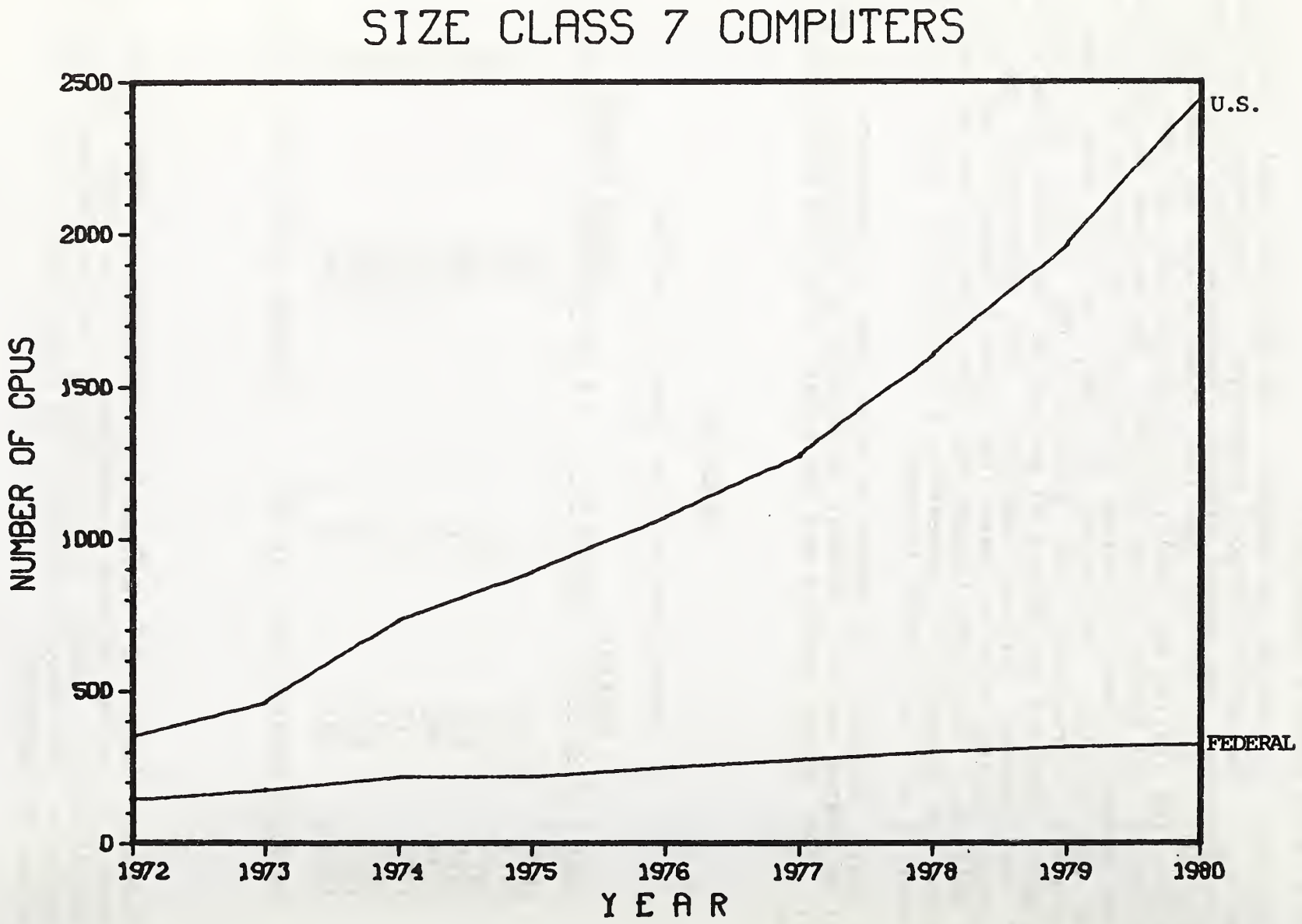
SIZE CLASS 7 COMPUTERS
NUMBER OF CPUS
2500
2000
1500
1000
500
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 35

There are a number of things which are quite interesting about this size class. First, as is apparent from both the graph and the actual numbers, the Federal Government has a higher percentage of the U.S. base in this size class than in any other. In 1972, the Federal size class 7 computers represented over 40 percent of the U.S. size class 7 computers, while in 1980 they had over 13 percent. Even though this percentage has declined, it is still higher then for any other size class. This percentage decline reflects the facts that the growth rate of size class 7 computers has been higher in the United States (28 percent average growth rate) than in the Federal Government (almost 12 percent average growth rate).

Even though the Federal growth rate is lower than that in the United States, the growth rate in both universes for size class 7 is higher than for any other size class. This has, of course, influenced the makeup of the general purpose computer base in both the United States and the Federal Government. In 1972, Federal size class 7 computers represented less than four percent of the Federal general purpose computers. By 1980 they represented over 10 percent. In the United States, size class 7 computers represented less than one percent of the U.S. general purpose computers in 1972 and over four percent in 1980.

As the smaller size classes continue to decline in number or to show a very small growth rate the number of size class 7 computers will continue to increase constituting an even larger percent of the U.S. and Federal general purpose computer inventories.

3.5 Minicomputers - Federal vs. U.S.

Figure 36 shows a graph of the minicomputers in the United States and the Federal Government. As is obvious, there has been a dramatic increase in the growth of the U.S. minicomputers from 1972 to 1980. This figure also shows that the number of minicomputers in the Federal Government has also increased, although the increase does not appear as dramatic because of the scale of the graph. The actual growth rates for the U.S. and Federal Government minicomputers are given in table 21.

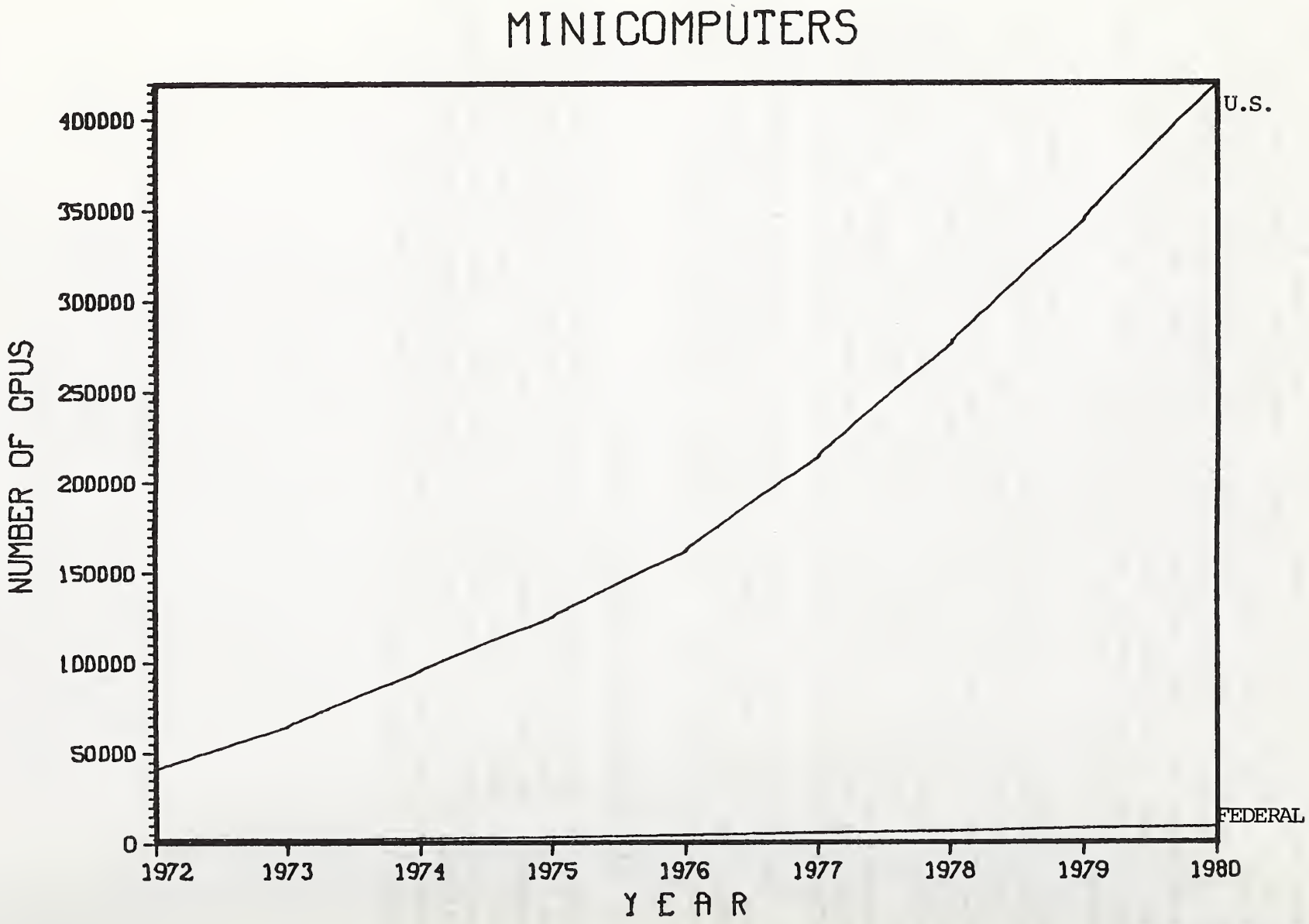
MINICOMPUTERS
NUMBER OF CPUS
400000
350000
300000
250000
200000
150000
100000
50000
0
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR
U.S.
FEDERAL

Figure 36

TABLE 21

Growth Rate of Minicomputers

Year	Federal # of CPUs	Growth (%)	United States # of Computers	Growth (%)
1972	1,804		41,370	
1973	2,256	25	65,400	58
1974	3,045	35	89,700	37
1975	3,842	26	126,300	41
1976	4,775	24	162,500	29
1977	6,079	27	215,300	32
1978	6,985	15	275,800	28
1979	8,574	23	345,200	25
1980	9,237	8	419,700	22
Average growth rate = 23%			Average growth rate = 34%	

As is evidenced by the growth rate figures, the U.S. minicomputers have grown by an average of 34 percent per year since 1972. There are 10 times the number of minicomputers in 1980 than there were in 1972. The growth rate of Federal Government computers is also significant at an average of 23 percent per year. This growth rate is larger than the growth rate of any of the size classes of general purpose computers in the Federal Government. Because of the differences in the growth rates, the number of Federal minicomputers represented over four percent of the U.S. installed minicomputer base in 1972 and a little over two percent in 1980.

Continued growth in the number of minicomputers is expected for both the United States and the Federal Government, although the growth rate in the United States has slowed in the last two years. The author believes that even though microprocessors have taken over some of the applications which were utilizing small minicomputers, superminis have taken over the domain of some of the small general purpose computers. The net result seems to be the continued growth of minicomputers in both the United States and the Federal Government.

3.6 Conclusions

The analysis of all of the size classes of general purpose computers and the minicomputers shows that some trends in the Federal Government are similar to those in the United States while others are quite different. The large growth rate for minicomputers and the increase in size class 6 and 7 general purpose computers are similar. The growth rates for these Federal computers are smaller than the U.S. growth rates but the trends are the same. The most striking difference was the difference in the growth rates of size class 3 computers. The result of this difference is demonstrated in figure 29. By 1980 the Federal Government's general purpose computers were almost

evenly divided among size classes 2 and 3, classes 4 and 5, and classes 6 and 7. The smaller general purpose computers, size classes 2 and 3, still had a larger number than the other two groupings but the difference was relatively small. In the United States, there were twice the number of smaller general purpose computers than there were medium sized computers and four times the number of large general purpose computers. So the United States general purpose computers are still dominated by the small size classes. This is not true in the Federal Government.

References

1. Automatic Data Processing Equipment Inventory in the United States Government as of the end of the Fiscal Year 1981, General Services Administration, Washington, D. C., February 1982, 629 pp.

2. EDP Industry Report, Vol. 17, No. 3 and 4, June 26, 1981, p. 12.

3. Ibid, p. 13.

4. EDP Industry Report, Vol. 17, No. 2, June 3, 1981, p. 5.

5. Ibid, p. 4.

APPENDIX

Selections from the GSA ADP MIS Glossary*

ACQUISITION: A term which describes the actual purchase of a machine or system from a source outside the Federal Government, or describes the initial lease of a machine or system by an agency of the Federal Government from an external source. Machines or systems purchased subsequent to lease retain the original acquisition date. Machines or systems previously leased, released to an organization external to the Federal Government for a period which results in loss of equity, and then returned to an agency of the Federal Government will be considered acquisitions upon return.

ADPE CLASS CODES: (See Class Codes (ADPE)

ADPE: (See Automatic Data Processing Equipment)

AUTOMATIC DATA PROCESSING EQUIPMENT (ADPE): This includes general purpose electronic data processing equipment (EDPE) and punch card accounting machines (PCAM or EAM) irrespective of use, application or source of funding and includes ADPE built to Government specifications.

CENTRAL PROCESSING UNIT (CPU): A unit of a computer that includes the circuits controlling and interpretation and execution of instructions. Synonymous with main frame.

CLASS CODES (ADPE): A code which specifically describes the physical characteristiic of ADPE, not its function within a system.

COMPUTER, DIGITAL: A computer which processes information represented by combinations of discrete or discontinuous data as compared with an analog computer for continuous data. More specifically, it is a device for performing sequences of arithmetic and logical operations, not only on data but its own program. Still more specifically it is a stored program digital computer capable of performing sequences of internally stored instructions, as opposed to calculators, such as card programmed calculators, on which the sequence is impressed manually.

COMPUTER, GENERAL PURPOSE: A computer designed to solve a large variety of problems e.g., a stored program computer which may be adapted to any of a very large class of applications.

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*ADP Management Information System - Federal Management Circular 74-21 (February 25, 1974) - ADP MIS Reporting Procedures, General Services Administration, Washington, D.C., May 1, 1975, p. 7J-1--7J-13.

CPU: (See Central Processing Unit)

DIGITAL COMPUTER: (See Computer, Digital)

DIGITAL ELECTRONIC DATA PROCESSING SYSTEM: (See System, Digital Electronic Data Processing)

EDPE: (See Electronic Data Processing Equipment)

ELECTRONIC DATA PROCESSING EQUIPMENT (EDPE): A component or group of interconnected components consisting of input, arithmetic, storage, output and control devices which use electronic circuitry, operate on discrete data, and perform computations and logical operations automatically by means of internally stored or externally controlled programmed instructions. All peripheral or off-line data processing equipment in support of EDPE, except PCAM, is included in the electronic data processing equipment category.

GENERAL PURPOSE COMPUTER: (See Computer, General Purpose)

MACHINE: An individual unit, including features installed thereon, of an automatic data processing system, sub-system or supporting equipment and identified by a type and/or model number, such as a central processing unit, card reader, tape unit, card punch, card verifier, etc.

MANAGEMENT INFORMATION SYSTEM (MIS): The ADP Management Information System (ADP MIS) designed to provide for the management of automatic data processing (ADP) activities in the Federal Government.

MIS: (See Management Information System)

MULTIPROCESSING: A mode of operation, normally involving more than one CPU, which permits simultaneous execution of two or more programs or sequences of instructions by a digital computer.

PCAM: (See Punched Card Accounting Machine)

PUNCHED CARD ACCOUNTING MACHINE (PCAM): Machines and equipment primarily electro-mechanical in operation using punched cards as input-output media to record, verify, sort, list, tabulate, select, collate, merge, interpret, and total data.

SPECIAL GOVERNMENT DESIGN: A machine is identified as SGD (Special Government Design) in lieu of a manufacturer's designation when:

(1) it was extensively modified so that it lost its idenity as a specific manufacturer's type;
(2) it was built in-house;
(3) it was manufactured to special Government design specifications.

SYSTEM, DIGITAL ELECTRONIC DATA PROCESSING: A digital machine or group of interconnected digital machines consisting of input, arithmetic, storage, output, and control units which use electronic circuitry, oprate on discrete data, and perform computations and logical operations automatically by means of internally stored or externally controlled program instructions. (Synonymous with digital EDPS or digital computer system).

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12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

disk units; Federal Government computers; Federal minicomputers; Federal statistics; general purpose computers; magnetic tape units; terminals.

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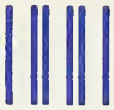

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