

BUSINESS OUTLOOK

GLOBAL ELECTRONICS INDUSTRY

WALT CUSTER
CUSTER CONSULTING GROUP
www.custerconsulting.com
October 2000

TOPICS

GLOBAL ECONOMY

ELECTRONIC EQUIPMENT

ACTIVE & PASSIVE COMPONENTS

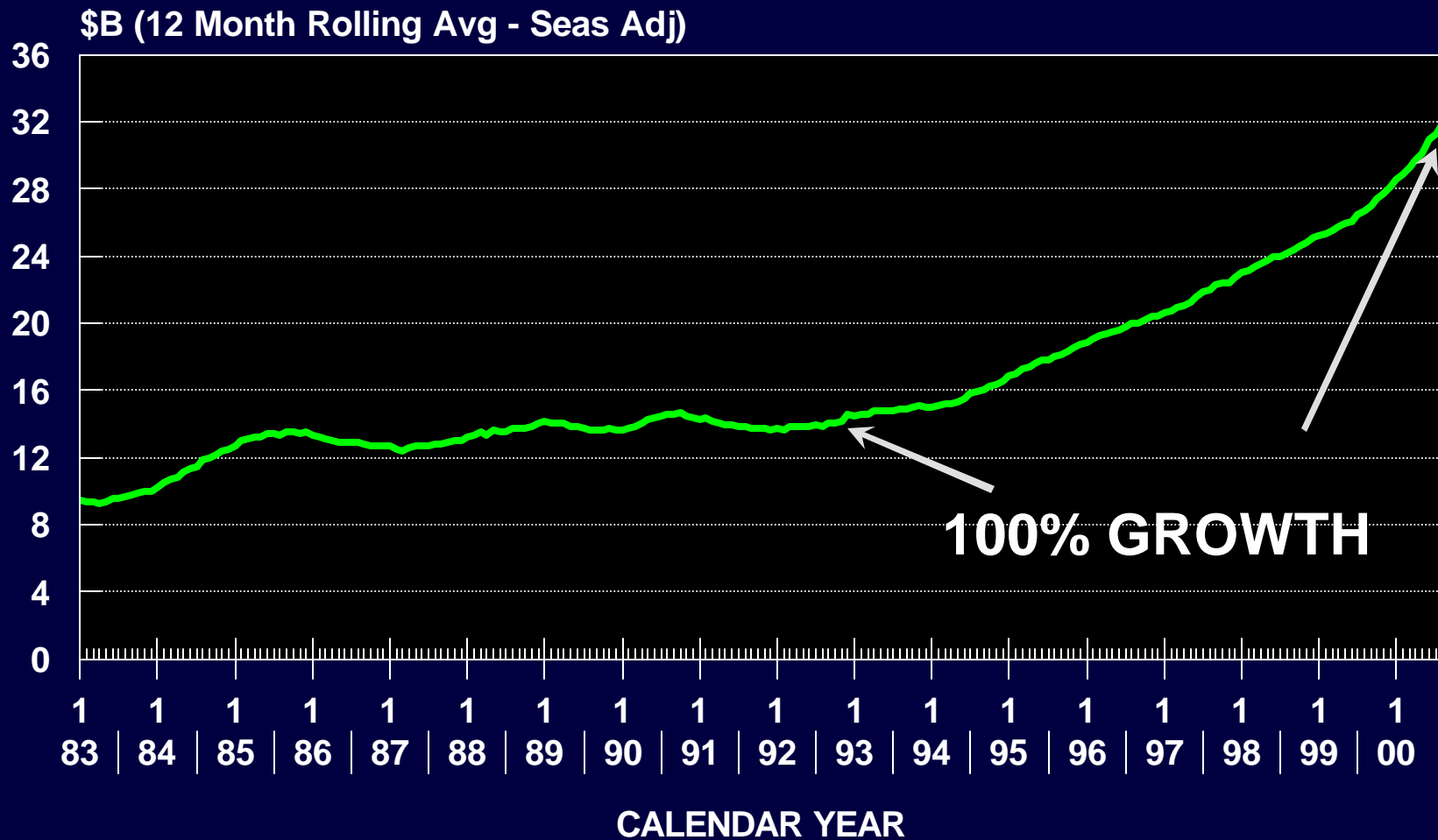
FUTURE OUTLOOK

**All of Today's
Charts are on:**

www.custerconsulting.com

US ELECTRONIC EQUIPMENT ORDERS

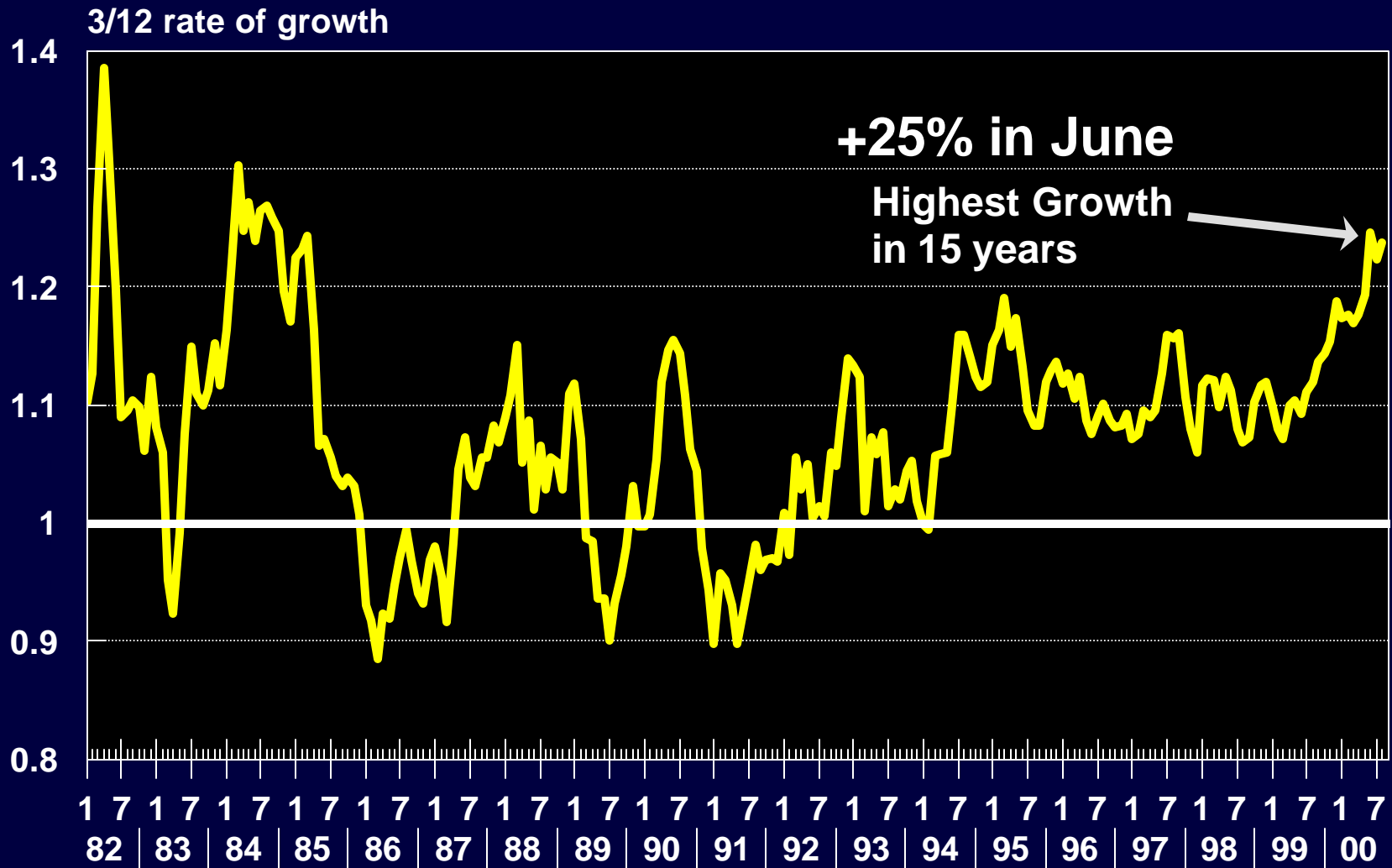
COMMUNICATION, COMPUTER & OFFICE,
MILITARY, INSTRUMENTS



US DEPT OF COMMERCE 10/2000

Electronic Equipment Order Growth

Computer & Office, Communications, Measurement & Control and Military



10/2000

CALENDAR YEAR

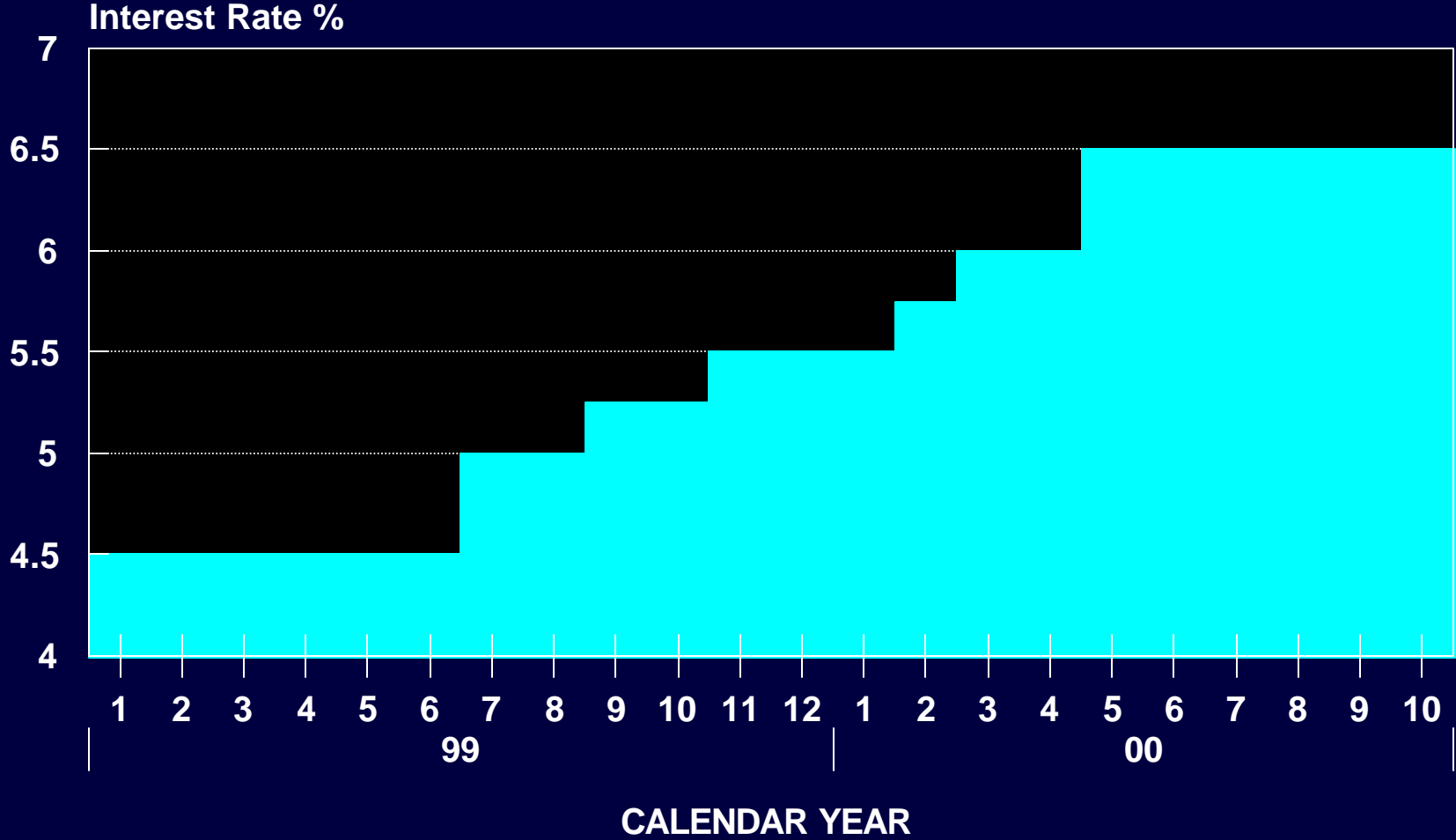
INDUSTRIAL PRODUCTION - WORLD

% CHANGE vs ONE YEAR EARLIER

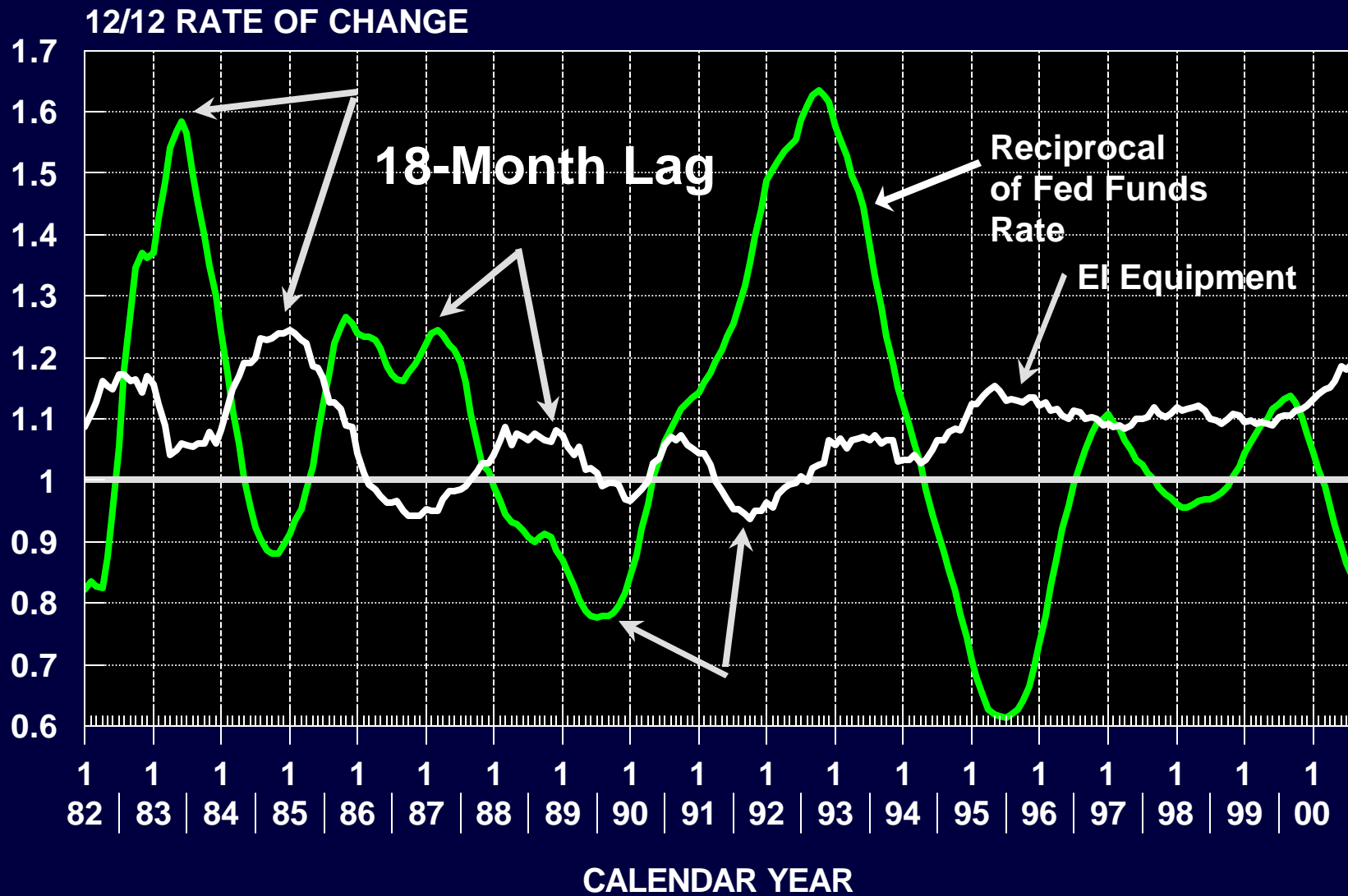
BRITAIN	+1.6 Aug
FRANCE	+3.5 June
GERMANY	+5.6 Aug
ITALY	0.0 July
NETHERLANDS	+6.1 June
SPAIN	+0.3 July
EURO-11	+5.1 July
RUSSIA	+10.2 Aug
CANADA	+5.7 July
USA	+5.7 Sep
CHINA	+12.8 Aug
MALAYSIA	+18.7 Aug
SINGAPORE	+20.5 Aug
S KOREA	+24.1 Aug
TAIWAN	+9.3 Aug
THAILAND	-2.3 Aug
JAPAN	+8.3 Aug

**Fed Raises
Rates
to Cool
Economy**

U.S. FEDERAL FUNDS RATE



Electronic Equipment Orders vs Interest Rates

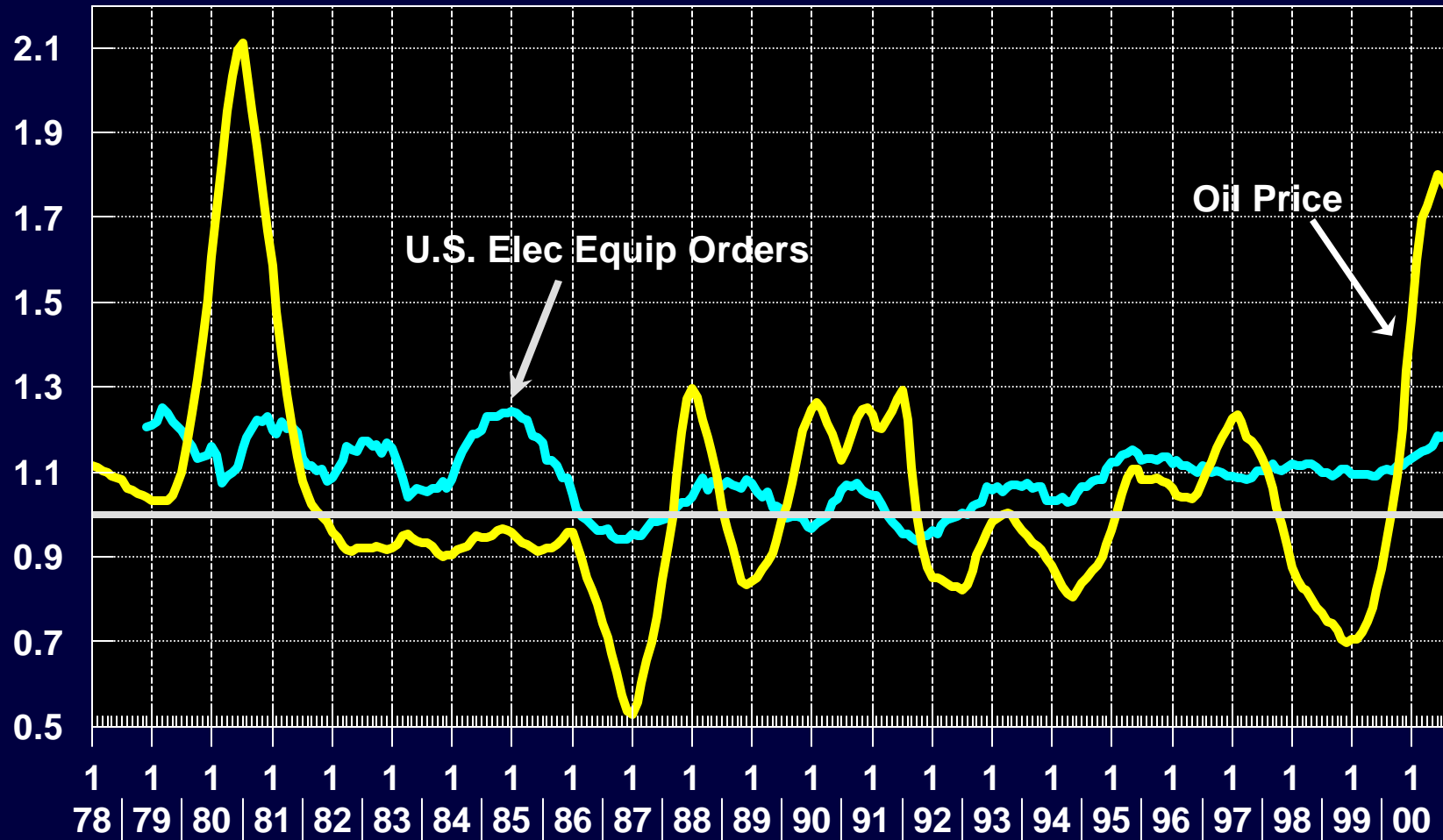


Data: Dept of Commerce & U.S. Federal Reserve Board
<http://www.federalreserve.gov/releases/h15/data.htm>

**What
About
Oil Prices?**

Electronic Equipment Orders vs Oil Price

12/12 RATE OF CHANGE



Data: Dept of Commerce & U.S. Federal Reserve
www.stls.frb.org/fred/data/business/oilprice

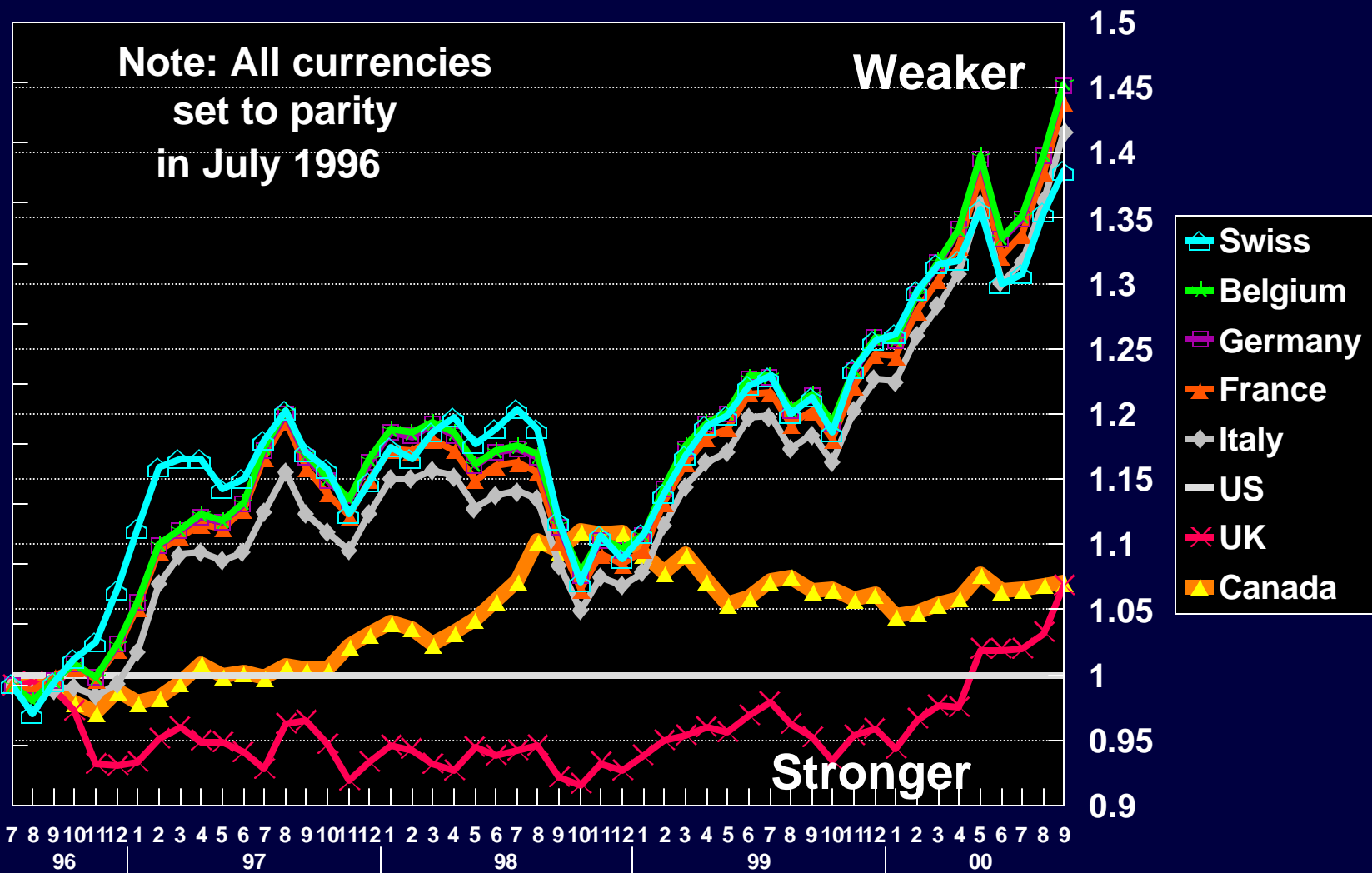
**What About
Oil Prices?**

**No Dramatic
Effect**

Exchange Rates

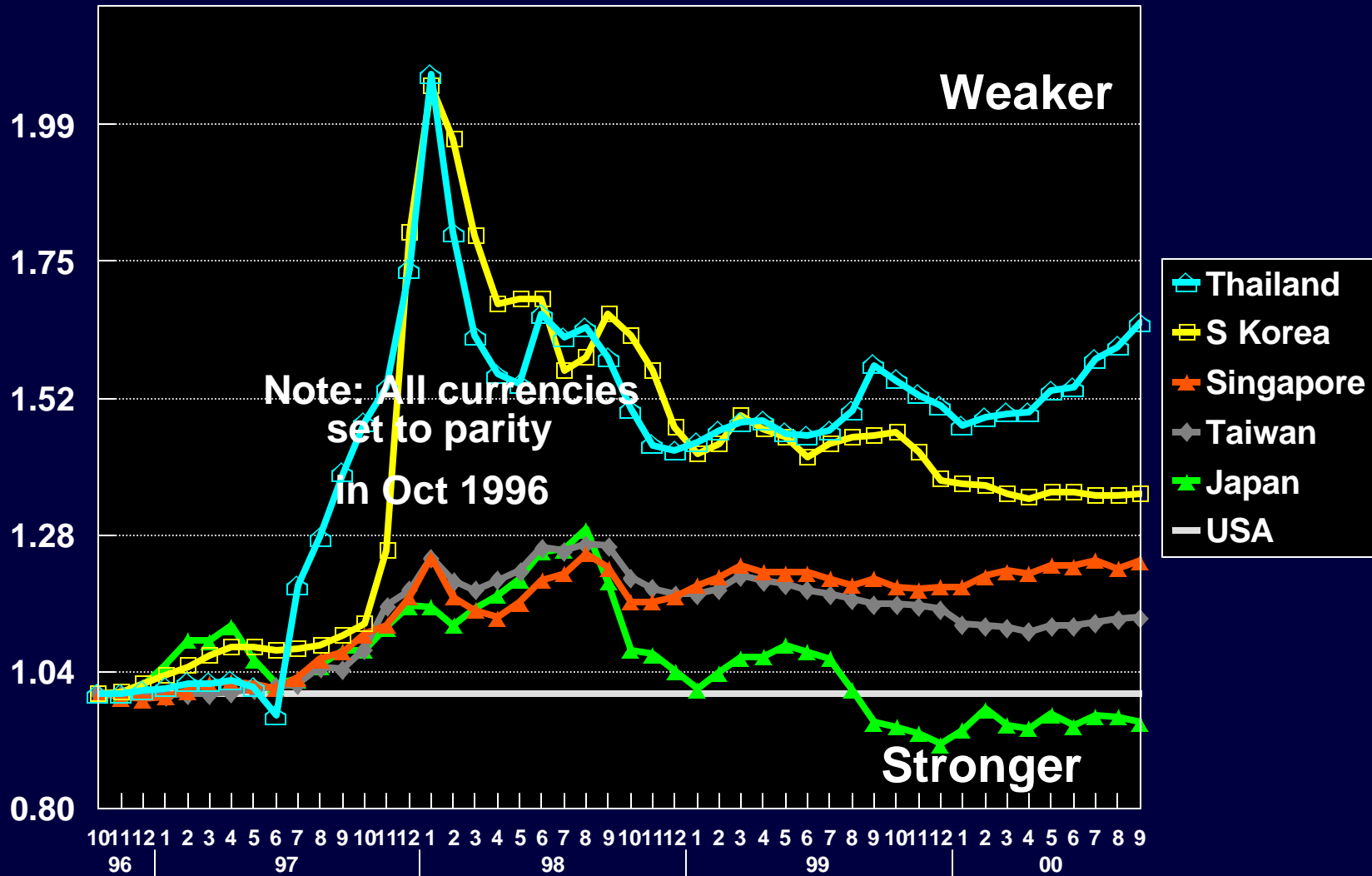
EUROPEAN EXCHANGE RATES vs US \$

7/96 = 1.00



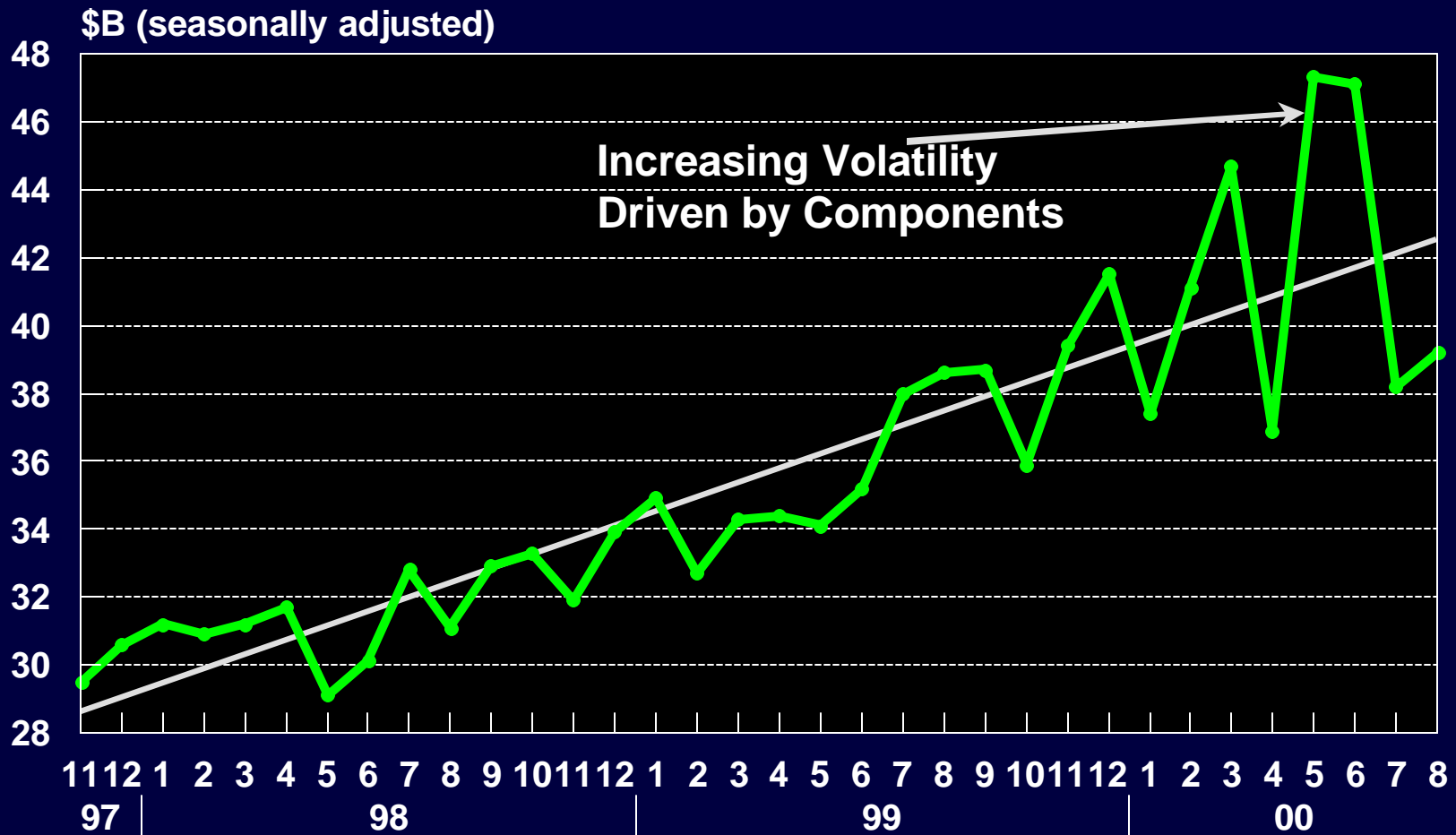
SE ASIA EXCHANGE RATE vs US \$

10/96 = 1.00



Current Electronics Situation

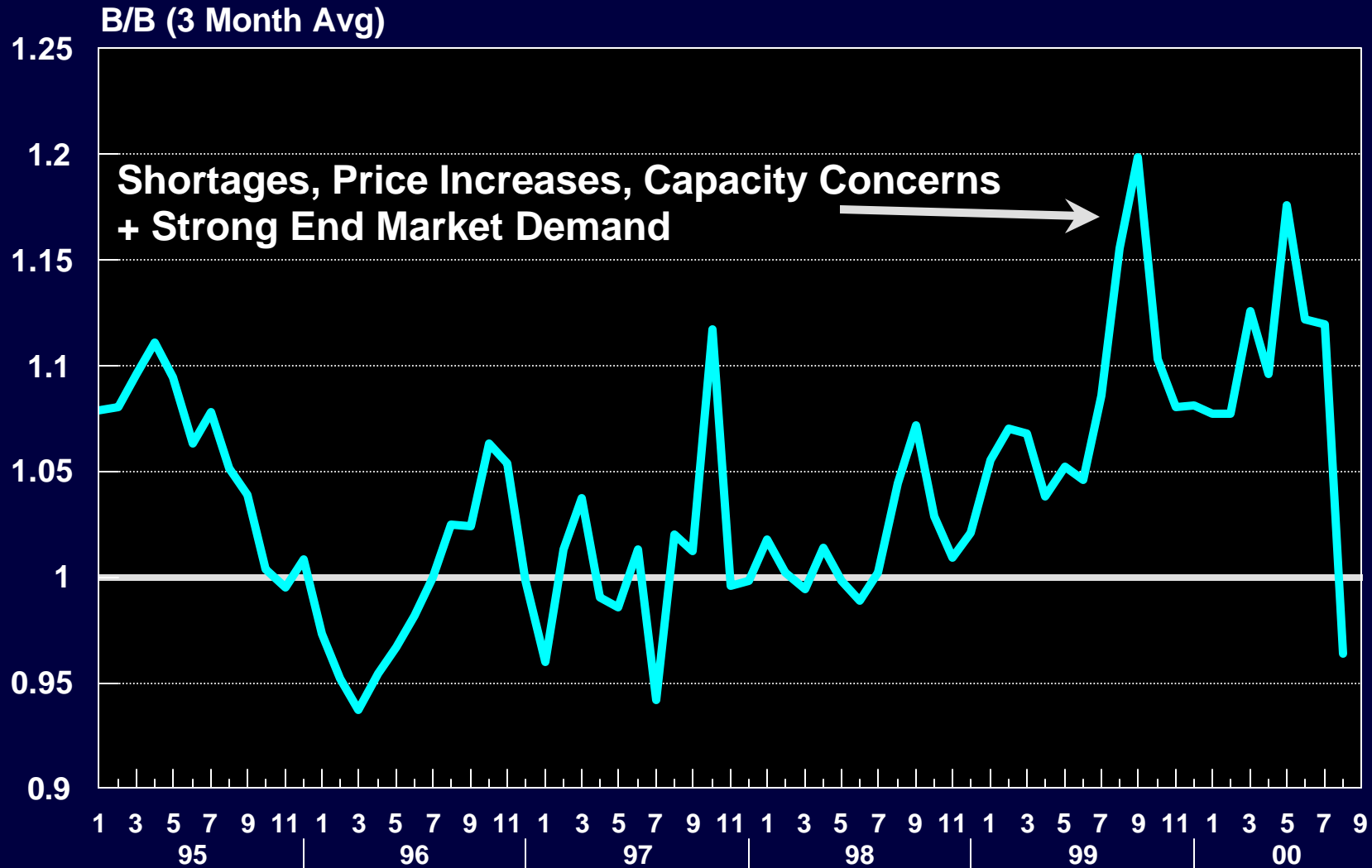
U.S. DURABLE GOODS ORDERS ELECTRONIC & OTHER ELECTRICAL EQUIPMENT



U.S Dept of Commerce 9/2000

U.S. Electronic Component Book/Bill Ratio

3-Month Average



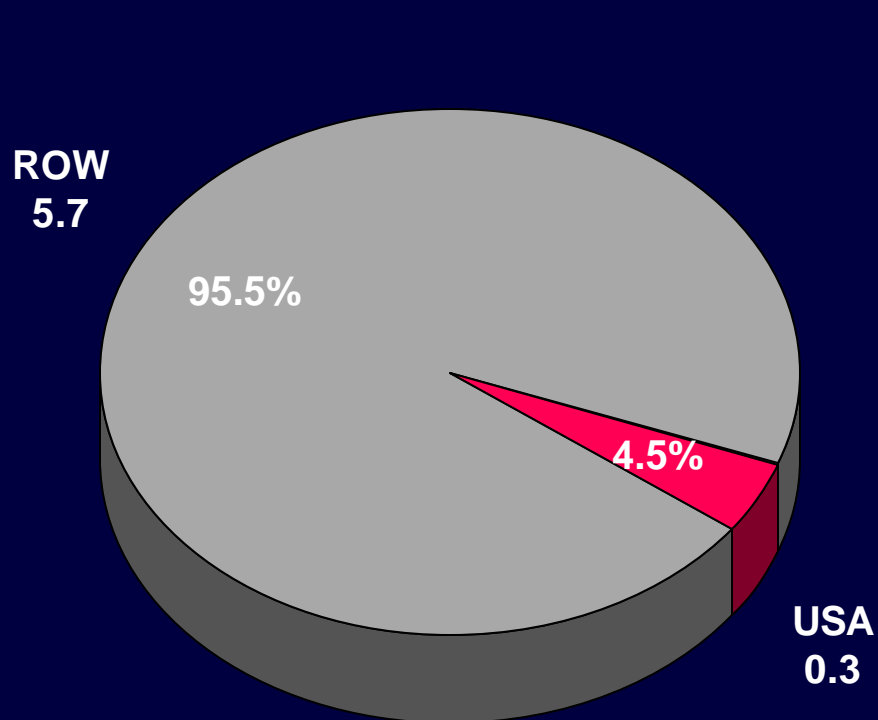
Globalization

a Major

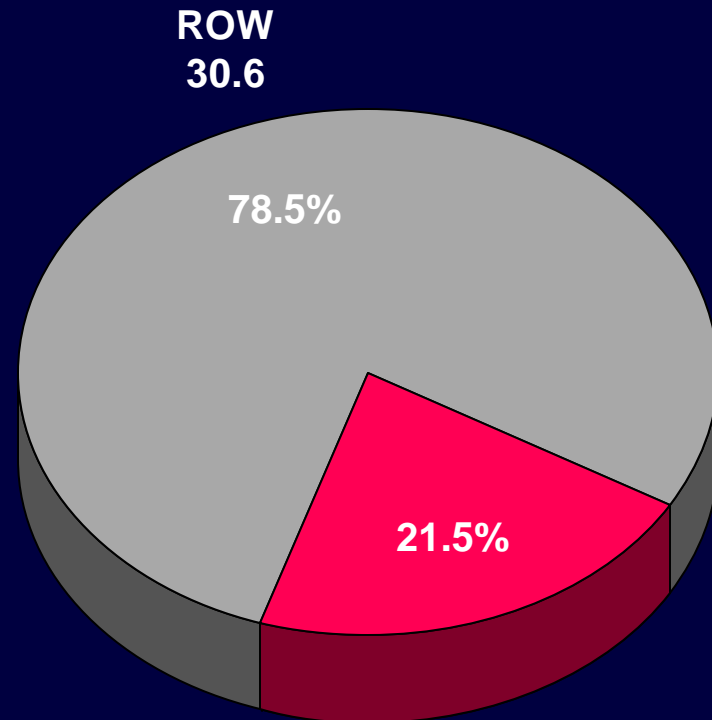
Driver

USA & WORLD

POPULATION & GROSS PRODUCT - 1998



**POPULATION
TOTAL: 6.0 B**



**GROSS PRODUCT
TOTAL: \$39 T**

LONG TERM GROWTH DRIVERS

INCREASING ELECTRONIC CONTENT OF CAPITAL GOODS

PRODUCTS THAT DID NOT EXIST A DECADE AGO

EMERGING GLOBAL MARKETS

**GLOBAL PERSONAL COMPUTER CATCH-UP TO USA
LEVELS**

CELLULAR PHONES - DEVELOPING NATIONS

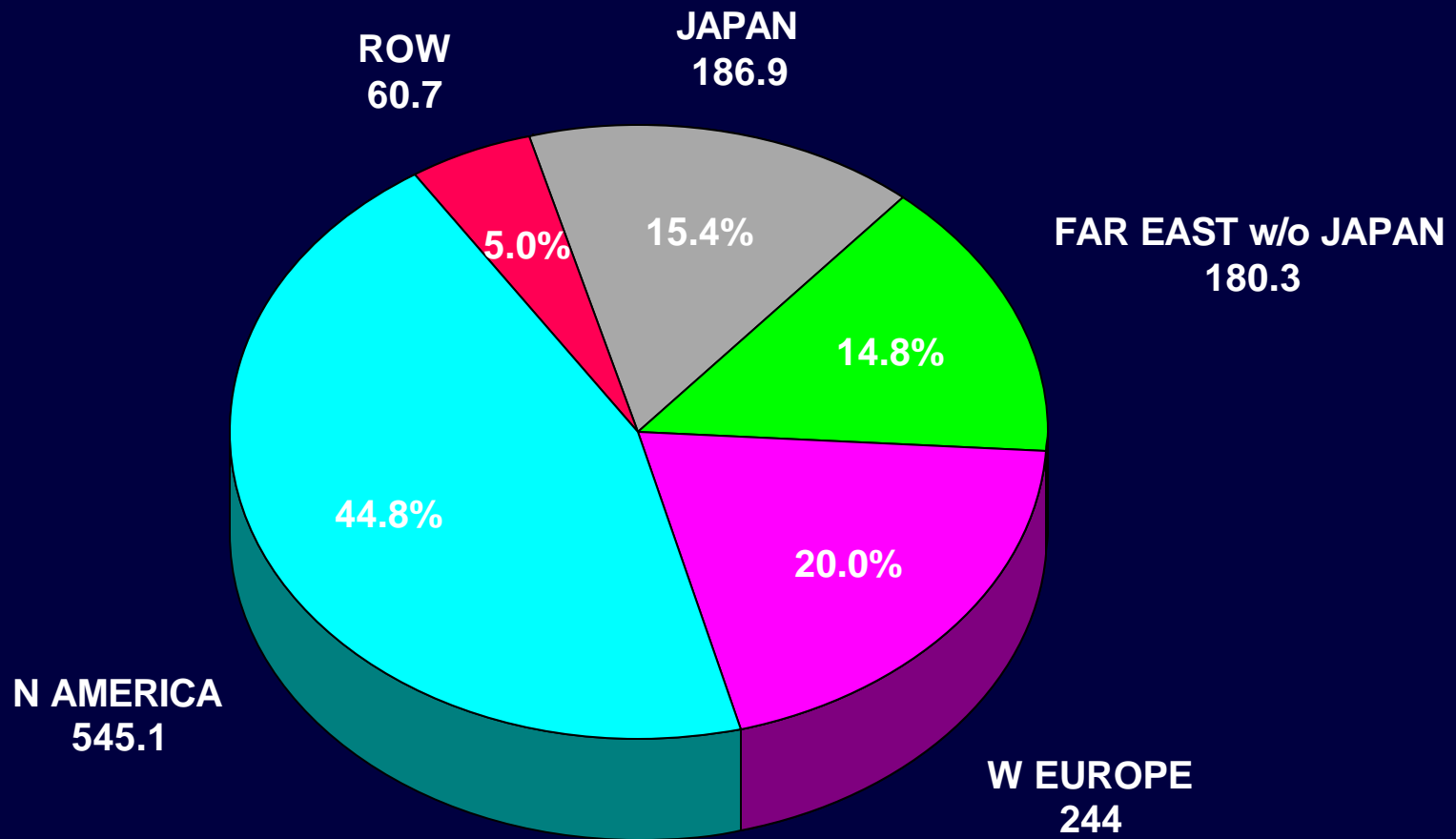
INTERNET EXPLOSION

E-BUSINESS INFRASTRUCTURE

Electronic Equipment

WORLD ELECTRONIC EQUIPMENT PRODUCTION

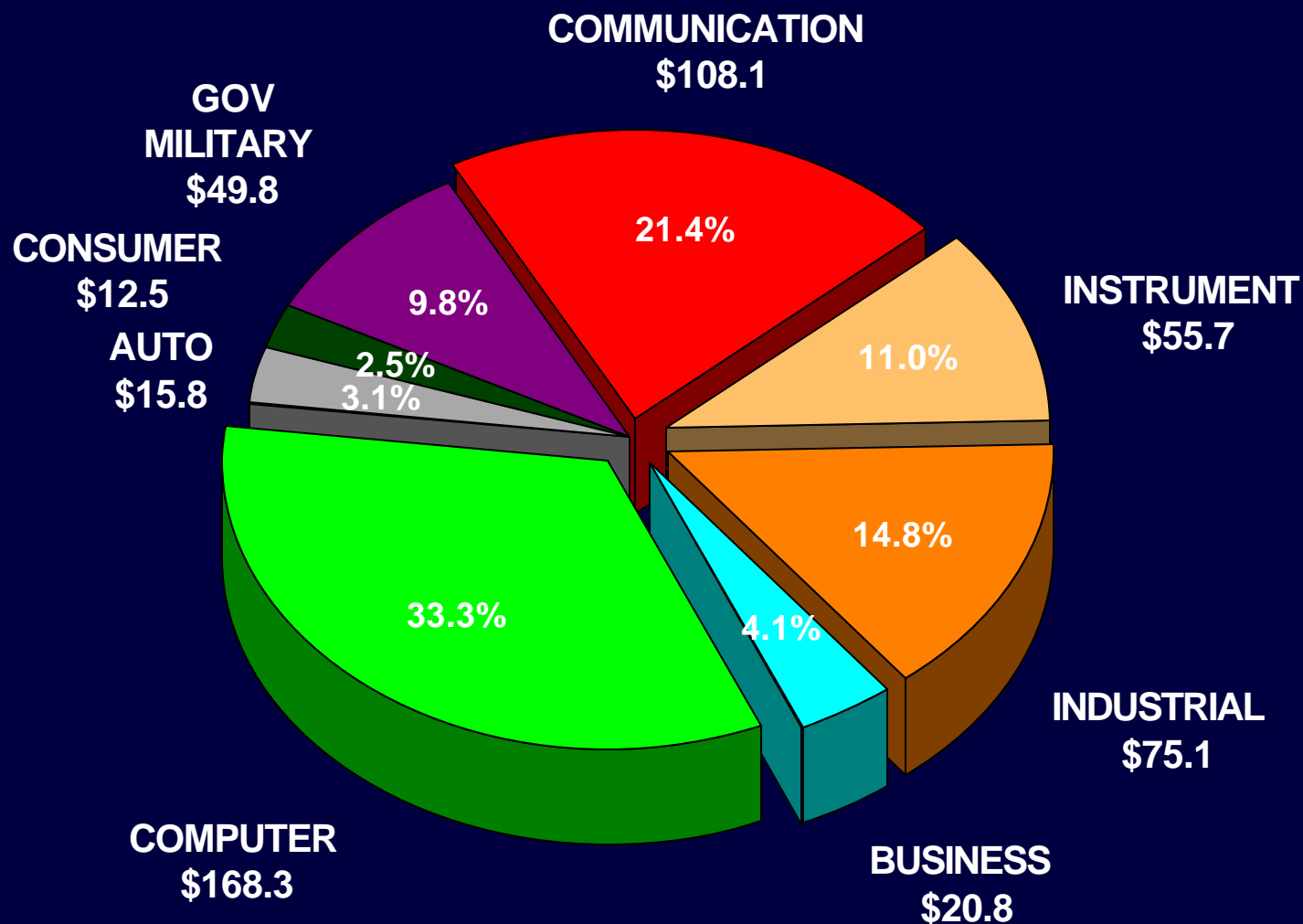
2000



TOTAL \$1,217 Billion

US PRODUCTION OF ELECTRONIC EQUIPMENT

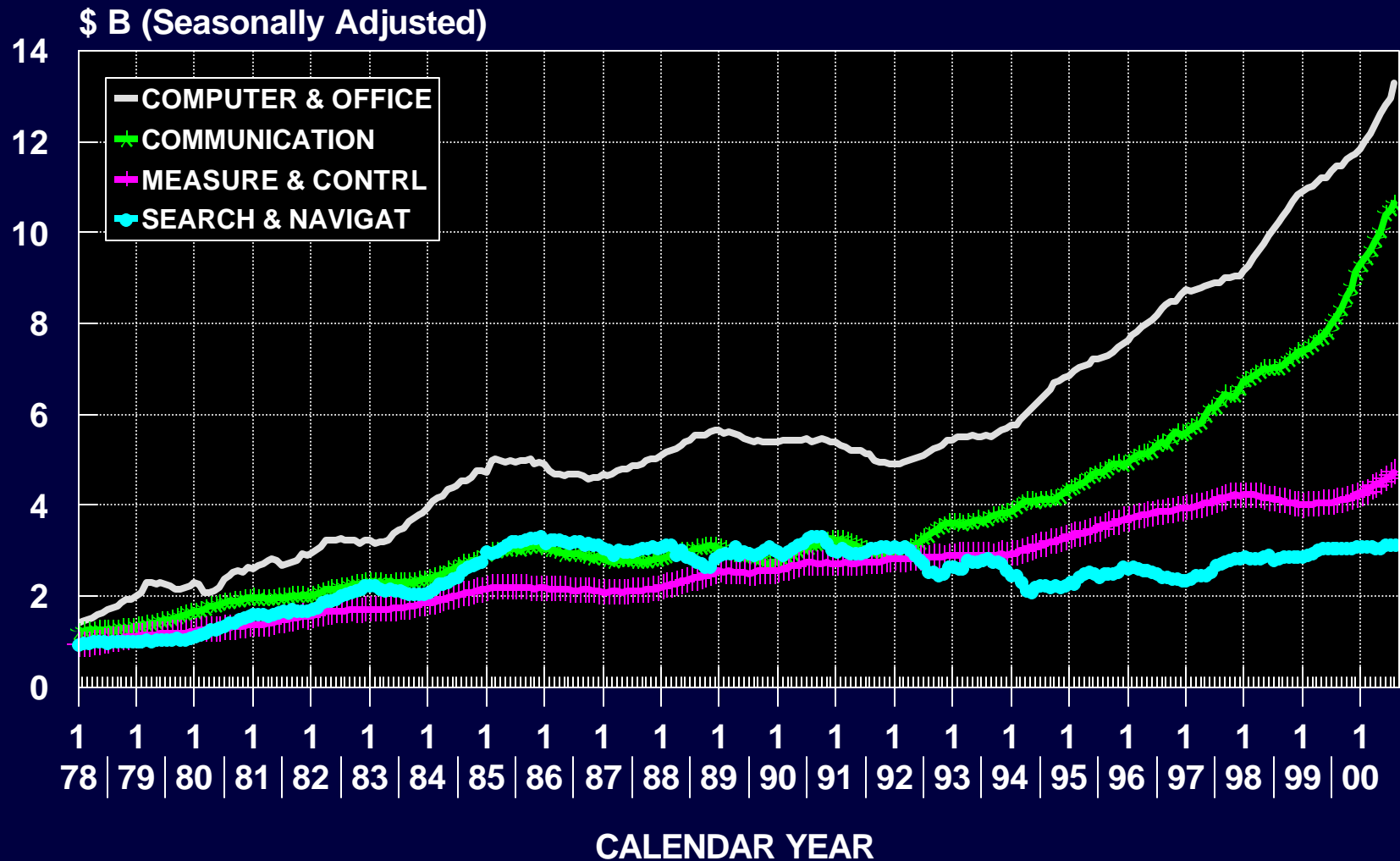
2000 ESTIMATE (\$B)



TOTAL = \$506 Billion

US ELECTRONIC EQUIPMENT BOOKINGS

12 MONTH ROLLING AVERAGE



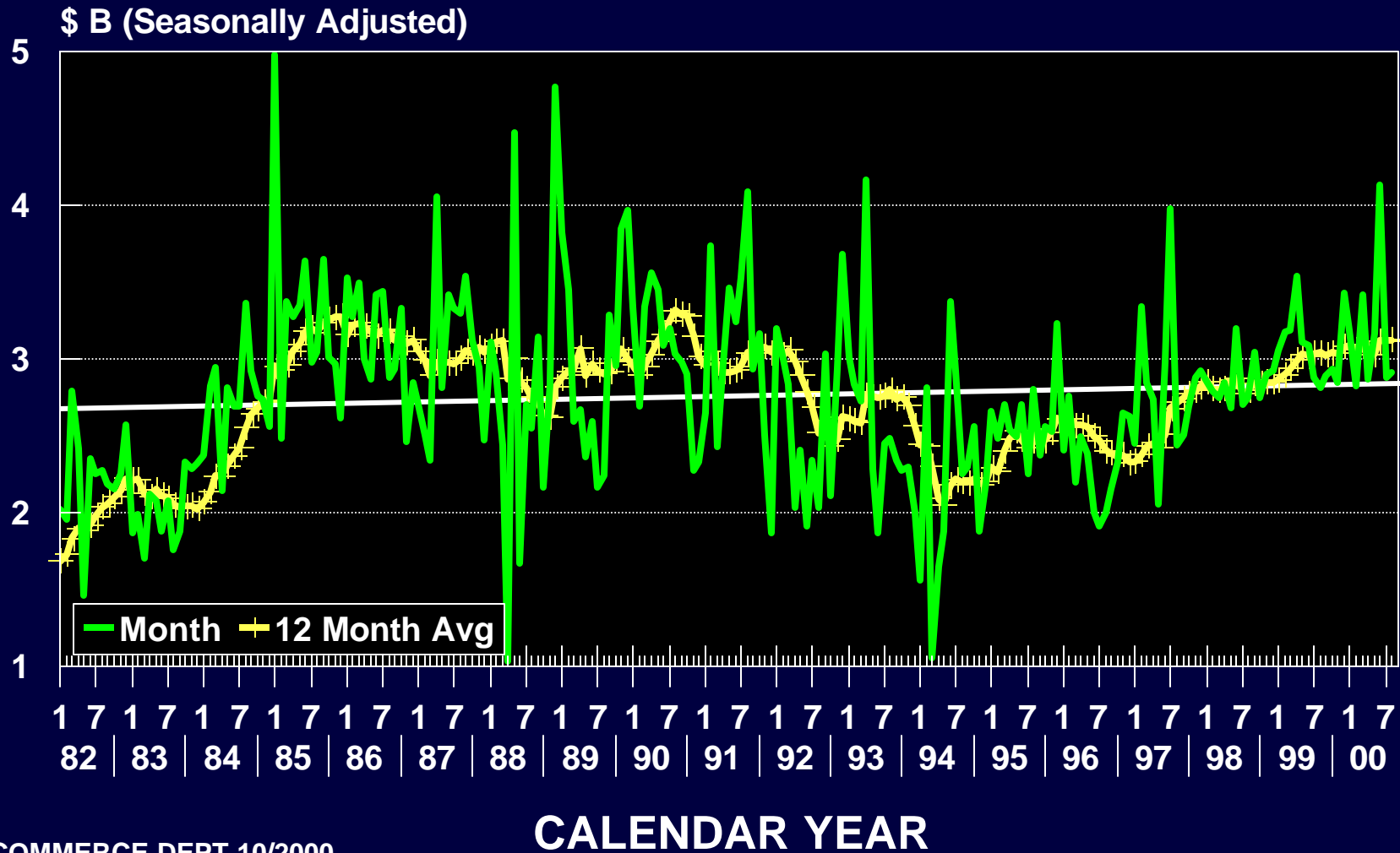
US DEPT OF COMMERCE 10/2000

Government & Military Electronics

SEARCH & NAVIGATION EQUIPMENT

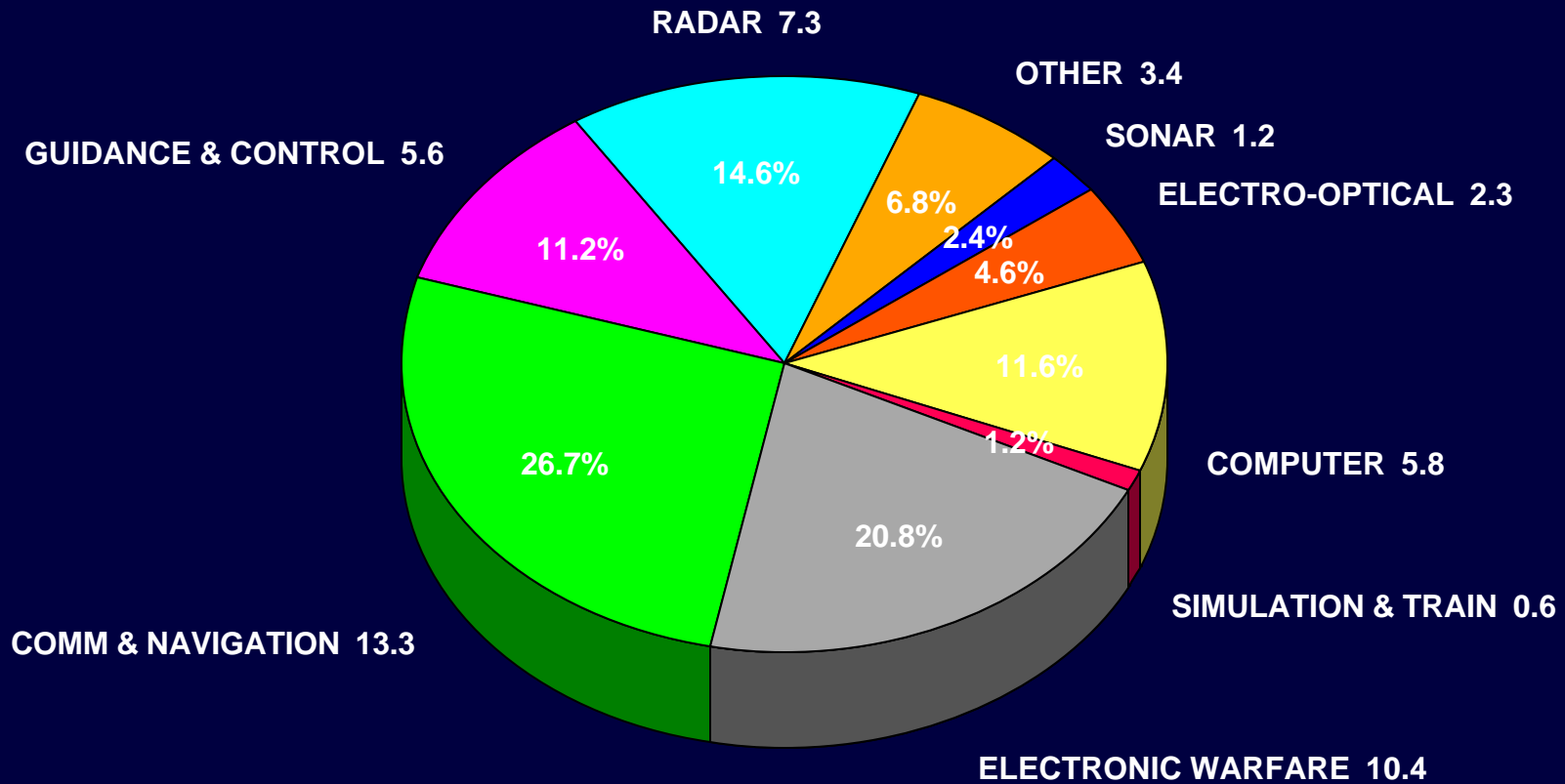
BOOKINGS

PRIMARILY MILITARY ELECTRONICS



GOVERNMENT & MILITARY ELECTRONICS PRODUCTION

U.S. - 2000



TOTAL: \$49.8 Billion

Electronic Company Prospector

Military/Aerospace Company Sample

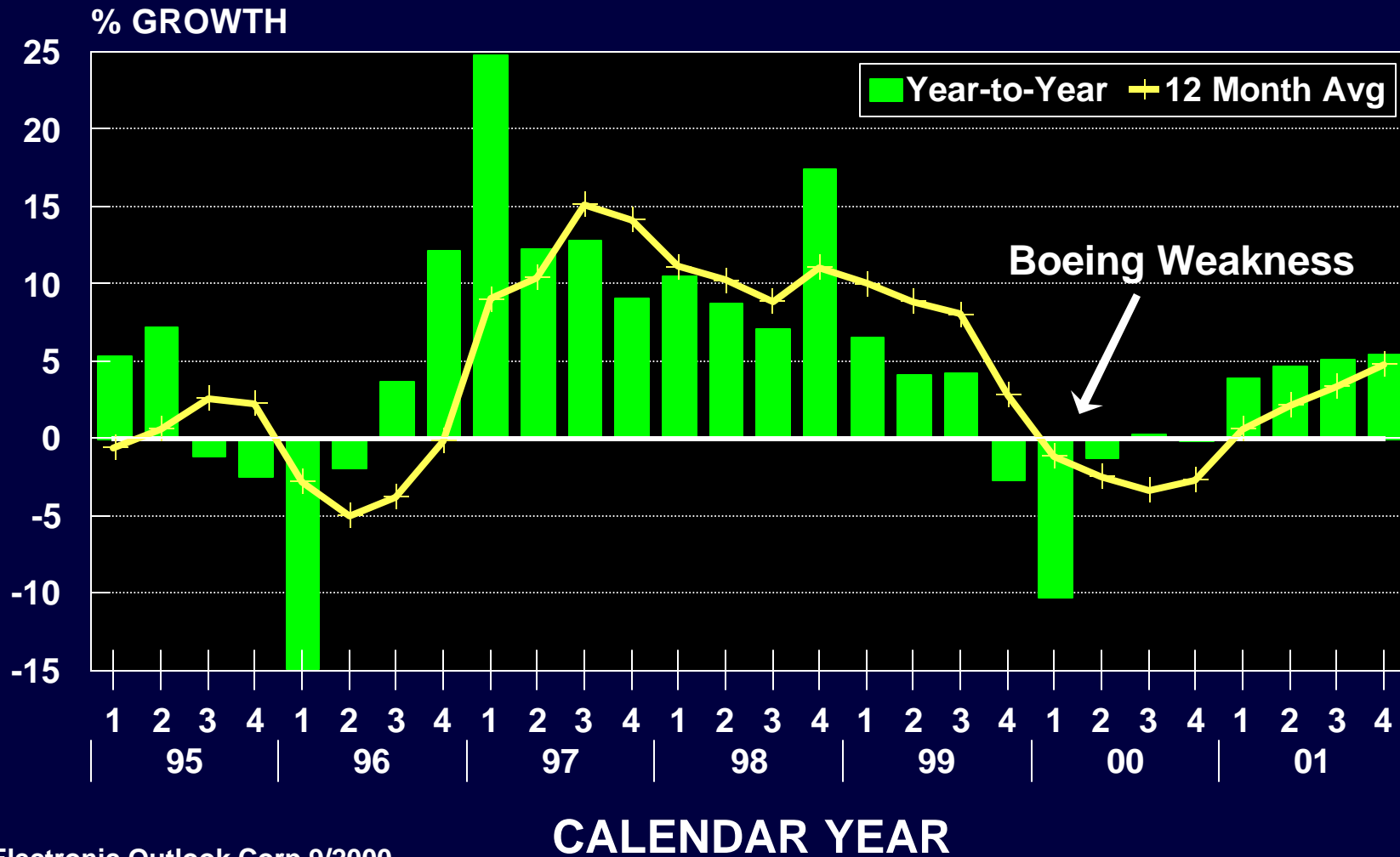
AEROFLEX (ARX) INC
AYDIN CORPORATION
BEI ELECTRONICS/TECHNOLOGIES
BOEING CORP
DATRON
EDAC TECHNOLOGIES
E-SYSTEMS
FAIRCHILD CORP
GRUMMAN
ITT DEFENSE GROUP
LITTON INDUSTRIES
LOCKHEED MARTIN CORP
LORAL CORP
MARTIN MARIETTA
MCDONNELL DOUGLAS
MOOG, INC
NORTHROP/GRUMMAN
ROCKWELL INTERNATIONAL
SPARTON CORP
ALLEGHENY/TELEDYNE AEROSPACE & ELEX.
TEXAS INST DEF. ELEX.
WATKINS-JOHNSON

AEROSONIC CORP
BE AEROSPACE, INC
CALIFORNIA AMPLIFIER
CUBIC CORP
EATON CORP
ESCO ELECTRONICS
EDO CORP
GENERAL DYNAMICS
HARRIS SYSTEMS
ITT IND Def. Prod. & Serv.
L-3 COMMUNICATIONS
LOGICON
LORAL SPACE & COMMUNIC
MAXWELL TECHNOLOGIES
MICRODYNE
MOTOROLA GOV/SPACE & SYS
RAYTHEON
ROCKWELL AVIONICS
SUNSTRAND CORP
TELEDYNE TECHNOLOGIES
TRIMLE NAVIGATION
WHITE ELECTRONIC DESIGNS

Electronic Outlook Corp
www.electronicoutlook.com

GOVERNMENT & MILITARY ELECTRONICS PRODUCTION

Revenue Growth - 42 Company Sample



Electronic Company Prospector

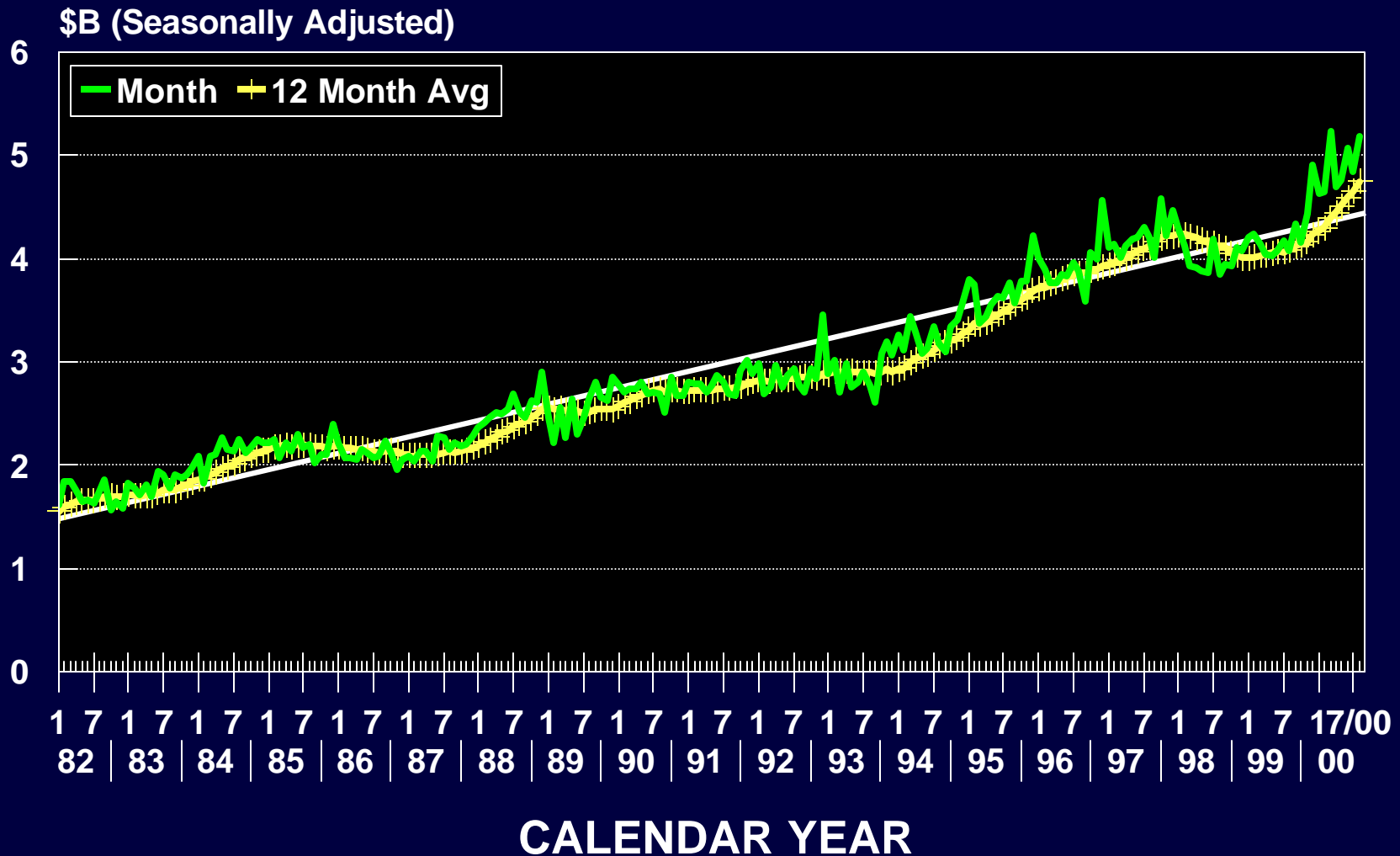
Military/Aerospace Company Sample

Top Companies by Revenue

	\$B			
	1998	1999	2000	2001
BOEING CORP	56.2	58.0	51.4	53.5
LOCKHEED MARTIN CORP	26.3	25.5	25.6	26.4
RAYTHEON	19.3	18.5	18.3	18.6
GENERAL DYNAMICS	6.7	9.0	10.5	11.3
NORTHROP/GRUMMAN	8.9	8.6	9.0	9.0
ROCKWELL INTERNATIONAL	6.9	7.2	7.4	7.9
LITTON INDUSTRIES	4.6	5.0	5.6	6.2
SUNSTRAND CORP	2.0	2.0	Acq by UTC	
LORAL SPACE & COMMUNIC	1.3	1.5	1.4	1.5
ITT IND Def. Prod. & Serv.	1.3	1.4	1.5	1.7

Instruments & Control Equipment

MEASUREMENT & CONTROL EQUIPMENT BOOKINGS



COMMERCE DEPT 10/2000

Communications Equipment

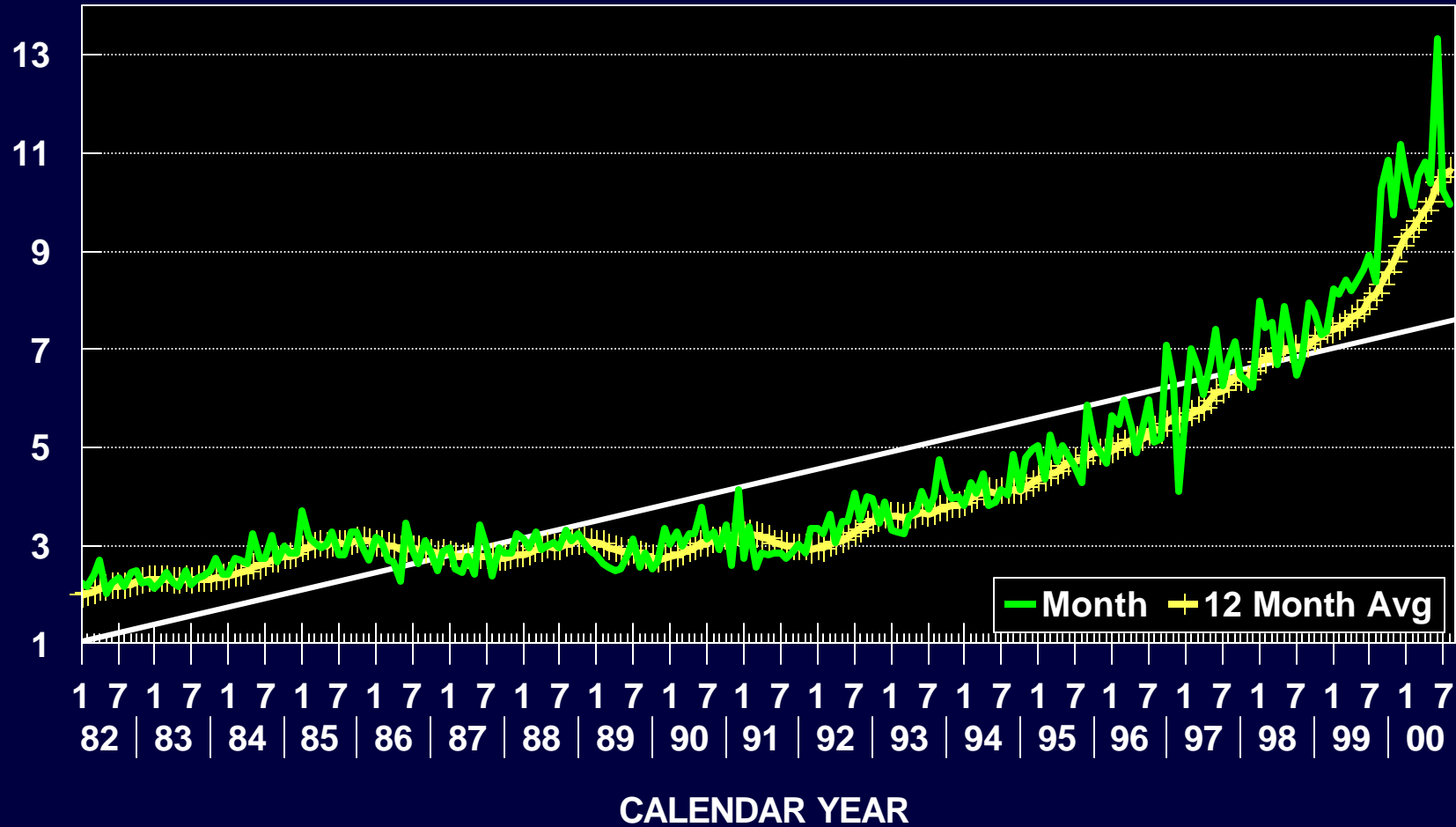
1996

**67% OF THE PEOPLE LIVING
TODAY HAVE NEVER MADE A
PHONE CALL.**

**90% OF THE WORLD'S
POPULATION
DOES NOT OWN A PHONE.**

COMMUNICATIONS EQUIPMENT BOOKINGS

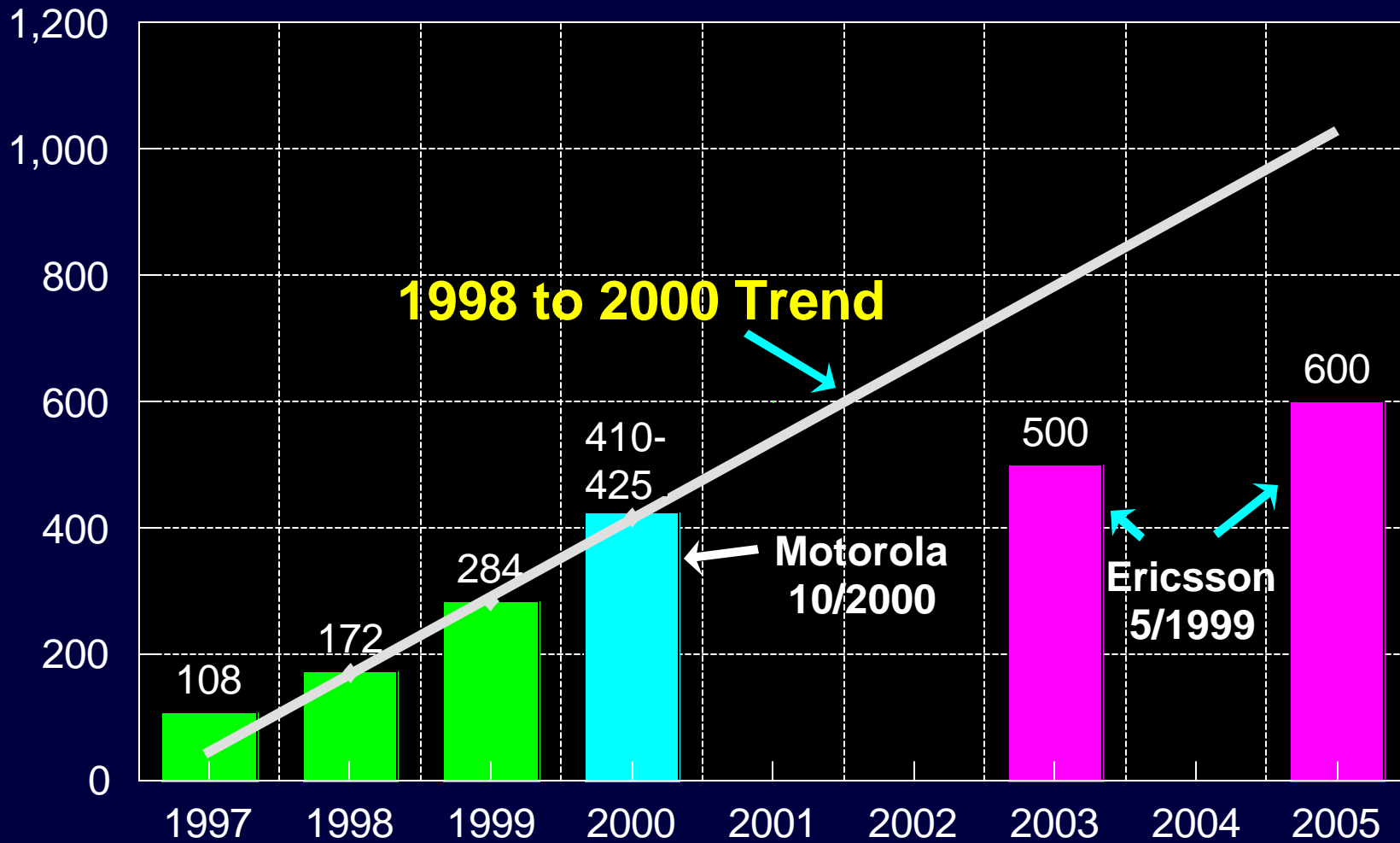
\$ B (Seasonally Adjusted)



COMMERCE DEPT 10/2000

WORLD CELLULAR PHONE GROWTH

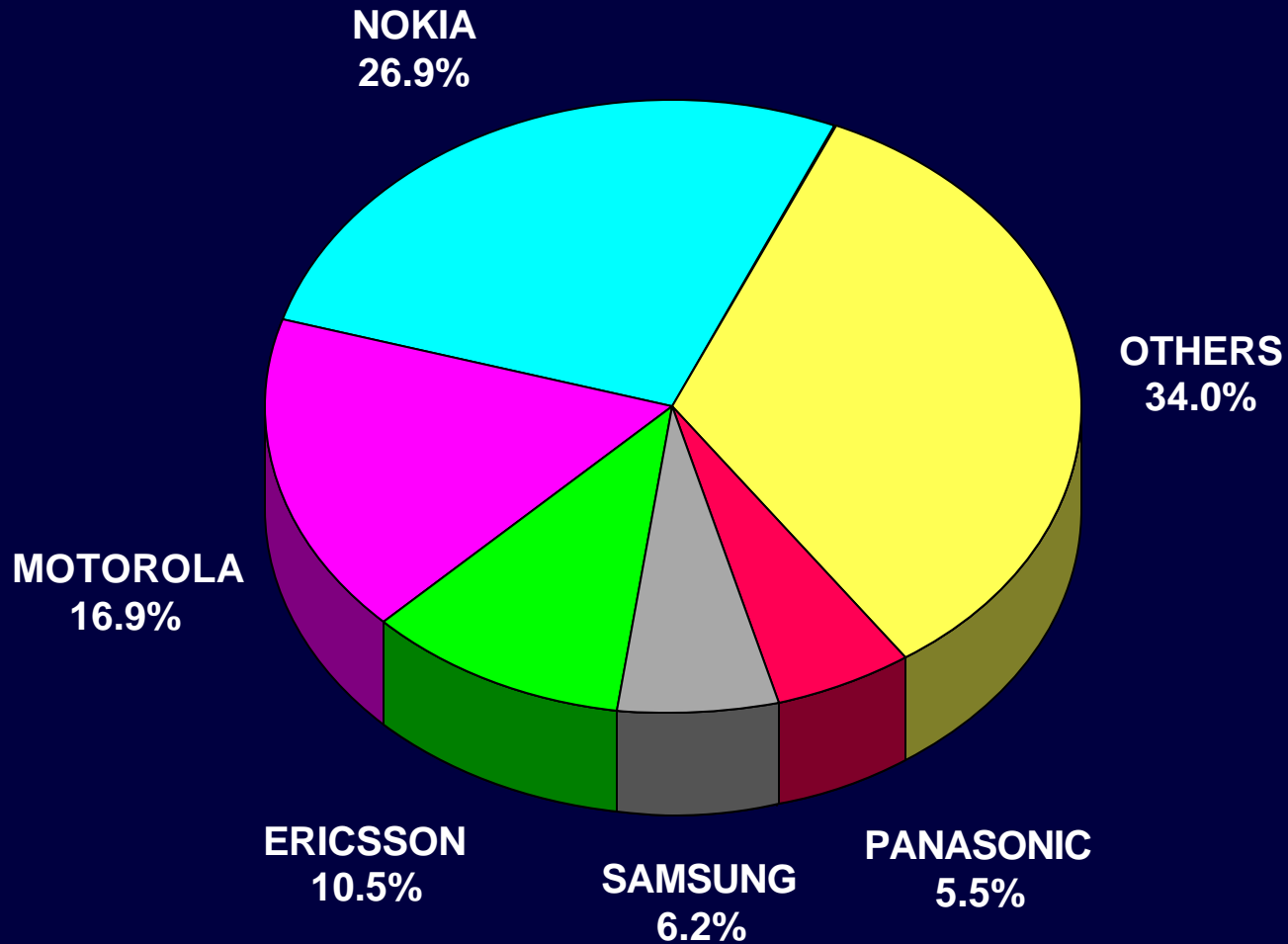
TOTAL SALES - ANALOG & DIGITAL



Ericsson 5/99 Forecast, Dataquest 2/2000, Motorola 10/2000

WORLD CELLULAR PHONE SALES

1999



DATAQUEST 2/2000

TOTAL: 283 MILLION UNITS

Worldwide Mobile Phone Sales

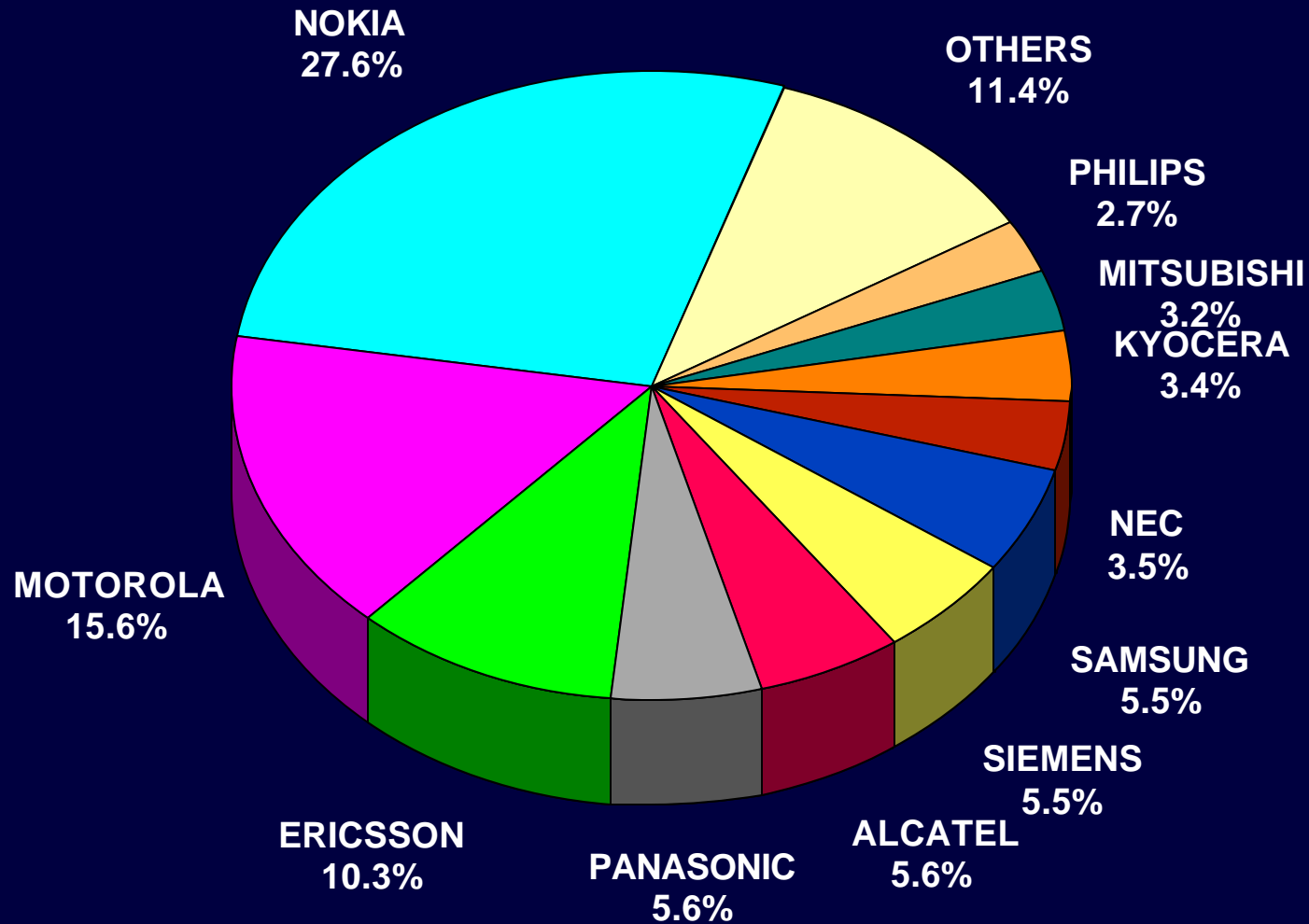
Units (000)

	1998		1999		99/98
	Units	% Share	Units	% Share	Growth %
Nokia	38,622	22.5	76,335	26.9	97.6
Motorola	33,379	19.5	47,818	16.9	43.3
Ericsson	25,906	15.1	29,785	10.5	14.8
Samsung	4,687	2.7	17,687	6.2	277.4
Panasonic	14,463	8.4	15,581	5.5	7.7
Others	54,538	31.8	96,376	34.0	76.7
Total	171,594	100.0	283,581	100.0	65.5

Dataquest 2/2000 Estimates

WORLD CELLULAR PHONE SALES

2Q 2000

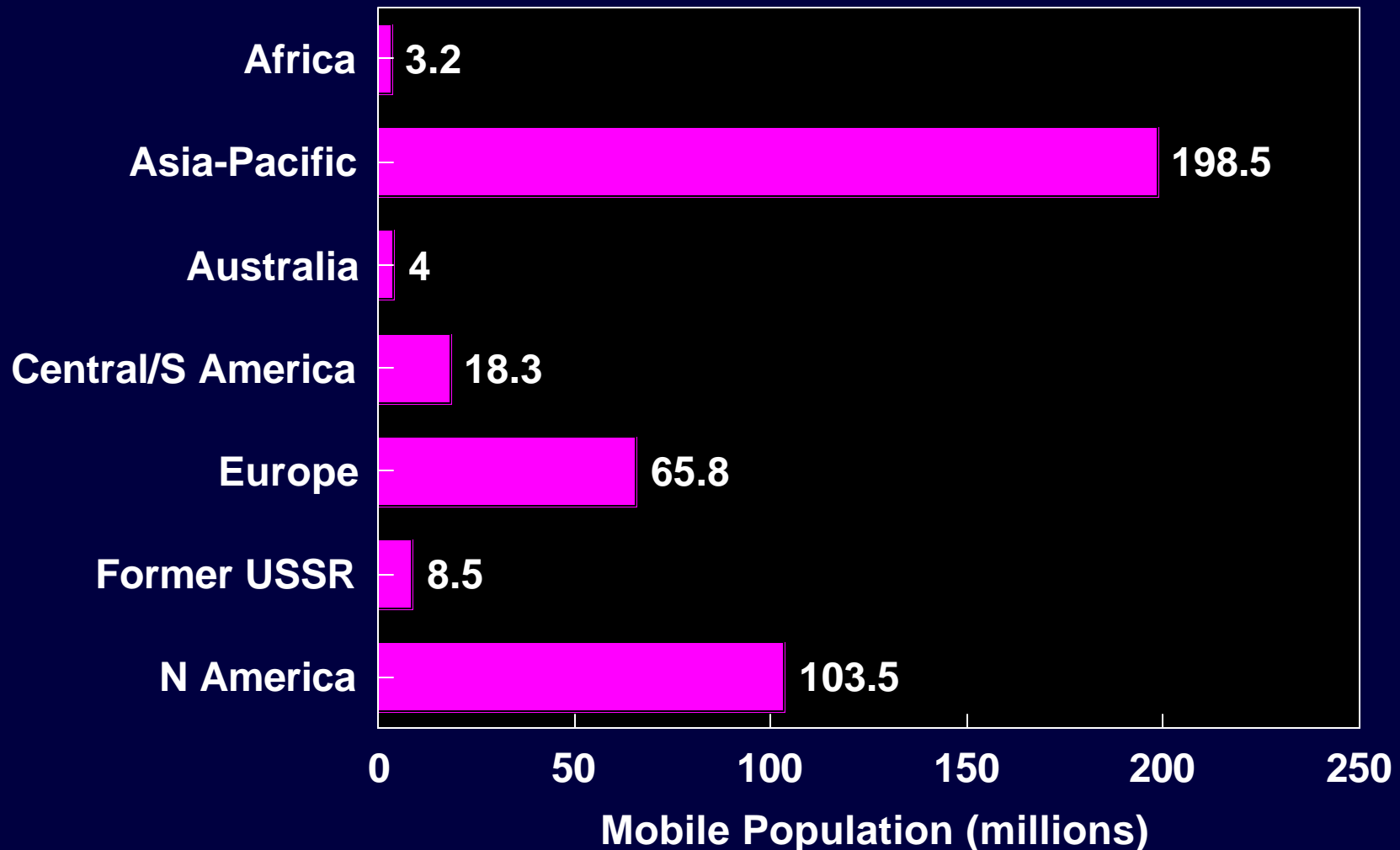


DATAQUEST 9/2000

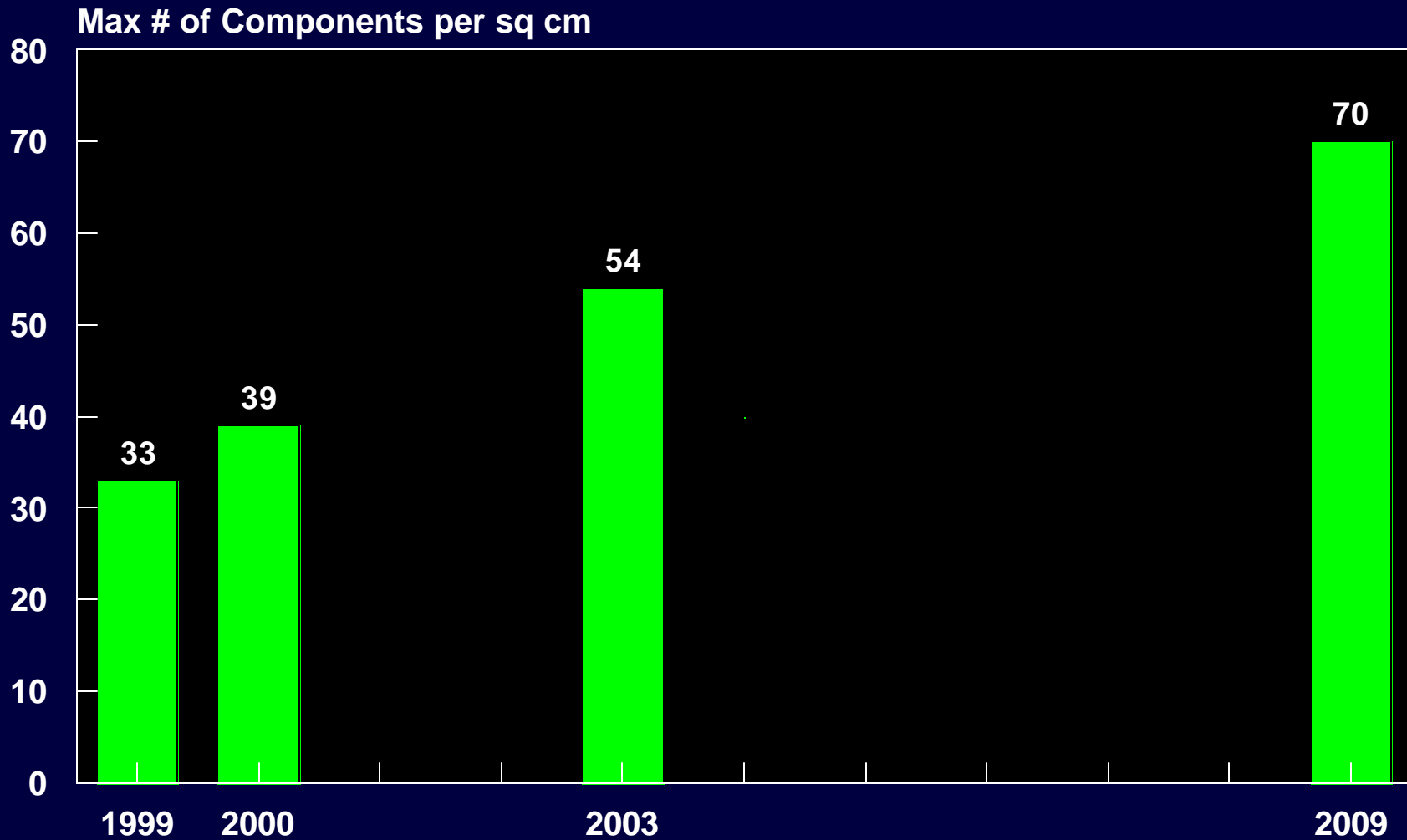
TOTAL: 98 MILLION UNITS

Mobile Technology Users - 2000

Handheld PCs, Cel Phones, Pagers & Smart Phones



Passive Component Densities in Cellular Headsets



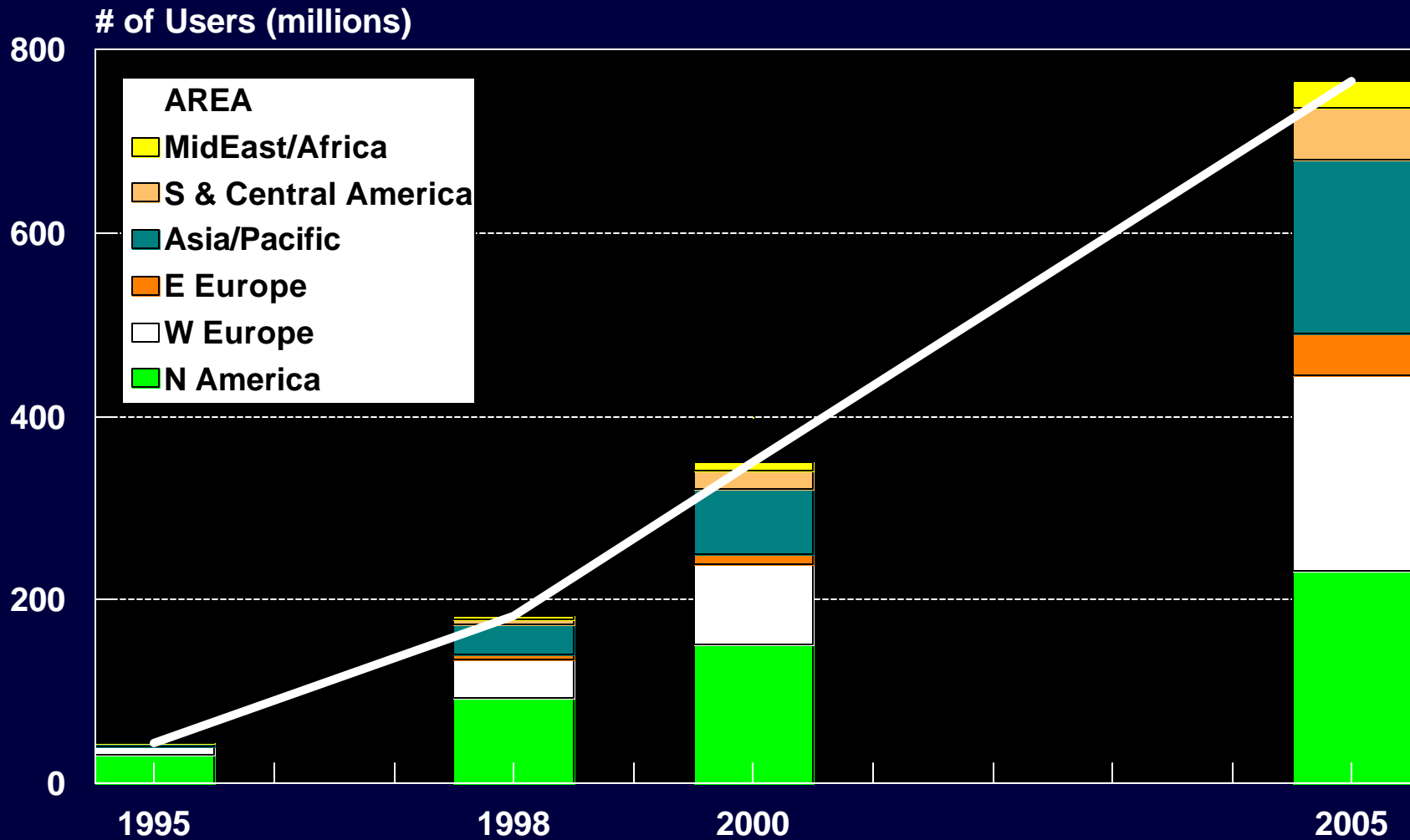
Internet

TECHNOLOGY INTRODUCTION

NUMBER OF YEARS TO REACH 10 MILLION USERS

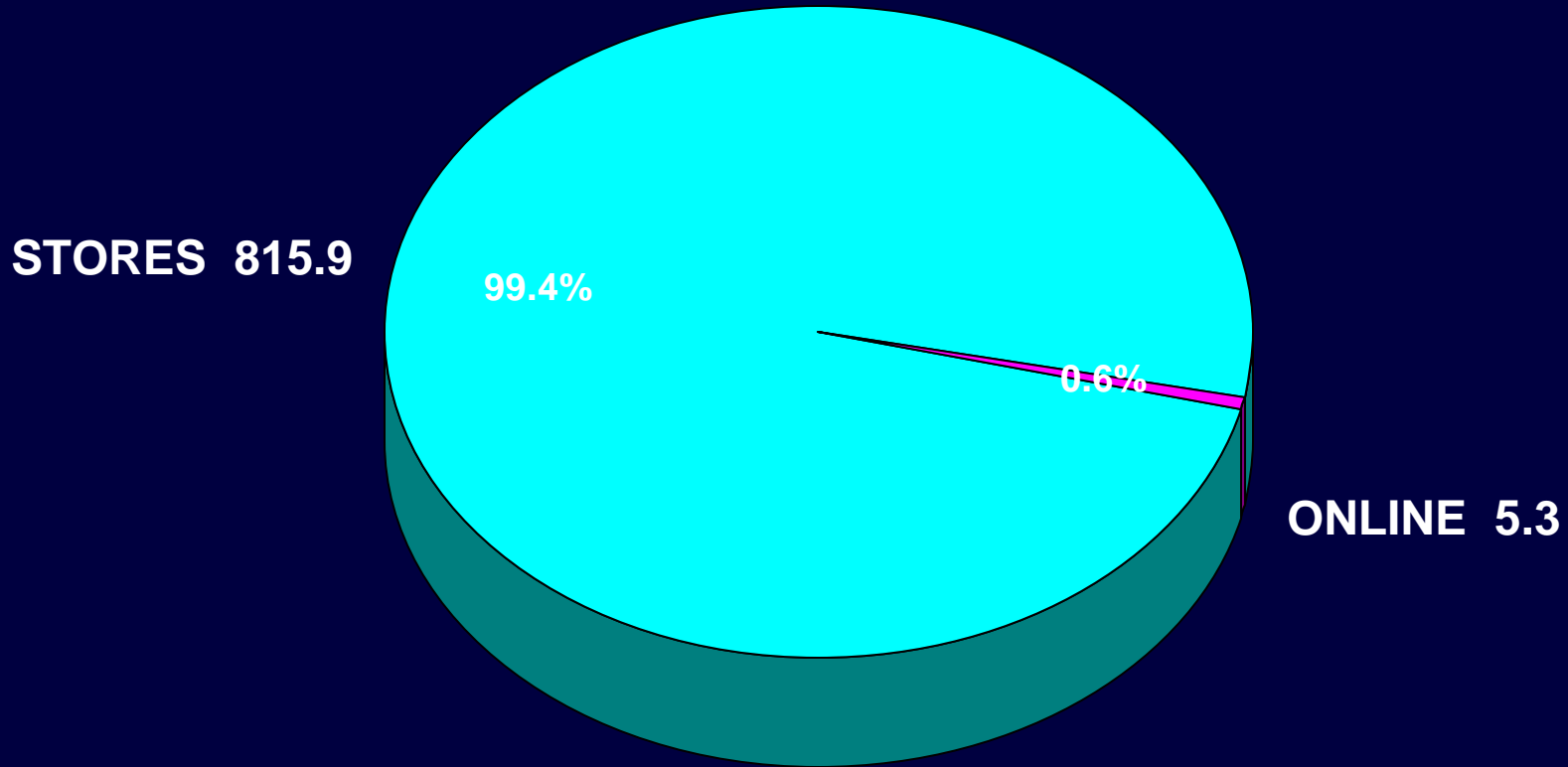
PAGER	41 YEARS
FAX MACHINE	22 YEARS
CELLULAR PHONE	9 YEARS
VIDEO RECORDER	9 YEARS
COMPACT DISC	6 YEARS
PERSONAL COMPUTER	6 YEARS
NETSCAPE BROWSER	10 MONTHS

World Internet Usage



RETAIL SALES - STORES vs ONLINE

U.S. - 4Q '99

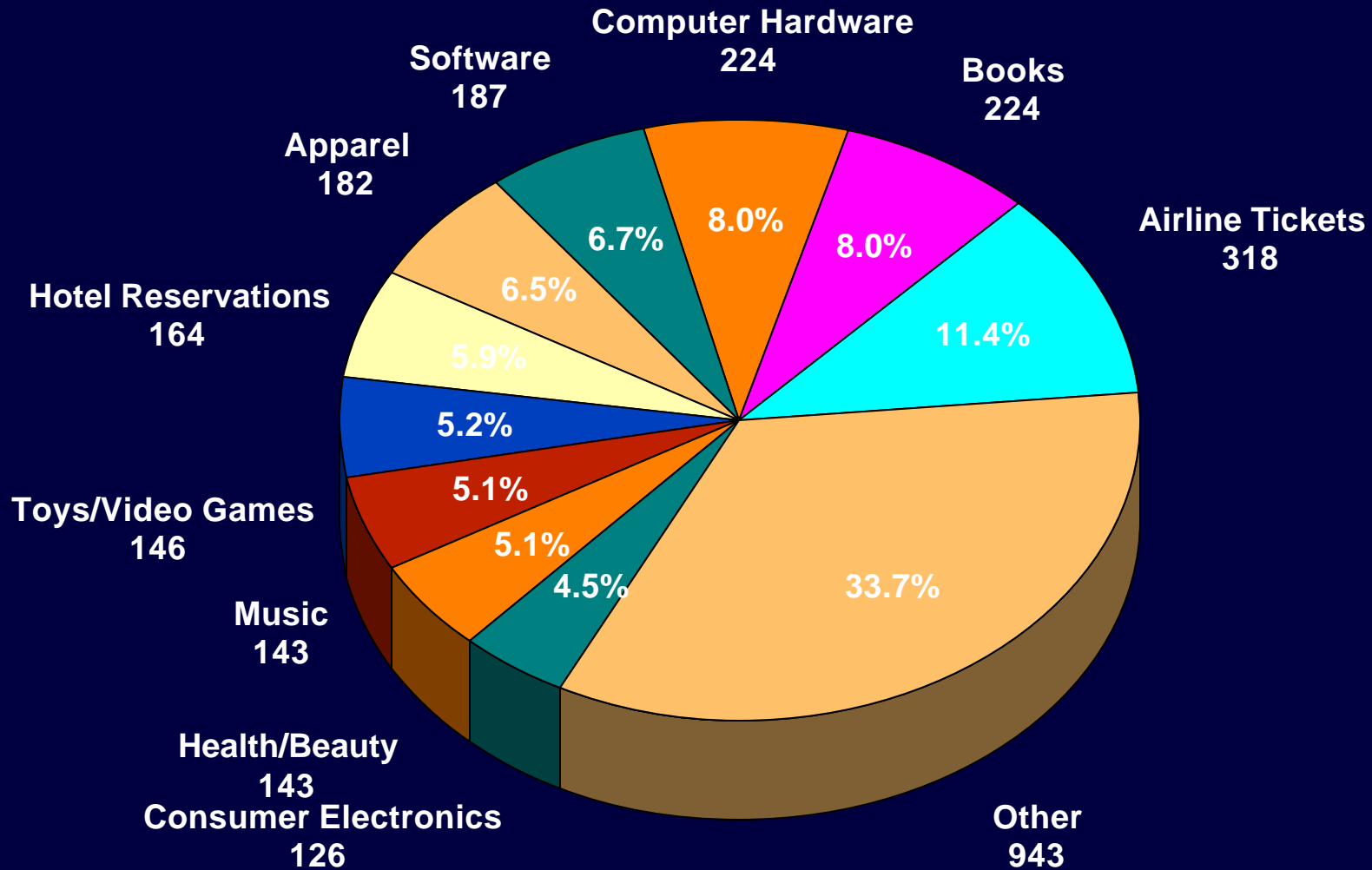


TOTAL: \$821.2 Billion

U.S. Dept of Commerce 3/2000

Total Online Retail Spending

U.S. - January 2000



TOTAL: \$2,800 Billion

National Retail Federation & Forrester Research 3/2000

Computer & Office Equipment

COMPUTER & OFFICE EQUIPMENT BOOKINGS

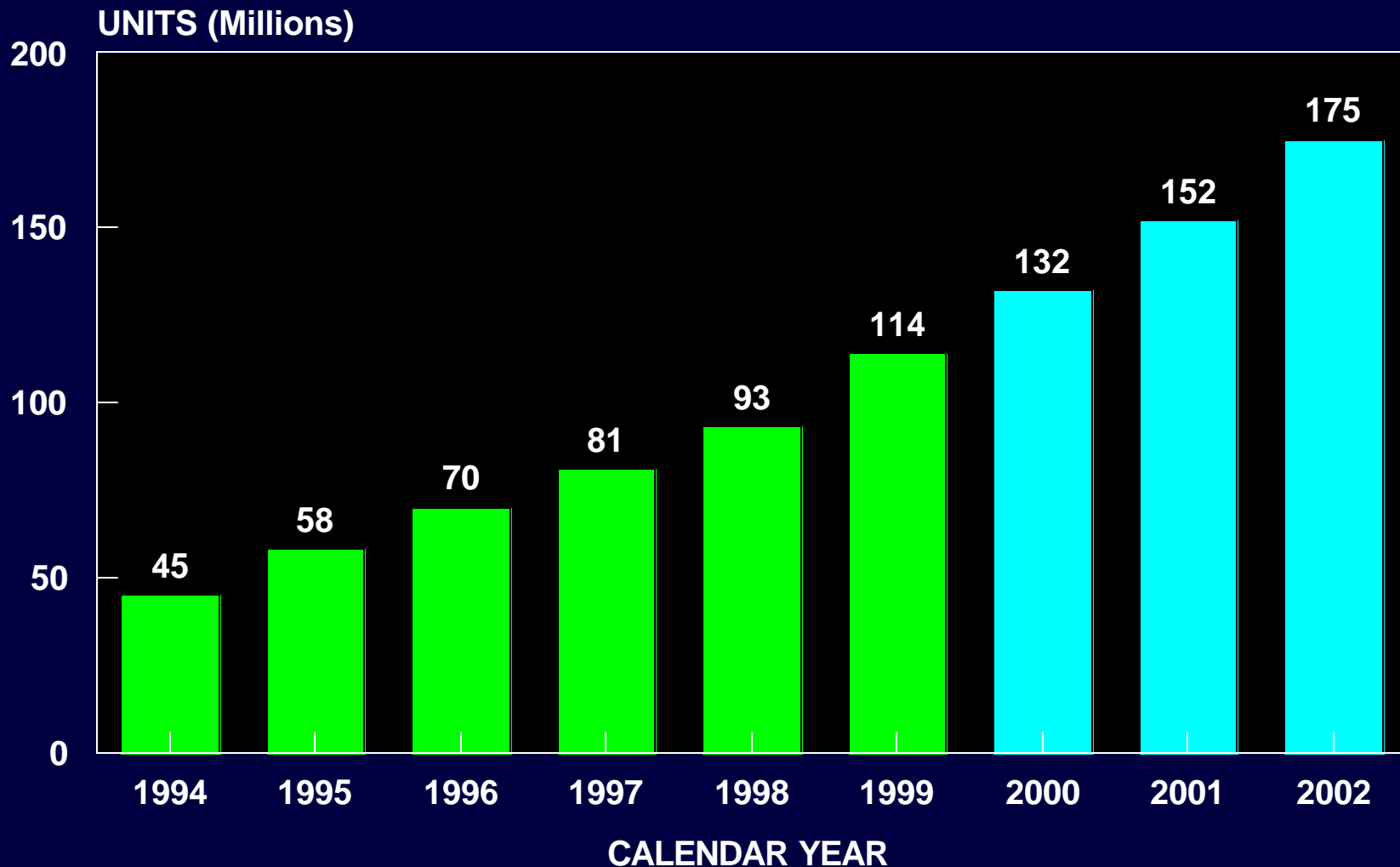
\$B (Seasonally Adjusted)



COMMERCE DEPT 10/2000

PERSONAL COMPUTER GROWTH

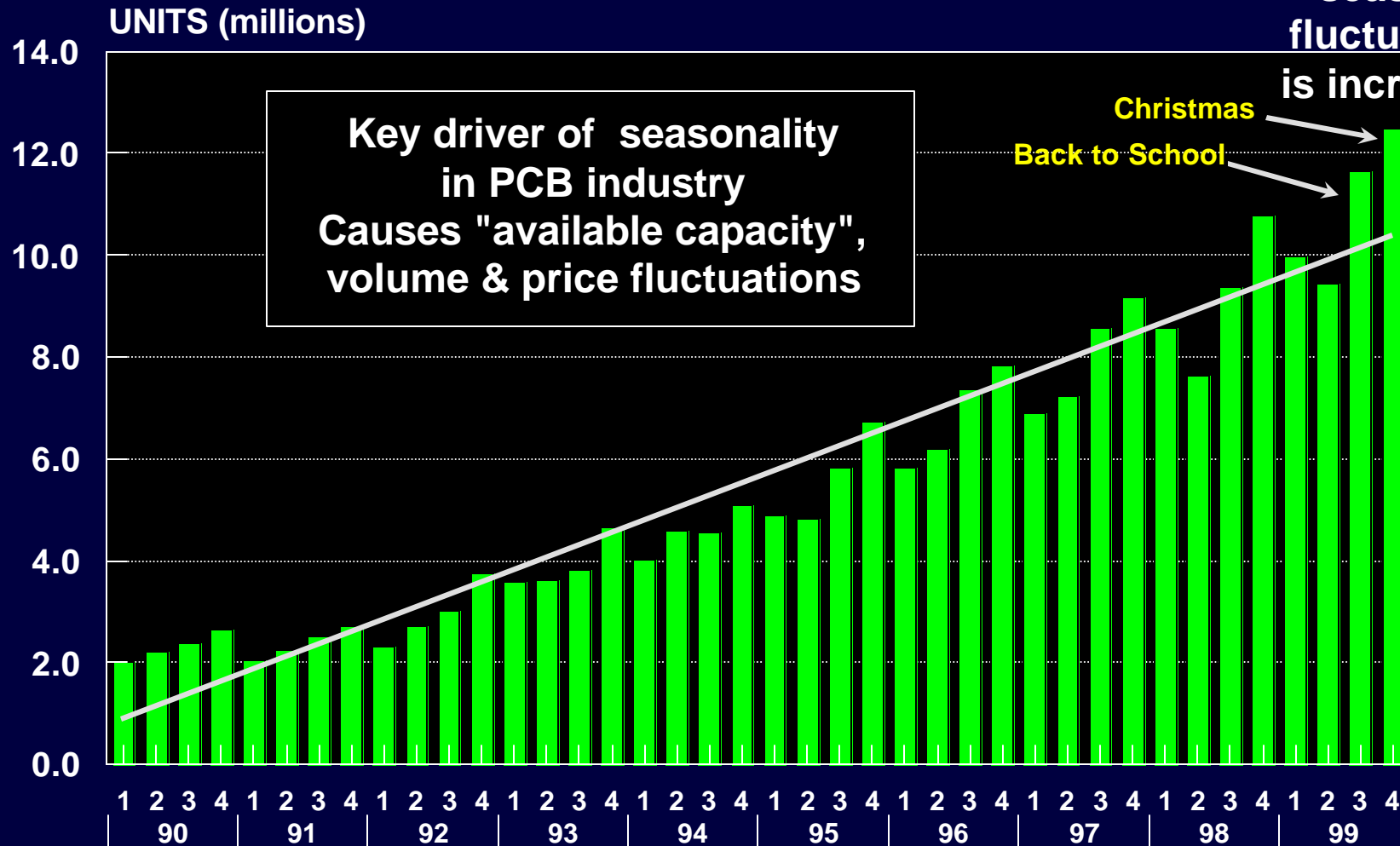
GLOBAL SALES



EBN:IDC, John Peedie Assoc 8/97, Dataquest 1/99 & 1/2000, Custer 1/2000
Desktops, Notebooks, Ultraportables - does not include Servers

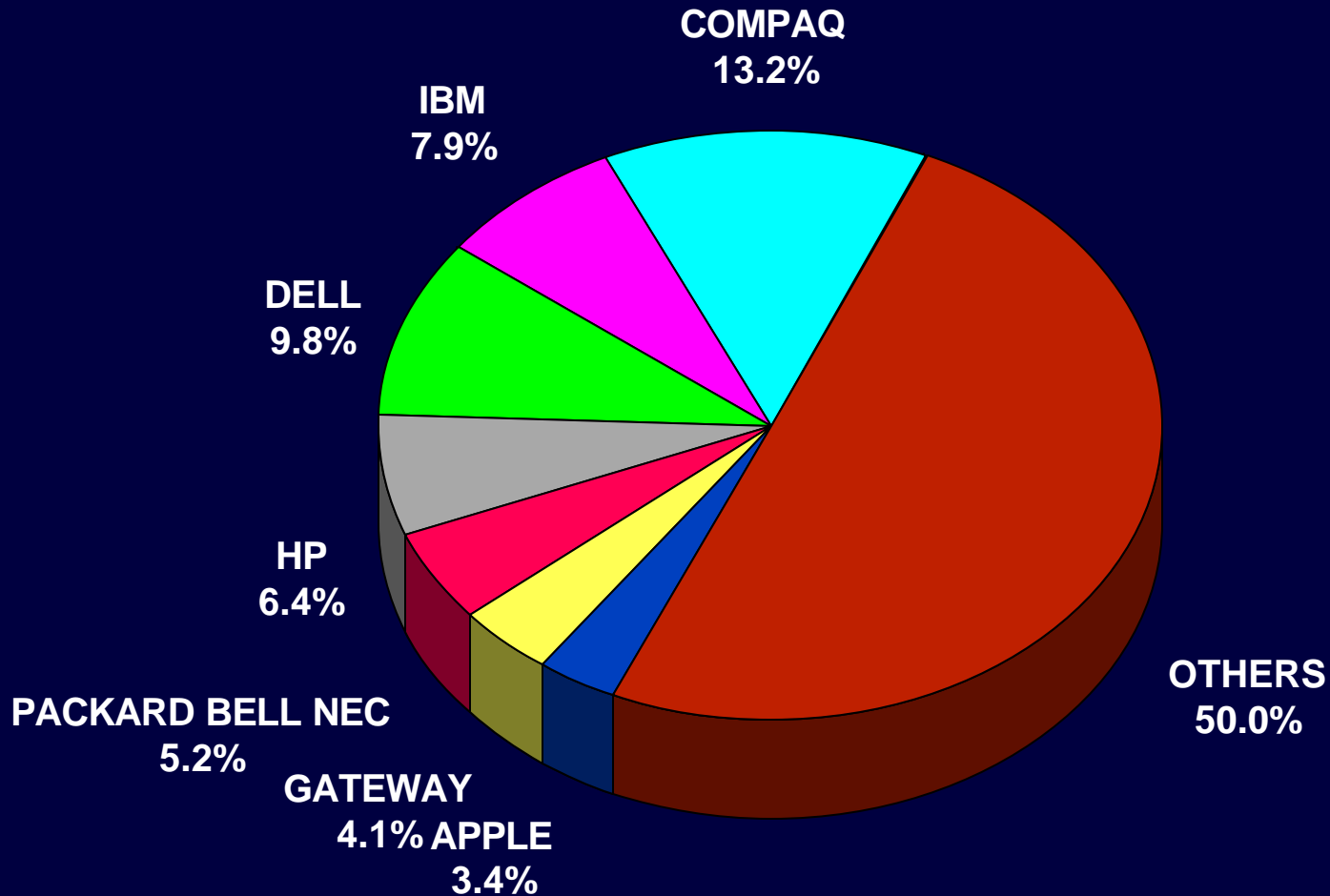
MICROCOMPUTER SHIPMENTS TO THE U.S.

Magnitude of seasonal fluctuations is increasing



WORLD PERSONAL COMPUTER MARKET

1999

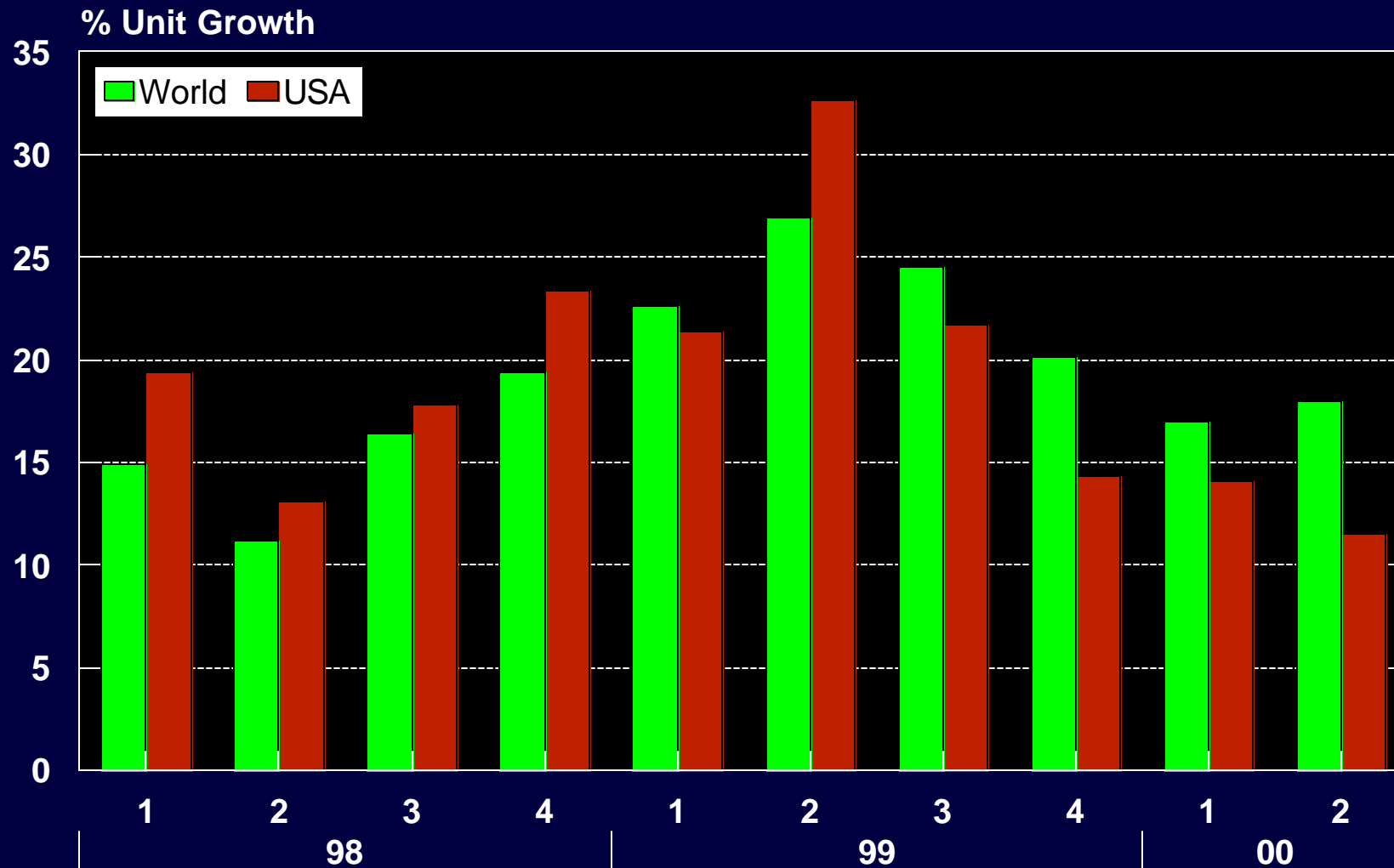


DATAQUEST 1/2000

Preliminary, Servers not included

TOTAL: 113.5 M UNITS

Personal Computer Market Growth World & USA



10 Richest People

	<u>Industry</u>	<u>Fortune</u> <u>\$M</u>	<u>% of</u> <u>GDP</u>	<u>Lived</u>
John D Rockefeller	Oil	900	2.7	1839-1937
Andrew Carnegie	Steel	250	1.2	1835-1919
Cornelius Vanderbilt	Shipping, railroads	105	1.15	1794-1877
John Jacob Astor	Fur trade, real estate	20	0.93	1763-1848
William Gates III	Computer software	71,000	0.71	1955-
Stephen Girard	Shipping, real est, ins	8	0.66	1750-1831
A T Stewart	Retail, whls, real est	50	0.56	1803-1876
Frederick Weyerhauser	Lumber	200	0.51	1834-1914
Jay Gould	Investing, railroads	72	0.50	1836-1892
Marshall Field	Department Stores	140	0.48	1834-1906

CRN: Yahoo Finance 9/2000

Computer Peripherals

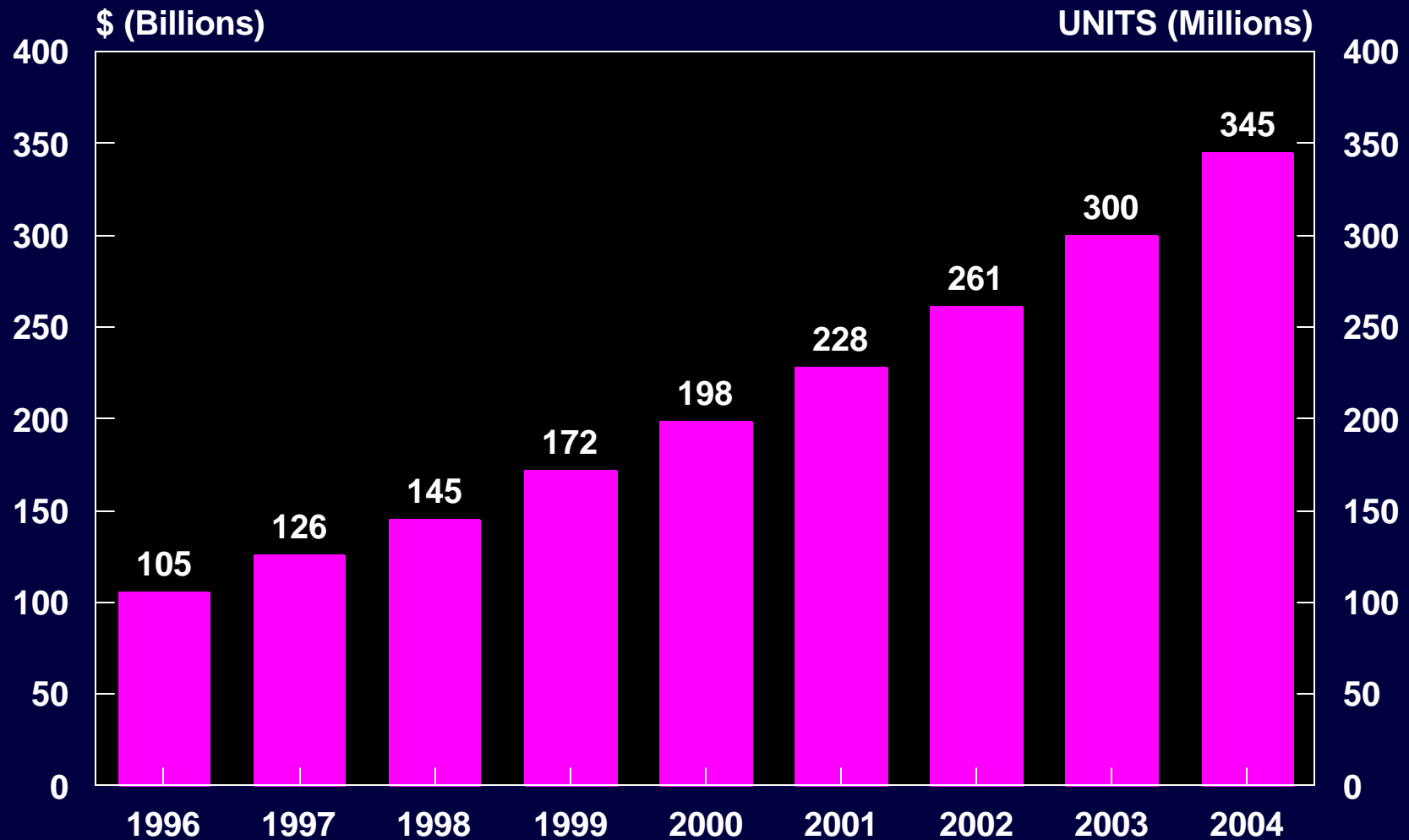
MOTHERBOARD MANUFACTURERS

WORLD - (\$M)

	<u>1998</u>	<u>1997</u>
Intel, OEM Product Solutions	2,400	\$3,000
AsusTek Computer	1,000	700
AOpen	870	825
Elitegroup Computer Systems	600	600
First International Computer	600	550
Giga-Byte Technology	348	220
Micro-Star International	298	196
Soyo Computer	280	254
Diamond Flower Electric Instrument	256	160
Shuttle	220	200

RIGID DISK DRIVES

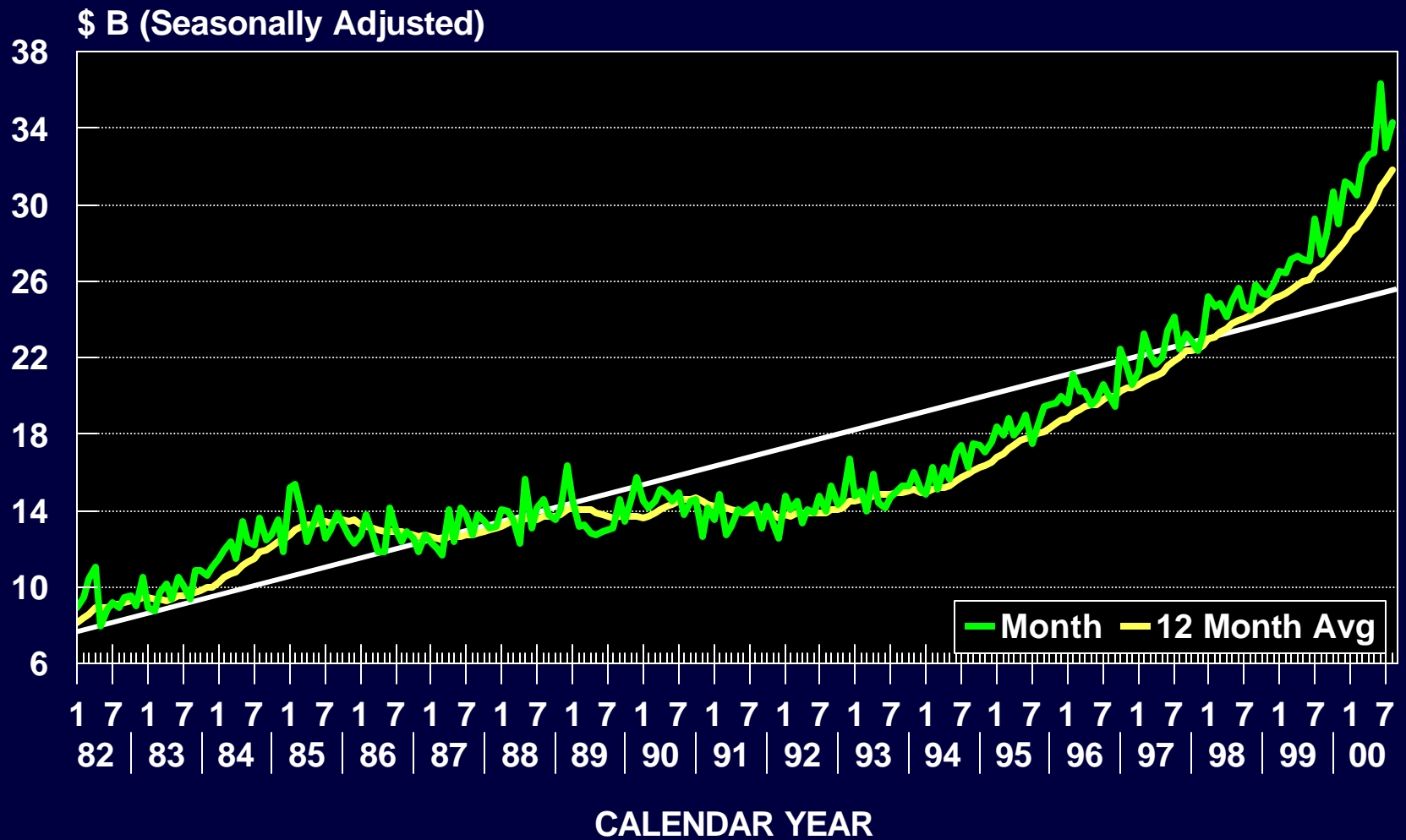
WORLDWIDE UNIT SHIPMENTS



DISK/TREND 6/98, TrendFocus 2/99, Forward Concepts 4/2000

Electronic Equipment Summary

TOTAL ELECTRONIC EQUIPMENT BOOKINGS



COMMERCE DEPT 10/2000

ELECTRONIC COMPONENTS BOOKINGS

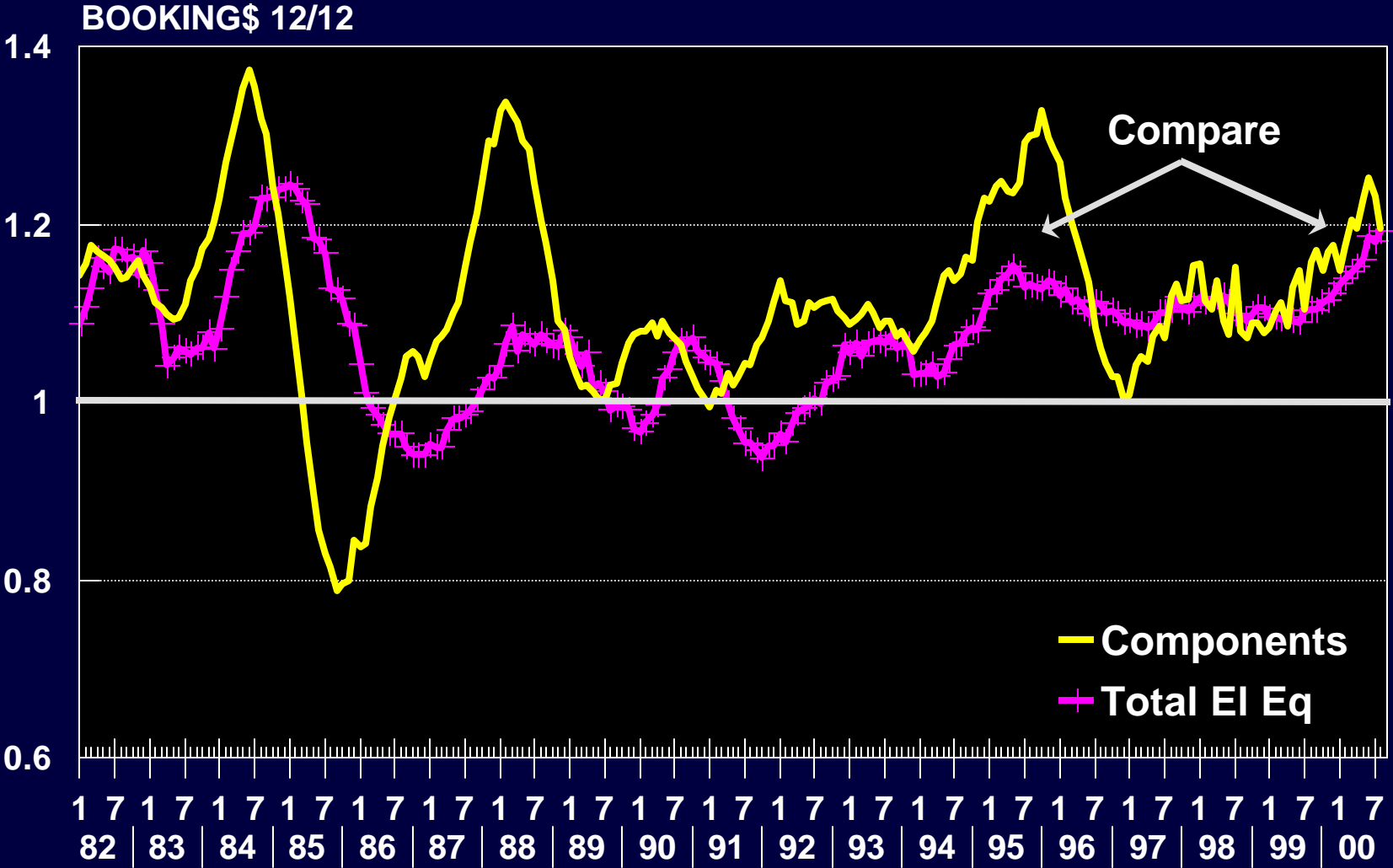
\$ B (Seasonally Adjusted)



COMMERCE DEPT 10/2000

CALENDAR YEAR

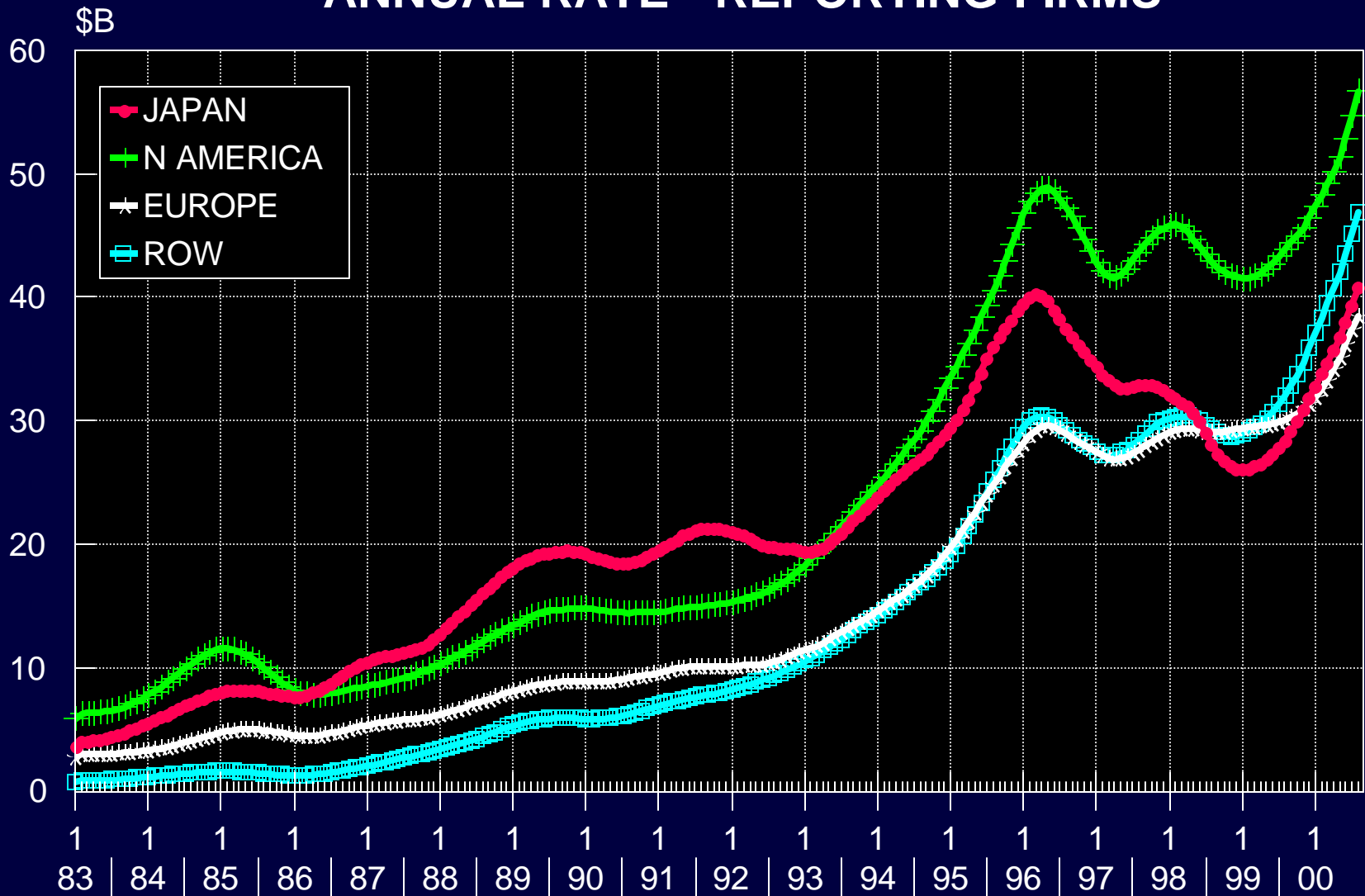
U.S. Electronic Components vs Total Electronic Equipment



Semiconductors

TOTAL SEMICONDUCTOR \$ SHIPMENTS TO AREA

ANNUAL RATE - REPORTING FIRMS



SIA website: www.semichips.org/

MONTHLY SEMICONDUCTOR SHIPMENTS

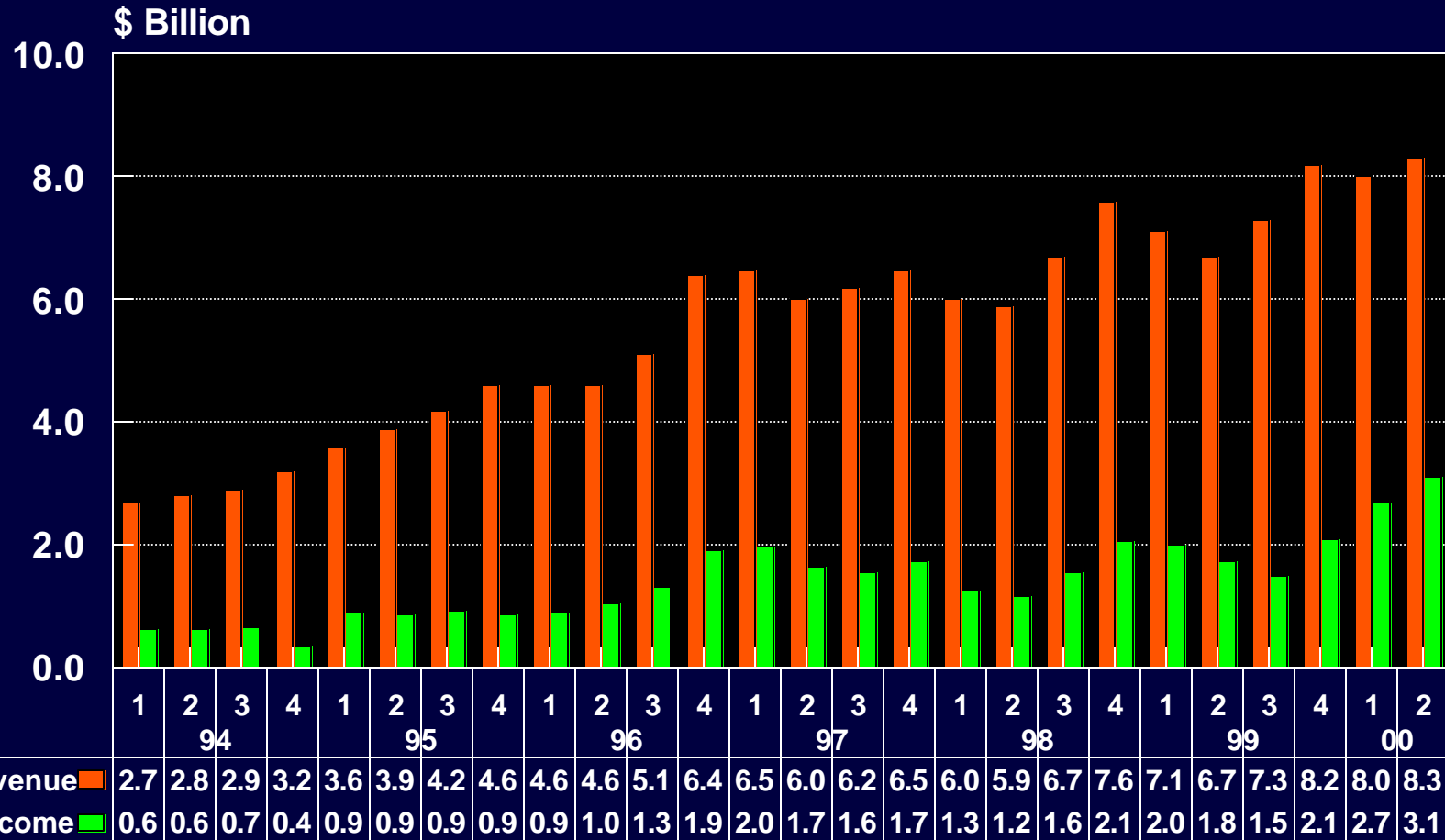
\$ Billions

	<u>8/99</u>	<u>8/00</u>	<u>% CH</u>
Americas	3.90	5.87	50 %
Europe	2.44	3.57	46 %
Japan	2.64	4.06	54 %
Asia Pacific	2.93	4.69	60 %
Total	11.91	18.19	53 %

SIA 10/2000 - Monthly data

Intel

Revenue & Net Income



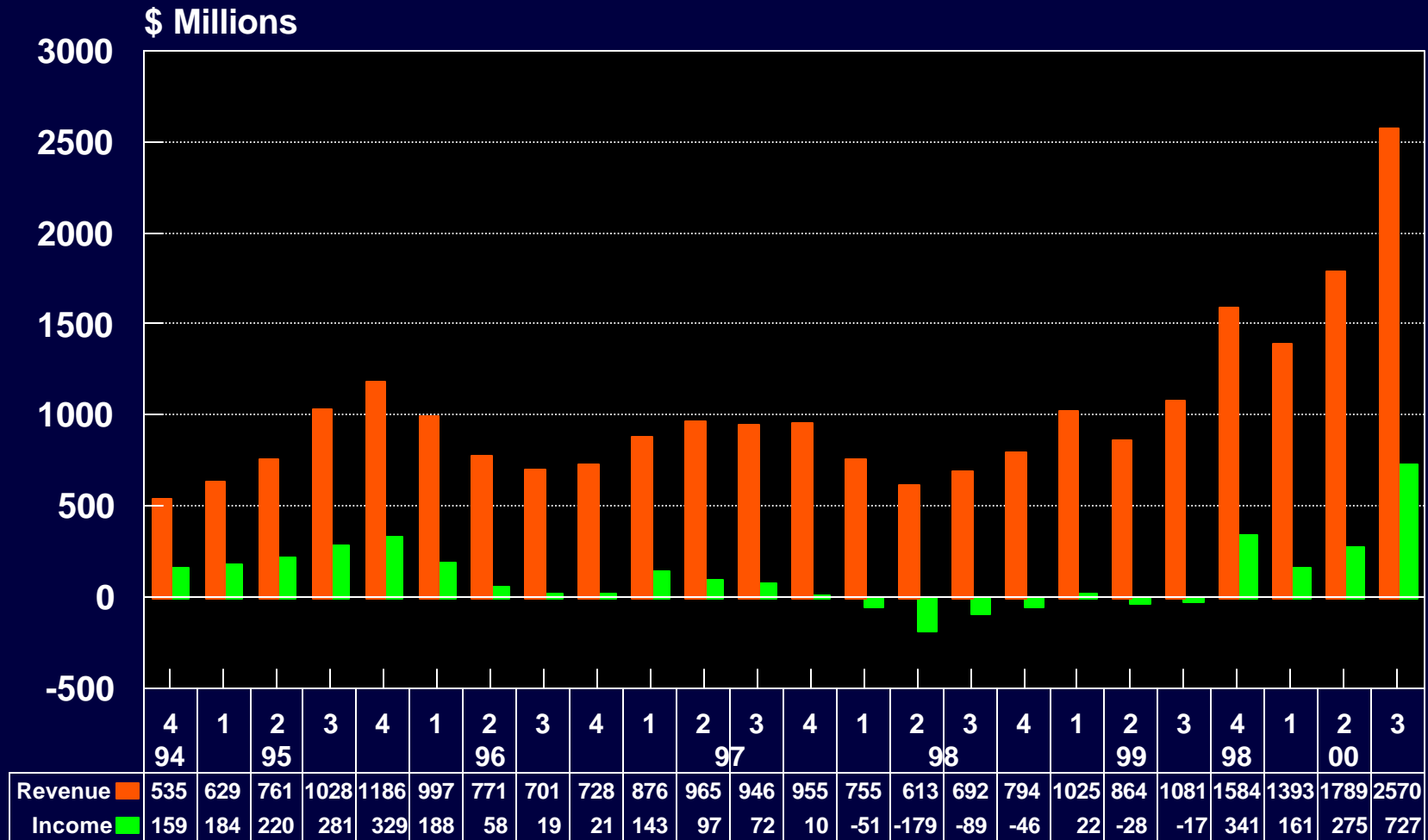
CY

INTC

FY=CY

MICRON TECHNOLOGY

Revenue & Net Income



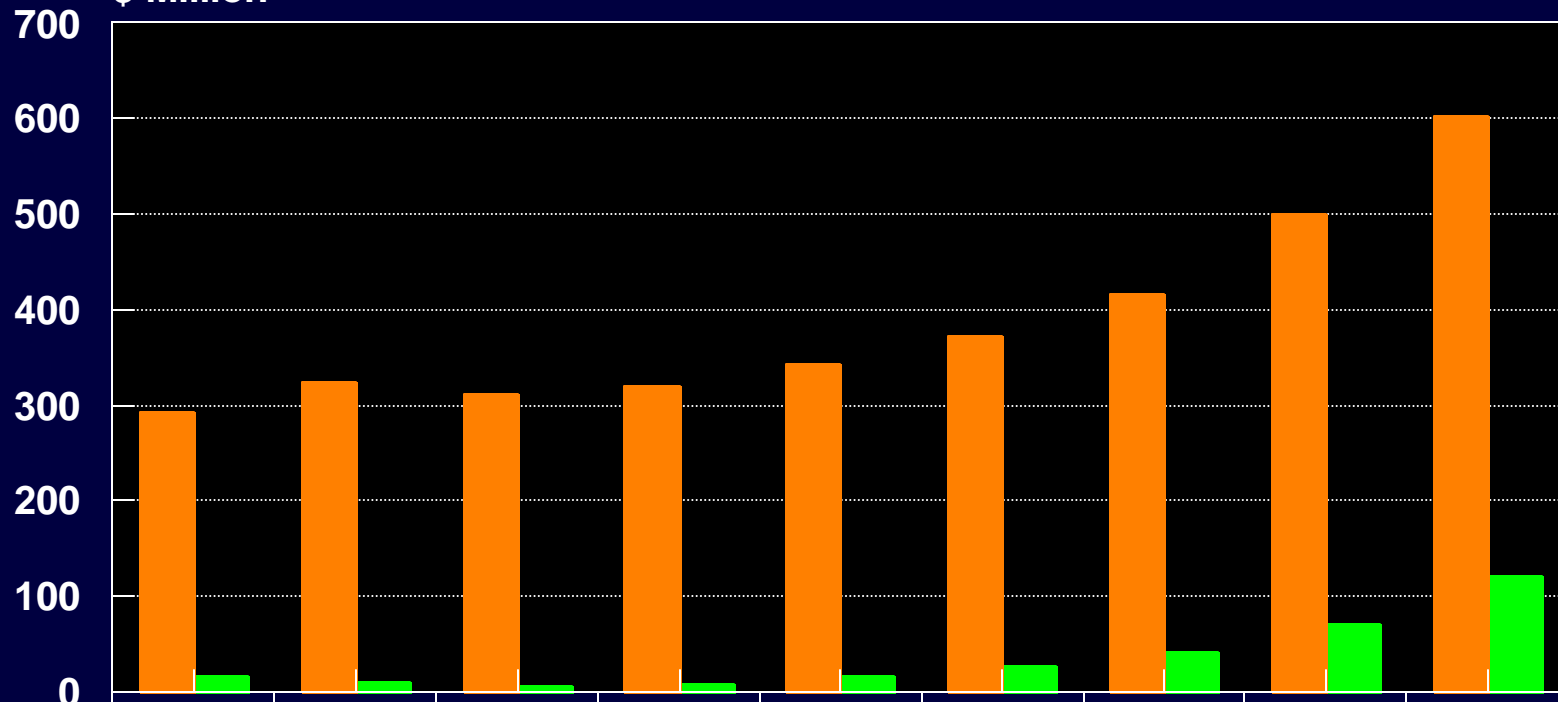
CY

MU

AVX Corp

Revenue & Net Income

\$ Million



Revenue ■
Income ■

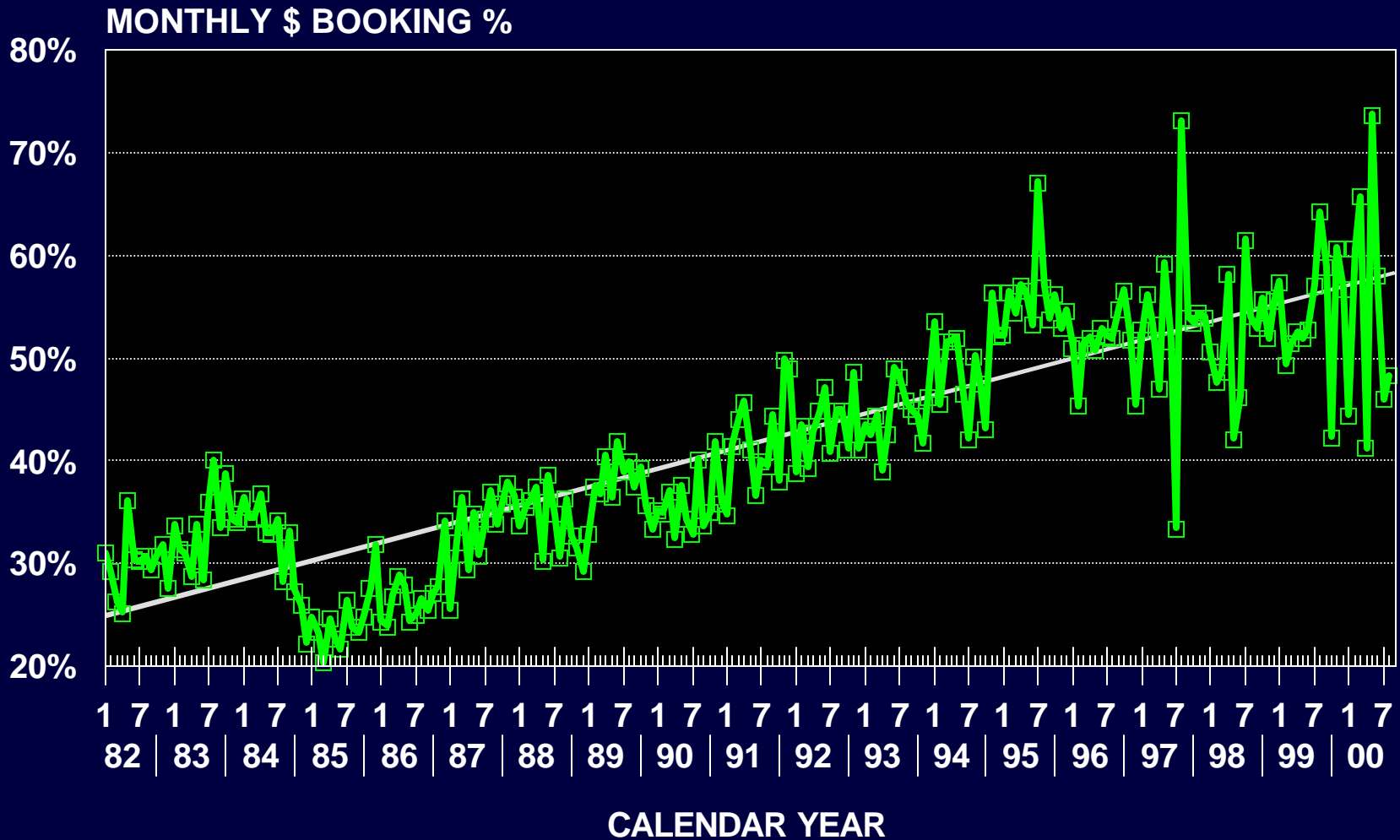
	2 98	3 98	4 98	1 99	2 99	3 99	4 99	1 00	2 00
Revenue	292	324	311	319	343	372	416	499	602
Income	17.4	10.5	6.1	7.6	17.5	26.1	42.5	70.9	120.4

CY

AVX

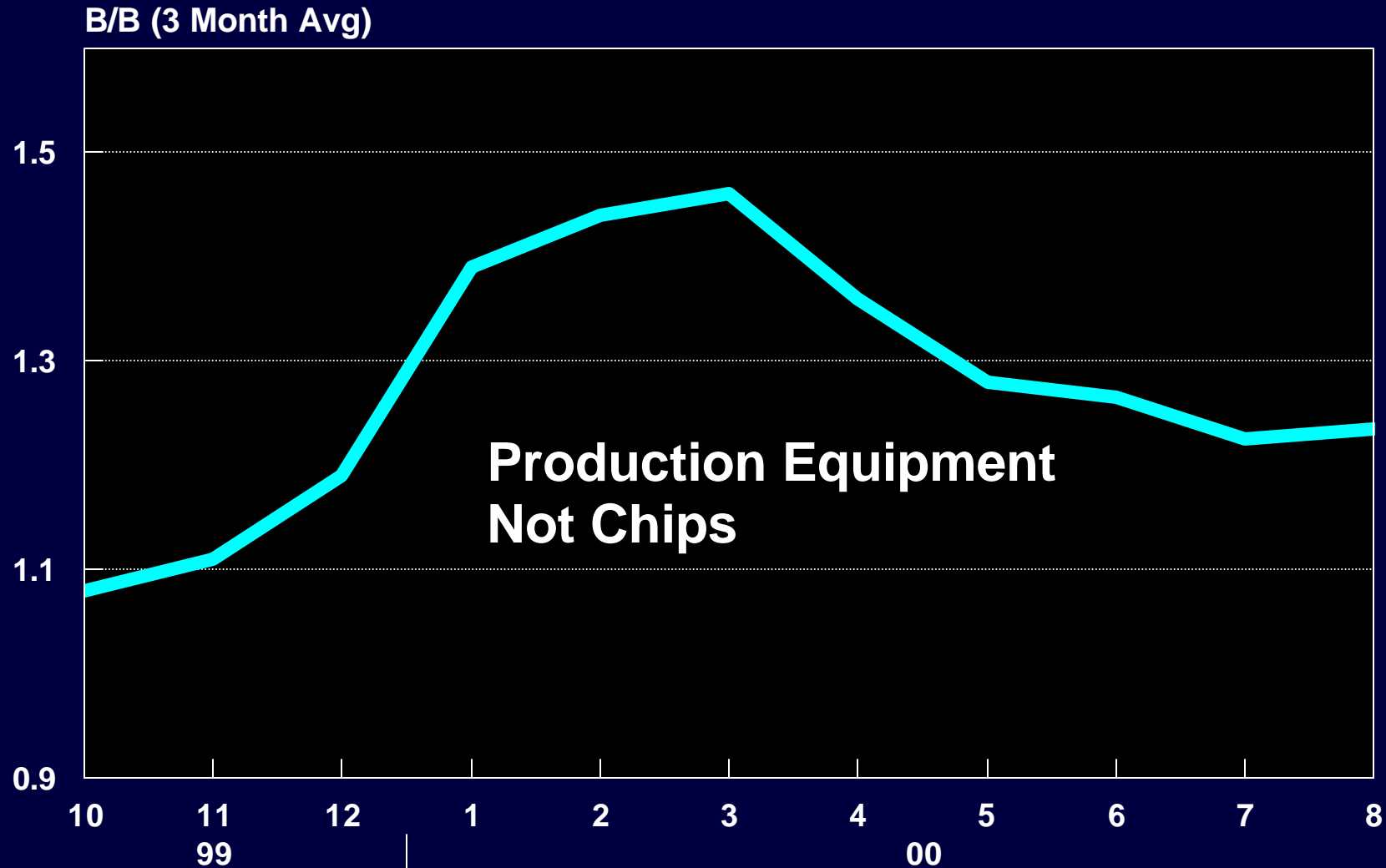
FY = CY

ELECTRONIC COMPONENT "PERCENTAGE" OF ELECTRONIC EQUIPMENT



COMMERCE DEPT 10/2000

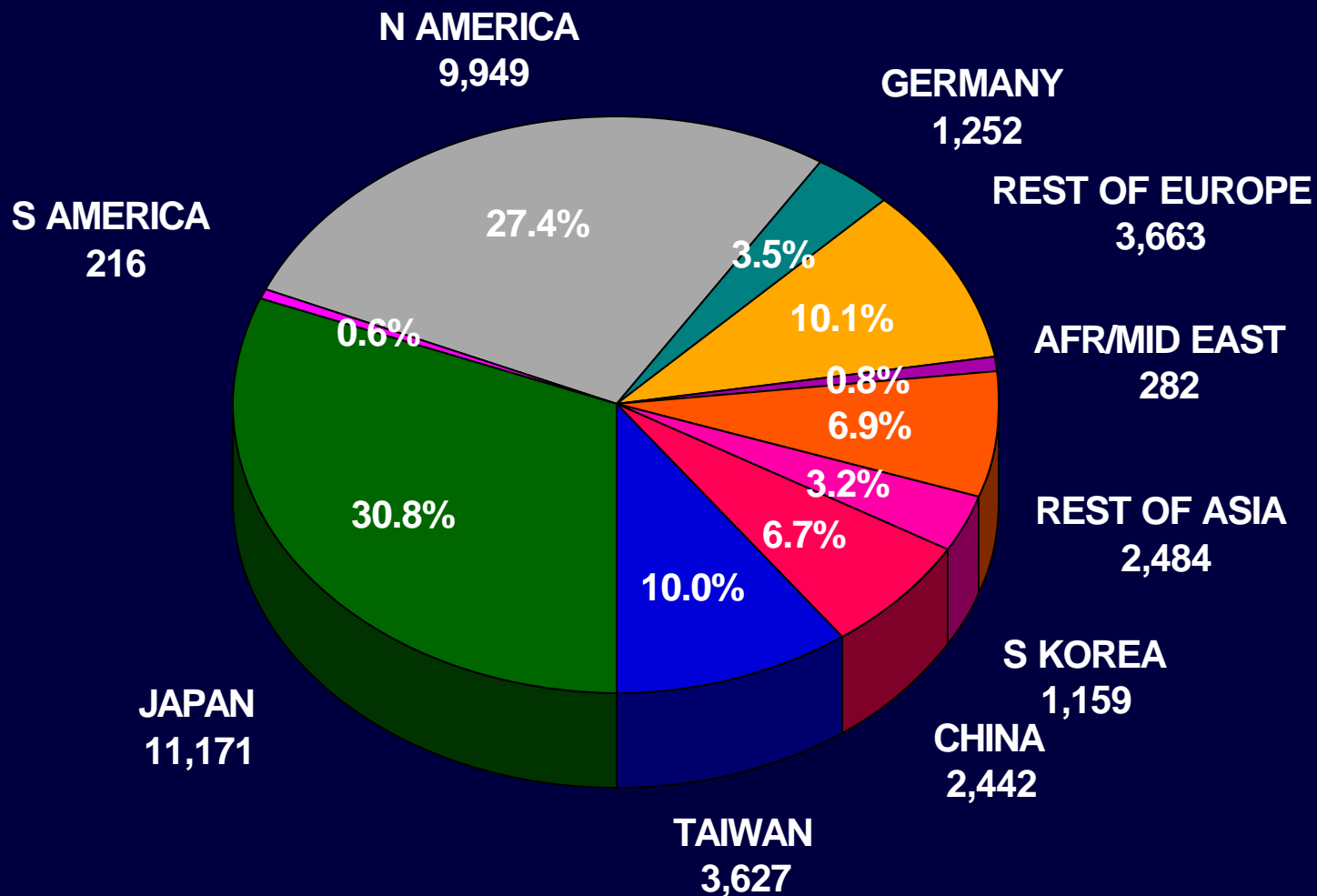
N American Semiconductor Equipment Industry Book/Bill Ratio



PCB Fabrication

1999 WORLD RIGID & FLEX PCB PRODUCTION

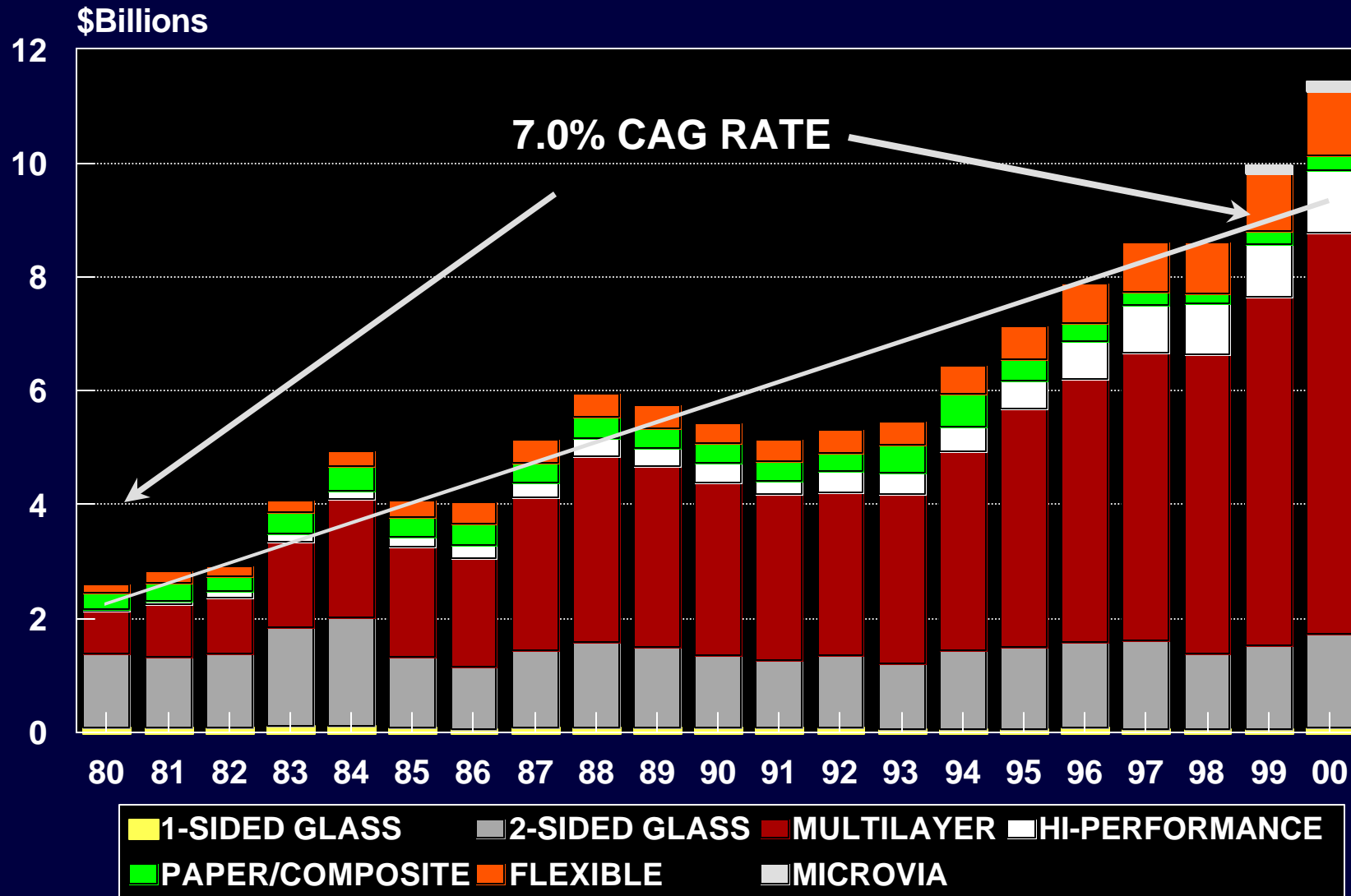
BY GEOGRAPHICAL AREA (\$M)



Total: \$36.2 Billion

IPC T/MRC 6/2000 (includes Buildup PCBs)

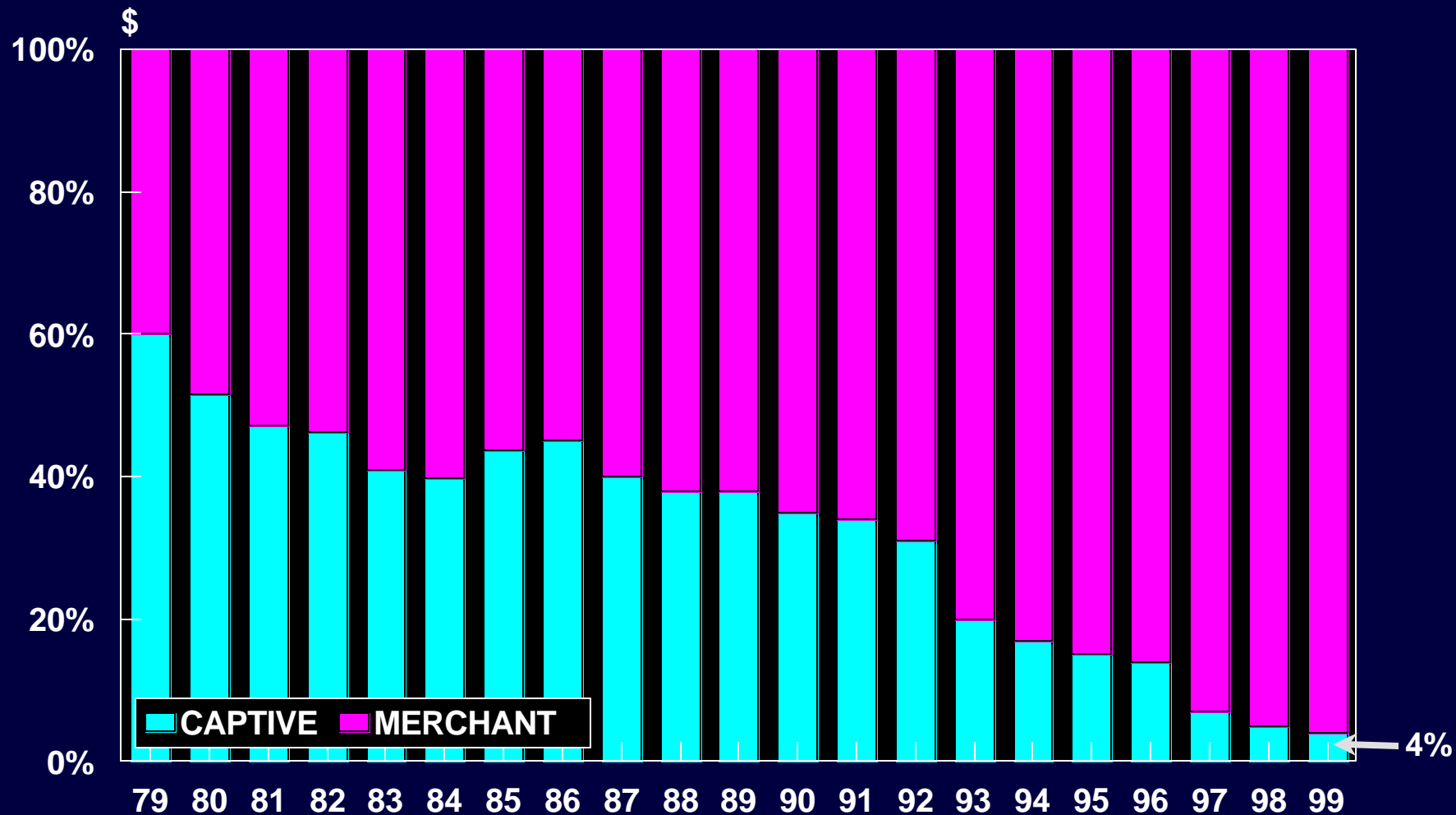
N. AMERICAN PCB SHIPMENTS



IPC T/MRC 6/2000 + Custer Forecast 10/2000

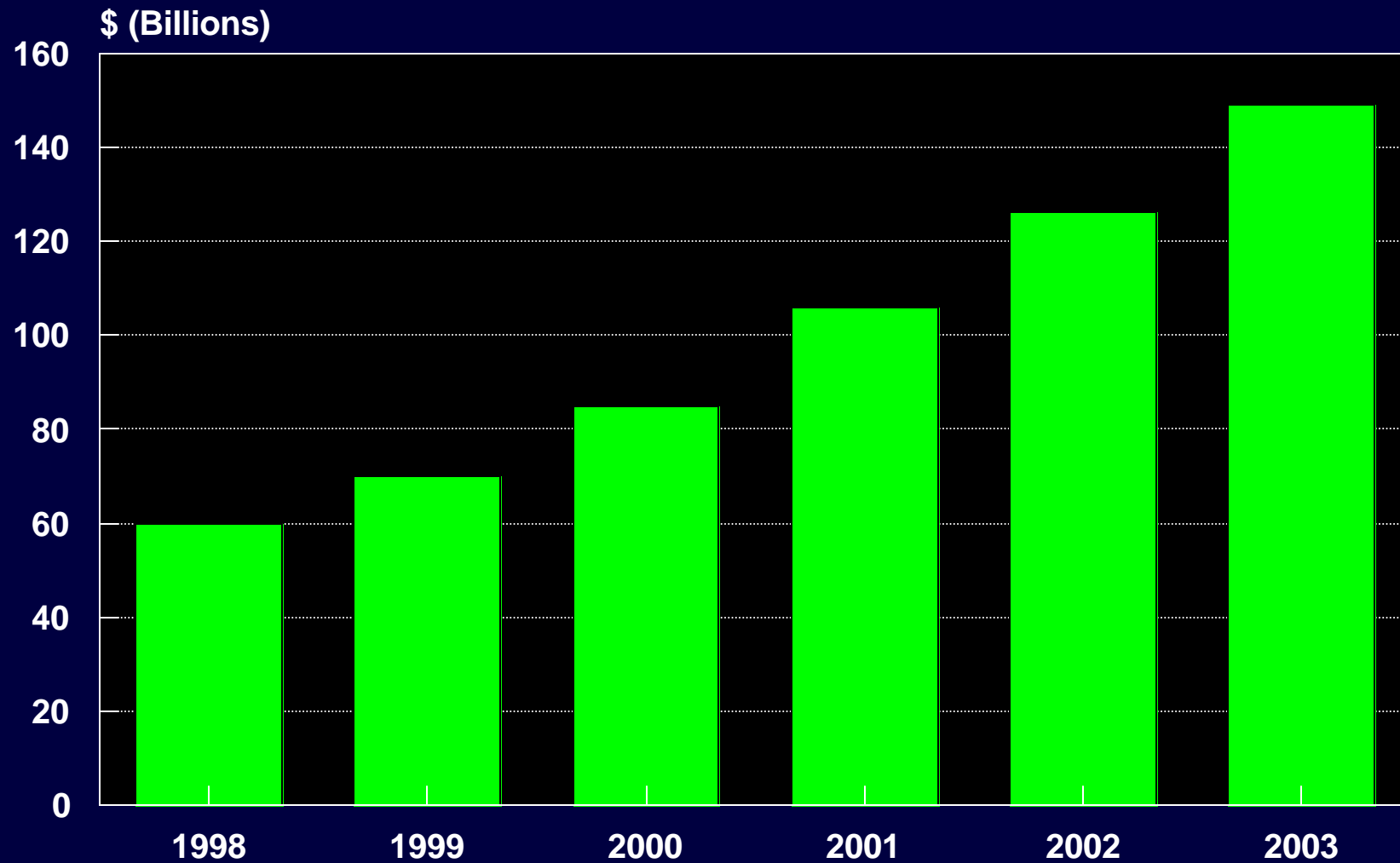
RIGID PCBs - MAKE OR BUY

U.S. CAPTIVE vs MERCHANT PRODUCTION



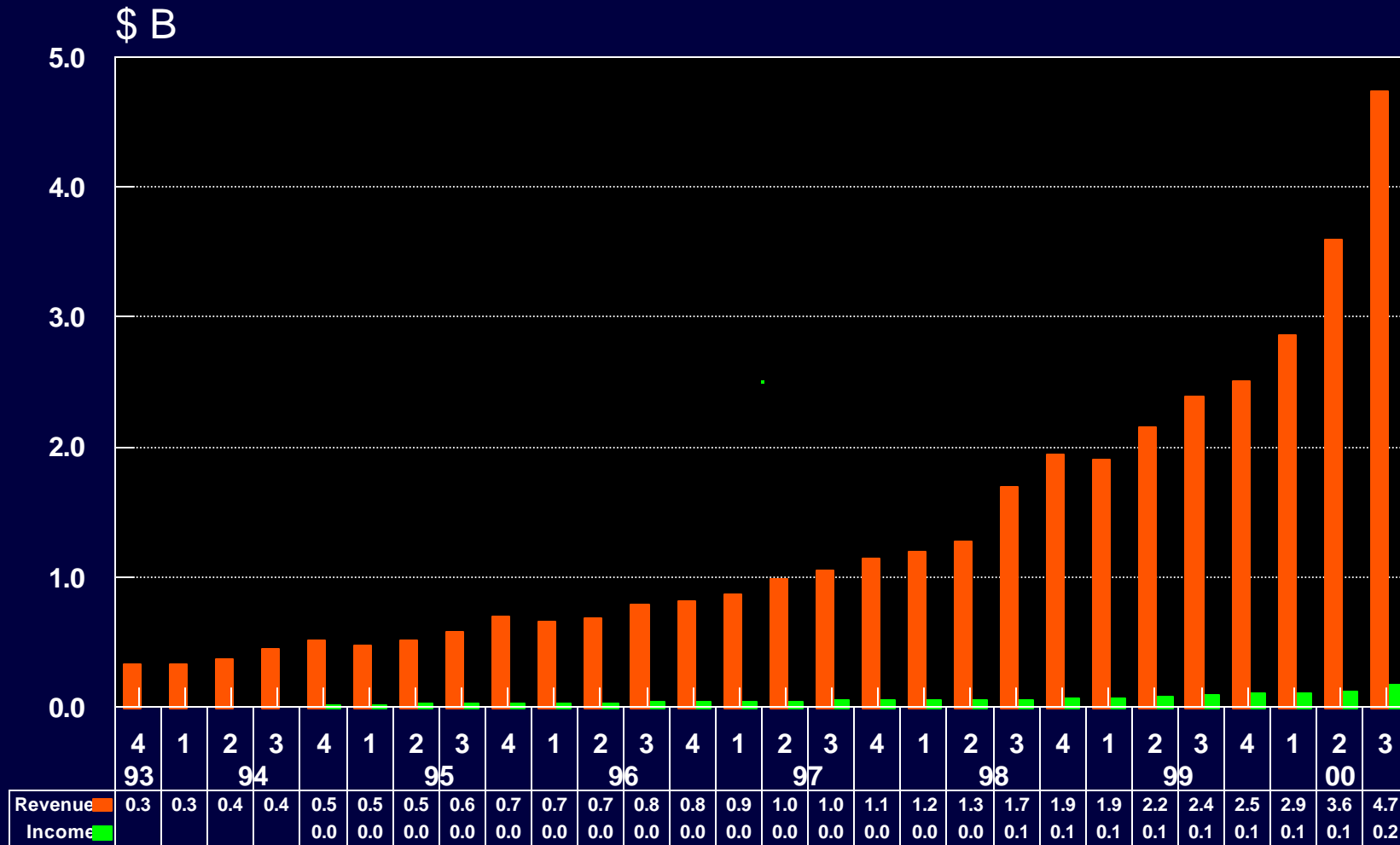
PCB ASSEMBLY

CONTRACT ELECTRONIC MANUFACTURERS WORLD SALES



SOLECTRON

Revenue & Net Income

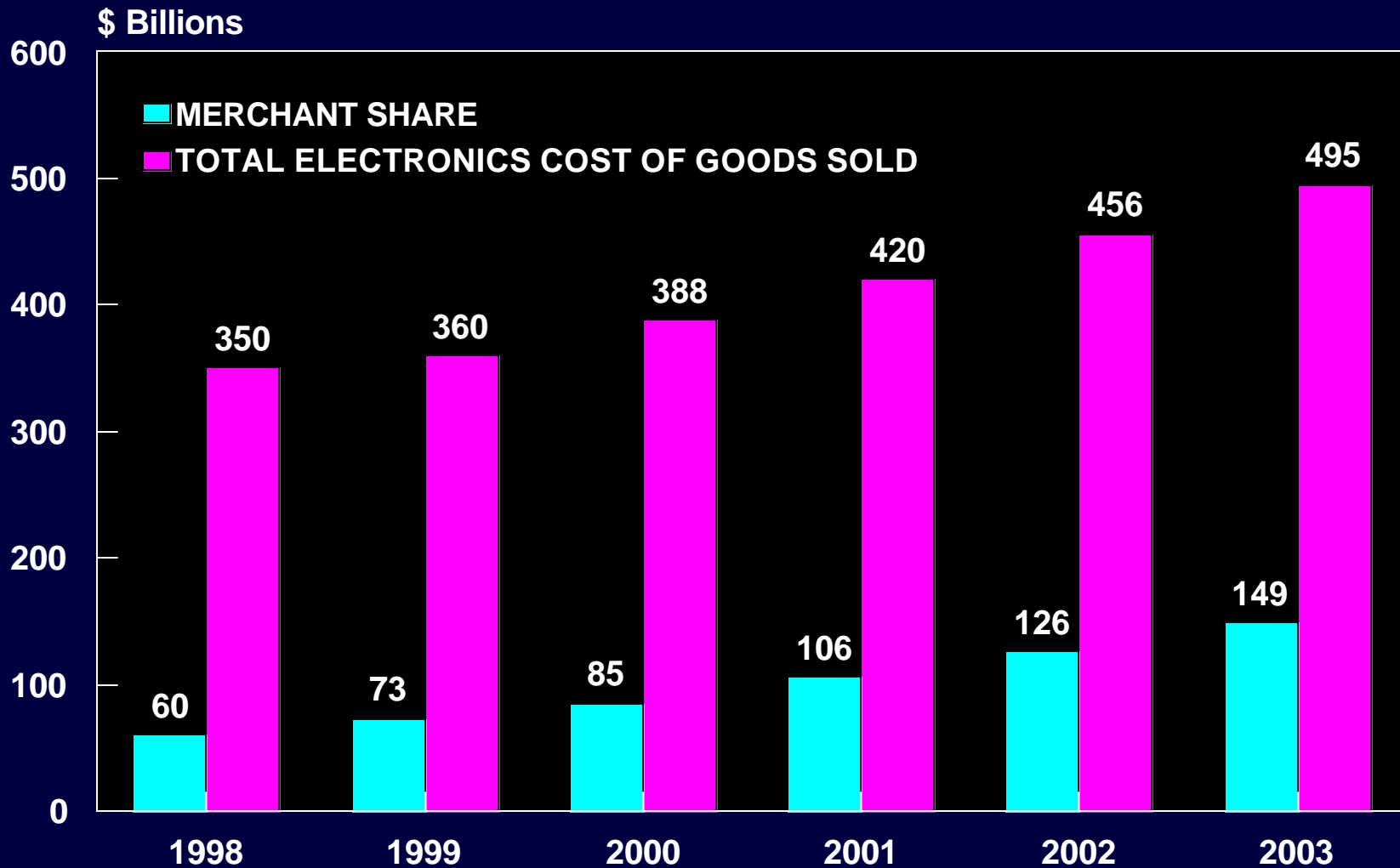


FY ends in August

SLR

CONTRACT ELECTRONIC MANUFACTURERS PICKING UP A LARGER SHARE

MERCHANT MARKET SHARE OF WORLD ELECTRONICS MARKET



EBN: Technology Forecasters 5/00, Custer estimates

TOP CONTRACT MANUFACTURERS - 1999

	<u>\$ Sales</u>	<u>99/98 Growth %</u>
Solectron	8,948	47
SCI Systems	7,225	10
Celestica	5,297	63
Flextronics Intl	3,219	79
Jabil Circuit	2,433	53
NatSteel Electronics	1,824	29
SYNNEX Information Tech	1,482	65
Sanmina	1,217	34
Universal Scientific	932	55
Dovatron Intl	923	57
Manufacturers' Services	921	10
Benchmark Electronics	878	67
C-MAC Industries	791	133
Elcoteq Network	752	91
ACT Manufacturing	696	18
Venture Manufacturing	576	32
JIT Holdings	529	55
Plexus	492	5

PCB Fabrication

(more info)

TOP N AMERICAN PCB MANUFACTURERS

PCB FAB & TOTAL - 1999 ESTIMATE (\$M)

	<u>PCB</u>	<u>TOTAL</u>
VIASYSTEMS	890	1,230
HADCO	866	1,015
TYCO	575	Large
DII GROUP (Multek)	440	1,100
PHOTOCIRCUITS	415	415
IBM	410	Large
SANMINA	390	1,375
HONEYWELL ACI	350	Large
DYNAMIC/DETAILS	275	275
3M	200	Large
MERIX	138	138
TTM TECHNOLOGIES	125	125
SHELDAHL	105	127
VIKTRON	93	93
CIRCUIT SYSTEMS	89	89
TOPPAN WEST	80	80
CIRCUIT-WISE	75	75
AUTOMATA INTERNATIONAL	75	75
BUREAU ELECTRONICS	74	74

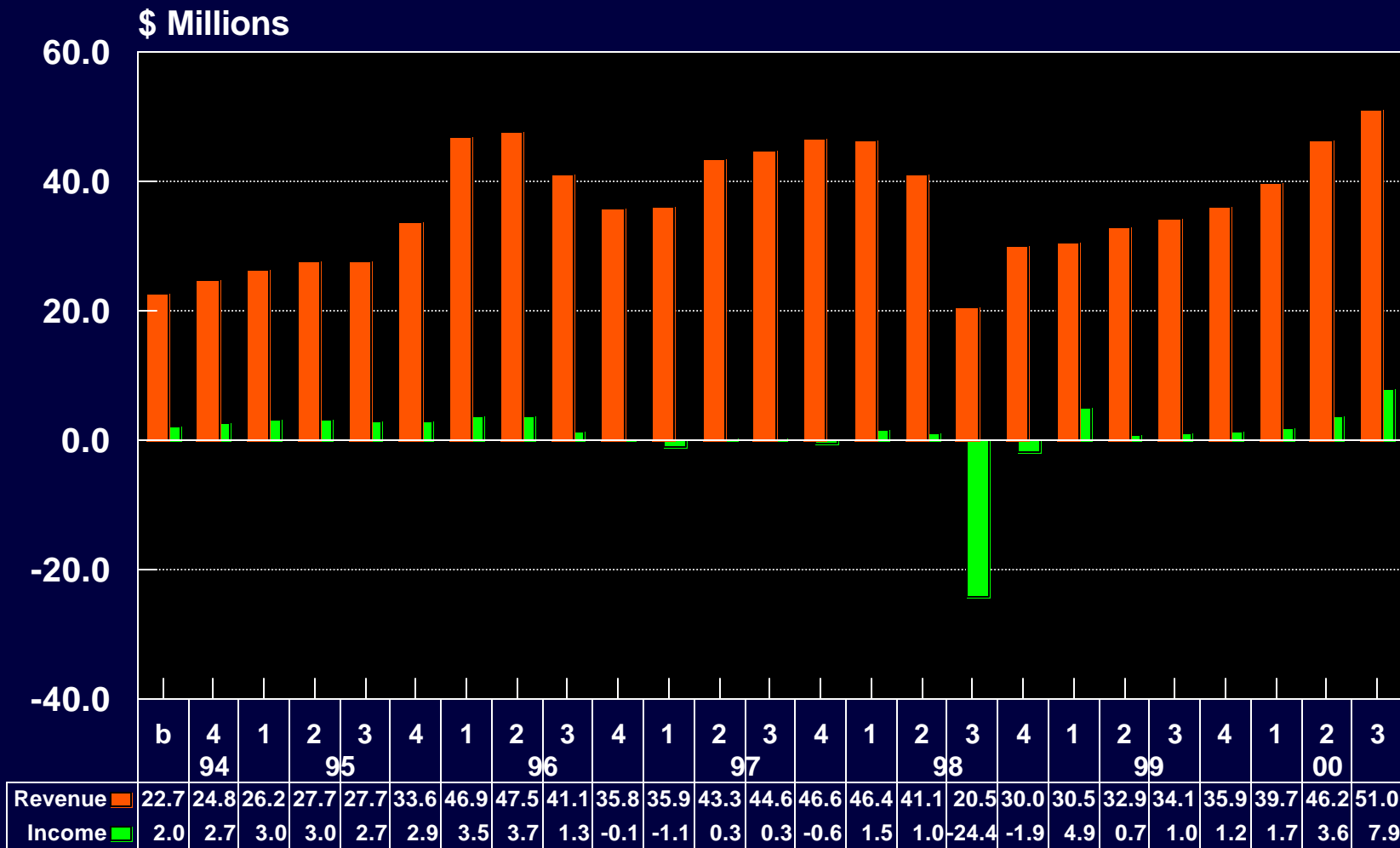
TOP WORLD PCB MANUFACTURERS

PCB Fab - 1999 ESTIMATE (\$M)

Ibiden	Japan	992
VIASYSTEMS	USA	890
HADCO	USA	866
Hitachi	Japan	844
Nippon Mektron	Japan	743
Tyco	USA	575
Fujitsu	Japan	570
Compeq	Taiwan	530
Multek/DII	USA	430
Matsushita	Japan	427
Photocircuits	USA	415
IBM	USA	410
Daeduck	S Korea	400
Mitsubishi Gas	Japan	392
Sanmina	USA	390
Nanya PCB	Taiwan	370
Honeywell ACI	USA	350
NEC	Japan	317
Samsung	S Korea	300
Wus PCB	Taiwan	290
Dynamic Detail	USA	275

MERIX

Revenue & Net Income

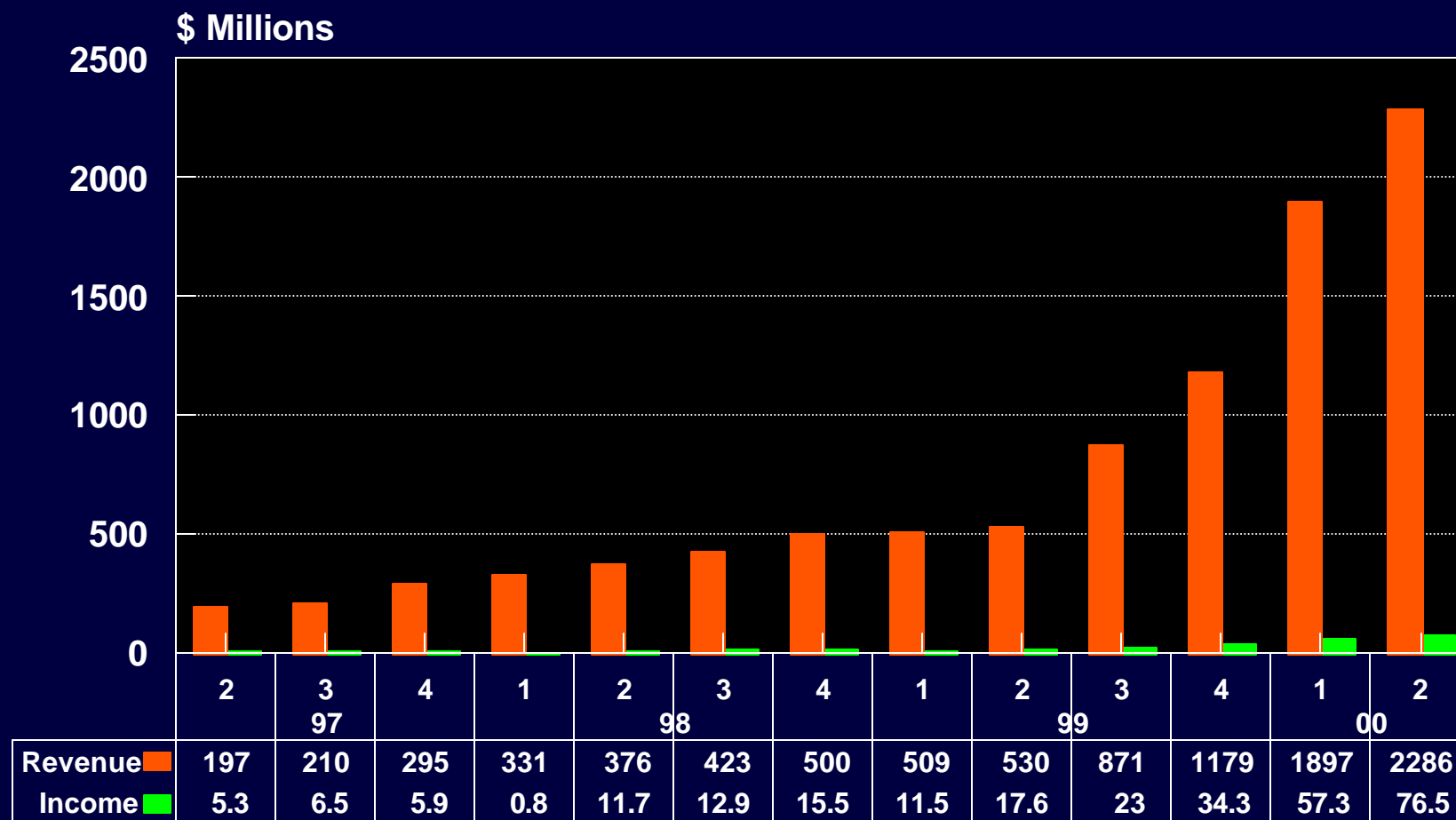


MERIX

FY ends May

Flextronics

Revenue & Net Income



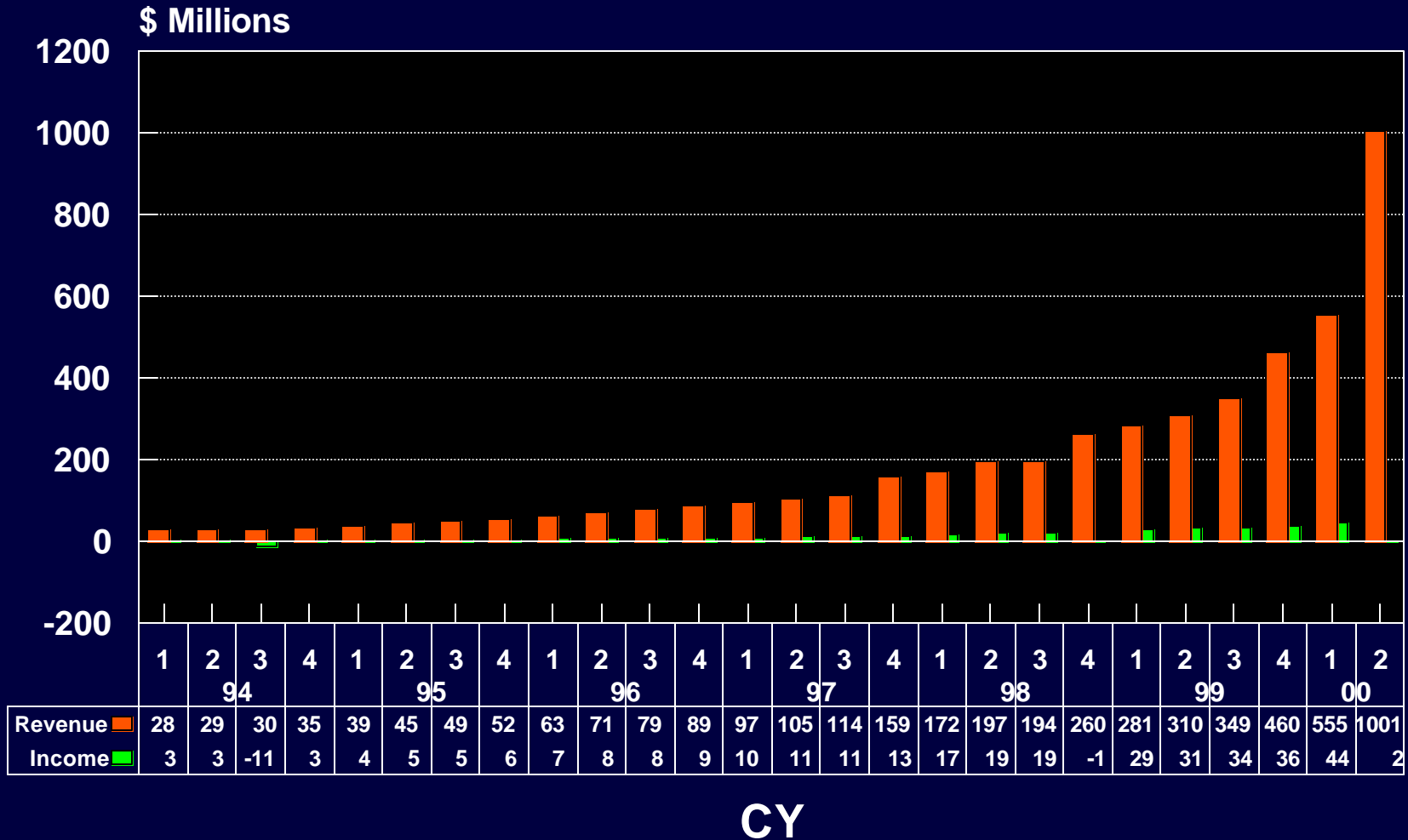
FY ends 3/31

CY

FLEX

SANMINA

Revenue & Net Income



FY ends September 30

SMAS

N. AMERICAN PCB MANUFACTURERS - PUBLIC DATA

QUARTERLY SALES & NET INCOME (\$M)

		LAST YEAR SALES	INC	THIS YEAR SALES	QUARTER INC	ENDING
CIRCUIT WORLD	TSE:CWW	3.6	-0.6	5.4	0.3	6/00
CORETEC	TSE:PCB	IPO in September 2000				
DYNAMIC/DETAILS	DDIC	71.7	-4.9	101.5	0.0	6/00
INNOVEX	INVX	20.6	1.5	38.4	0.4	6/00
MERIX	MERX	34.1	1.0	51.1	7.9	8/00
M-WAV	MWAV	1.9	-0.2	12.0	0.8	6/00
PARLEX	PRLX	19.9	1.3	31.3	1.7	6/00
SHELDAHL	SHEL	32.6	-2.0	36.2	-4.2	5/00
TTM	TTMI	24.8	1.3	42.1	2.1	3/00
TOTAL		209.2	-2.6	317.9	9.0	
INCOME %			-1.3%		2.8%	

Includes foreign sales

AUGUST N AMERICAN PCB GROWTH INDICATORS

% GROWTH - Aug 2000 vs Aug 1999

RIGID PCB \$ SHIPMENTS

UP 32.0%

RIGID PCB \$ BOOKINGS

UP 30.0%

RIGID PCB BOOK/BILL RATIO

3-MONTH AVG 1.21

1-MONTH 1.20

LAMINATE+PREPREG SQ FT SHIPMENTS

UP 25.8%

LAMINATE+PREPREG SQ FT BOOKINGS

UP 40.6%

FLEX CIRCUIT \$ SHIPMENTS

UP 34.6%

FLEX CIRCUIT \$ BOOKINGS

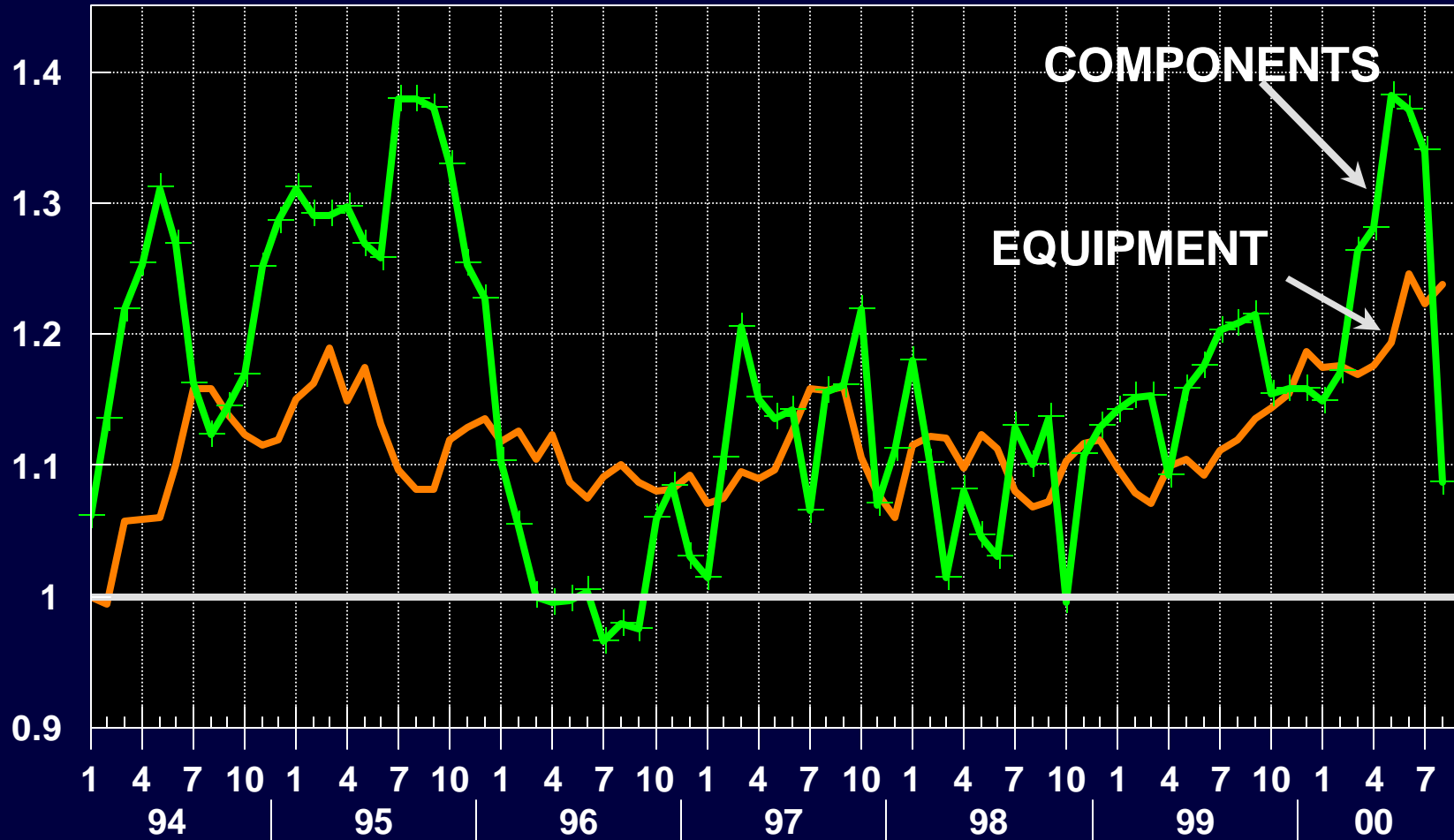
UP 3.2%

Growth Rates & Future Outlook

U.S. ELECTRONIC EQUIPMENT vs COMPONENTS

\$ BOOKINGS GROWTH

3/12 RATE OF CHANGE



10/2000

PRESENT GROWTH RATES (%)

U.S. ECONOMY & ELECTRONICS INDUSTRY

	LATEST MONTH	ANNUAL GROWTH RATE	3-MONTH GROWTH RATE
RIGID PCB BOOKING \$	8/00	122.0	130.6
RIGID PCB SHIPMENT \$	8/00	112.5	124.1
LAMINATE+PREPREG SHIPMENTS SF	8/00	114.7	123.1
ELECTRONIC COMPONENTS BOOK \$	8/00	119.6	108.7
ELECTRONIC EQUIPMENT BOOKINGS \$			
COMPUTER & OFFICE	8/00	116.2	122.9
COMMUNICATIONS	8/00	130.9	129.6
MEASURE/CONTROL INSTRUMENTS	8/00	116.0	122.5
MILITARY (SEARCH & NAVIG)	8/00	102.8	113.0
TOTAL ELECTRONIC EQUIPMENT	8/00	119.1	123.8
INDUSTRIAL PRODUCTION	9/00	105.3	105.7

NOTE: 3 month growth rates compare most recent 3 months to same 3 months one year earlier

Summary

- **N. American component & electronic equipment orders have all been strong in 2000. Lead times extended & overbooking became a concern.**
- **All key industrial countries' economies are growing. U.S. Interest rates were raised to limit future inflation.**
- **Component shortages have been serious problem. The electronic expansion in general & massive cel phone growth impacted global component availability.**
- **Personal computer induced seasonality continues.**
- **15-18% domestic component growth is likely for 2000. Early 2001 may see a short-term correction.**

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