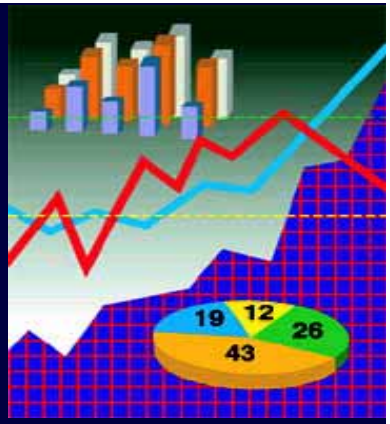


BUSINESS OUTLOOK

GLOBAL ELECTRONICS INDUSTRY

WALT CUSTER
CUSTER CONSULTING GROUP
www.custerconsulting.com
January 2013

There is
a
Happy Ending

Topics

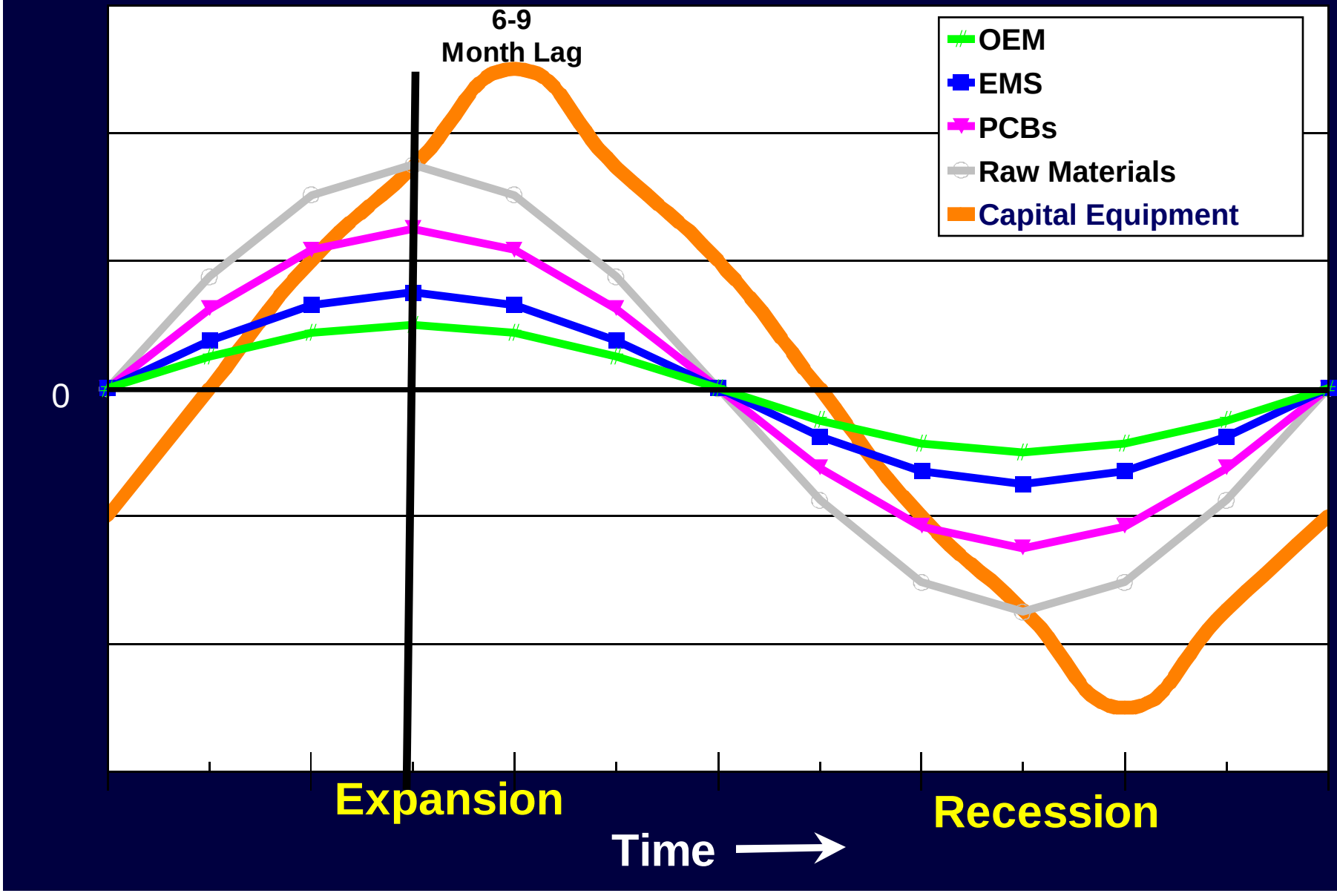
Business Cycles

- Electronic Equipment
- Semiconductors
- EMS/ODM Companies
- Printed Circuit Boards
- Process Equipment & Materials

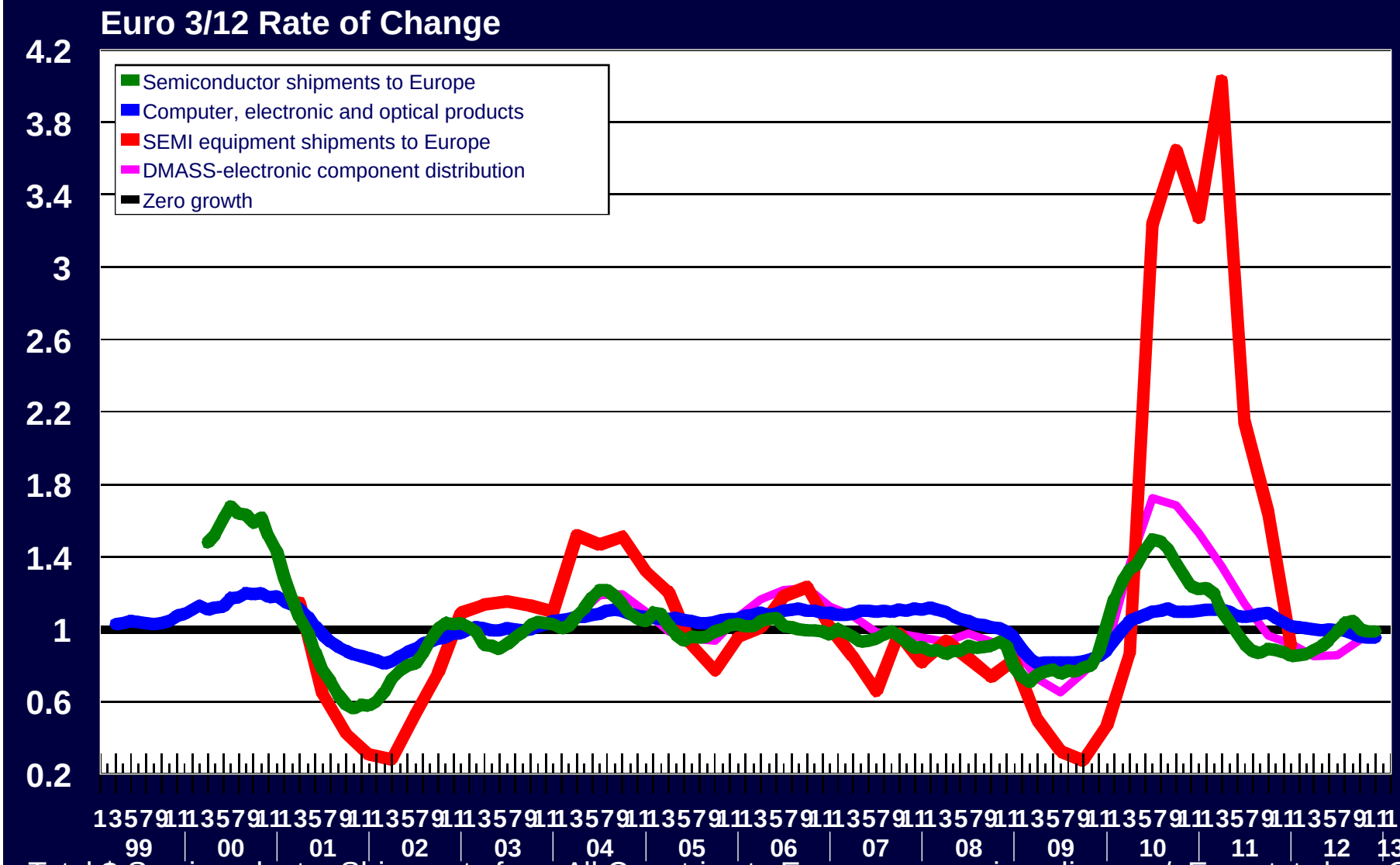
Leading Indicators & Other Forecasting Tools

Forecasts

BUSINESS CYCLE
Components & Capital Equipment

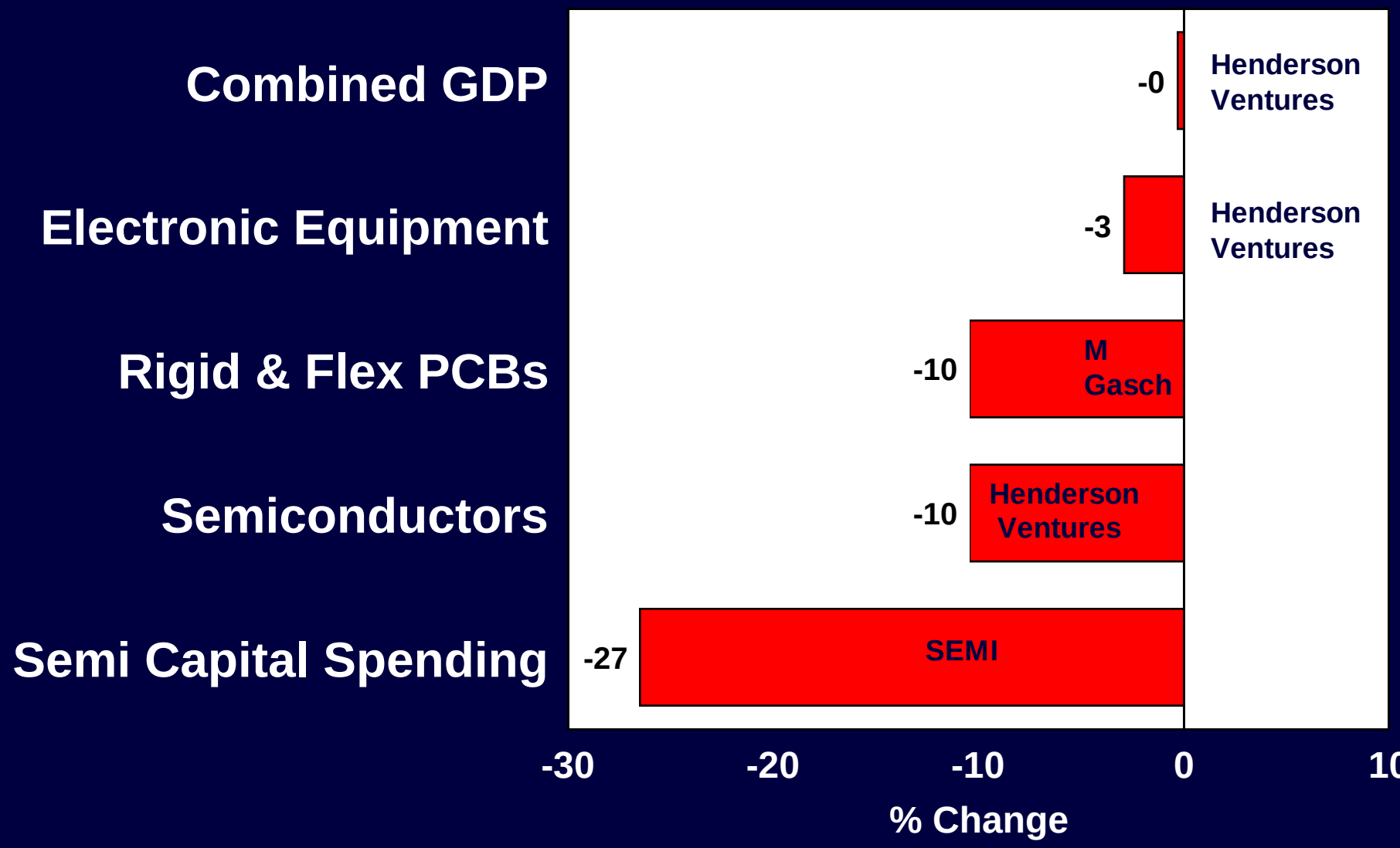


European Computer, Electronic and Optical Products, Semiconductors, & SEMI Equipment Shipments



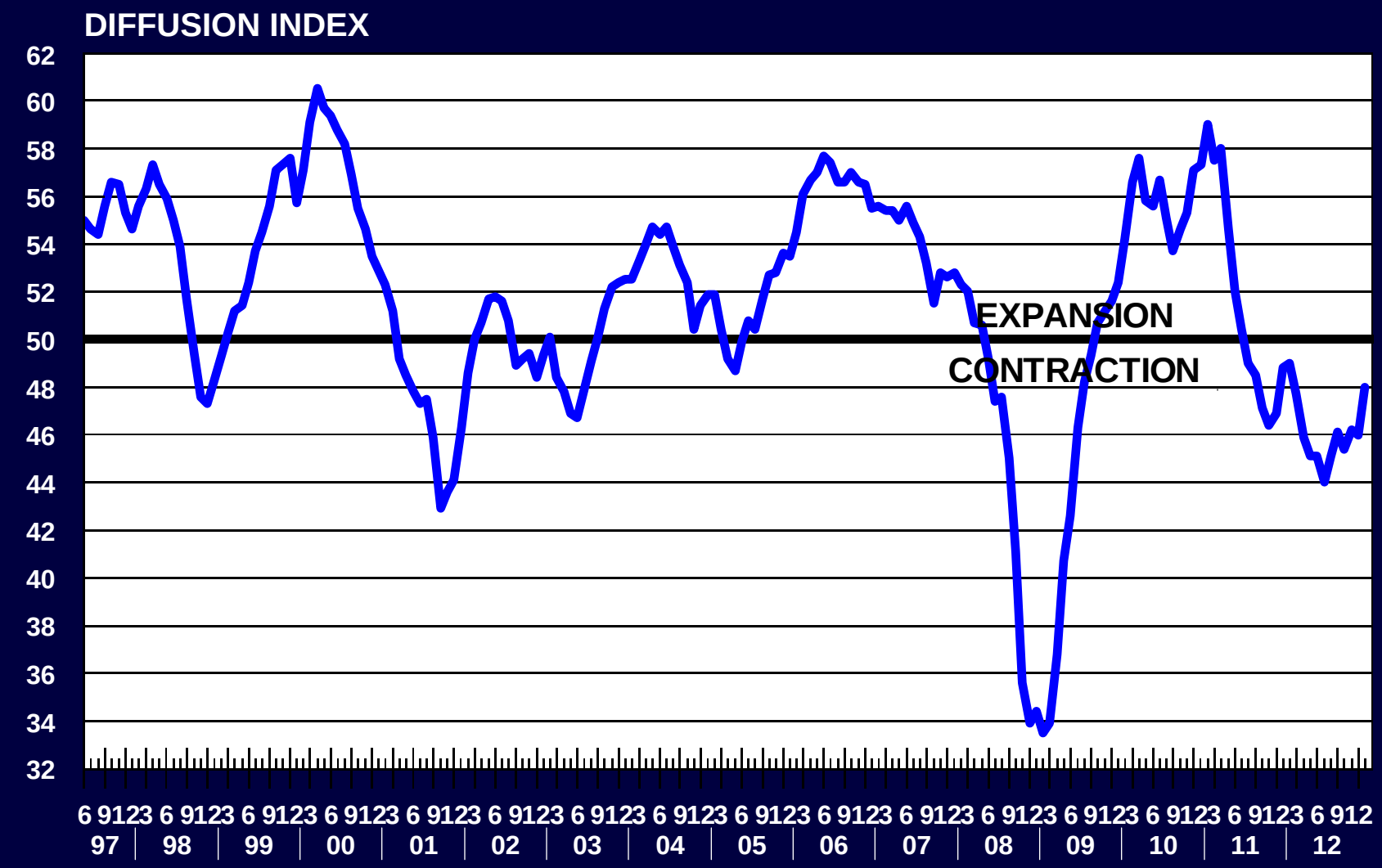
Total $ Semiconductor Shipments from All Countries to Europe www.sia-online.org/, Eurostat class C26 & SEMI, CCG Extrapolation of SEMI growth

European Electronic Supply Chain Forecast 2012 vs 2011



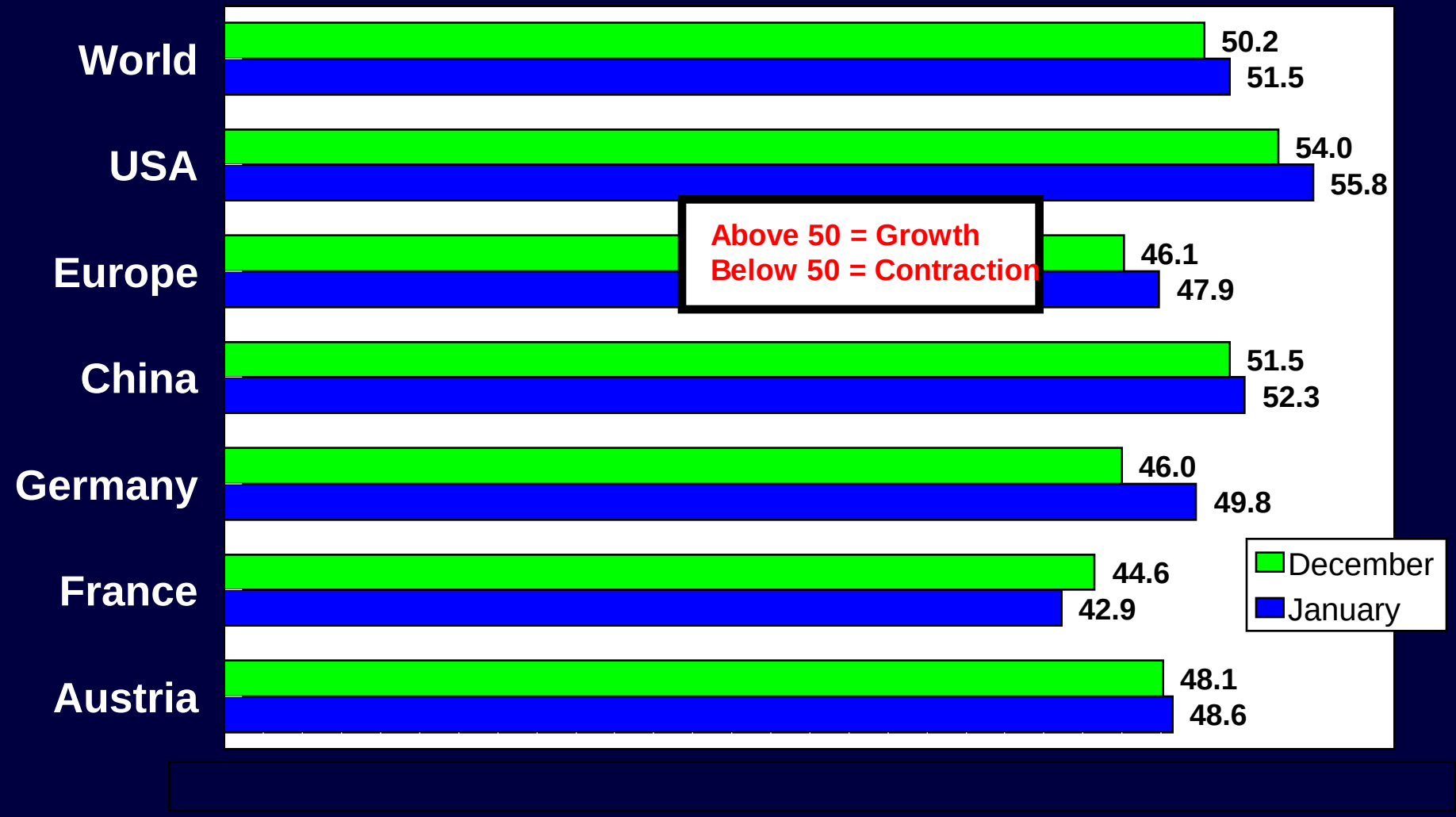
Global Economy

Eurozone "Purchasing Managers" Index



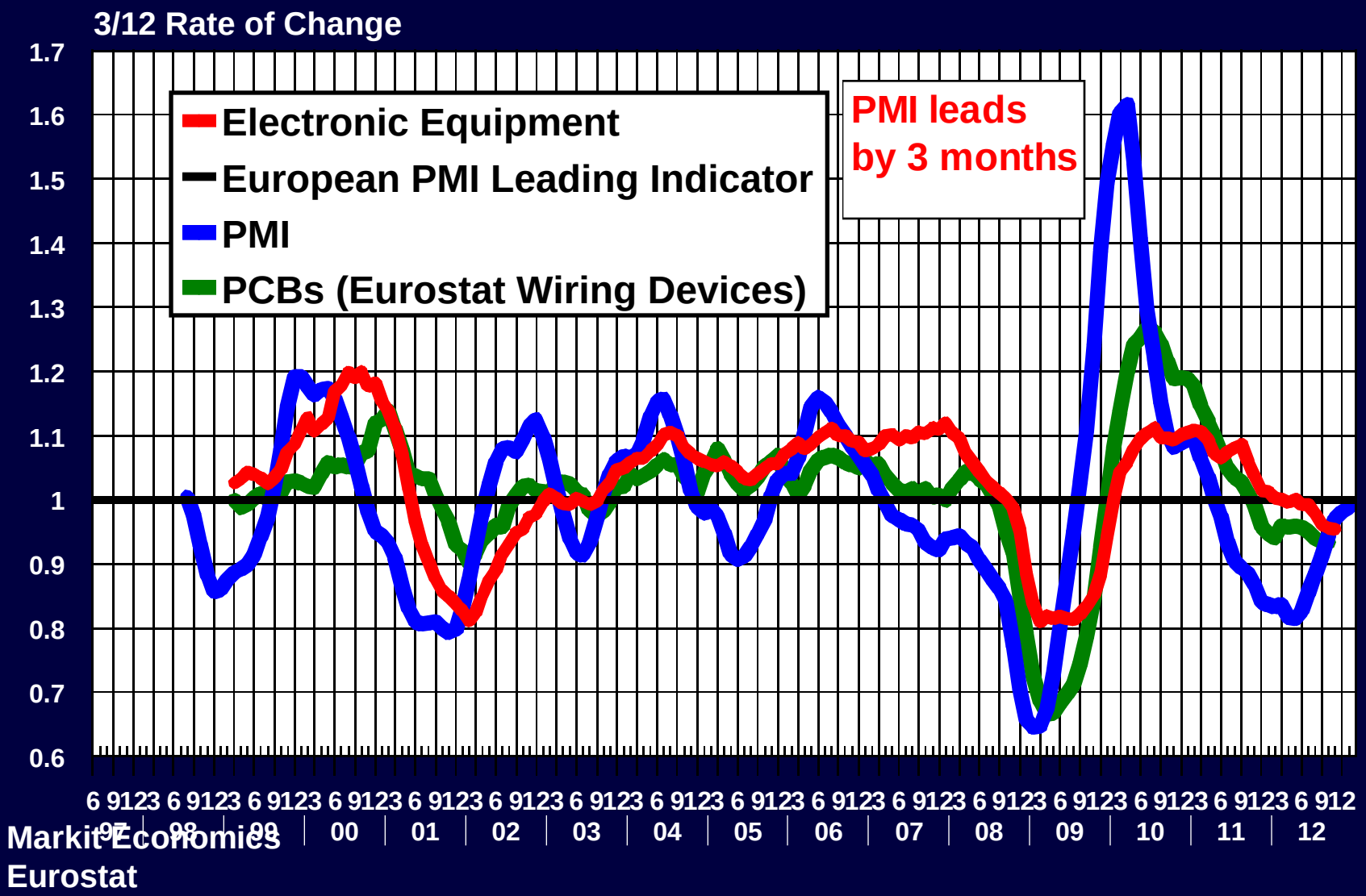
Markit Economics

Purchasing Managers' Indices
December 2012 vs. January 2013



Markit Economics, JPMorgan

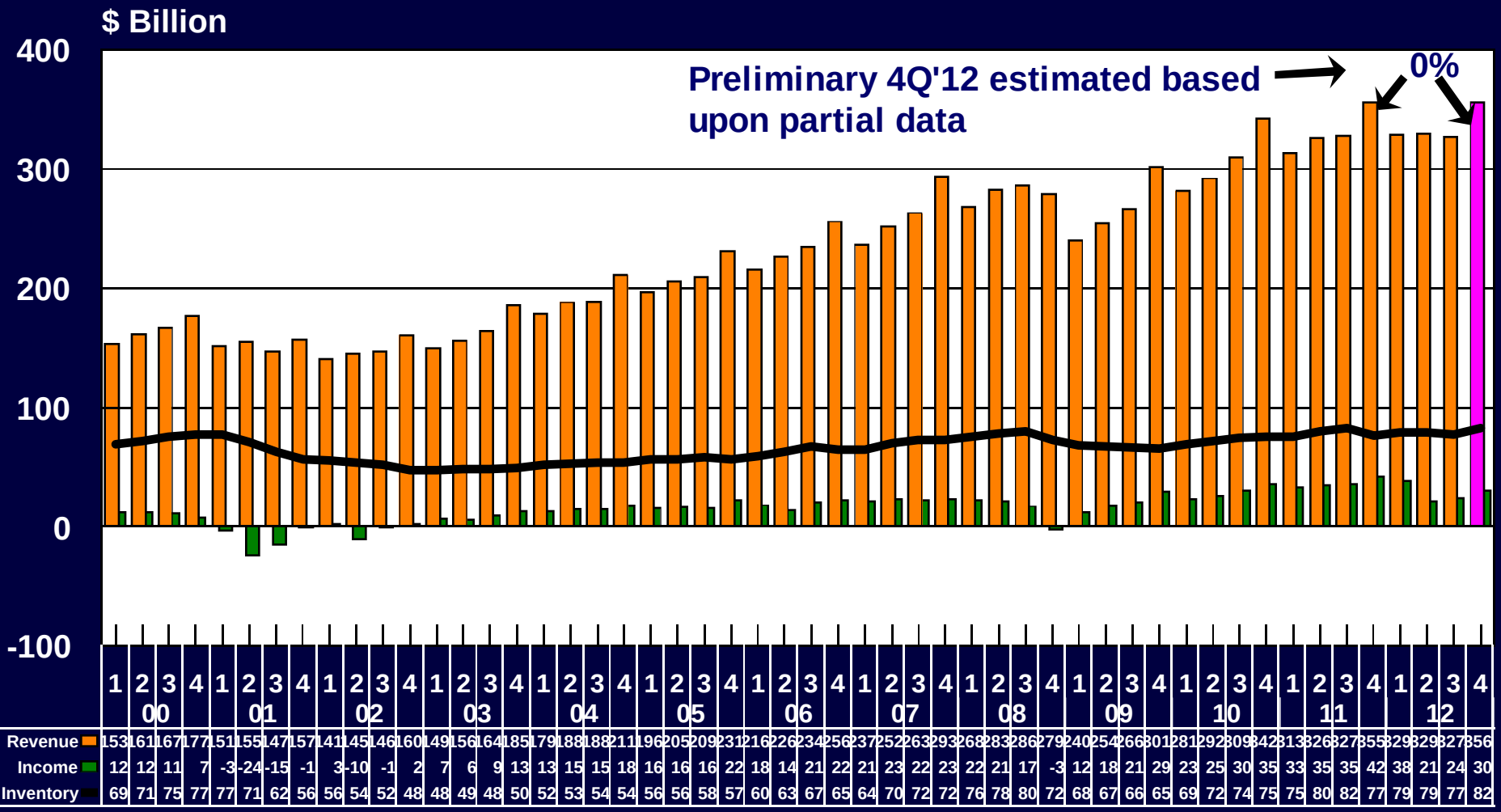
Eurozone PMI vs. Electronic Equipment & PCBs



Markit Economics
Eurostat

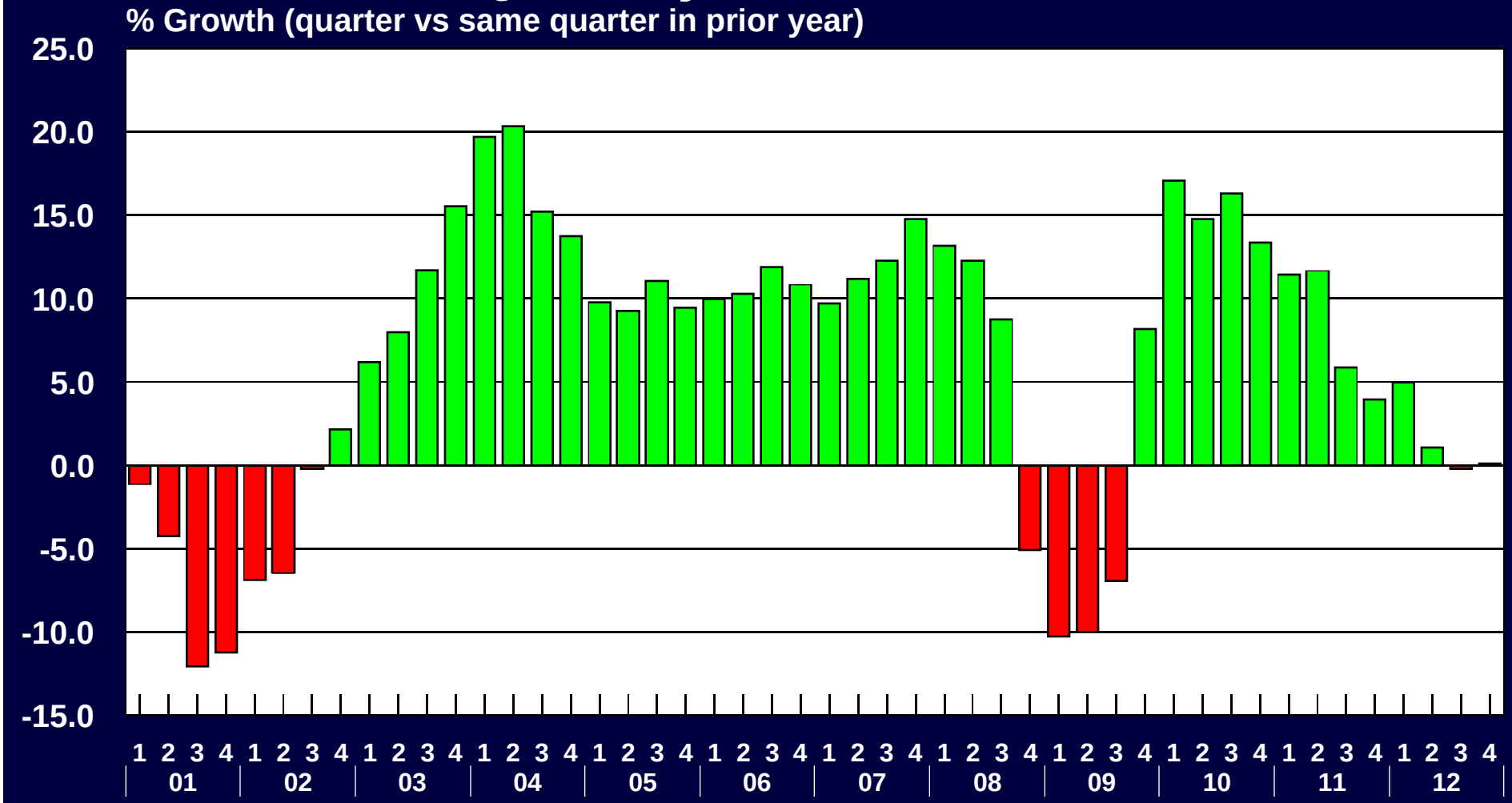
Electronic Equipment

Electronic Equipment Suppliers
Composite of 116 Public Companies
Revenue, Net Income & Inventory



Computer 13, Internet 9, Storage 10, Communication 20, SEMI 20, Medical 24, Instruments 11, Military 6, Business & Office 3

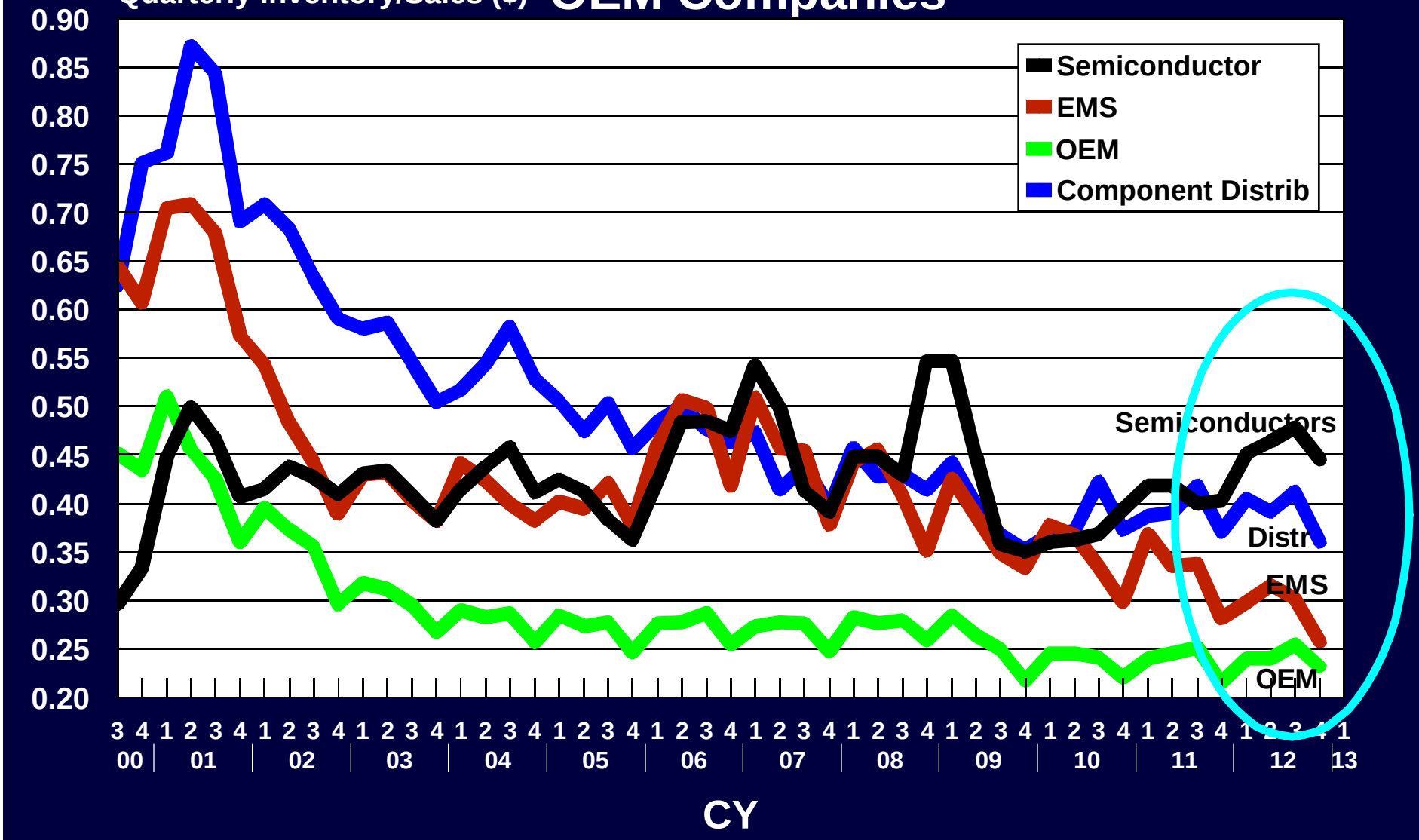
Electronic Equipment Suppliers
Composite of 116 Public Companies
Quarterly Revenue Growth



Computer 11, Internet 5, Storage 10, Communication 11, SEMI 13, Medical 24, Instruments 6, Military 6

Inventory/Sales Ratio

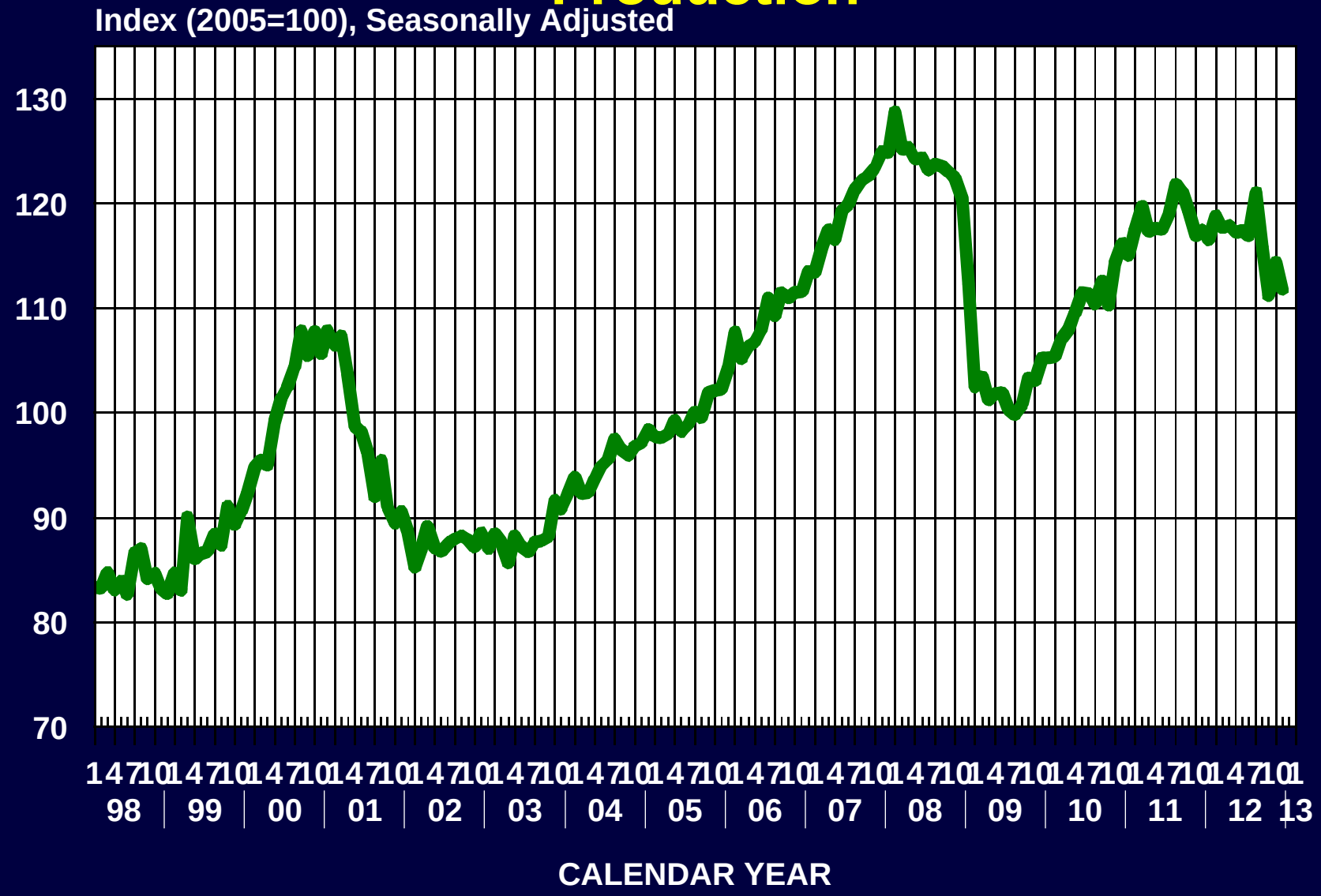
Large Component Distributors, Semiconductor, EMS & OEM Companies



4 Component Distributor, 18 Semiconductor, 12 EMS and 104 OEM Company Composite

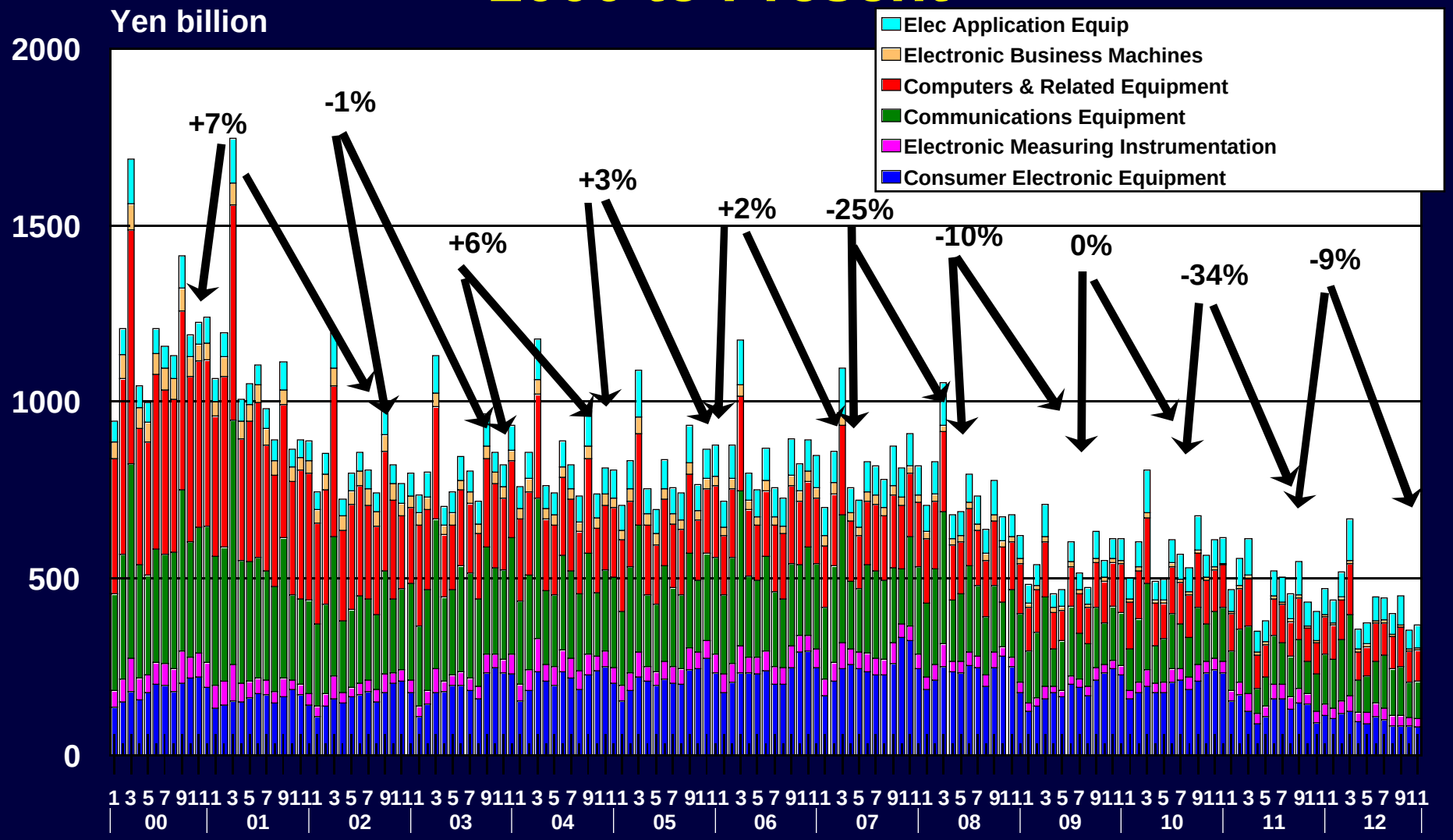
Regional Electronic Equipment Growth

European Computer, Electronic & Optical products Production



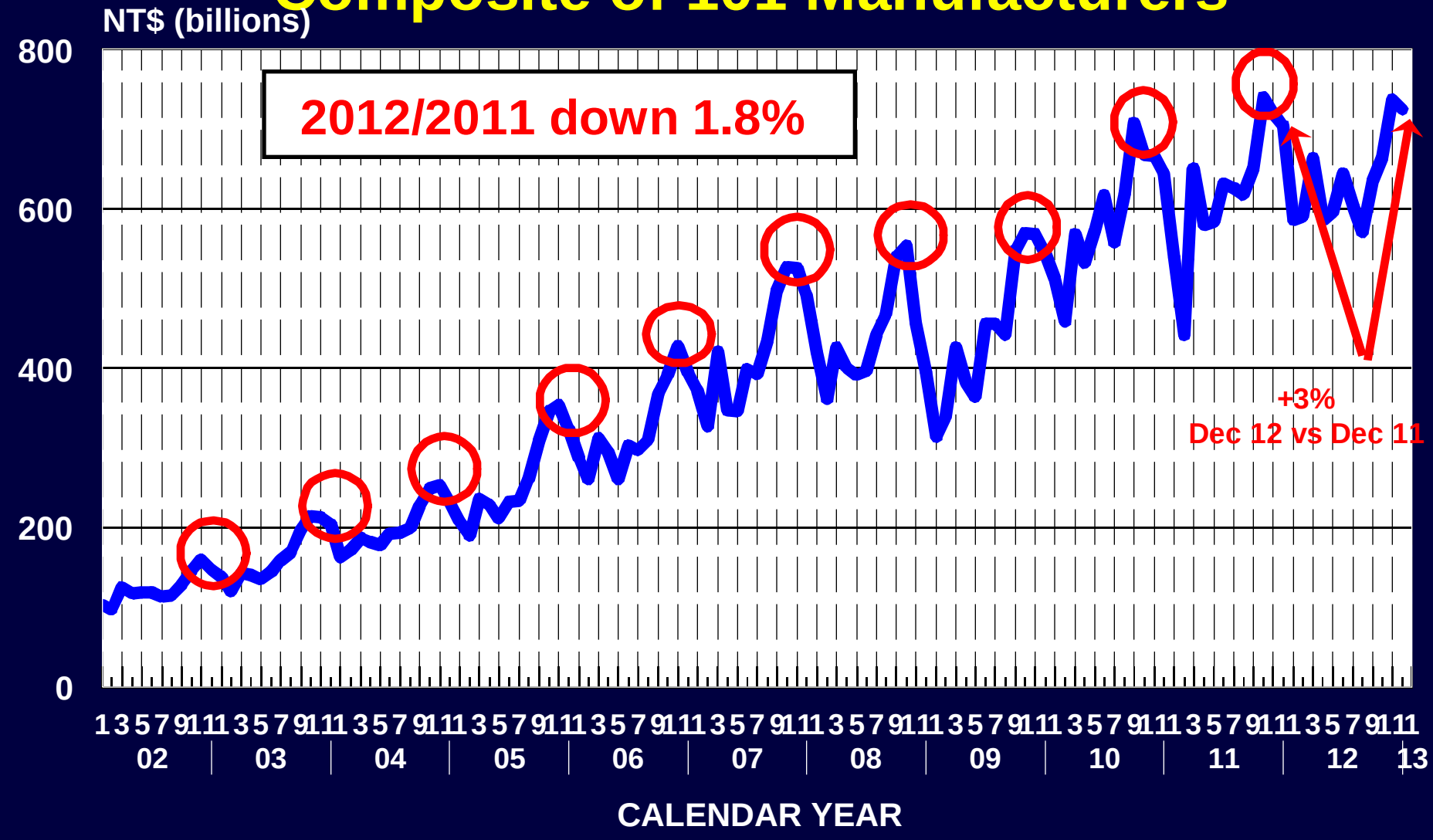
Eurostat, C26 category, EU 27 countries

Japan Electronic Equipment Production 2000 to Present



JEITA www.jeita.or.jp/

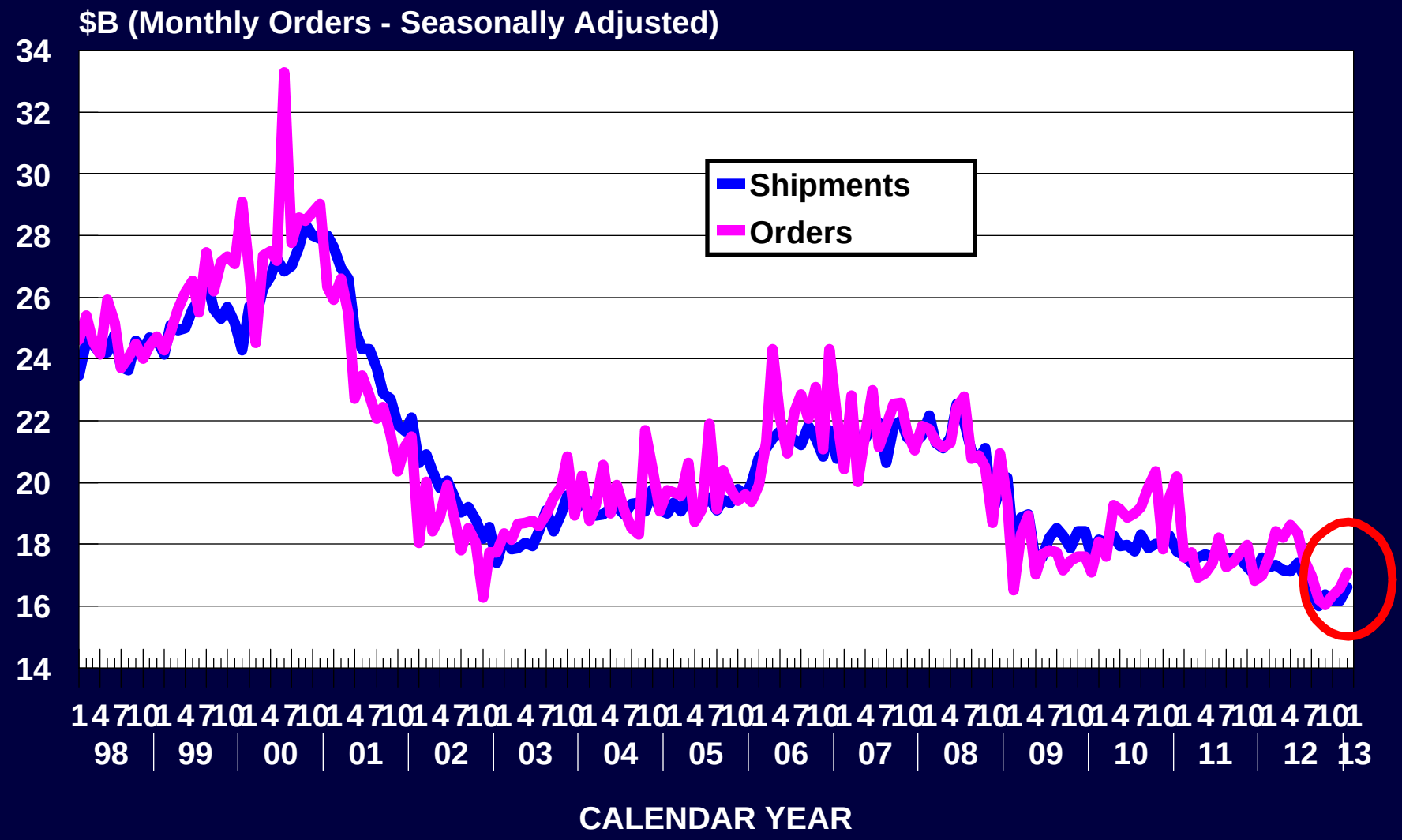
Taiwan/China Electronic Equipment Producers
Composite of 101 Manufacturers



Taiwan listed companies, often with significant manufacturing in China

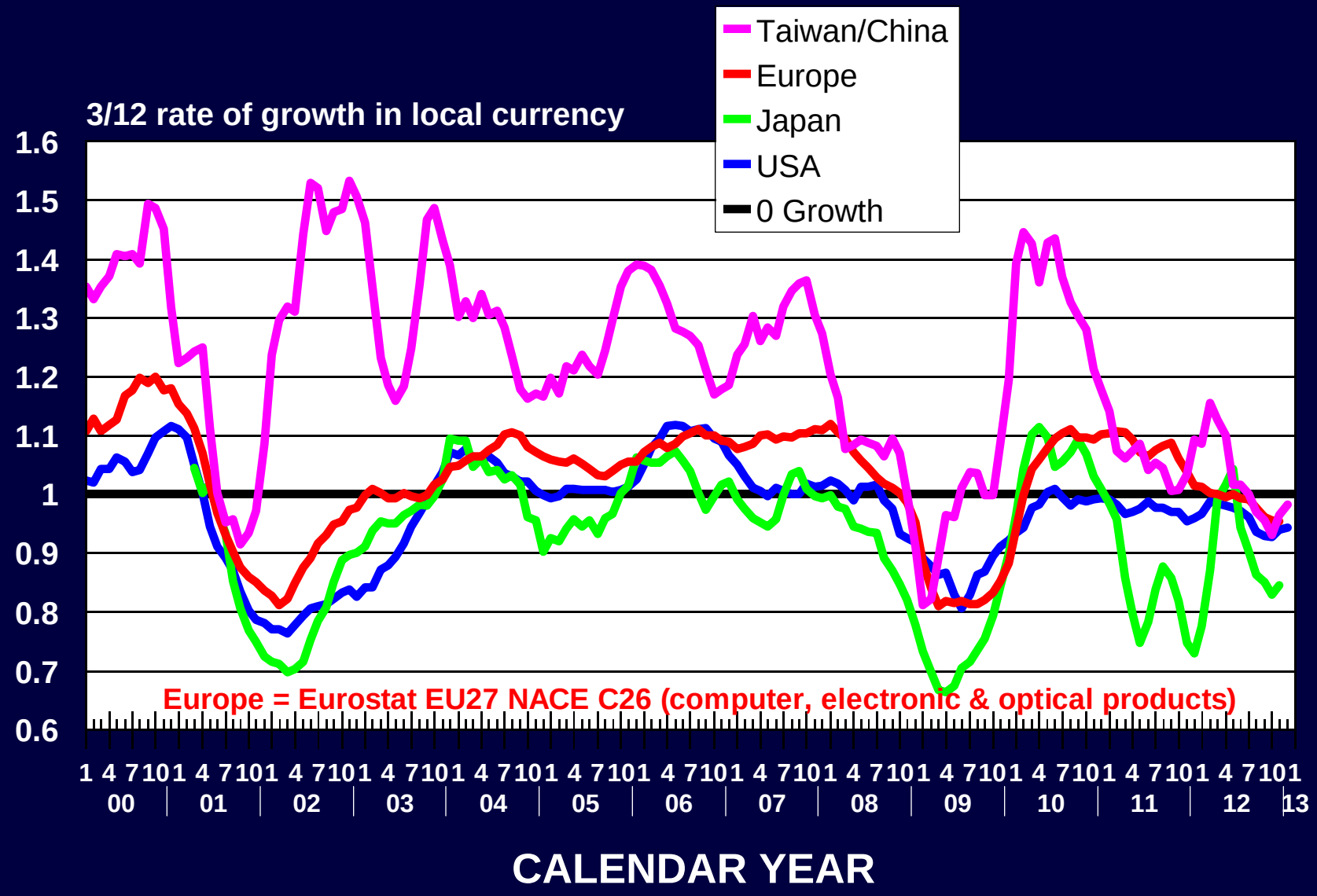
US Electronic Equipment Orders & Shipments

Communications, Computer, Military, Instruments



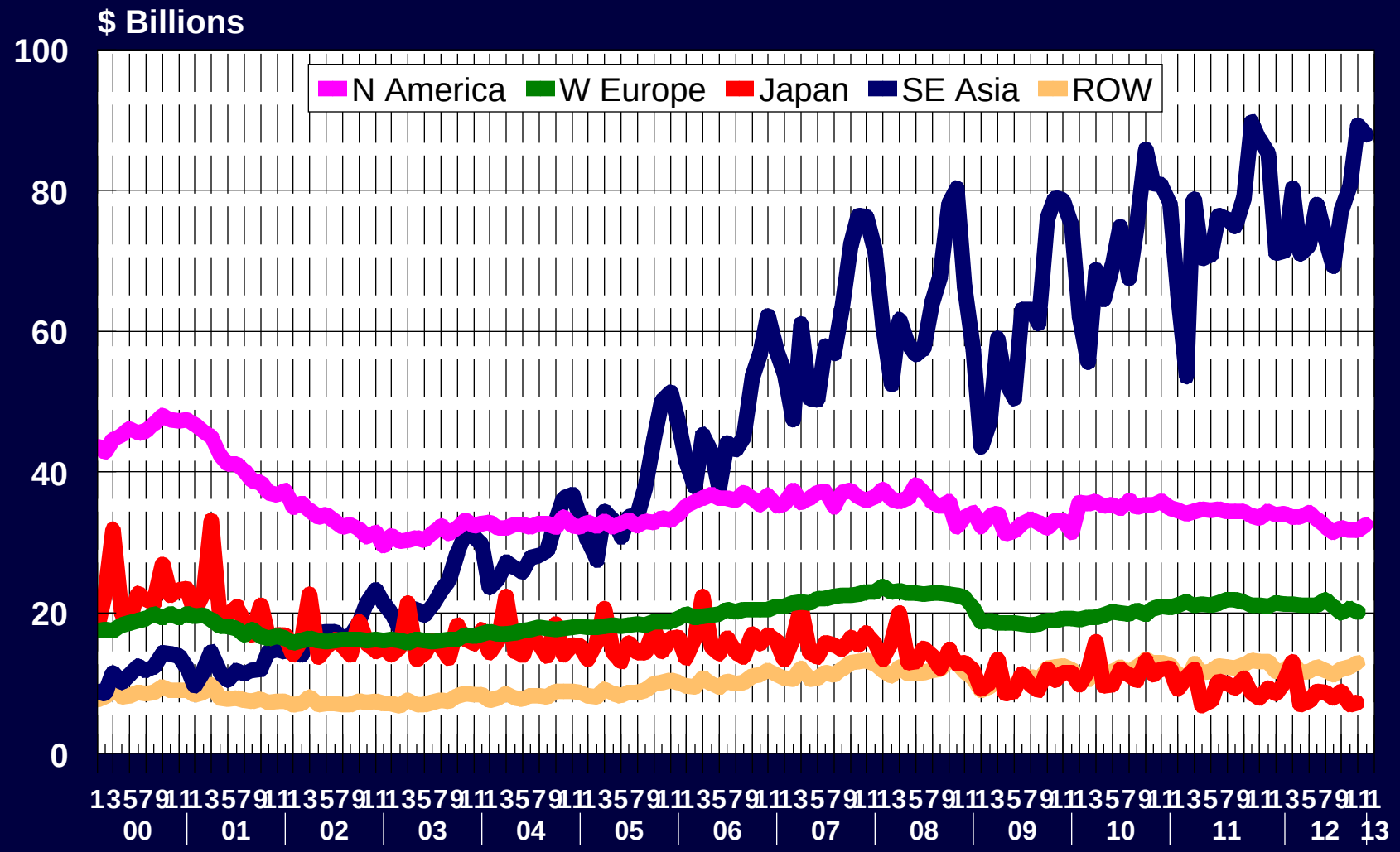
www.census.gov/indicator/www/m3/

Global Electronic Equipment Shipment Growth



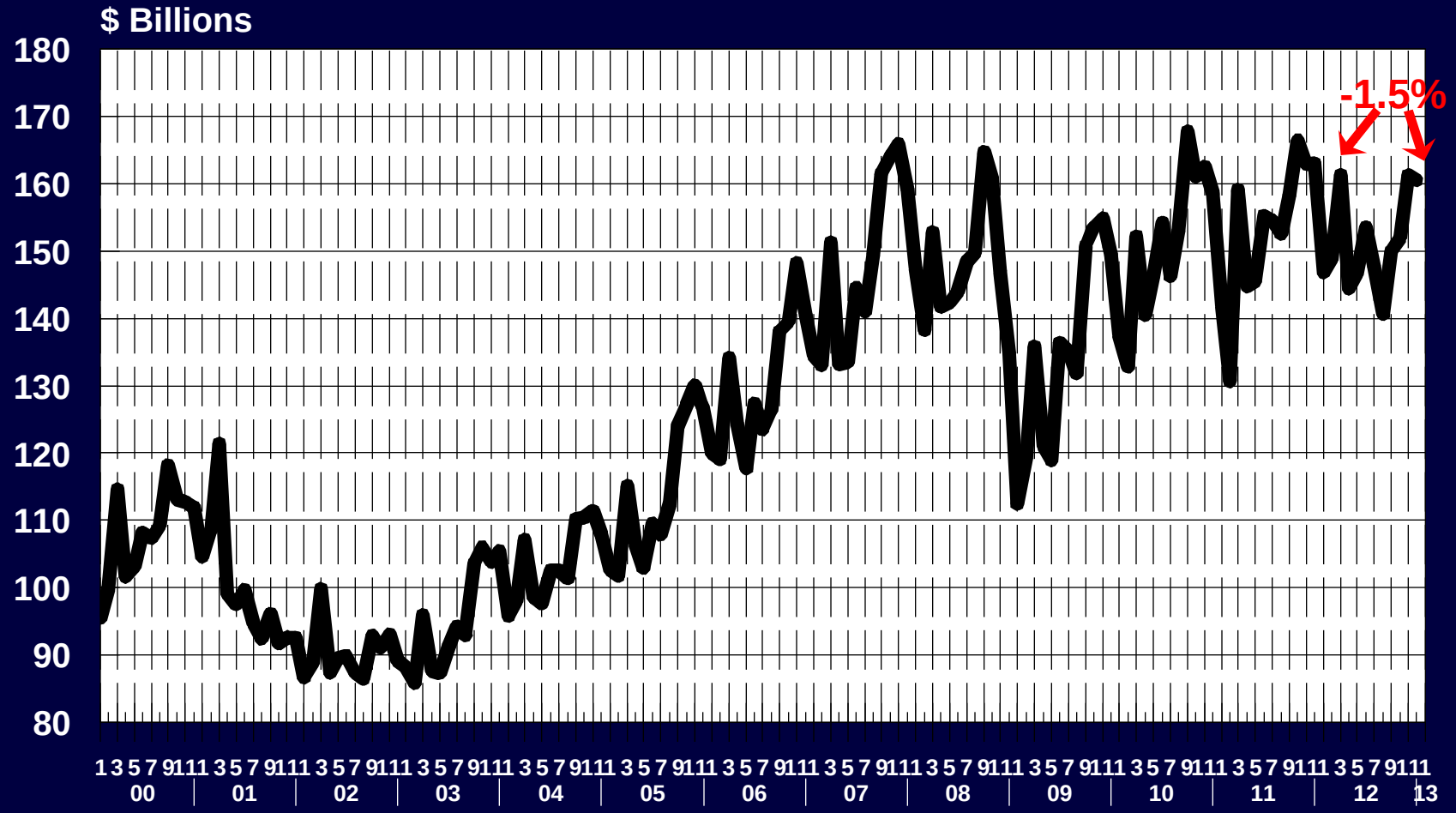
World Electronic Equipment Monthly Shipments

Converted @ Constant 2010 Exchange Rates

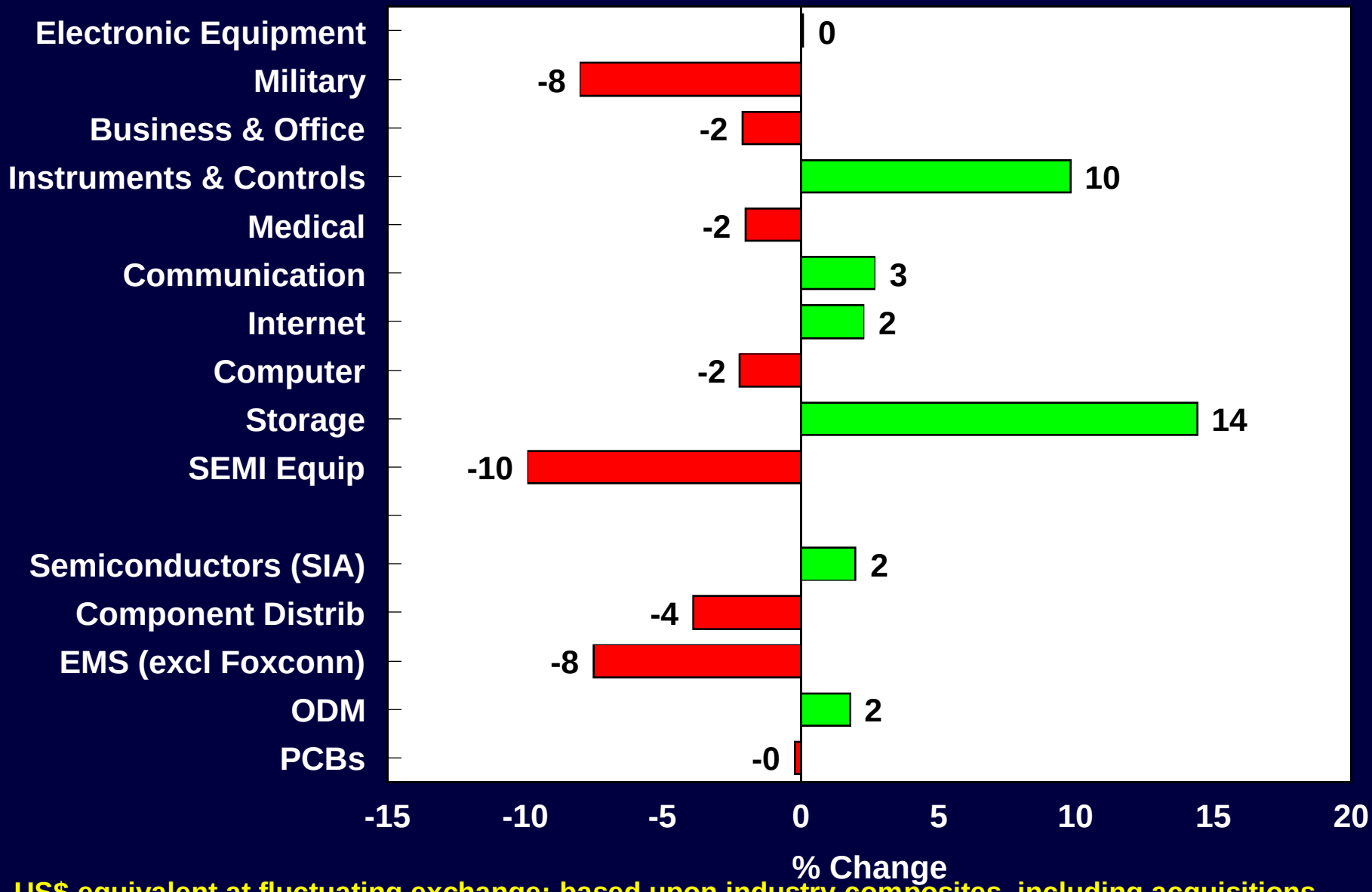

$ Billions
100
80
60
40
20
0
N America
W Europe
Japan
SE Asia
ROW
1 3 5 7 9 11 1 3 5 7 9 11 1 3 5 7 9 11

World Electronic Equipment Monthly Shipments

Converted @ Constant 2010 Exchange Rates

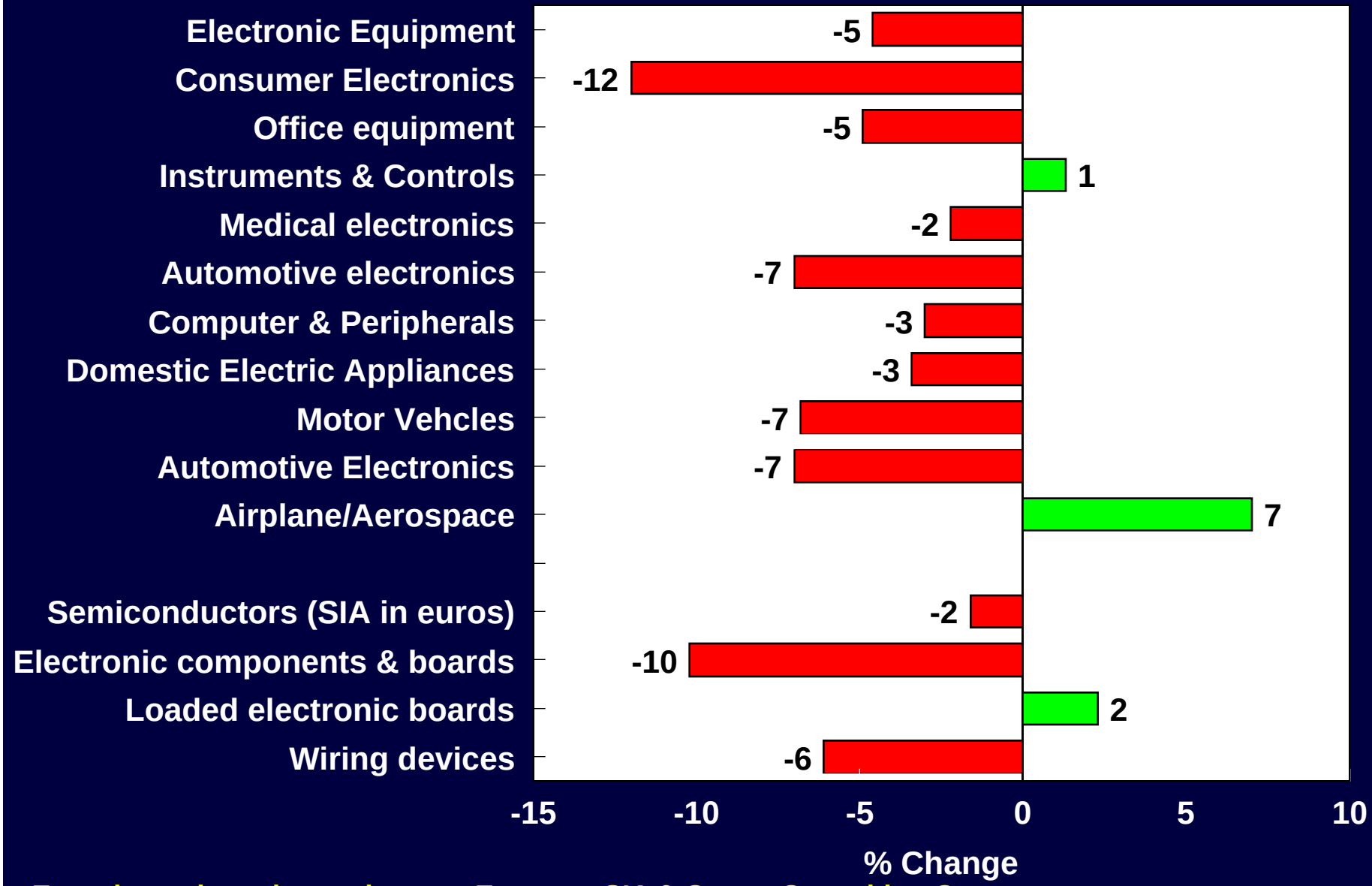

$ Billions
180
170
160
150
140
130
120
110
100
90
80
-1.5%
1 3 5 7 9 11 1 3 5 7 9 11 1 3 5 7 9 11

Global Electronic Supply Chain Growth 4Q'12 vs. 4Q'11 (Very Preliminary)



US$ equivalent at fluctuating exchange; based upon industry composites including acquisitions

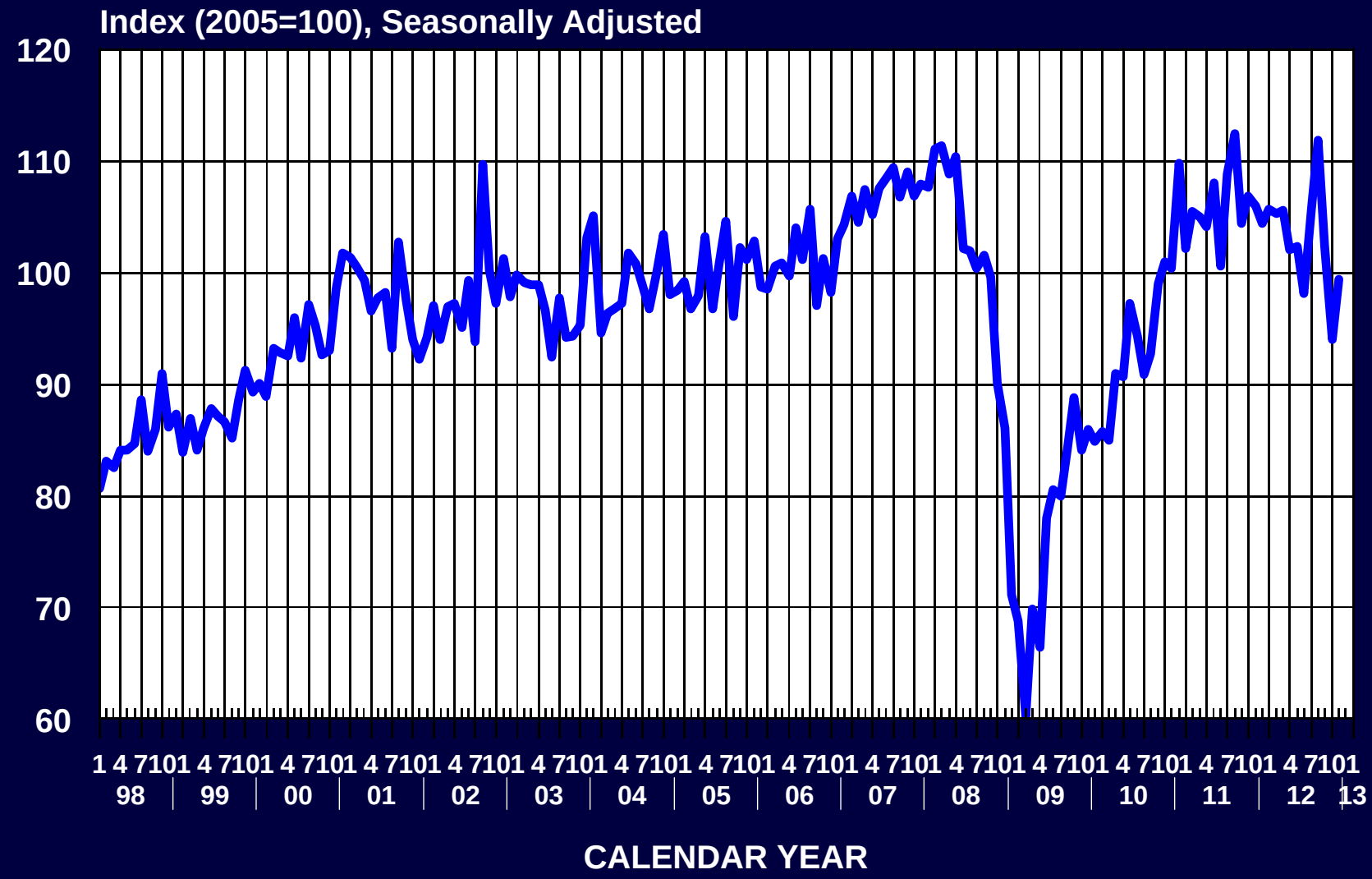
European Electronic Supply Chain Growth
Sep-Nov '12 vs Sep-Nov '11



Euro denominated growth rates; Eurostat, SIA & Custer Consulting Group

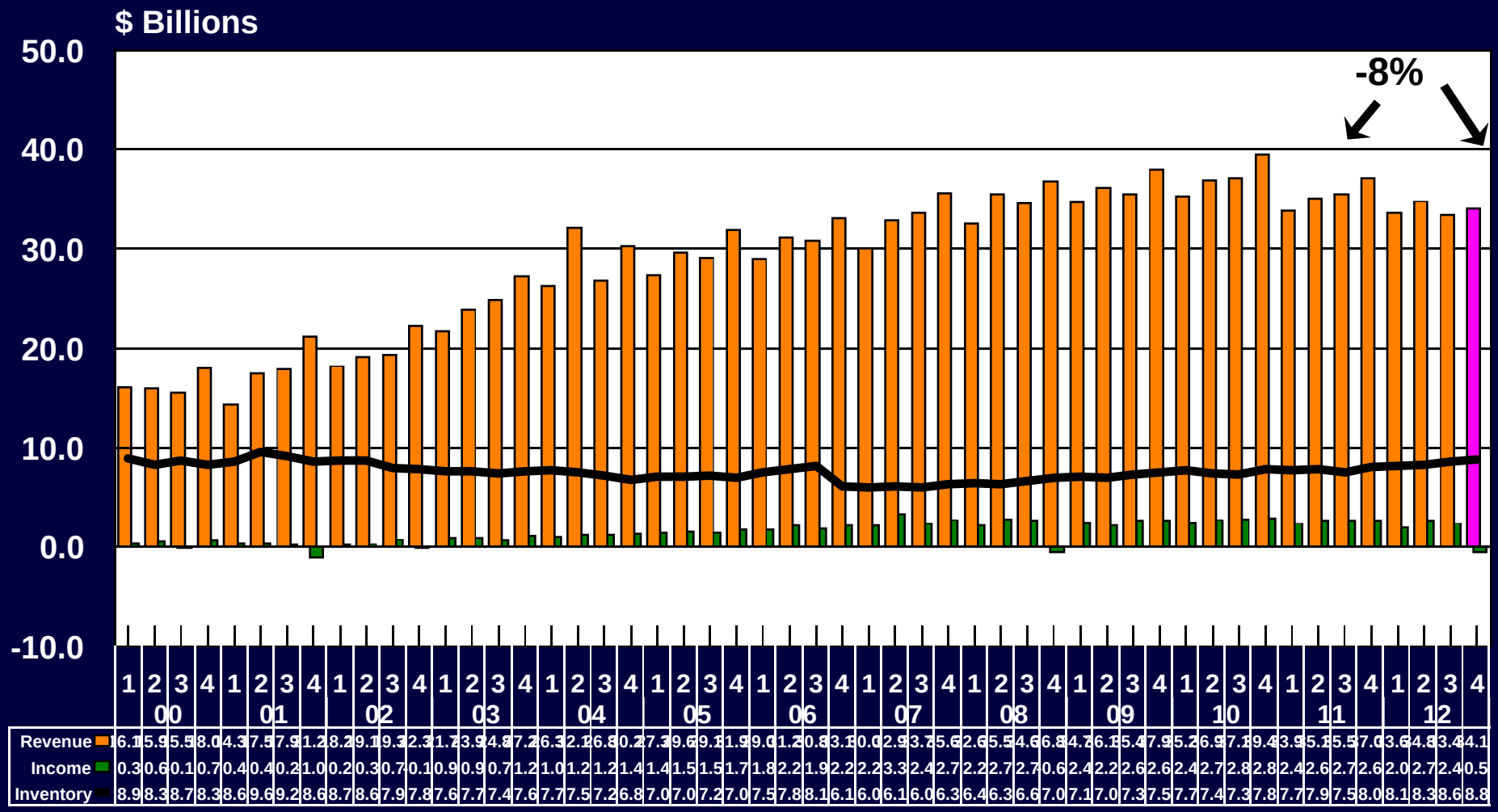
European Motor Vehicle Production

Monthly Index (Year 2005 = 100)



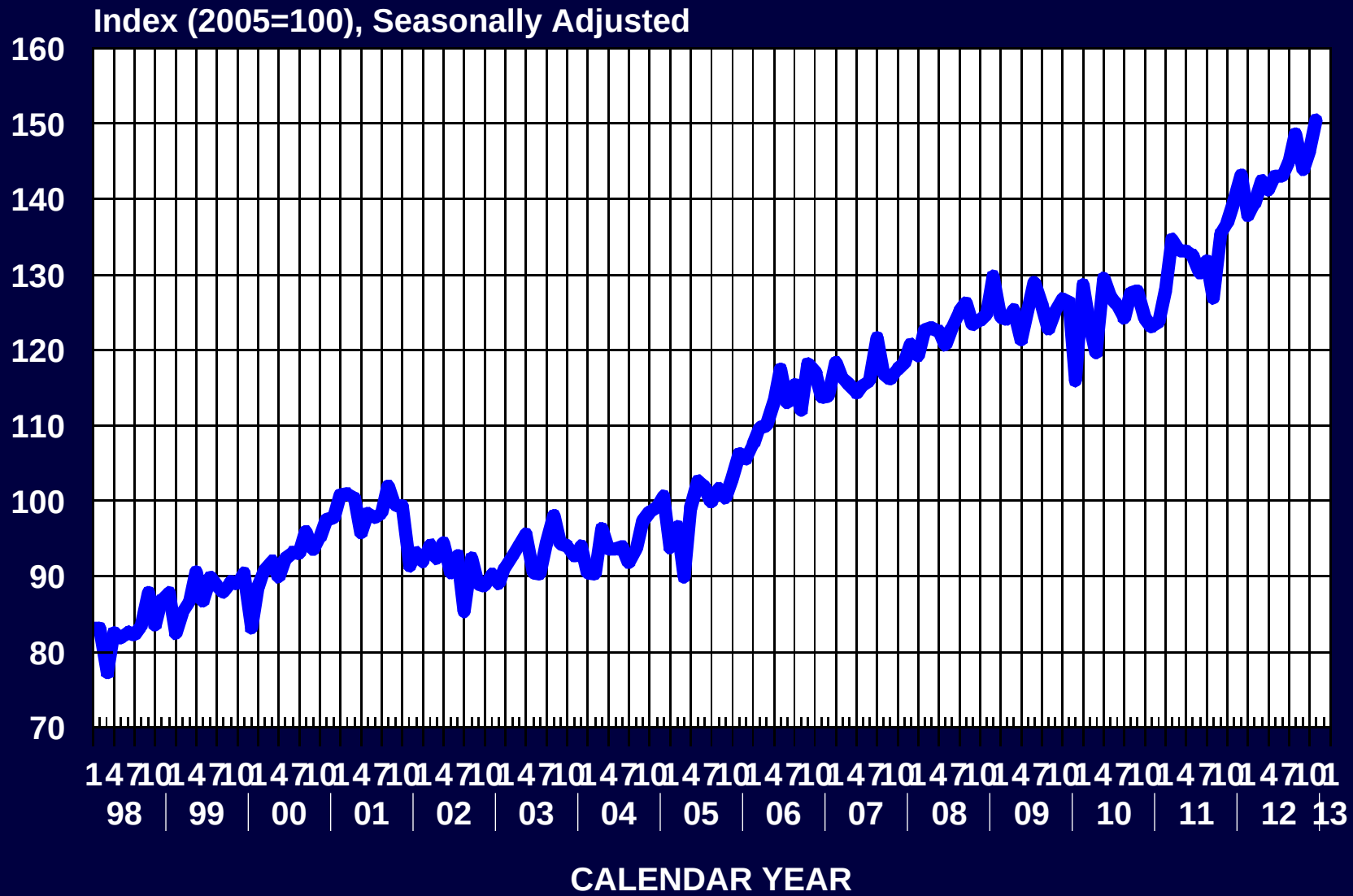
Eurostat, C219

Military Equipment
Composite of 6 Public Companies
Revenue, Net Income & Inventory



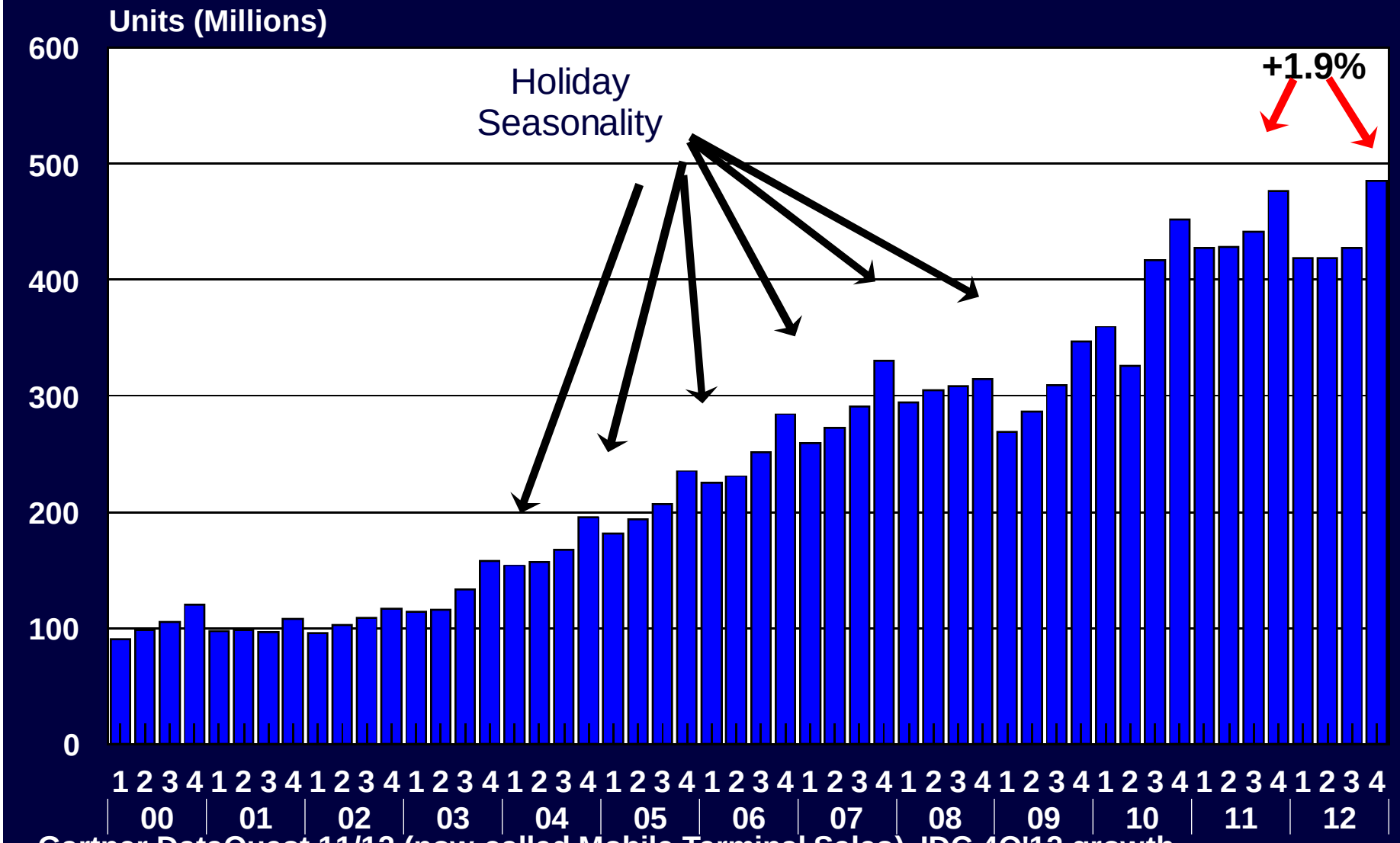
General Dynamics, Harris, Lockheed, Northrop Grumman, Raytheon, Rockwell Collins

European Production - Aircraft, Spacecraft & Related Equipment



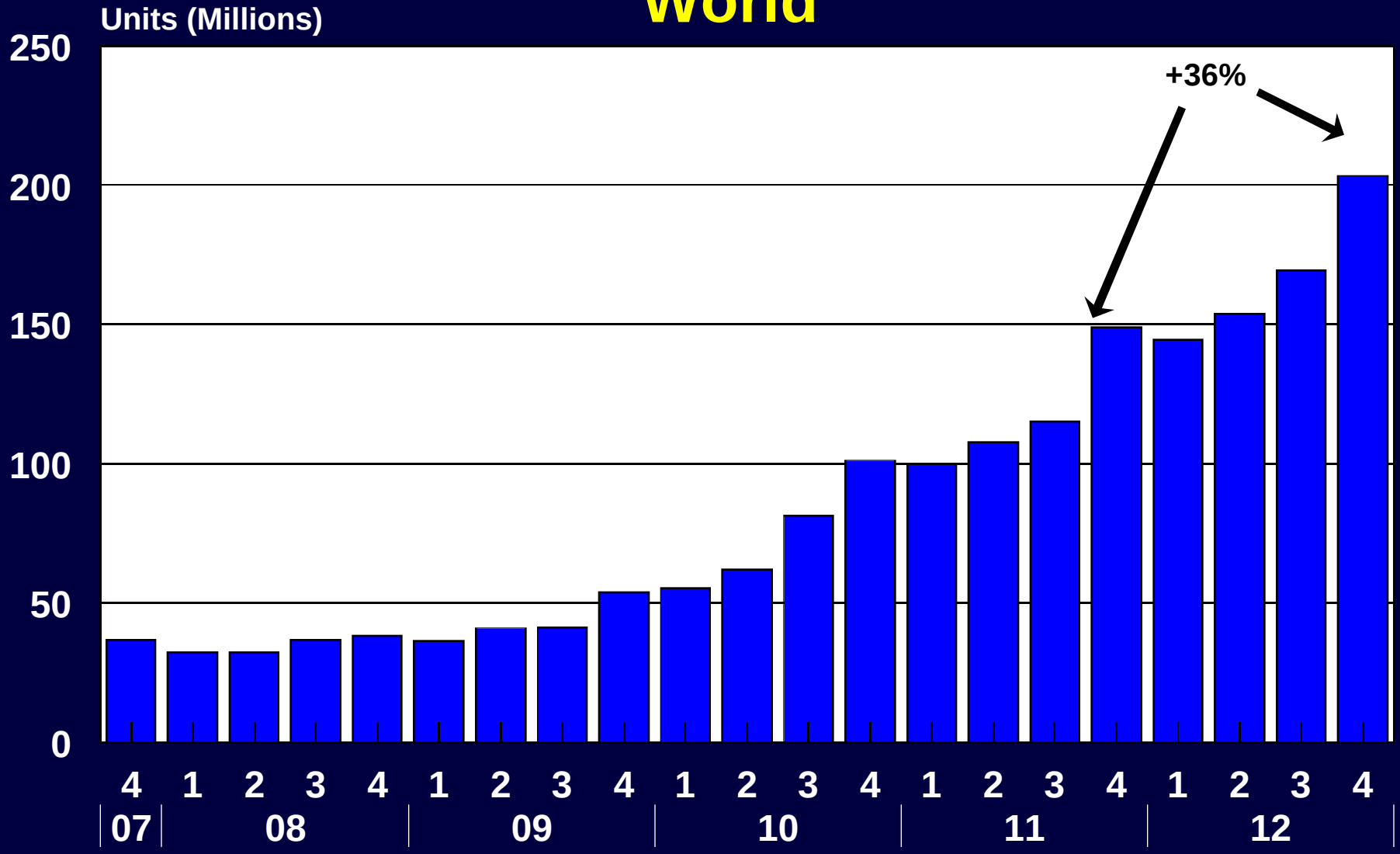
Eurostat, C303

Mobile Phone Unit Shipments
World



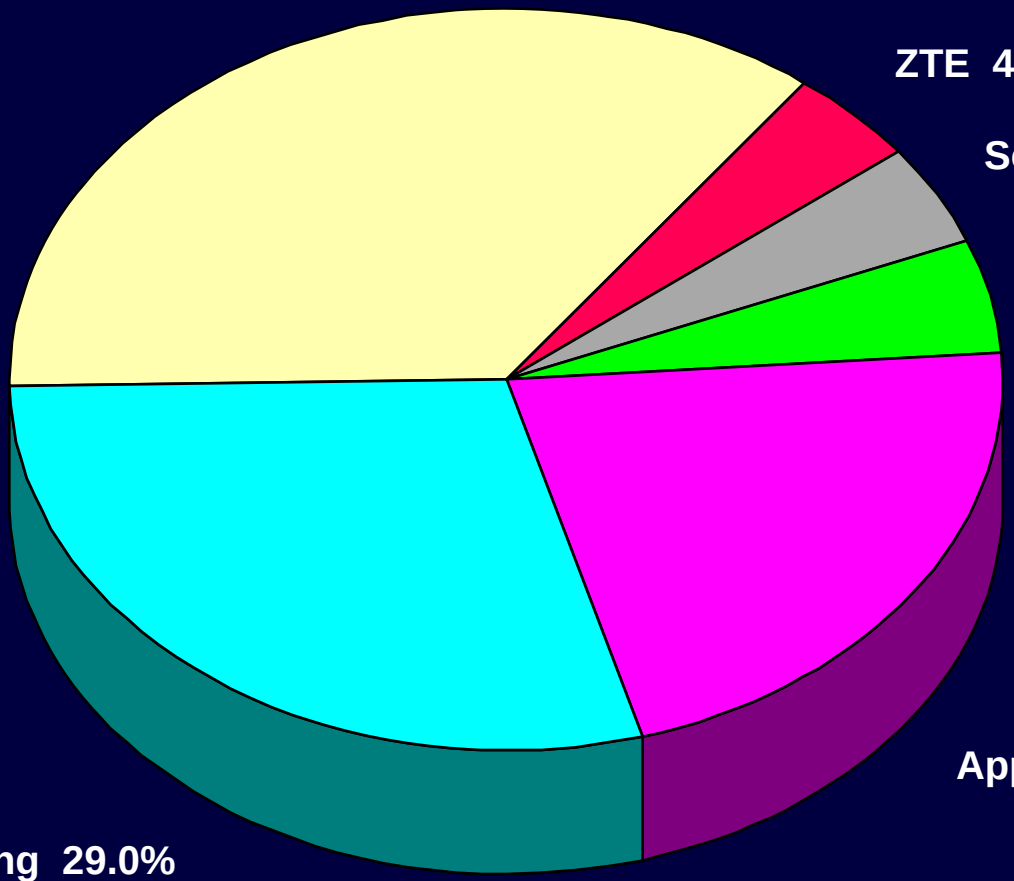
Gartner DataQuest 11/12 (now called Mobile Terminal Sales), IDC 4Q'12 growth

Smartphone Unit Shipments to End Users World



Gartner DataQuest 11/12 + IDC 4Q'12 growth

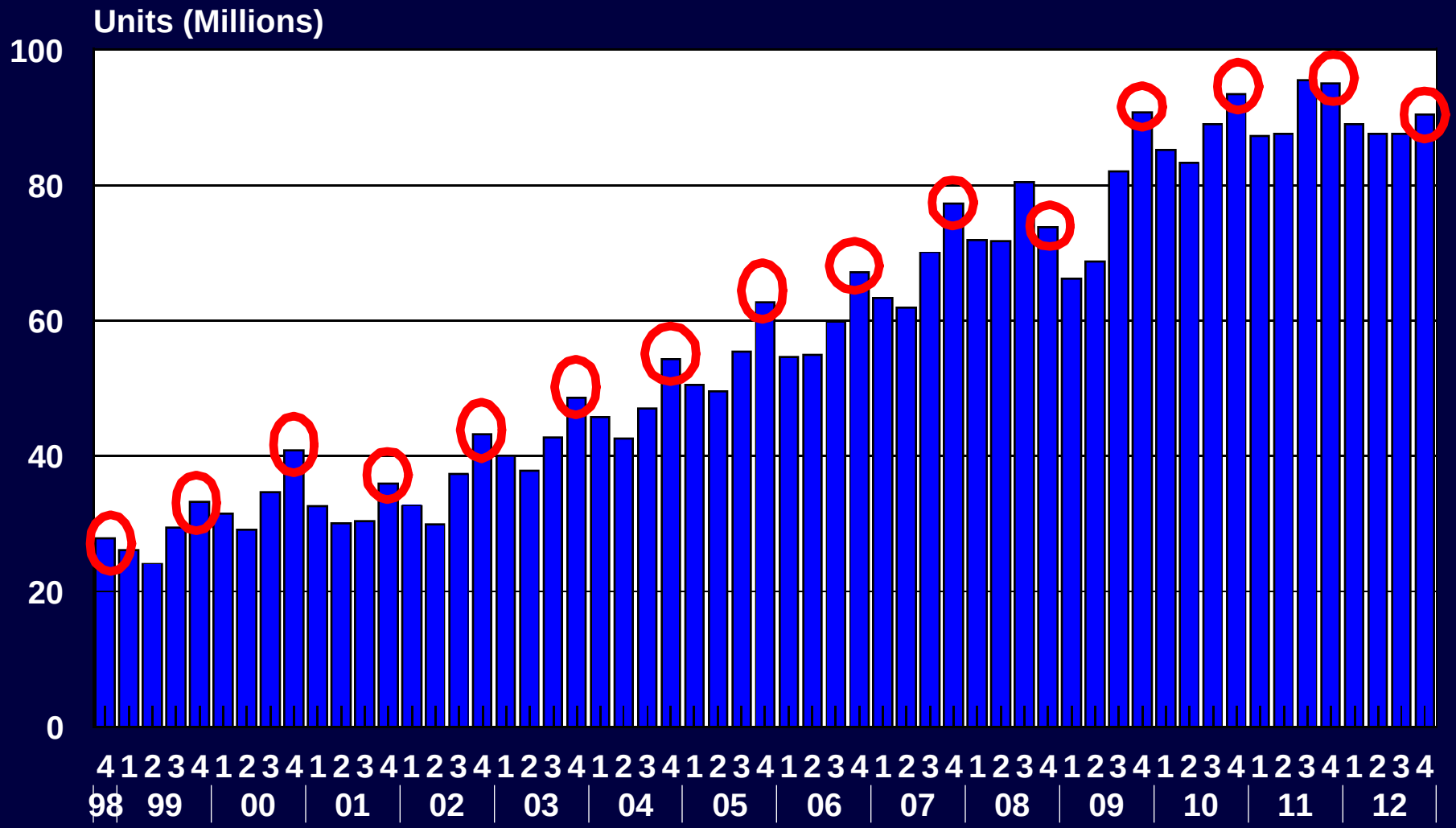
World Smartphone Sales
4Q'12



Total: 219.4 Million Units

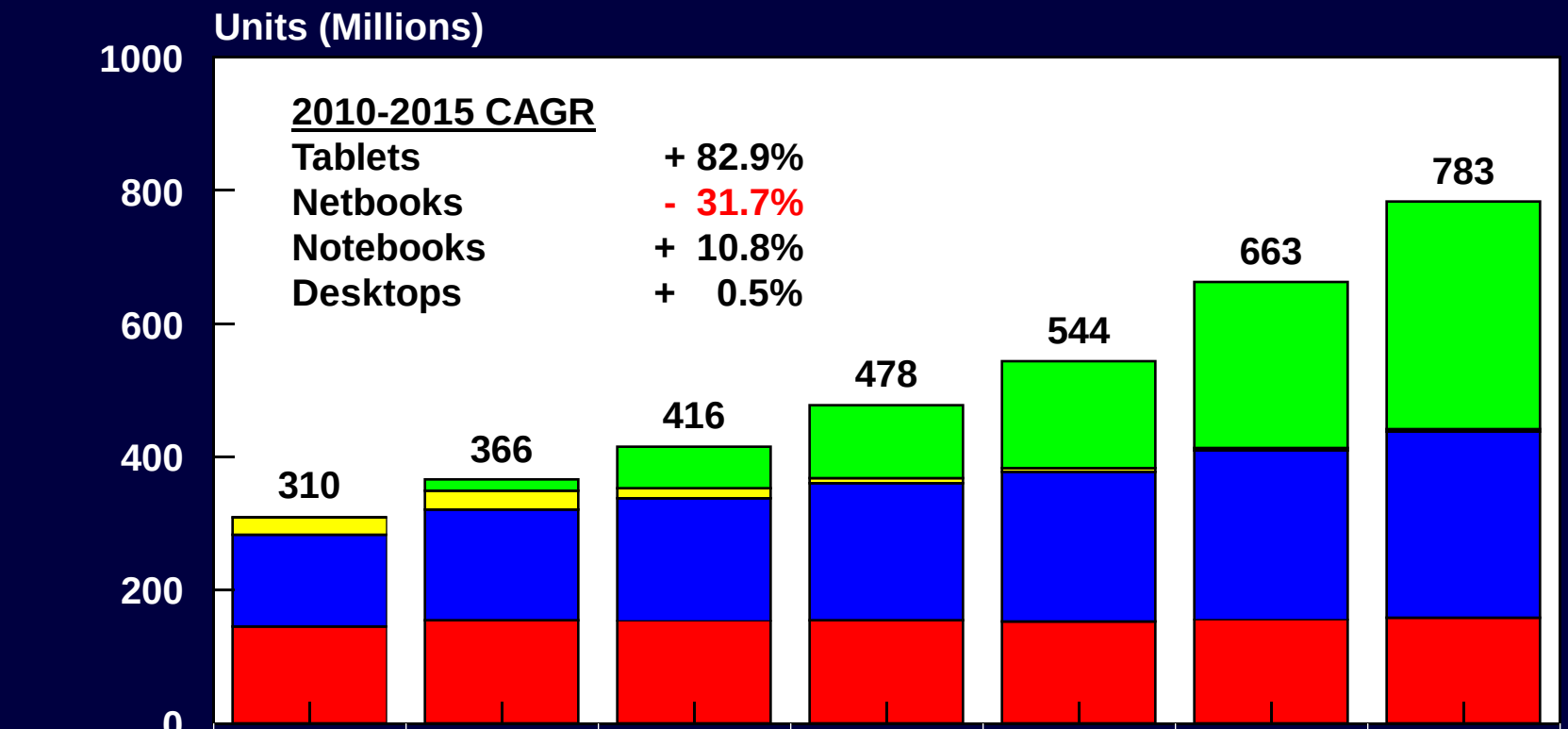
IDC 1/13

Personal Computer Unit Shipments
World



Gartner 1/2013
Servers & Media Tablets not included

Makeup of Personal Computer Market



	2009	2010	2011	2012 F	2013 F	2014 F	2015 F
Tablets	1	17	63	110	160	249	341
Netbooks	26	27	15	8	6	5	4
Notebooks	137	167	184	205	225	253	279
Desktops	146	155	154	155	153	156	159

IC Insights 5/12

Semiconductors

Top 10 Semiconductor Design TAM by Company
US$ Billion

	2011	2012	% CH
Samsung	18.6	23.9	28.9
Apple	18.8	21.4	13.6
HP	16.0	14.0	-12.7
Dell	9.9	8.6	-13.4
Sony	7.7	7.9	1.9
Lenovo	7.8	7.8	0.3
Toshiba	7.8	6.5	-17.1
LG Electronics	6.5	6.0	-6.7
Cisco	5.4	5.4	-0.8
Nokia	8.6	5.0	-42.6
Others	199.7	191.1	-4.3
Total	306.8	297.6	-3.0

Gartner 1/13

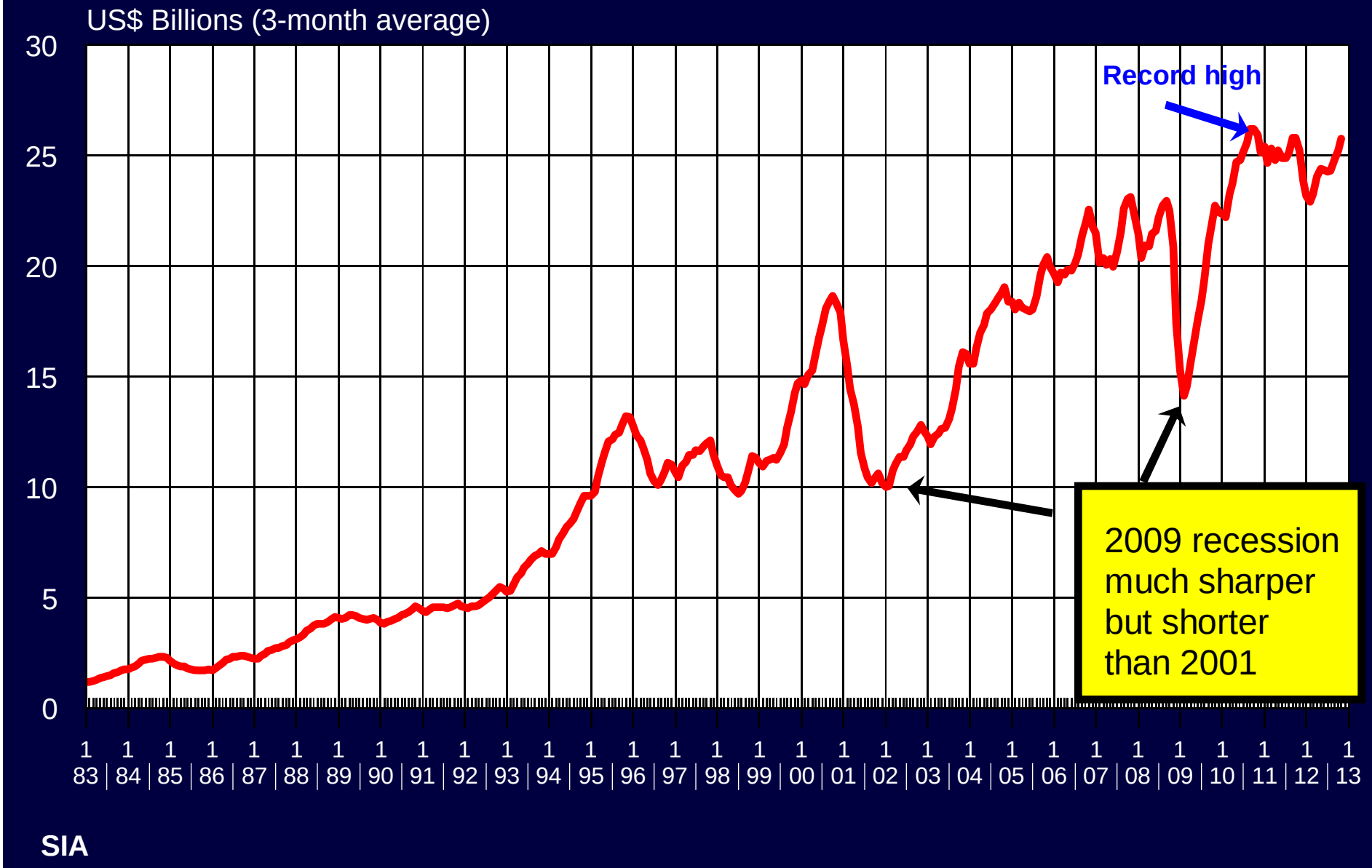
Monthly Semiconductor Shipments
$ Billions (3-month average)

	11/11	11/12	% CH
Americas	4.59	5.03	+9.7%
Europe	3.03	2.80	-7.4%
Japan	3.82	3.41	-10.8%
Asia Pacific	13.79	14.49	+5.1%
Total	25.22	25.73	+2.0%

SIA www.sia-online.org/

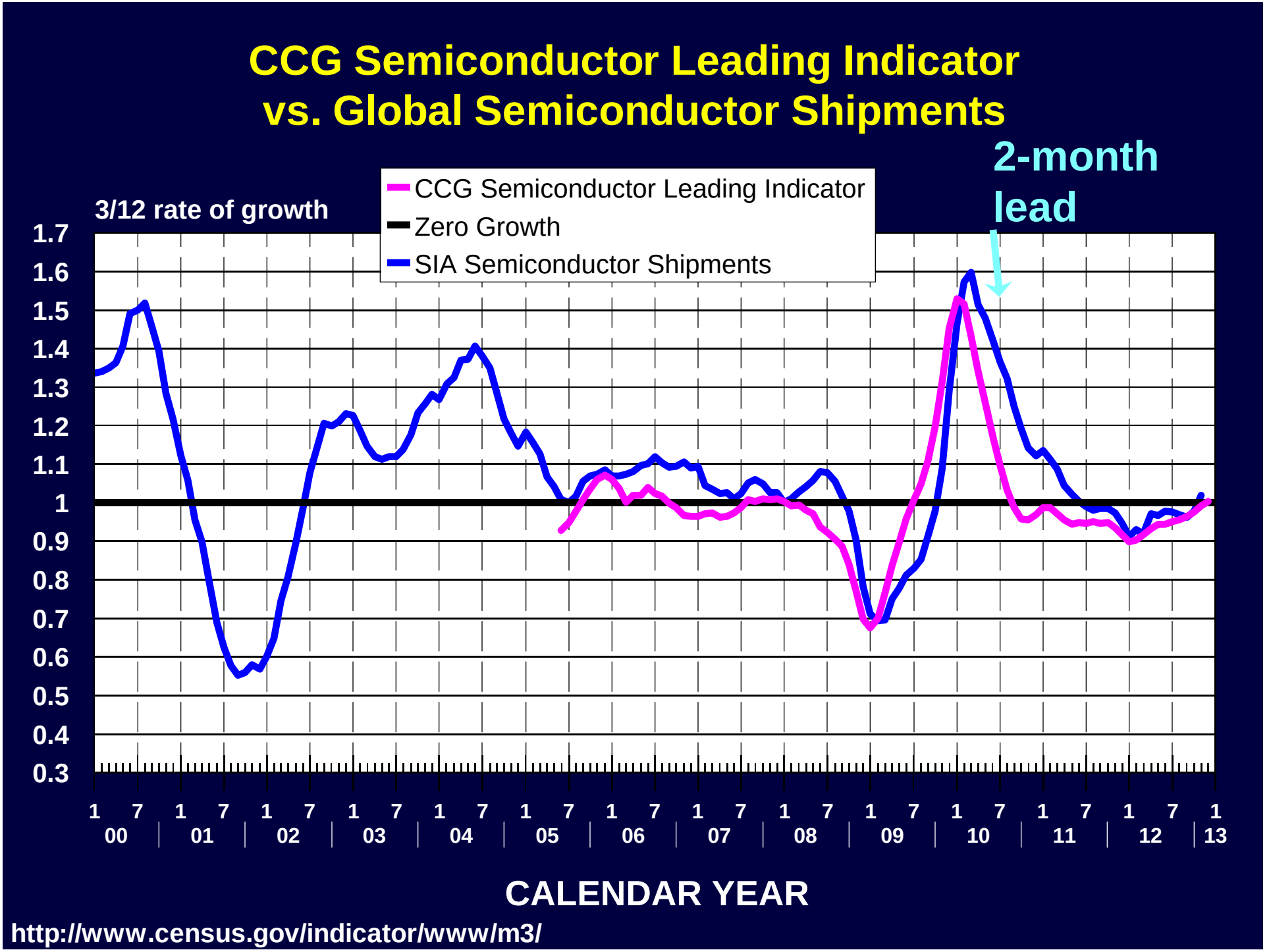
World Semiconductor Shipments

Monthly US$



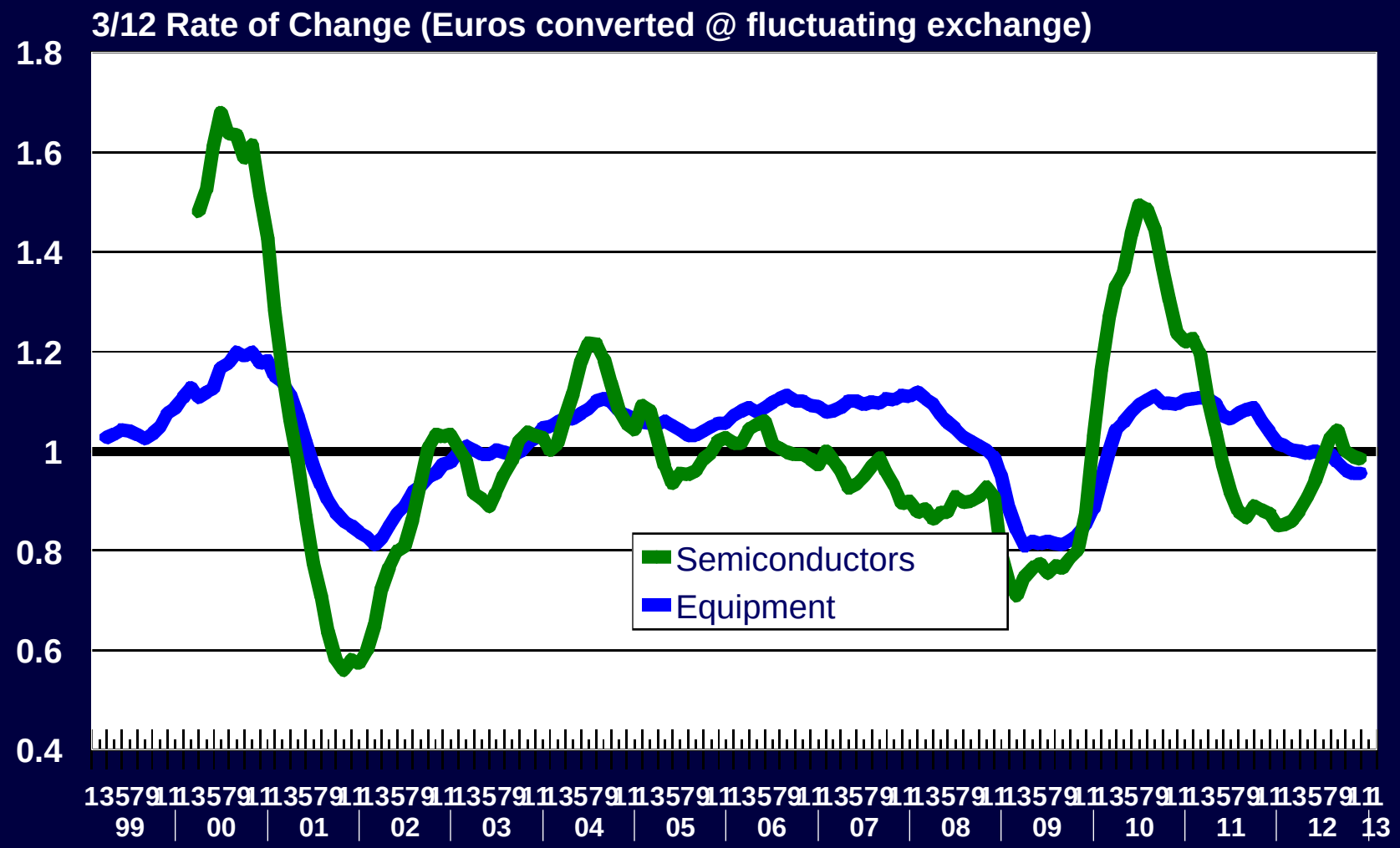
SIA

CCG Semiconductor Leading Indicator vs. Global Semiconductor Shipments



http://www.census.gov/indicator/www/m3/

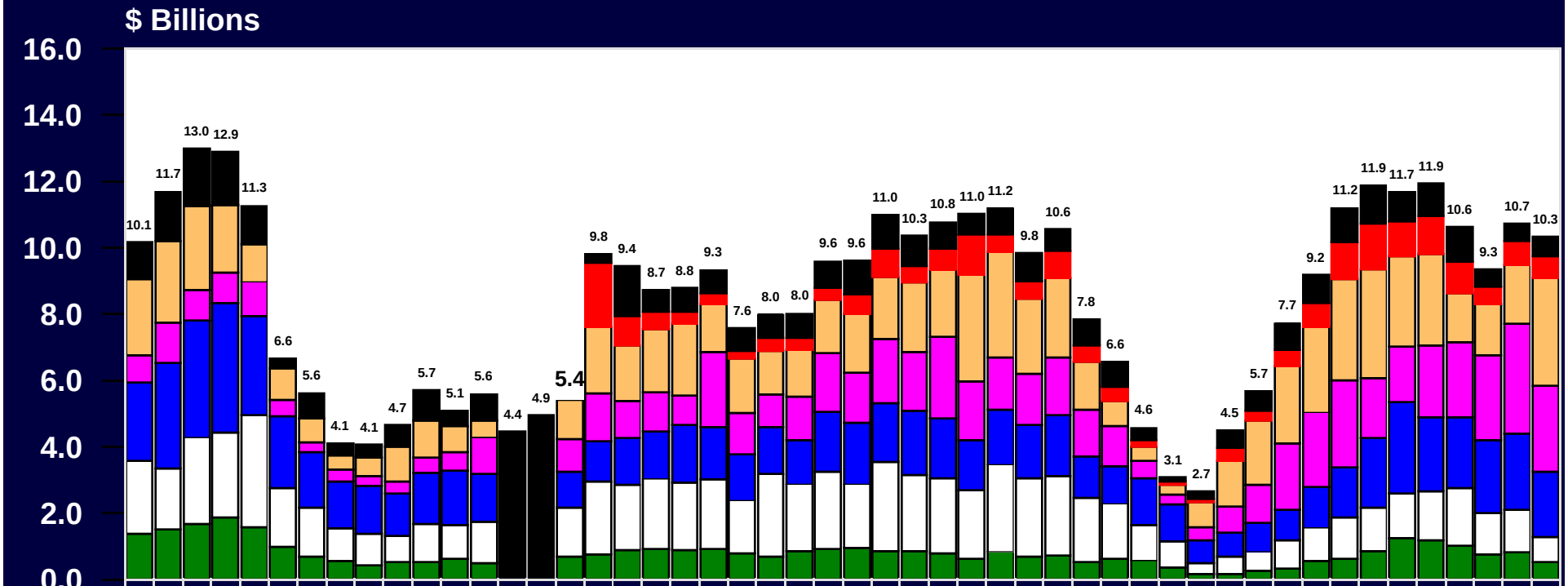
Semiconductor Shipments to Europe vs. European Electronic Equipment Production



Total $ Semiconductor Shipments from All Countries to Europe www.sia-online.org/,
Eurostat class C26, EU27, European Computer, Electronic & Optical products Production

Semiconductor Fab, Assembly, Packaging,Test & Measurement Equipment

Semiconductor Capital Equipment Shipments by Area

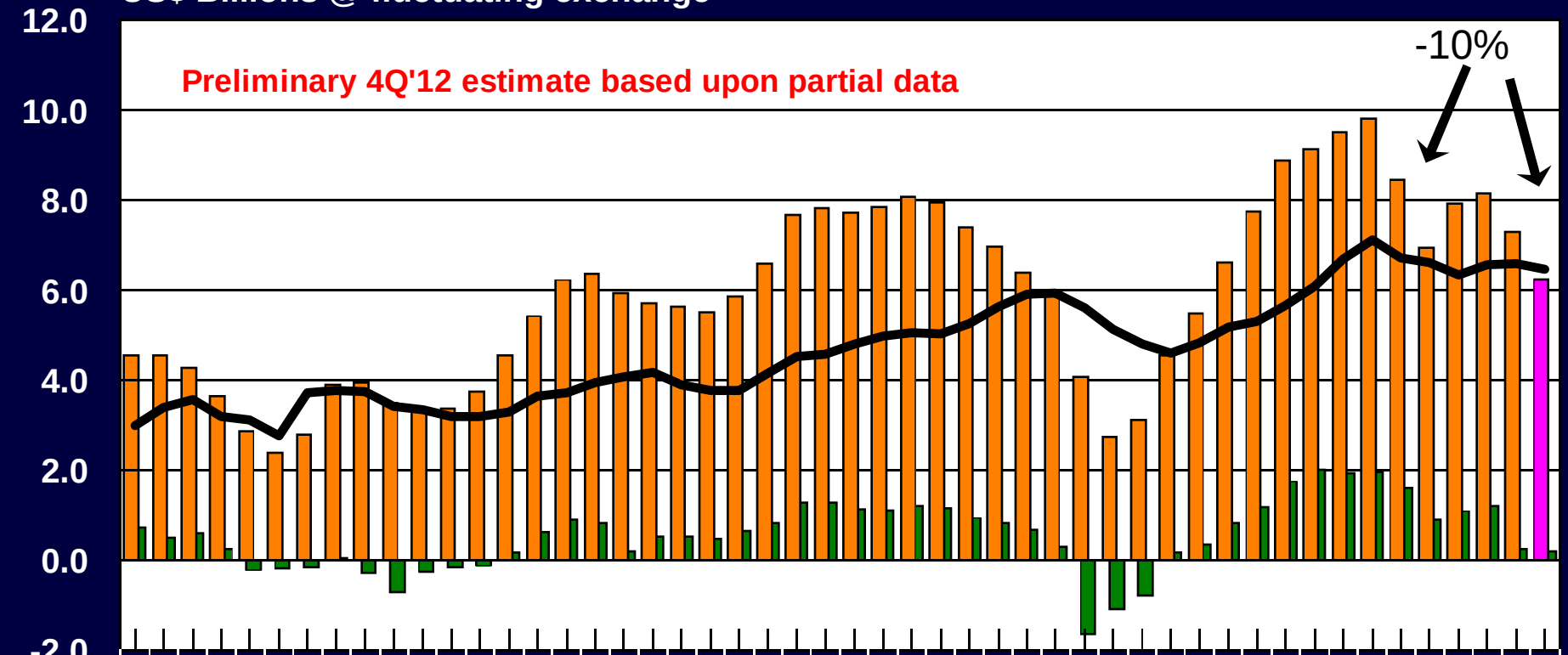


| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4

Semiconductor Fab, Test & Measurement Composite of 20 Public Companies

Revenue, Net Income & Inventory

US$ Billions @ fluctuating exchange

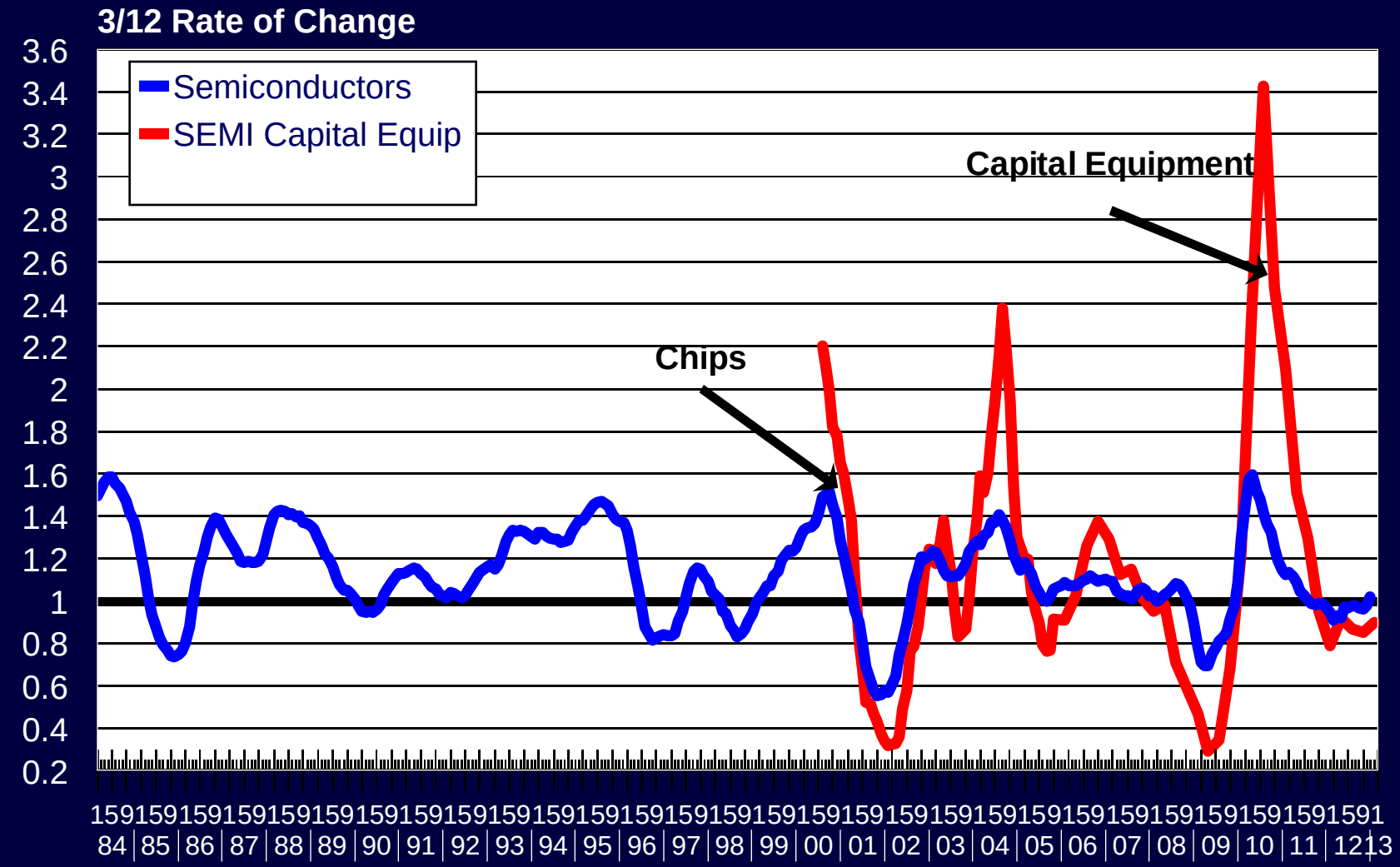


	3 00	4	1	2 01	3	4	1	2 02	3	4	1	2 03	3	4	1	2 04	3	4	1	2 05	3	4	1	2 06	3	4	1	2 07	3	4	1	2 08	3	4	1	2 09	3	4	1	2 10	3	4	1	2 11	3	4	1	2 12	3	4
Revenue	4.5	4.5	4.3	3.6	2.9	2.4	2.8	3.9	4.0	3.5	3.3	3.4	3.8	4.5	5.4	6.2	6.4	5.9	5.7	5.6	5.5	5.9	6.6	7.7	7.8	7.7	7.9	8.1	7.9	7.4	7.0	6.4	6.0	4.1	2.7	3.1	4.5	5.5	6.6	7.8	8.9	9.1	9.5	9.8	8.4	6.9	7.9	8.2	7.3	6.2
Income	0.7	0.5	0.6	0.2	0.2	0.2	0.2	0.1	-0.3	0.7	-0.3	0.2	0.1	0.2	0.6	0.9	0.8	0.2	0.5	0.5	0.5	0.6	0.8	1.3	1.3	1.1	1.1	1.2	1.1	0.9	0.8	0.7	0.3	1.6	1.1	0.8	0.2	0.3	0.8	1.2	1.7	2.0	1.9	1.9	1.6	0.9	1.1	1.2	0.2	0.2
Inventory	3.0	3.4	3.6	3.2	3.1	2.8	3.7	3.8	3.7	3.4	3.3	3.2	3.2	3.3	3.6	3.7	3.9	4.1	4.2	3.9	3.8	3.8	4.2	4.5	4.6	4.8	5.0	5.0	5.0	5.2	5.6	5.9	5.9	5.6	5.1	4.8	4.6	4.8	5.2	5.3	5.7	6.1	6.7	7.1	6.7	6.6	6.3	6.6	6.6	6.5

Applied Materials, ASM Intl, ASML, Advantest, KLA Tencor, Novellus, Hitachi Hi Tech, Lam Research, BTU, LTX-Credence, FEI, FSI, Intervac, Kulicke & Soffa, MKS Instruments, Rudolph, Teradyne, Ultratech Stepper, Varian semiconductor, Veeco

Global Semiconductor & Semiconductor Capital Equipment

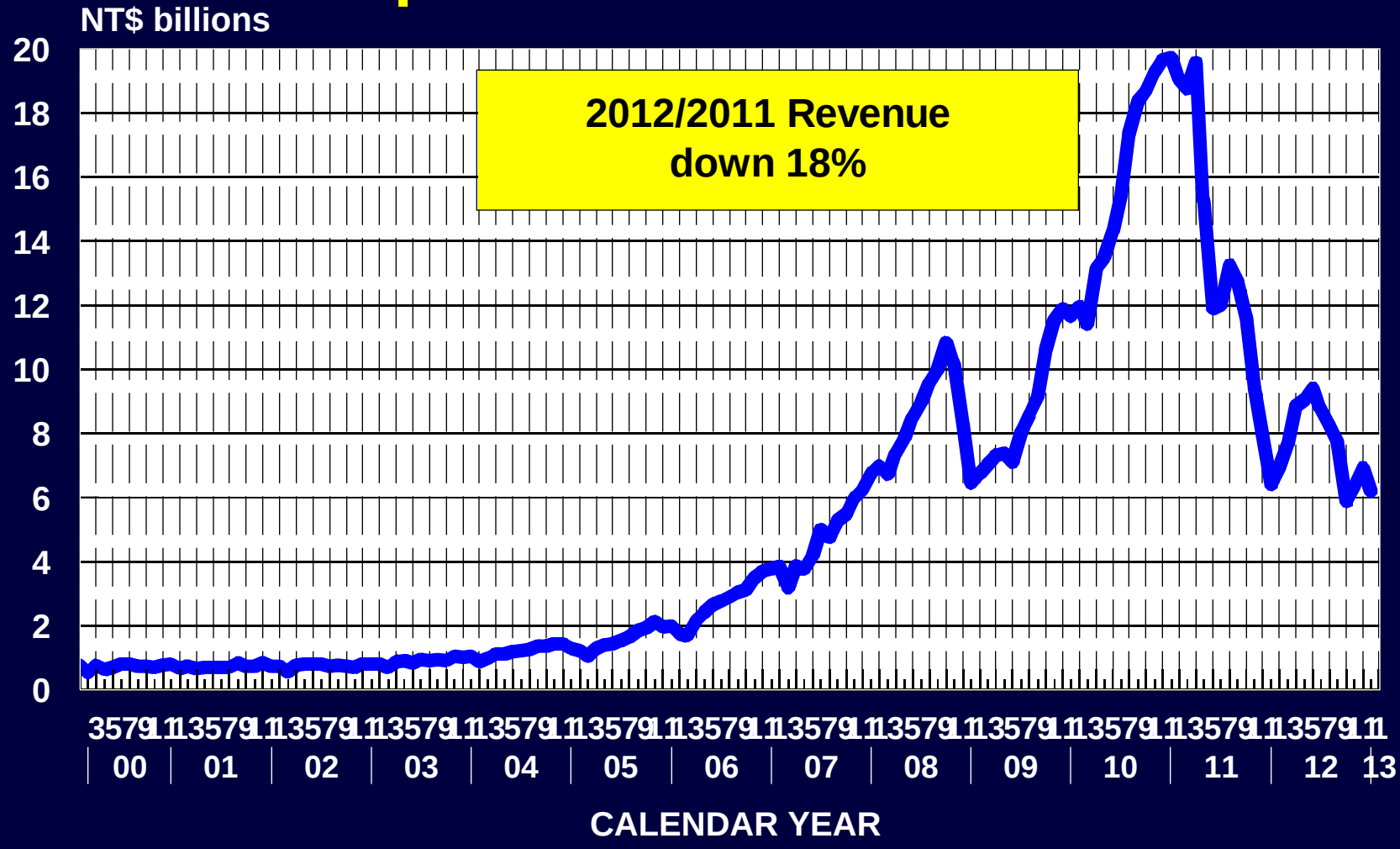
3-Month Shipment Growth Rates on $ Basis



Sources: SIA; Semiconductor Equipment Association of Japan, www.semi.org, Custer Consulting Group SEMI equipment sector composite 2012 growth

Solar/Photovoltaic

Taiwan Solar/Photovoltaic Panel Companies
Composite of 17 Manufacturers

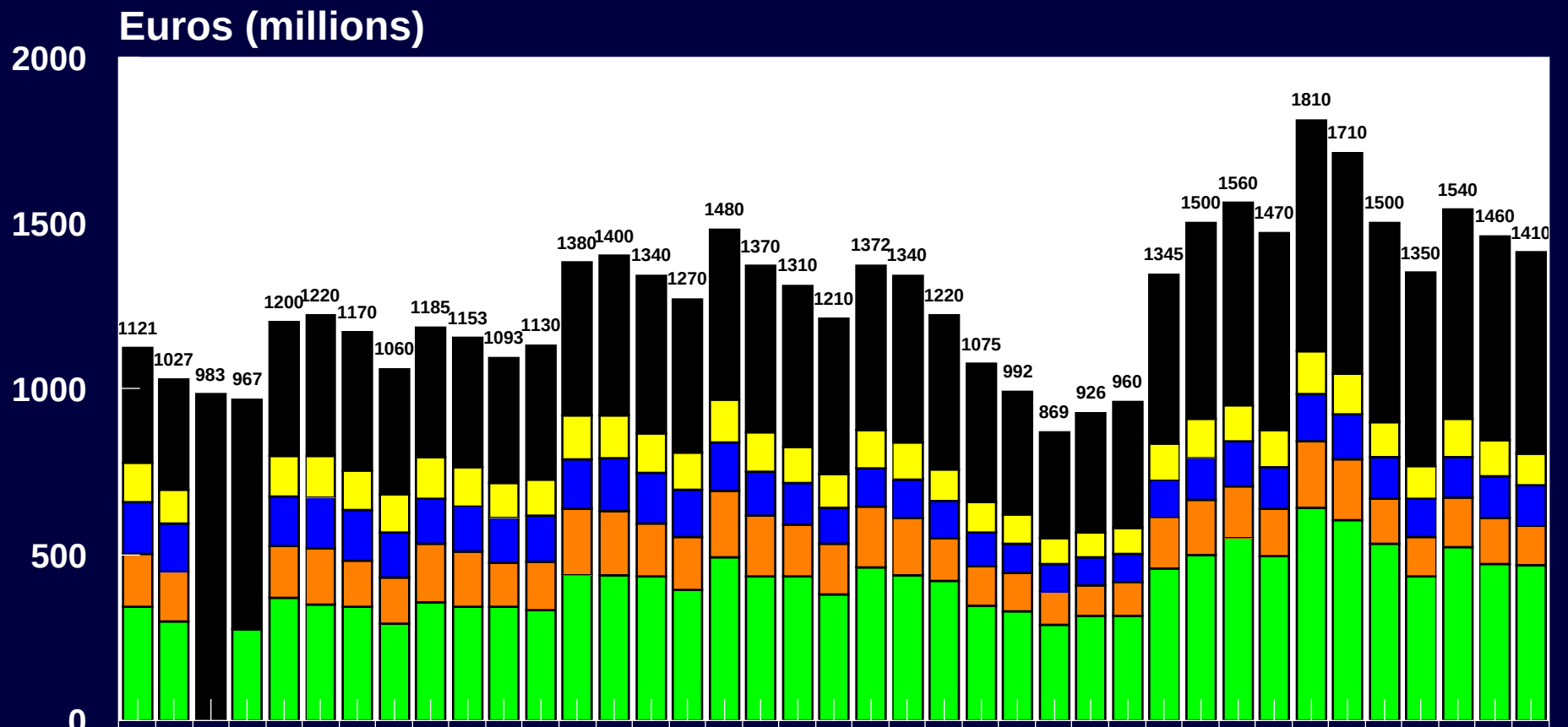


Big Sun Energy Technology, Daxon, DelSolar, e_TON Solar Tec, Eversol, Gintech, Green Energy Technology (GET), Ligitek, Motech, Neo Solar Power, Phoenixtec Power Co (PPC), Precision Silicon, Sino-American Silicon Products, Sonartech, Sysgration, Tyntek, Wafer Works

Component Distributors

DMASS

European Semiconductor Distribution Industry

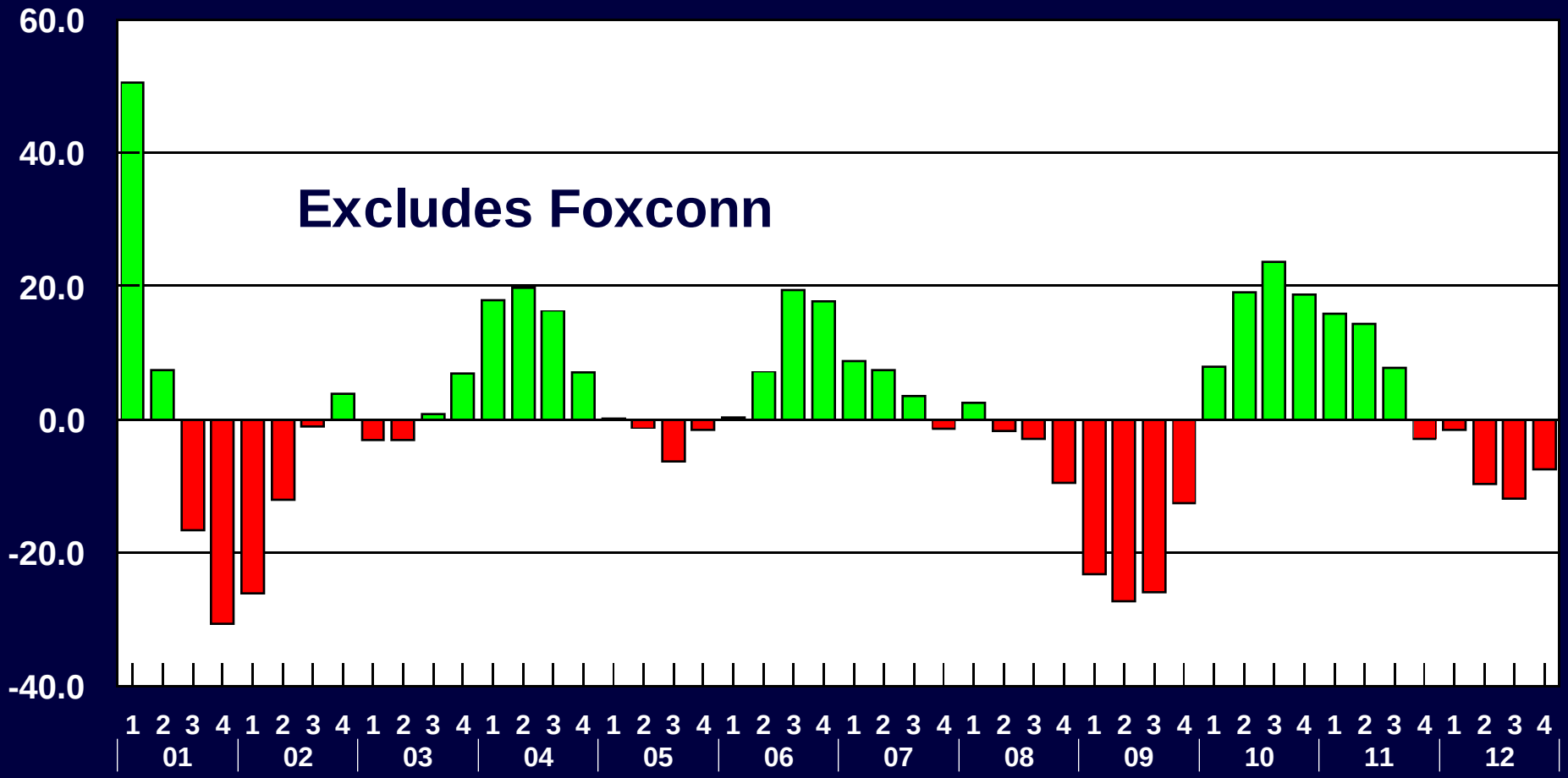


	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
	03				04				05				06				07				08				09				10				11				12			
Other	346	331	983	693	403	422	418	377	392	391	376	406	461	481	475	462	513	503	487	467	497	502	464	417	370	321	361	381	510	590	609	596	696	664	601	585	631	615	607
France	116	103			122	125	118	118	124	116	105	107	133	130	118	113	129	117	107	102	114	111	96	93	91	78	73	78	111	118	109	112	130	122	104	96	115	110	95
UK	157	144			149	154	154	133	137	138	138	140	149	158	154	142	146	133	127	109	117	116	110	101	86	82	86	83	112	128	138	125	144	138	128	117	122	124	123
Italy	161	152			158	171	138	140	175	166	131	144	198	193	159	160	201	182	155	152	183	174	132	117	116	99	91	104	155	166	153	143	200	183	136	118	150	139	116
Germany	342	297		274	368	348	342	292	357	342	343	333	439	438	434	393	491	435	434	380	461	437	419	347	329	289	315	314	457	498	551	494	640	603	531	434	522	472	469

http://dmass.com/

EMS & ODM Companies

Large EMS Providers
Composite of 8 Public Companies
Quarterly Revenue Growth



Benchmark+Pemstar, Celestica, Flextronics+Solectron, Jabil, Plexus, Sanmina-SCI, Sypris,Venture Mfg

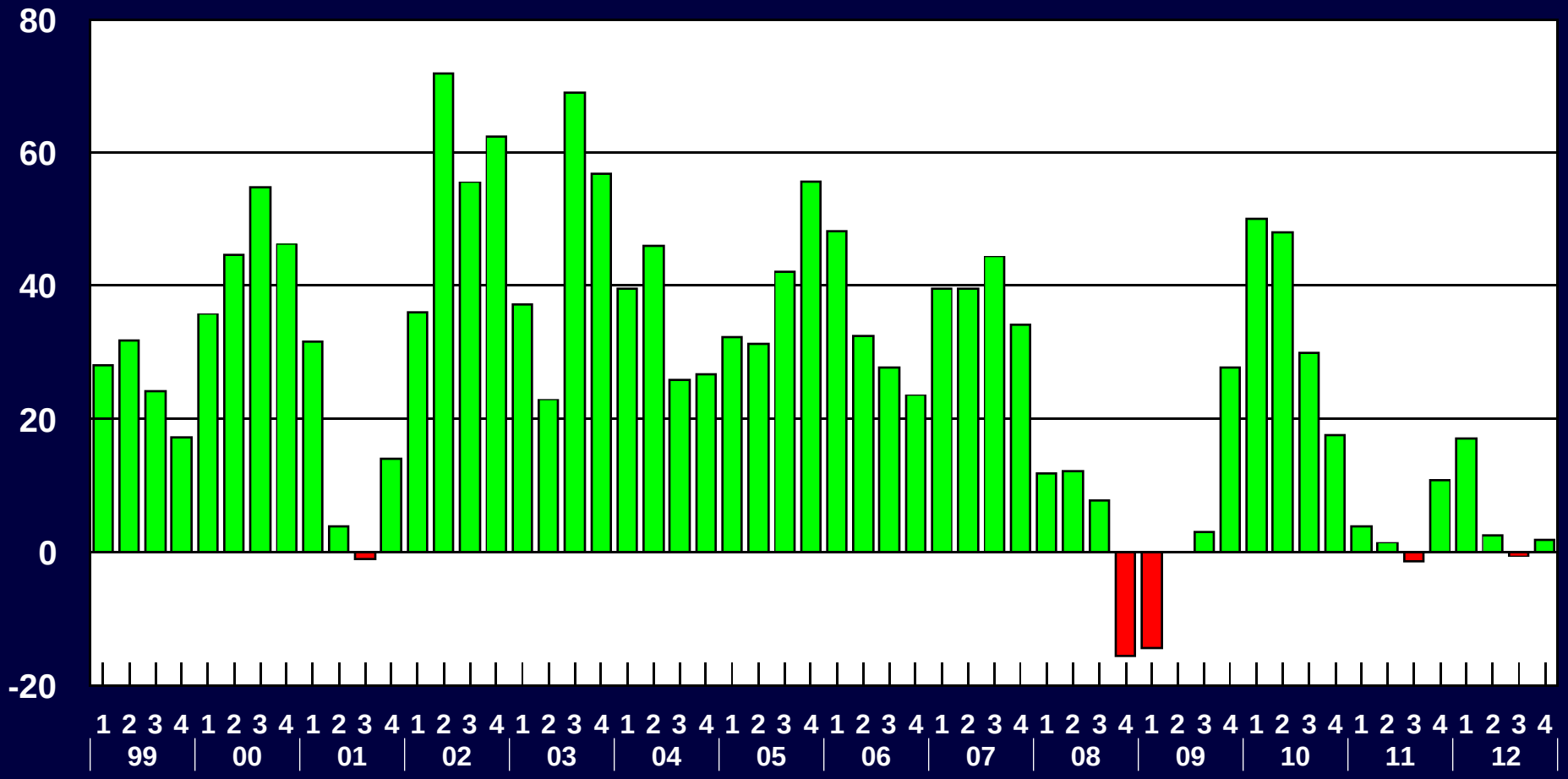
Large Taiwan ODM Providers

2012 vs. 2011 Sales ($M)

	2011	2012	2011/2010 Growth %
Foxconn (Hon Hai)	93,837	108,937	16%
Quanta Computer	35,884	32,659	-9%
Compal Electronics	21,976	29,562	-6%
Wistron	19,827	20,260	2%
Chimei Innolux	16,424	15,955	-3%
Asustek Computer	10,749	12,693	18%
Inventec	11,451	10,843	-5%
Lite On Technology	3,201	2,597	-19%
Mitac International	1,138	962	- 15%
Inventec Appliance	837	0	0%
Total	215,324	234,468	+ 9%

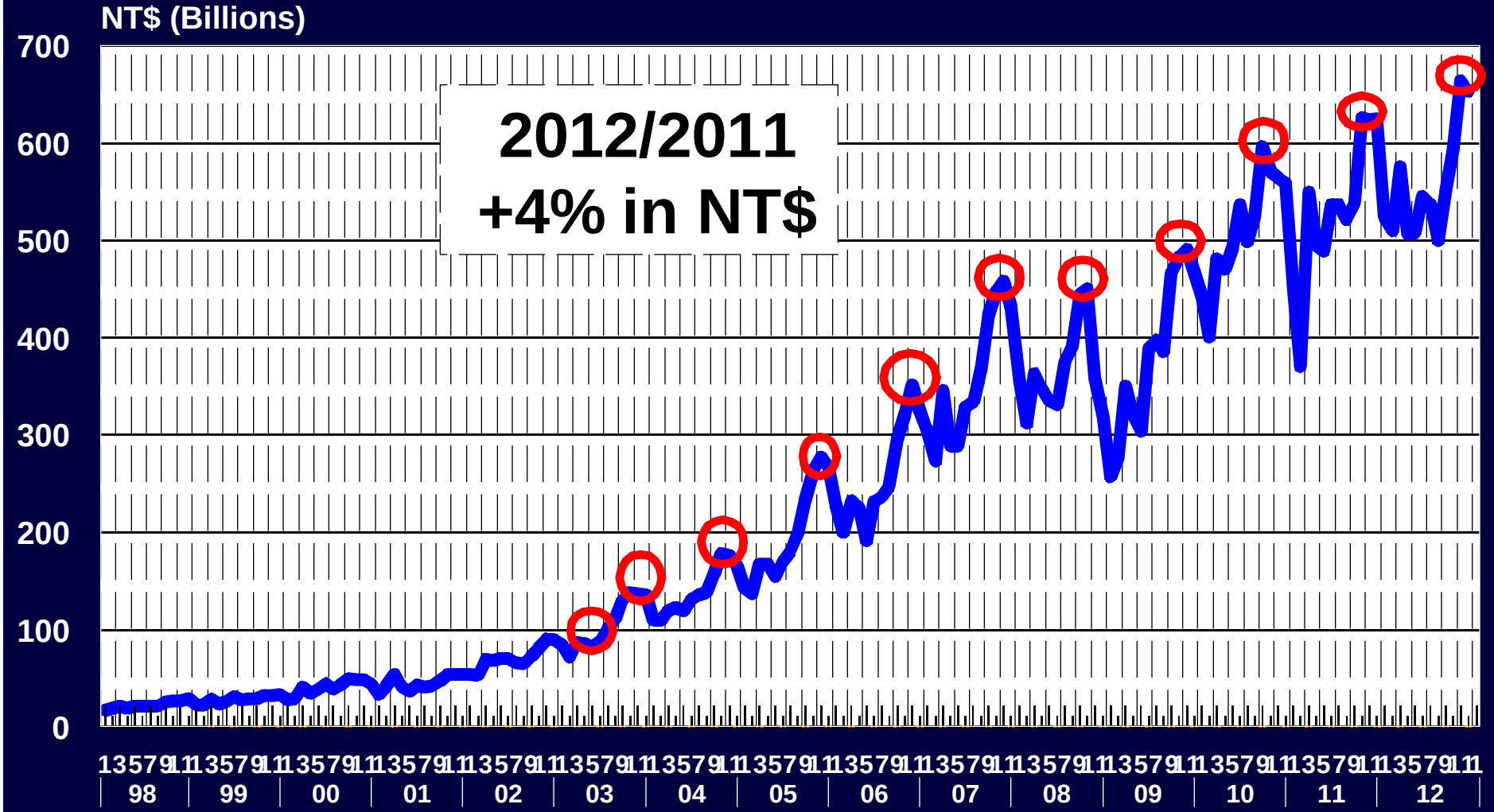
Source: Company data, NT$ converted at constant avg 2012 exchange (29.554 NT$ = 1US$)

Large ODM Companies
Composite of 10 Public Manufacturers
Quarterly Revenue Growth



Asustek Computer, Compal Electronics, Foxconn, Chimei Innolux, Inventec, Inventec Appliance, Lite On Technology, Mitac International, Quanta Computer, Wistron

Taiwan ODM Companies
Composite Sales of 10 Large Manufacturers



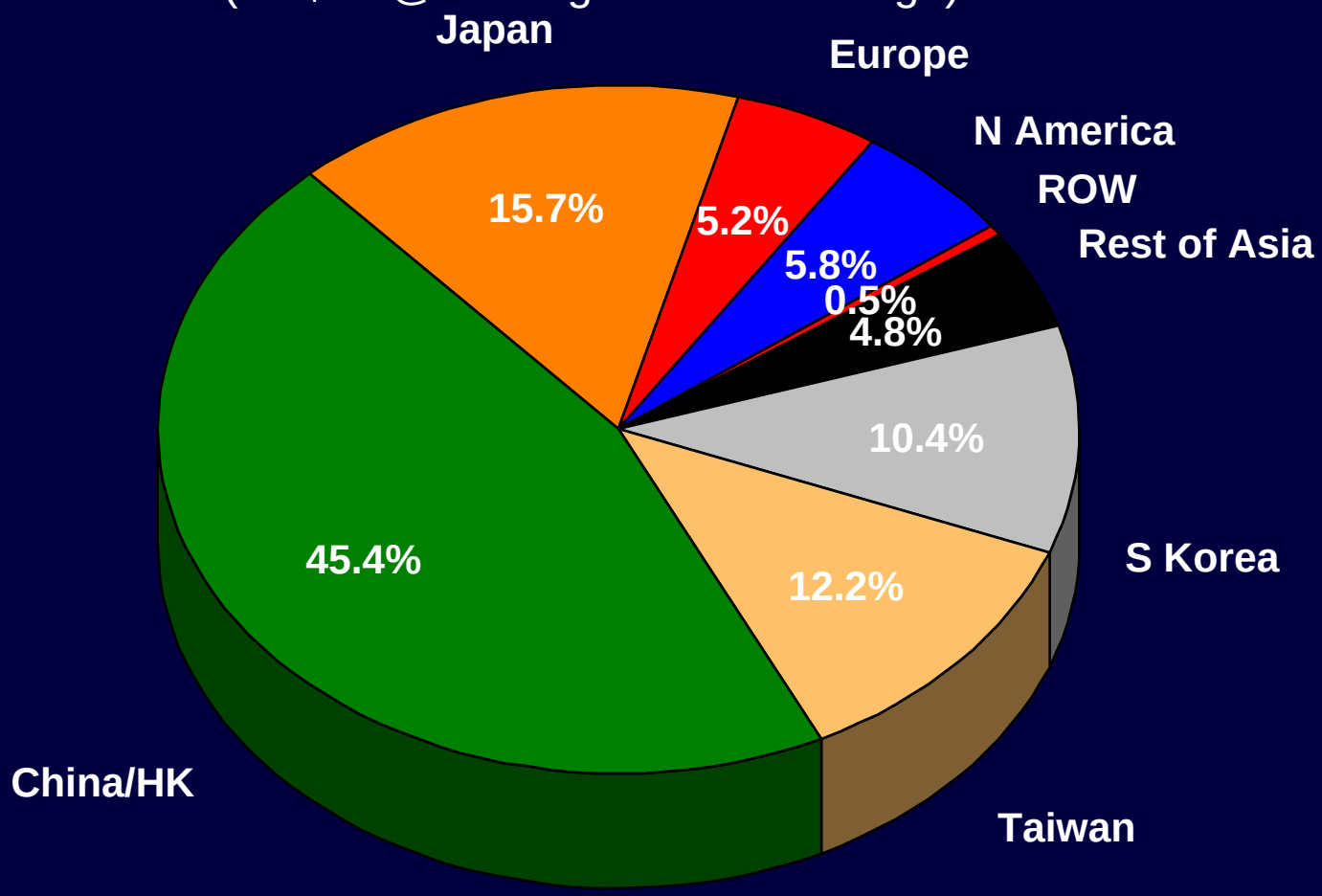
Company Financial Releases

Asustek Computer, Chei Mei, Compal Electronics, Foxconn, Chimei Innolux , Inventec, Inventec Appliance, Lite On Technology, Mitac International, Quanta Computer, Wistron, Chei Mei Display replacing Chei Mei & Innolux Display 3/10 & later

PCB Fabrication

2011 World Rigid PCB Production by Geographical Area

(US$ M @ Average 2011 Exchange)

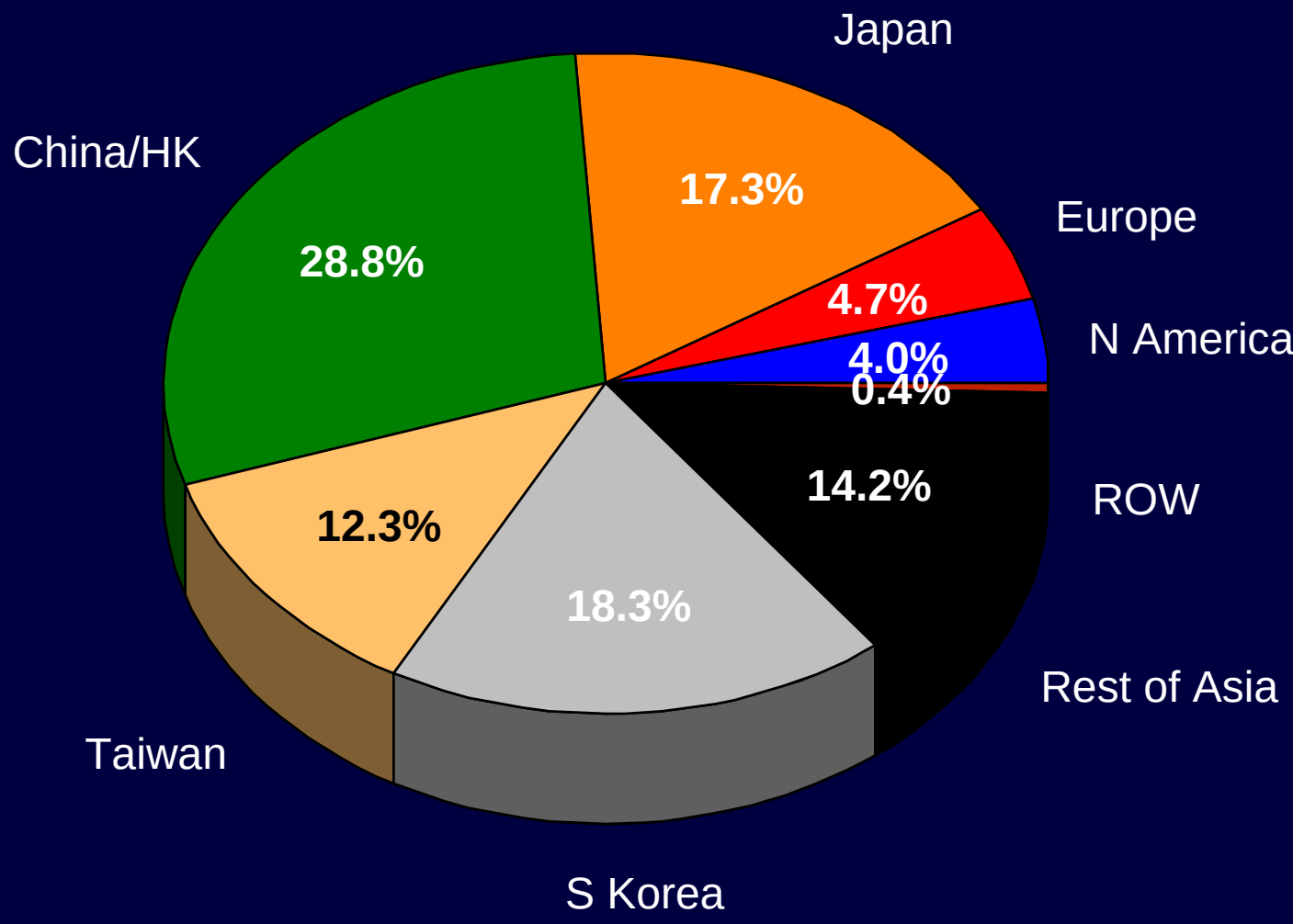


Total: $50.7 Billion

IPC 9/12

2011 World Flex & Rigid Flex PCB Production by Geographical Area

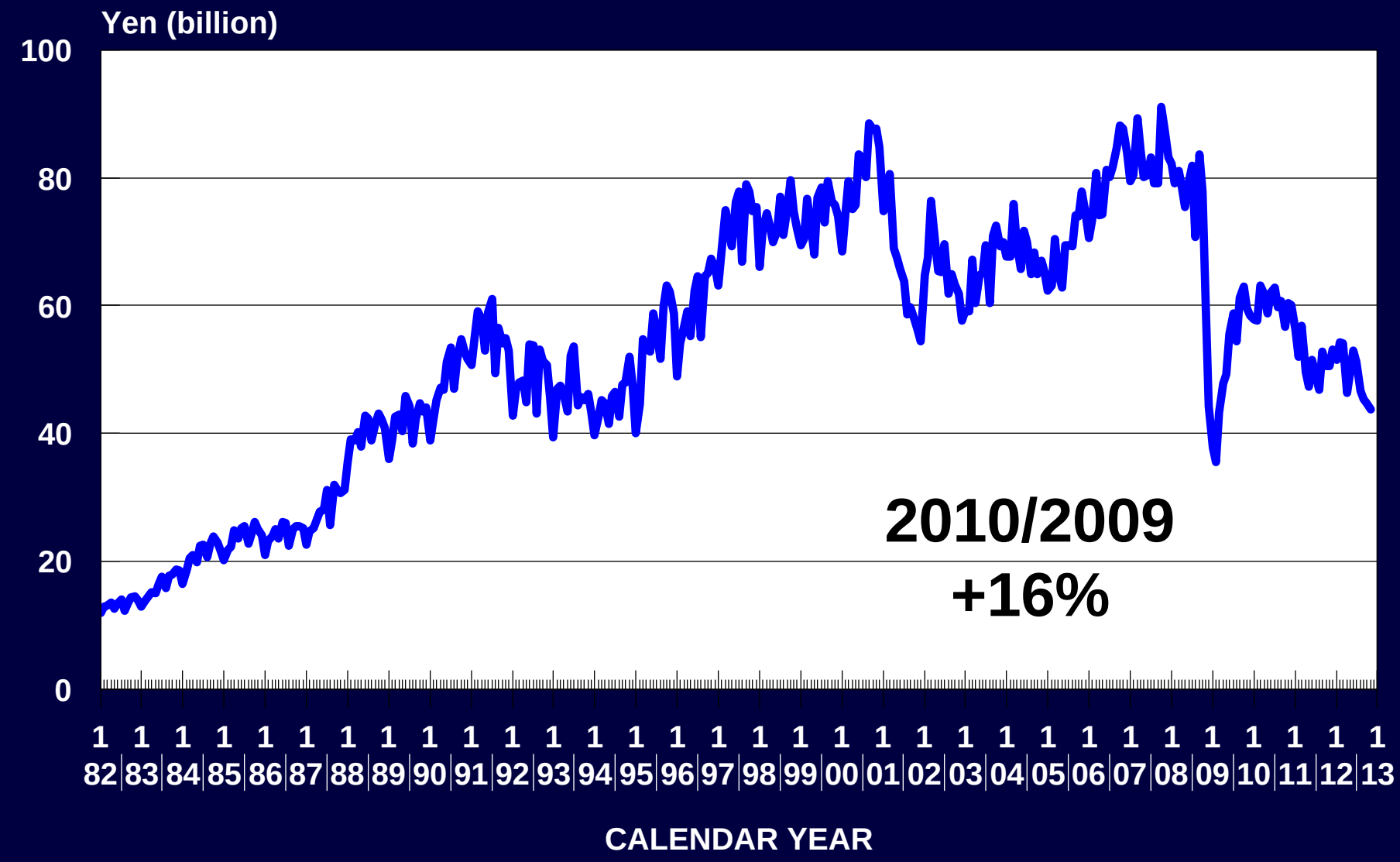
(US$ M @ Average 2011 Exchange)



Total: $8.5 Billion

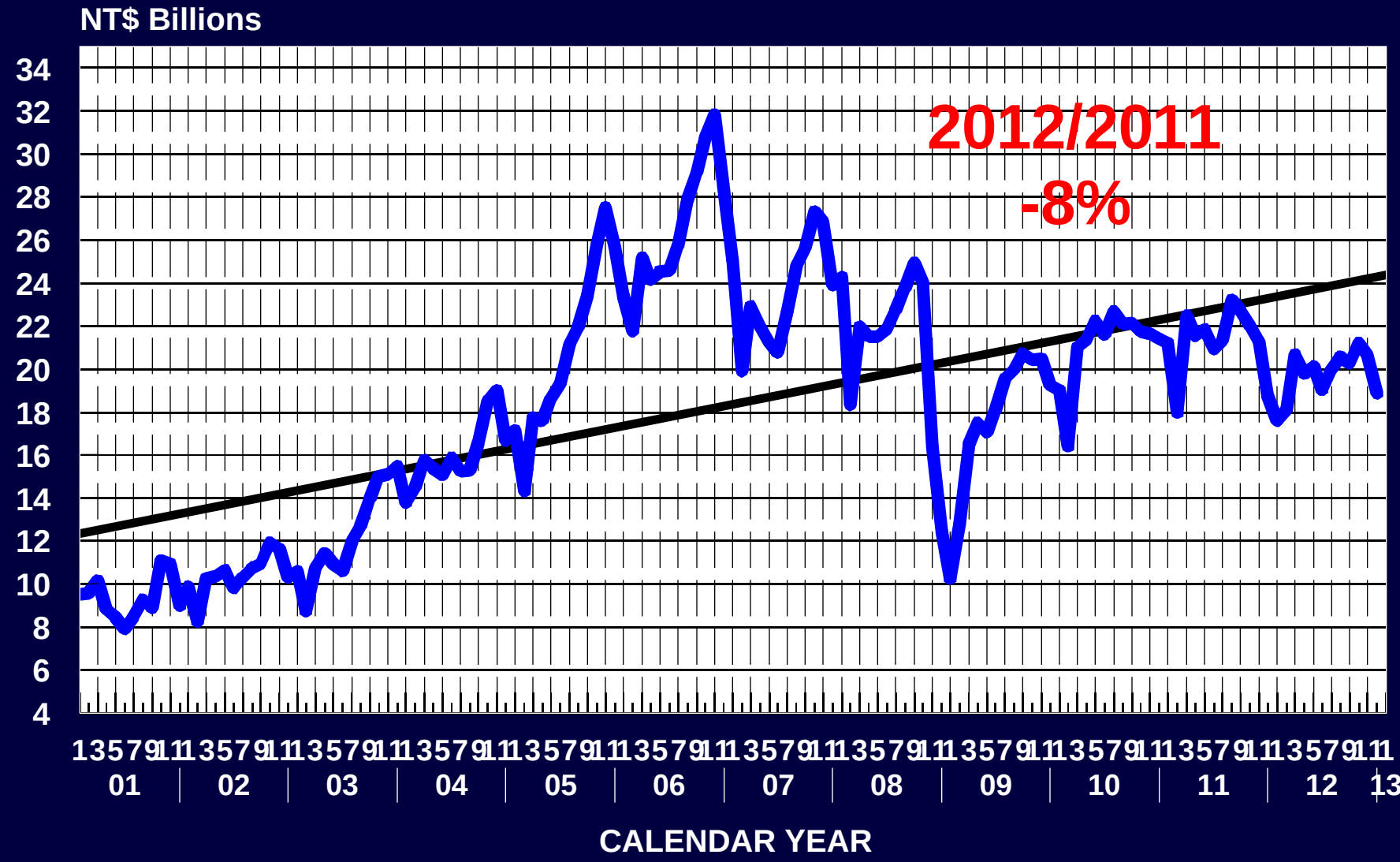
IPC 9/12

Japan PCB Shipments



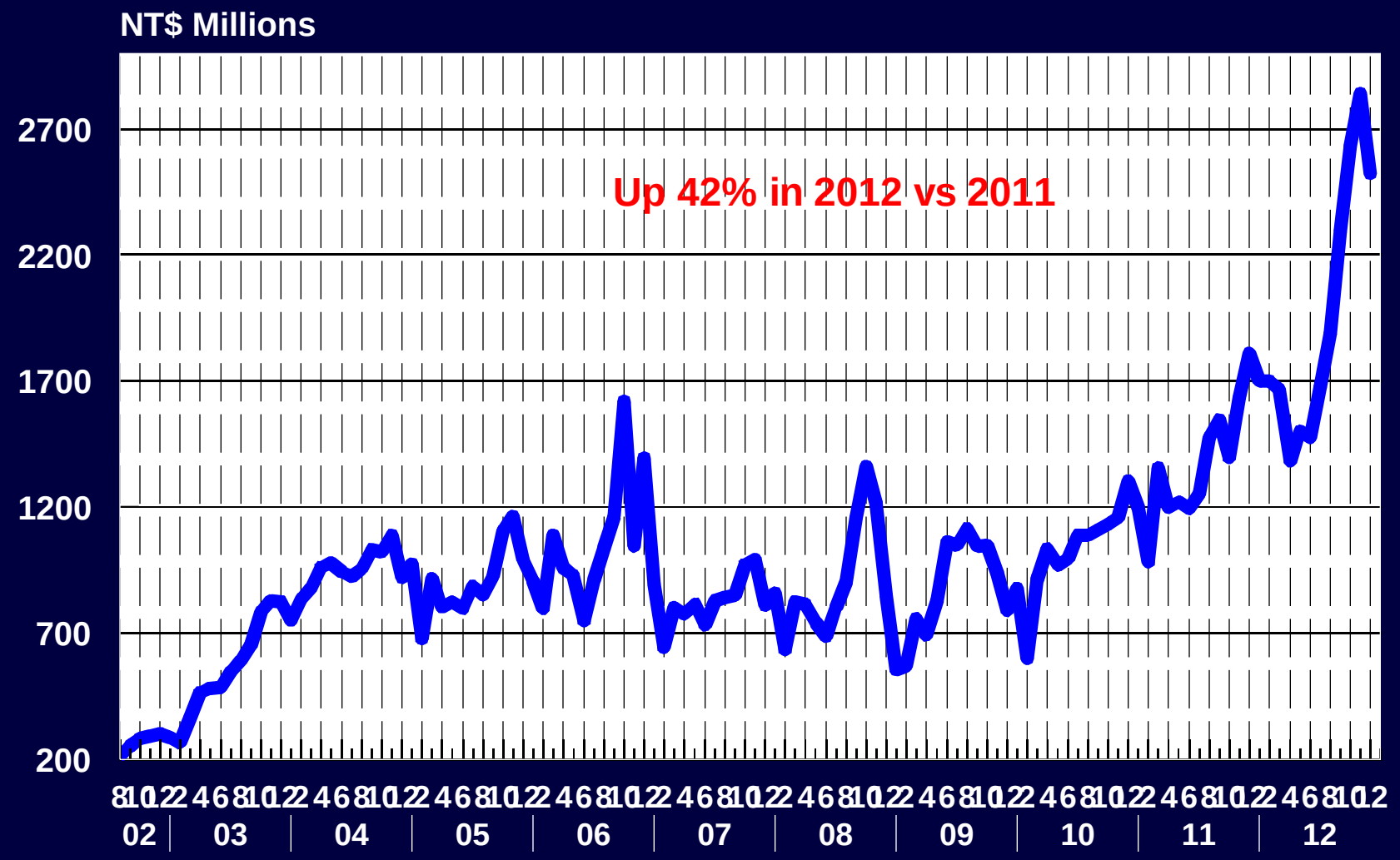
www.jpca.org/kikaitoukei/kikai2012.xls

Taiwan Rigid PCB Shipments
Composite of 42 Taiwan-listed Manufacturers



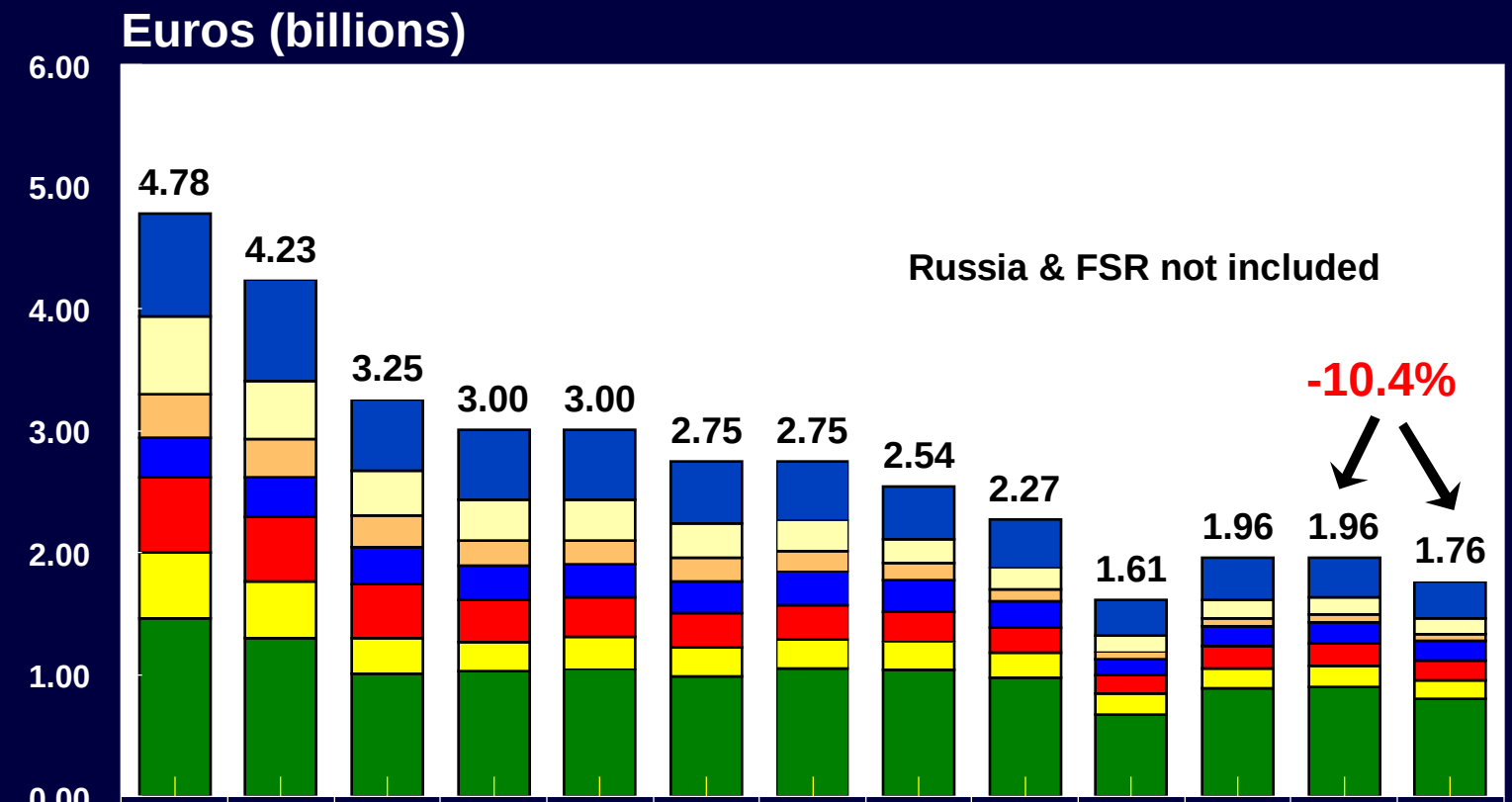
Company Financial Releases

Taiwan Flex Circuit Shipments
Composite of 3 Manufacturers



Company Financial Releases
Career Tech, Flexium Interconnect, Uniflex

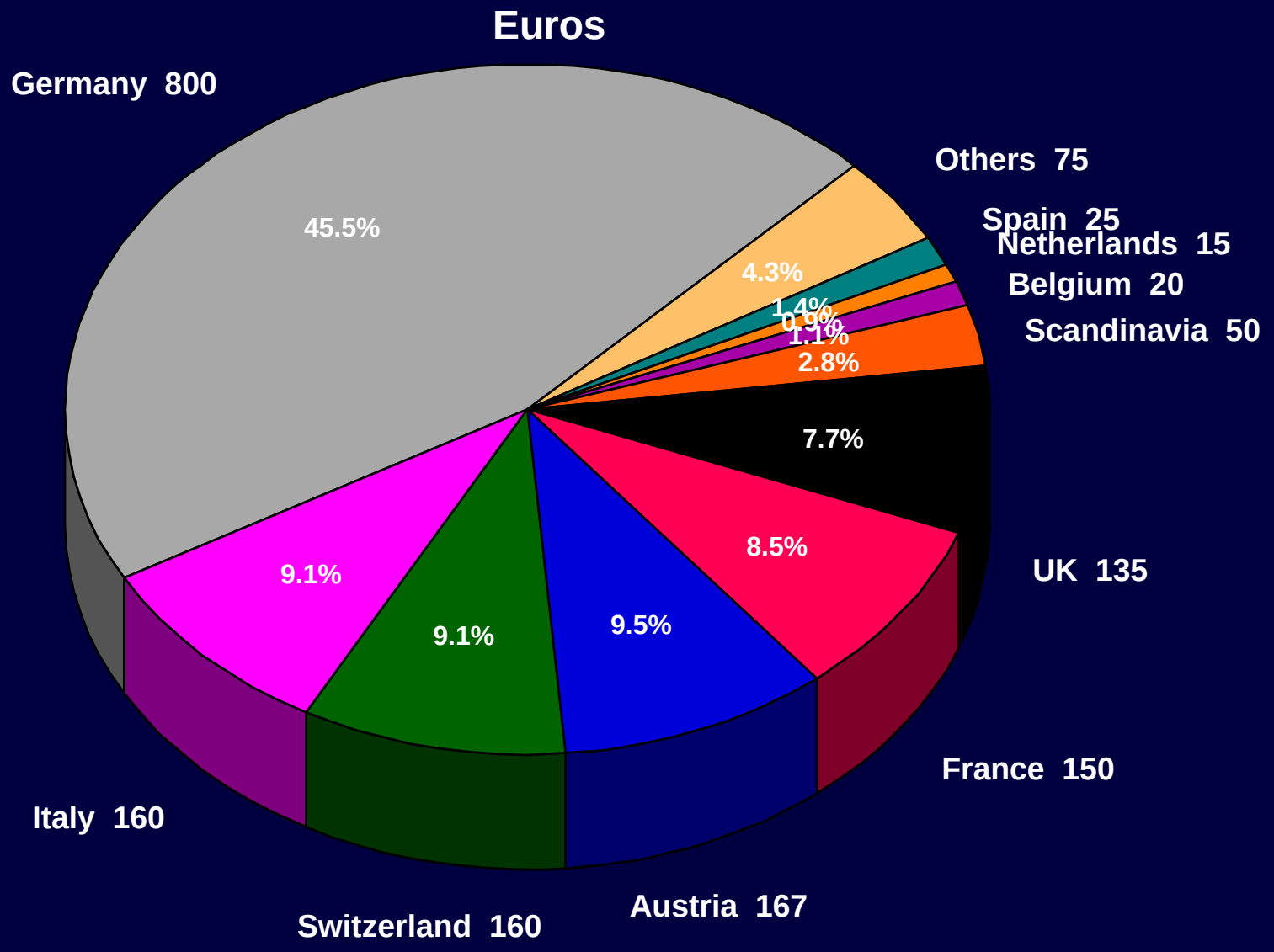
European PCB Production



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
OTHER	0.84	0.83	0.58	0.57	0.57	0.51	0.48	0.44	0.39	0.29	0.35	0.33	0.30
UK	0.64	0.48	0.37	0.34	0.33	0.28	0.25	0.20	0.18	0.14	0.15	0.14	0.14
Scandanavia	0.35	0.31	0.26	0.20	0.20	0.20	0.17	0.14	0.10	0.06	0.06	0.06	0.05
Austria	0.32	0.33	0.30	0.29	0.27	0.26	0.27	0.26	0.21	0.13	0.16	0.17	0.17
Italy	0.62	0.53	0.44	0.34	0.32	0.28	0.28	0.25	0.21	0.16	0.18	0.19	0.16
France	0.54	0.46	0.29	0.24	0.27	0.24	0.23	0.23	0.21	0.17	0.17	0.17	0.15
Germany	1.46	1.30	1.01	1.03	1.04	0.98	1.05	1.04	0.97	0.68	0.88	0.90	0.80

M Gasch 1/13

2012 European Rigid & Flex PCB Production

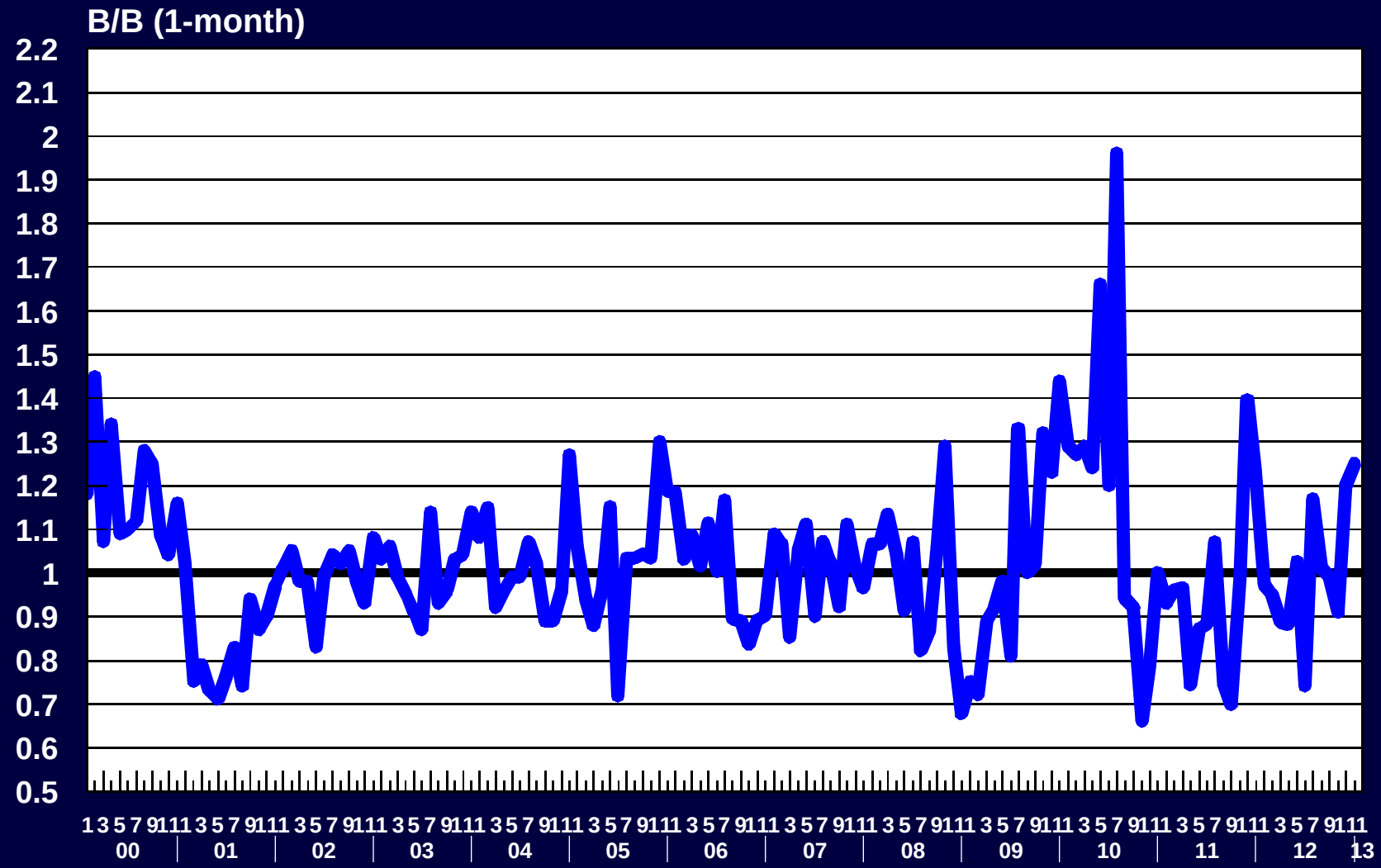


Total: Eur 1,757 Million

M Gasch 1/12

PCB Book/Bill - VdL/ZVEI

Primarily German PCB Makers


B/B (1-month)
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
1 3 5 7 9 11 1 3 5 7 9 11 1 3 5 7 9 11

European PCB Market Comments

Surprisingly good bookings in ZVEI-region in Nov & Dec, mainly due to the automotive industry. Automotive held orders back for a long time (or at least it didn't schedule bulk orders) but at year end it had to firm booking to cover the first half of 2013.

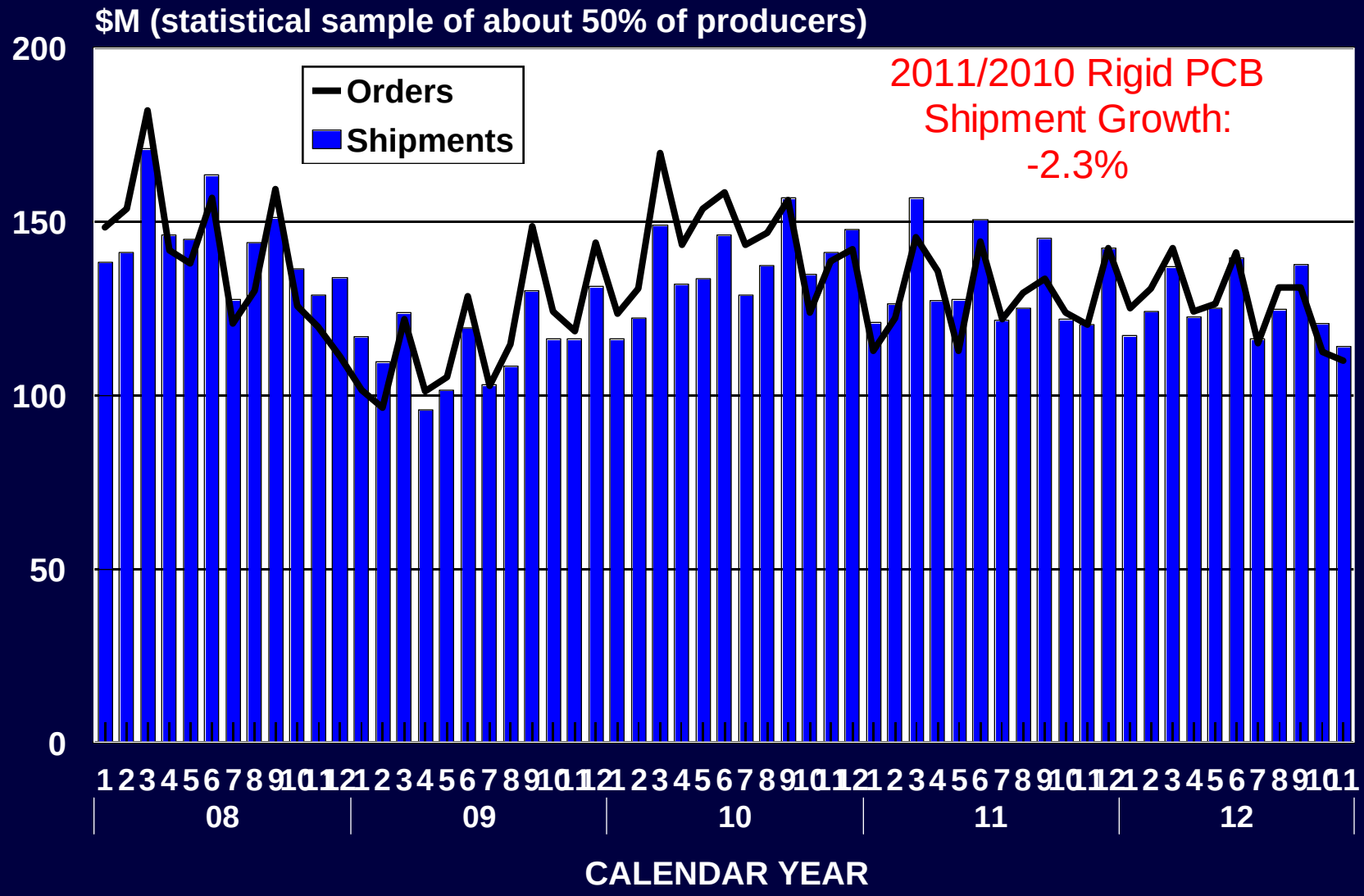
The Thailand floodings shifted PCB orders to Europe in 2011, but in 2012 these orders moved back. In addition the insecurity about the USA and European economies prompted companies to be more careful in their booking behaviour.

Much of the PV industry PCB purchases are gone from Europe.

The situation in January 2013 is a bit blurred. There were high B/B ratios in Nov & Dec but now it seems to be quiet. However some suppliers are quite busy; others are not.

Michael Gasch, Data4PCB 1/2013

N American Rigid PCB Shipments & Orders

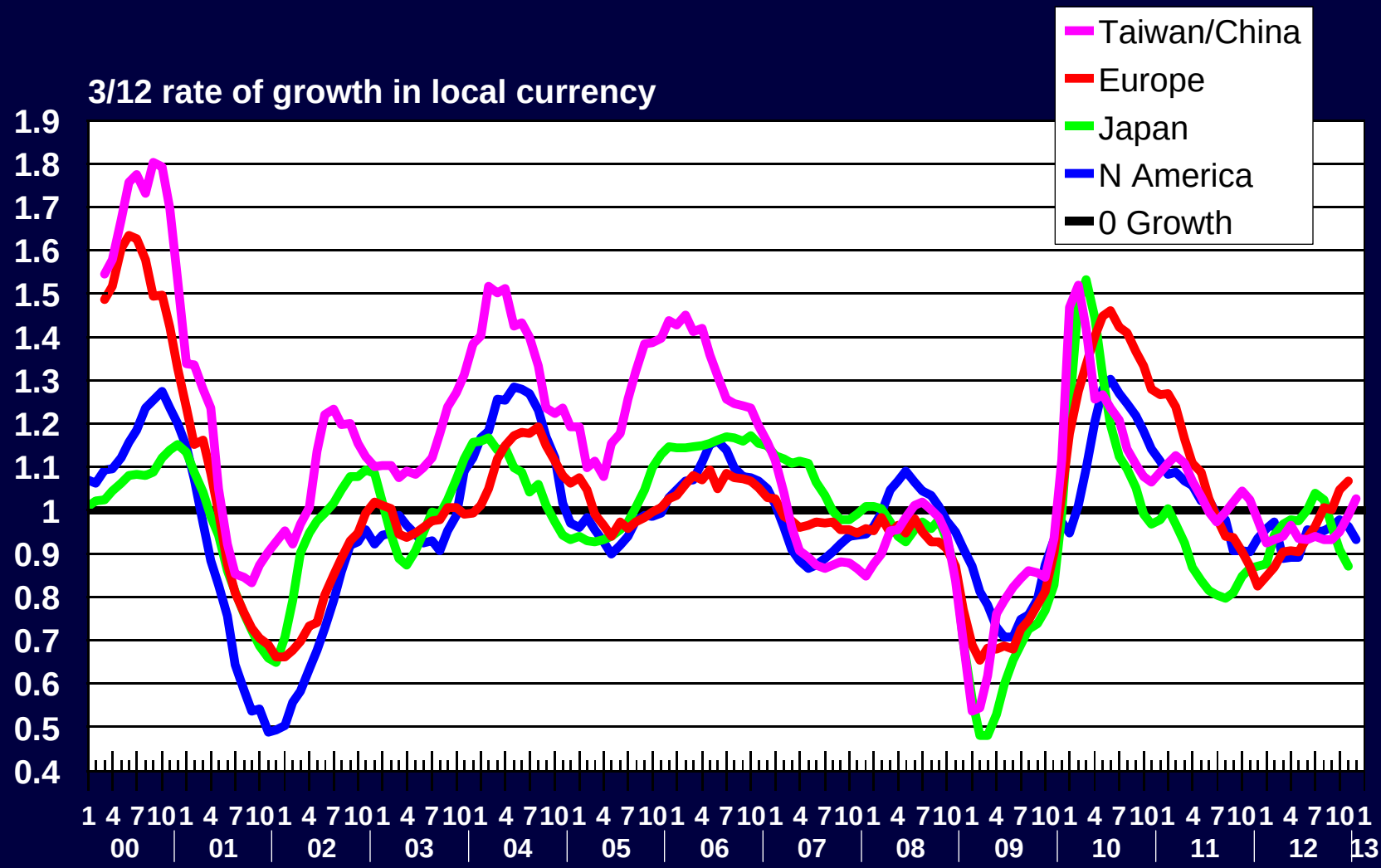


Note: IPC survey captures "market" not domestic production. About 15% of the above represents imported boards resold by N American PCB producers in survey.

IPC

World PCB Model

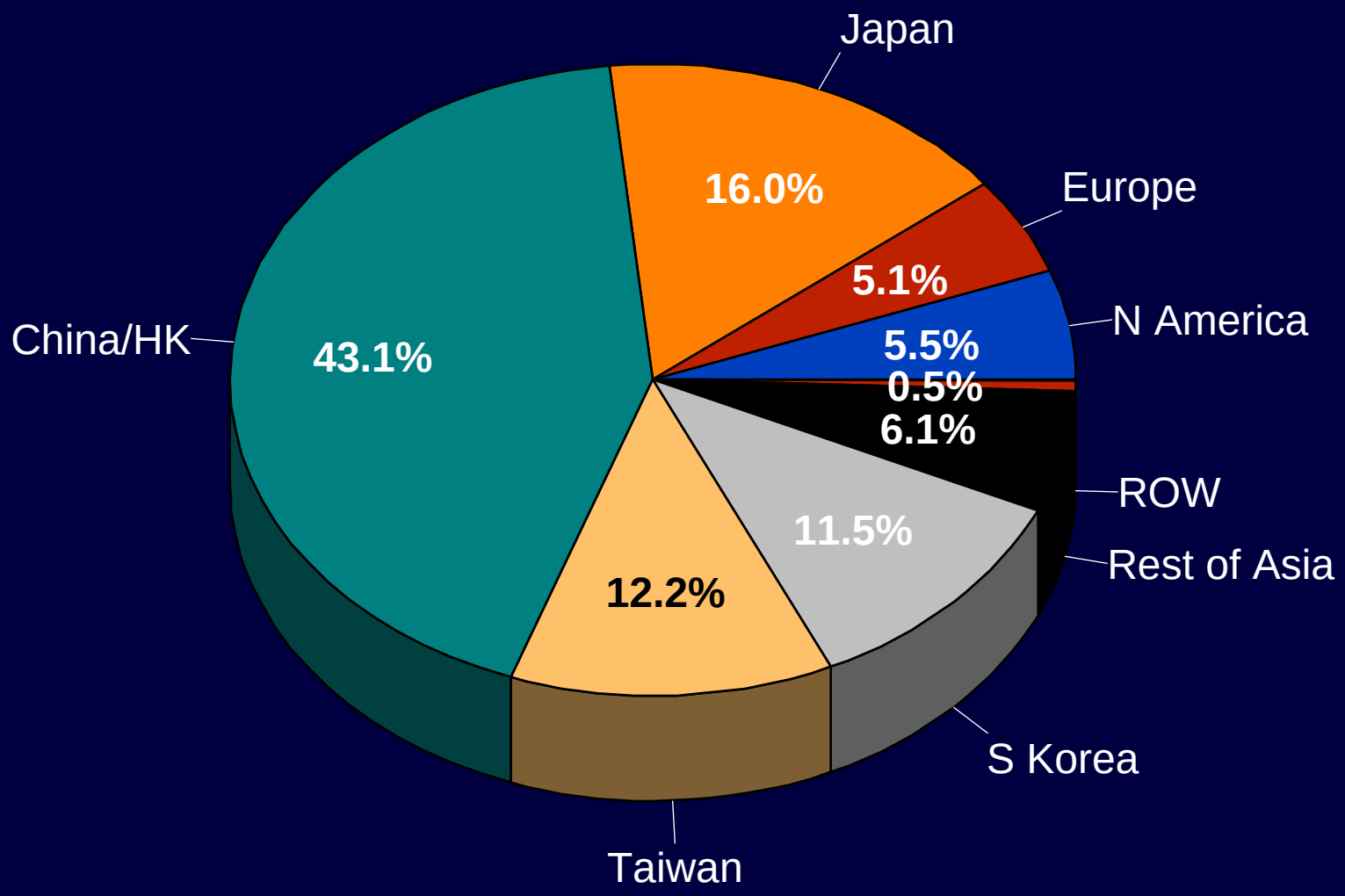
Regional PCB Shipment Growth



Sources: IPC, JPCA, Taiwan/China composite; modified SIA chip shipments to approximate Europe

2011 World Rigid & Flex PCB Production by Geographical Area

(US$ M @ Average 2011 Exchange)

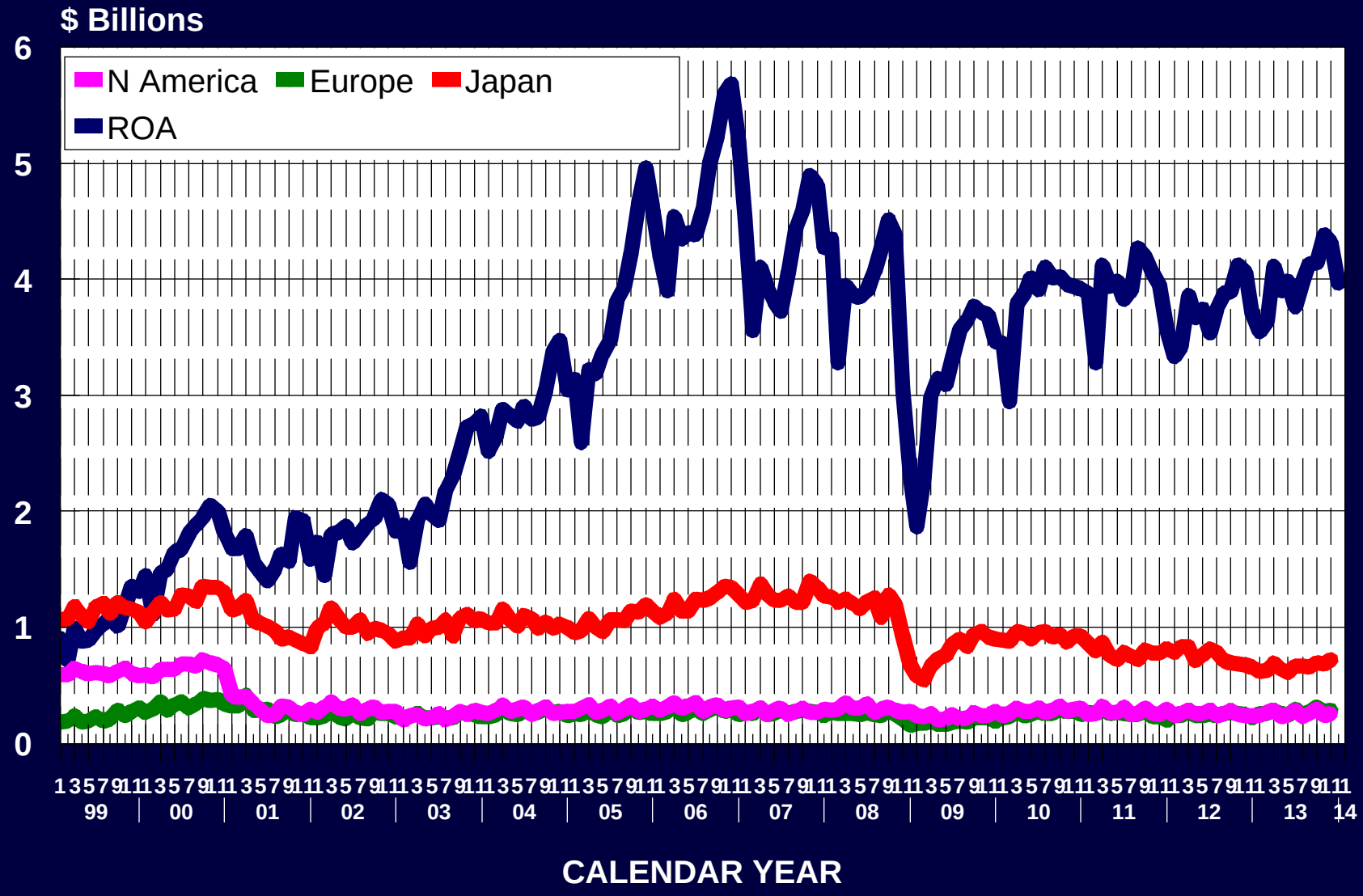


Total: $59.1 Billion

IPC 9/2012

World PCB Monthly Shipments (with forecast)

Converted @ Constant 2011 Exchange Rates

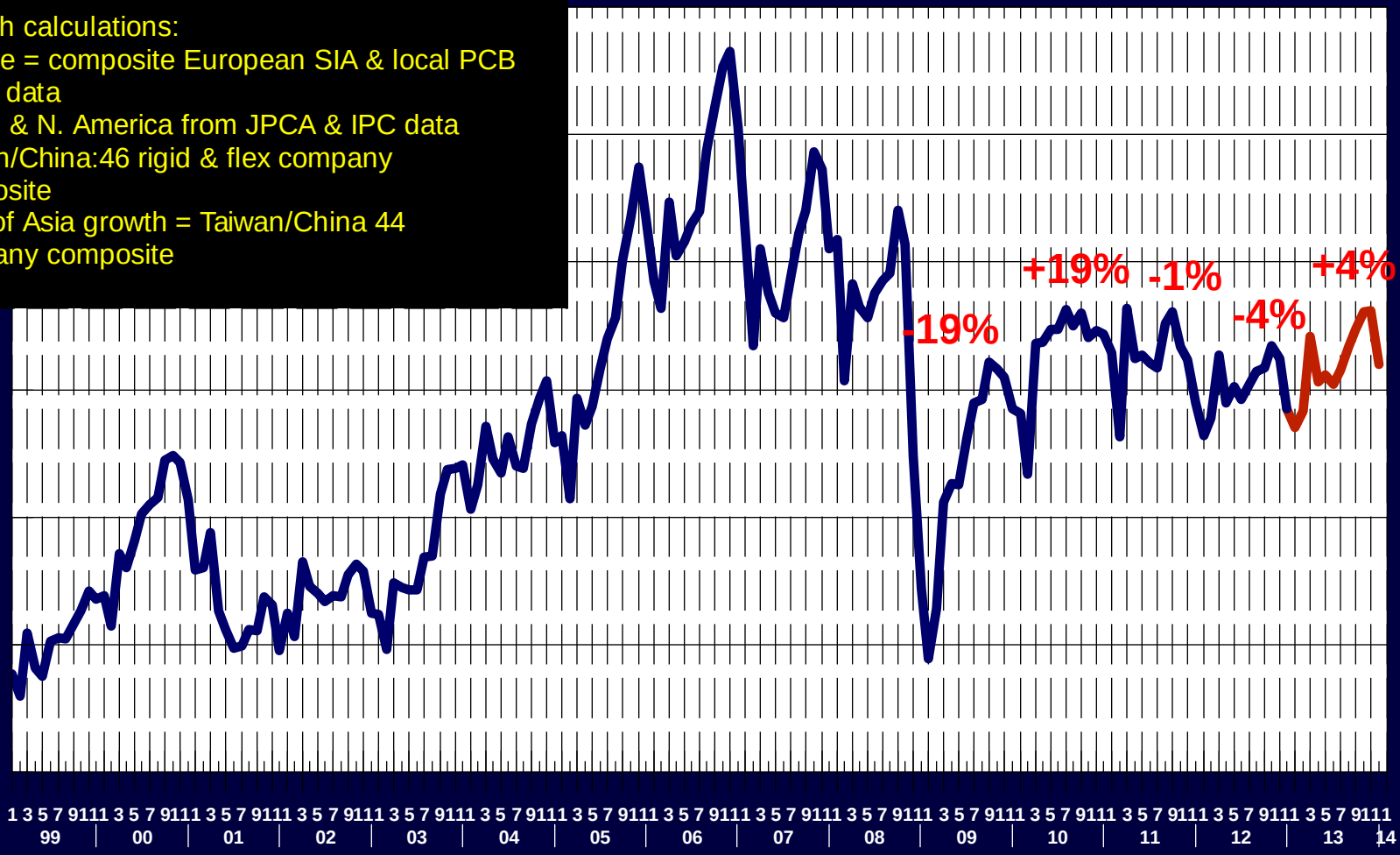


Source: Custer Consulting Group

World PCB Shipments (with forecast)
converted at constant 2011 exchange rates

$ Billion

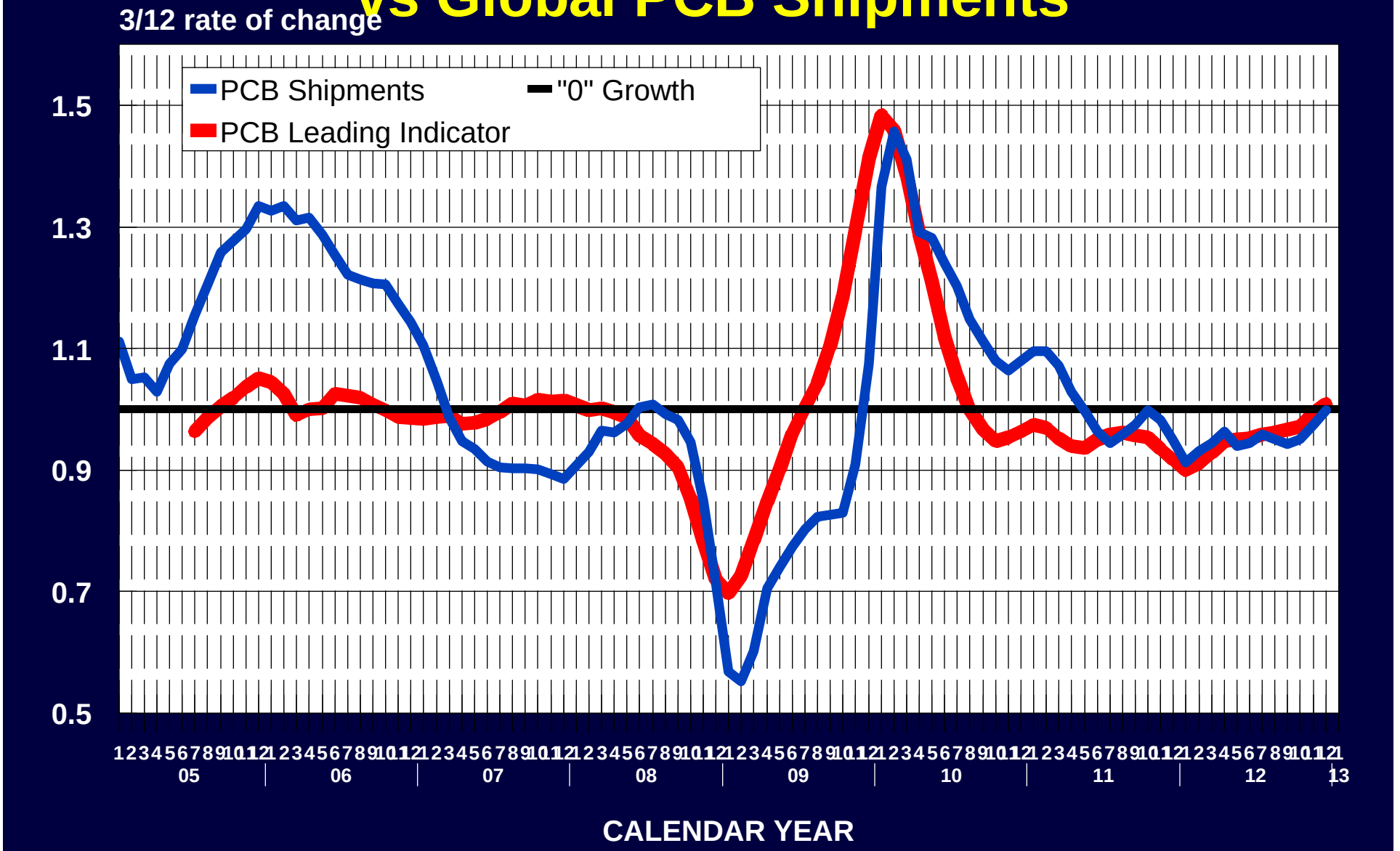
Growth calculations:
Europe = composite European SIA & local PCB assoc data
Japan & N. America from JPCA & IPC data
Taiwan/China:46 rigid & flex company composite
Rest of Asia growth = Taiwan/China 44 company composite



CALENDAR YEAR

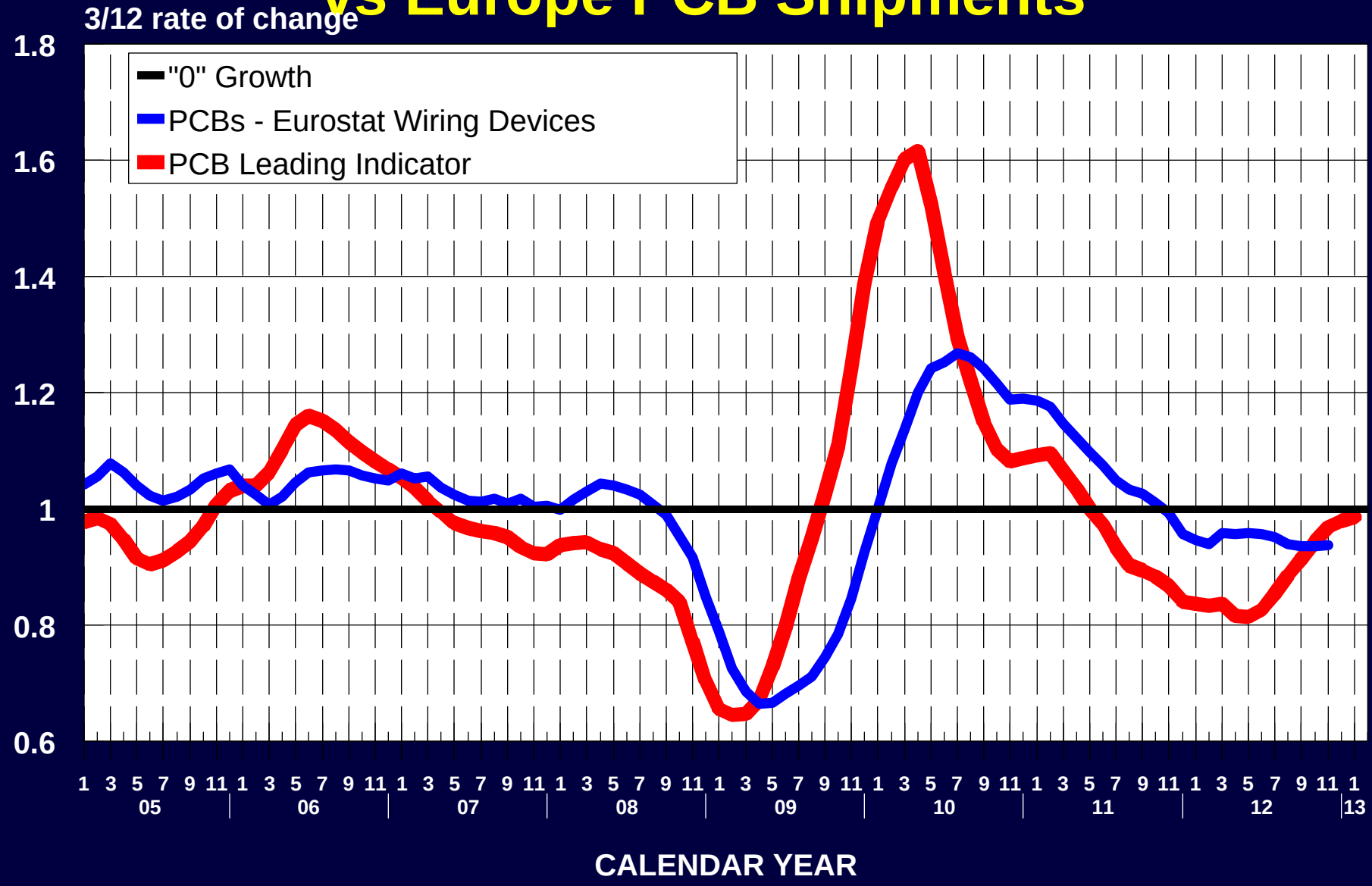
Source: Custer Consulting Group - 2010 base year expanded by monthly growth of N. American, European, Japanese & Taiwan/China monthly PCB shipments

CCG Global PCB Leading Indicator vs Global PCB Shipments



Source: Custer Consulting Group

Europe PMI Leading Indicator vs Europe PCB Shipments



Source: Custer Consulting Group

Forecasts

GDP Growth

Constant $ Growth Rates Converted @ Constant Exchange Rates

	2011	2012	2013	2014	2015
World	3.0	2.4	2.6	3.6	4.0
USA	1.8	2.3	2.0	3.0	3.4
EU	1.6	-0.3	0.3	0.9	1.6
Japan	-0.7	2.1	0.4	2.0	2.4
Four Tigers	3.9	1.7	2.3	3.8	4.7
China	9.2	7.6	7.8	8.2	8.4

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www.hendersonventures.com

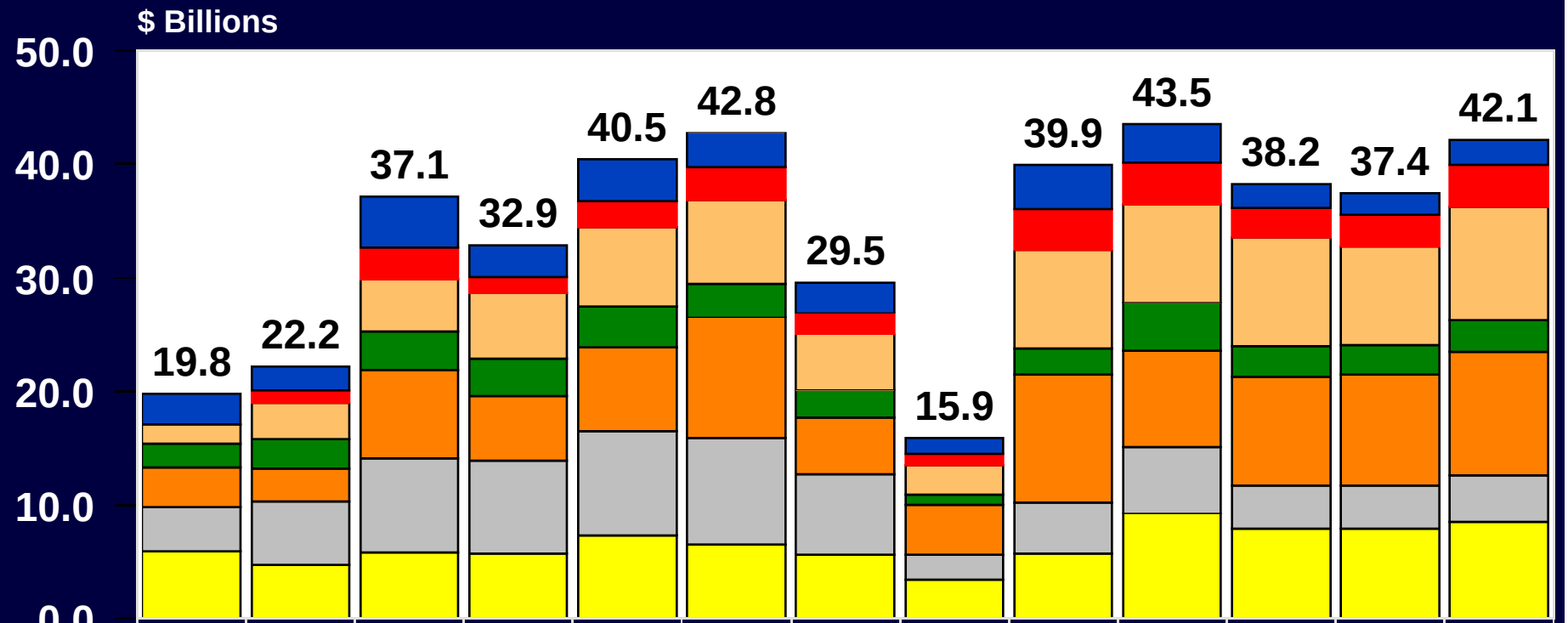
Electronic Equipment Production Growth

Current $ Growth Rates Converted @ Constant Exchange Rates

	2011	2012	2013	2014	2015
World	3.9	-0.9	4.3	5.9	7.0
USA	-0.4	-3.9	1.8	3.0	5.7
W Europe	2.0	-2.9	0.6	2.4	3.6
Japan	-13.6	-12.3	-3.7	2.4	3.0
Four Tigers	5.2	0.6	4.7	6.3	6.8
China	10.8	1.4	5.8	7.1	8.3

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www.hendersonventures.com

Worldwide Semiconductor Capital Equipment Market by Geography (with forecast)

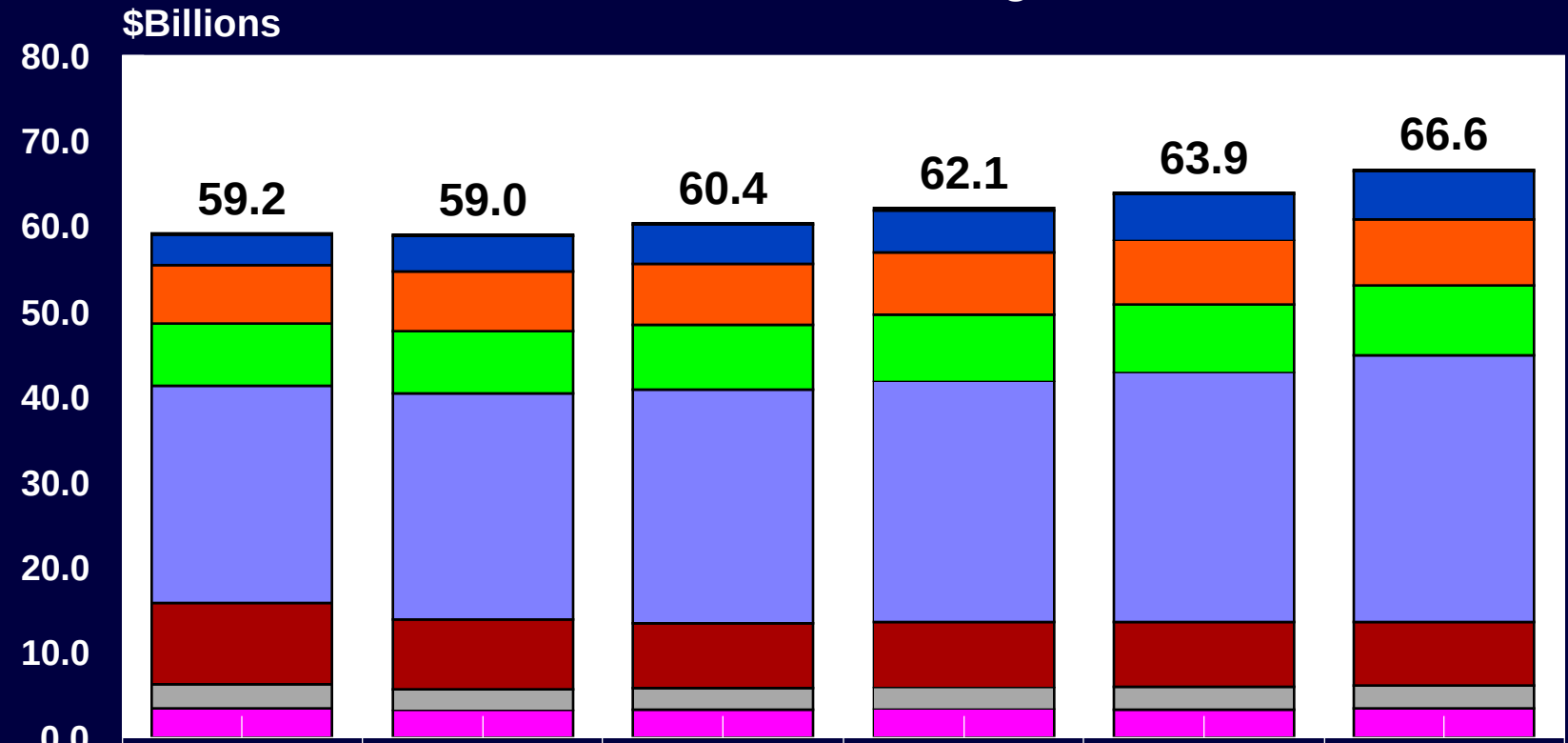


	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
ROW	2.7	2.1	4.5	2.9	3.7	3.1	2.6	1.4	3.8	3.4	2.1	1.9	2.2
China		1.2	2.7	1.3	2.3	2.9	1.9	0.9	3.7	3.7	2.6	2.9	3.7
S Korea	1.7	3.2	4.6	5.8	7.0	7.4	4.9	2.6	8.6	8.7	9.6	8.6	10.0
Europe	2.1	2.6	3.4	3.3	3.6	2.9	2.5	1.0	2.3	4.2	2.7	2.6	2.8
Taiwan	3.5	2.9	7.8	5.7	7.3	10.7	5.0	4.4	11.3	8.5	9.6	9.8	10.9
Japan	3.9	5.6	8.3	8.2	9.2	9.3	7.0	2.2	4.4	5.8	3.7	3.8	4.0
N America	5.9	4.7	5.8	5.7	7.3	6.6	5.6	3.4	5.8	9.3	8.0	7.9	8.6

SEMI 12/2012 (and prior reports)

World PCB Production

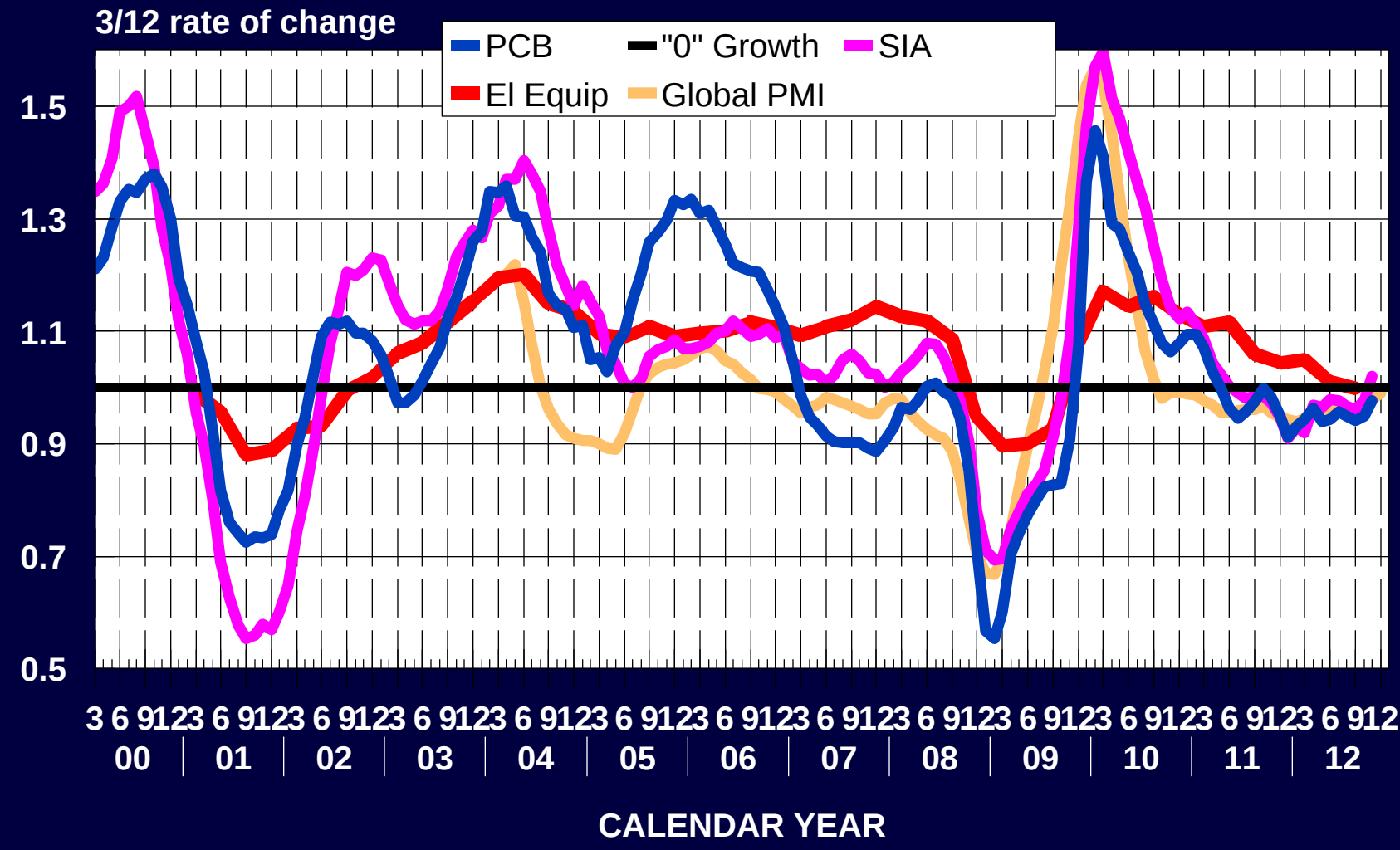
Converted @ 2012 Exchange Rates



	2011	2012	2013	2014	2015	2016
ROW	0.2	0.2	0.2	0.2	0.3	0.3
Rest of Asia	3.6	4.2	4.6	5.0	5.4	5.6
S. Korea	6.8	7.0	7.2	7.2	7.5	7.8
Taiwan	7.3	7.3	7.6	7.8	8.0	8.1
China	25.5	26.5	27.4	28.2	29.3	31.3
Japan	9.4	8.2	7.6	7.7	7.6	7.5
Europe	3.0	2.4	2.5	2.5	2.6	2.7
Americas	3.4	3.2	3.3	3.4	3.4	3.4

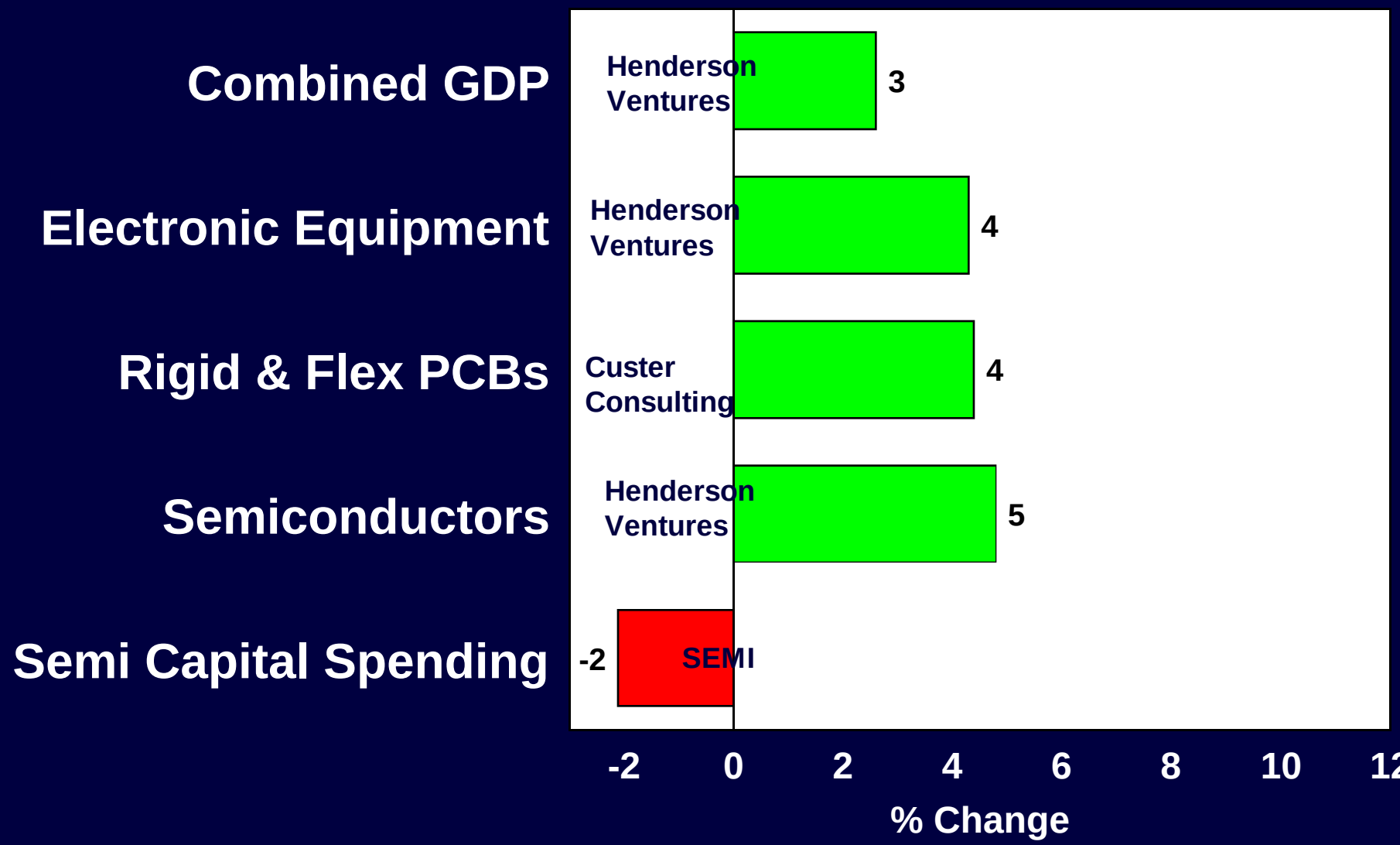
NT Information Ltd 1/13

Global PMI, Electronic Equipment, PCB & Semiconductor Shipments

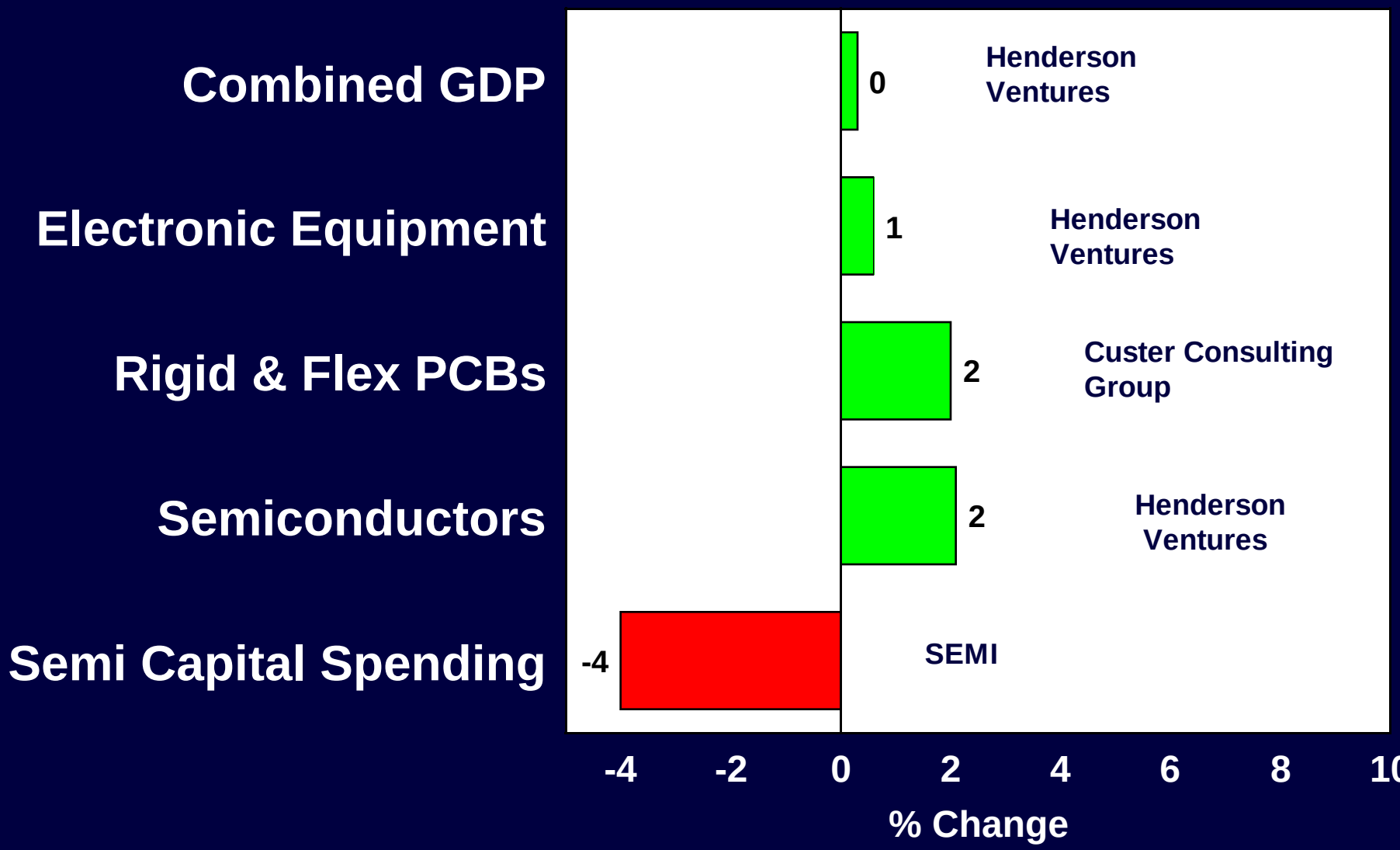


Source: Custer Consulting Group

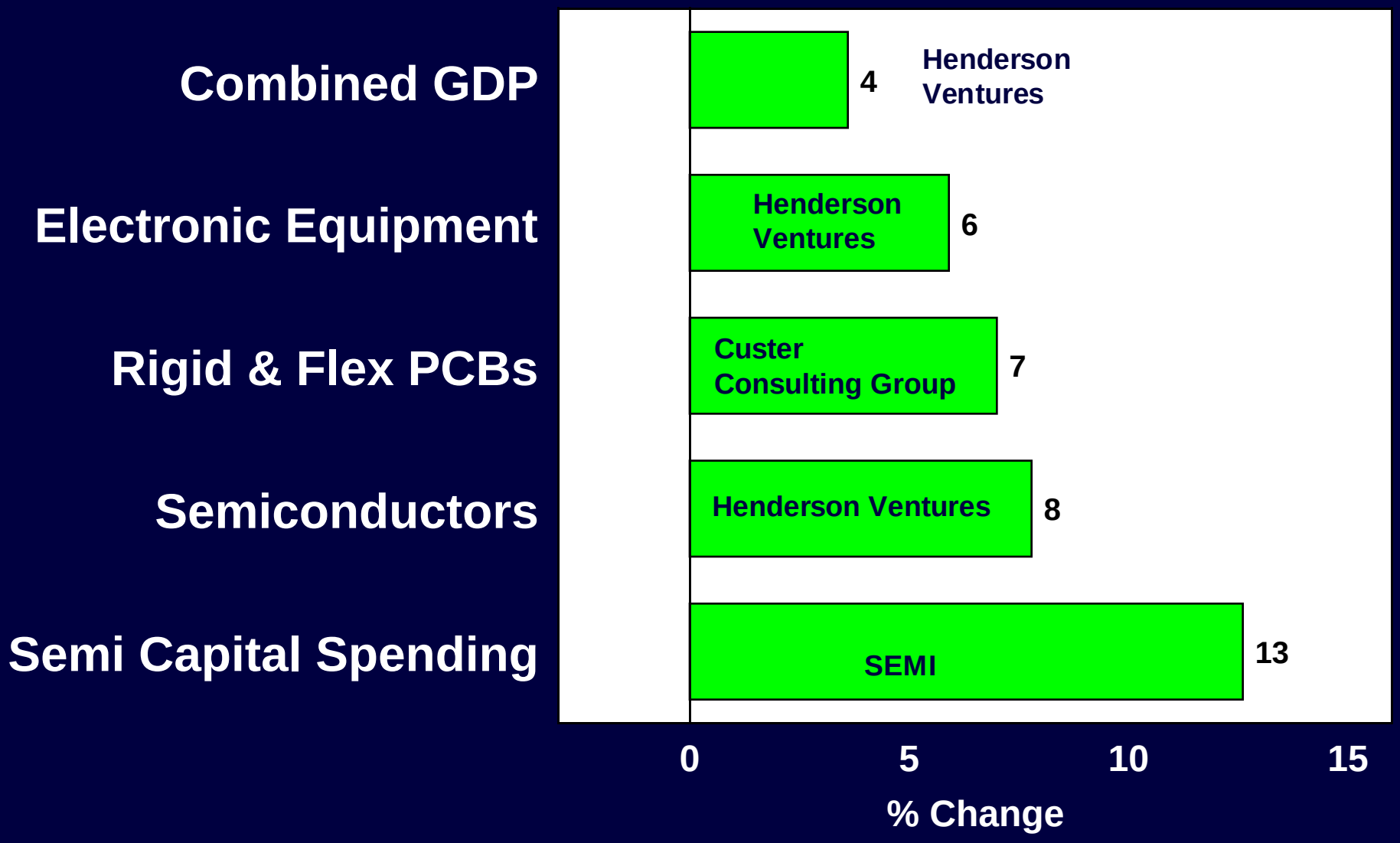
Global Electronic Supply Chain Forecast 2013 vs 2012



European Electronic Supply Chain Forecast 2013 vs 2012



Global Electronic Supply Chain Forecast 2014 vs 2013



Conclusions

Weak (but improving) global business conditions

USA has signs of recovery; SE Asia growing modestly; Japan still in trouble

Europe is still struggling but leading indicators are improving & Index of Executive and Consumer Sentiment is at 7 month high.

Leading indicators for many countries point to growth. They are useful for tracking the recovery regionally. PCB Capital equipment tracks SEMI capital equipment & lags PCBs by 6 months.

For Europe the short term forecast appears to be stability at current levels.

How to Use this Information at Your Company

Methodology

Assemble historical monthly data on key product lines

Identify coincident & leading indicators

Compare your company to:
- EMS, ODM & Process Equipment Composites
- Semiconductor shipments by geography
- Electronic equipment & PCB growth by region
- Your competitors & sector composites
- Other series that may apply

Use leading indicators to predict your companies future sales

Custer Consulting Group Products

Daily News Services (6 days/week)
- **Global electronics supply chain**
- **Solar/Photovoltaic supply chain**

Business Outlook
- **Market charts & data**
  - **Global market**
  - **OEMs**
  - **Components, EMS, ODM, materials & process equip**
  - **Solar/Photovoltaic**
- **Weekly Market Comments with latest charts**