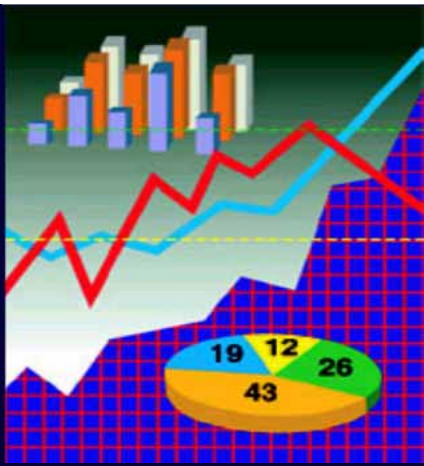


Business Outlook

Global Electronics Industry

(with emphasis on Europe)

Custer Consulting Group
www.custerconsulting.com

November 2016

Business Conditions

2016 Situation

Many global electronic equipment volume markets (except automotive) are stagnant; emerging new volume products are not yet large.

Europe is dependent on industrial, automotive, mil/aero & medical.

China has been in turmoil but is now recovering. However its normal seasonal pre holiday upturn is ending.

The U.S. presidential election outcome was quite unexpected. Major changes in foreign and domestic policy are likely.

Europe is again expanding but Brexit, a fragile banking situation, political unrest, immigration issues & terrorist threats are all issues.

20161113

Industrial Production – World

% Change vs. One Year Earlier

Britain	+ 0.3 Sep
Czech Republic	+ 2.7 Sep
France	+ 0.5 Aug
Germany	+ 1.3 Sep
Italy	+ 4.1 Aug
Netherlands	+ 2.4 Sep
Russia	- 0.8 Sep
Spain	+ 1.2 Sep
Euro Area	+ 1.8 Aug
Canada	- 0.1 Aug
USA	- 1.0 Sep
China	+ 6.1 Sep
India	- 0.7 Aug
Malaysia	+4.9 Aug
Vietnam	+ 7.0 Oct
Singapore	+ 6.7 Sep
S Korea	- 2.0 Sep
Taiwan	+ 5.0 Sep
Thailand	+ 0.6 Sep
Japan	+ 0.9 Sep

www.economist.com + Eurostat

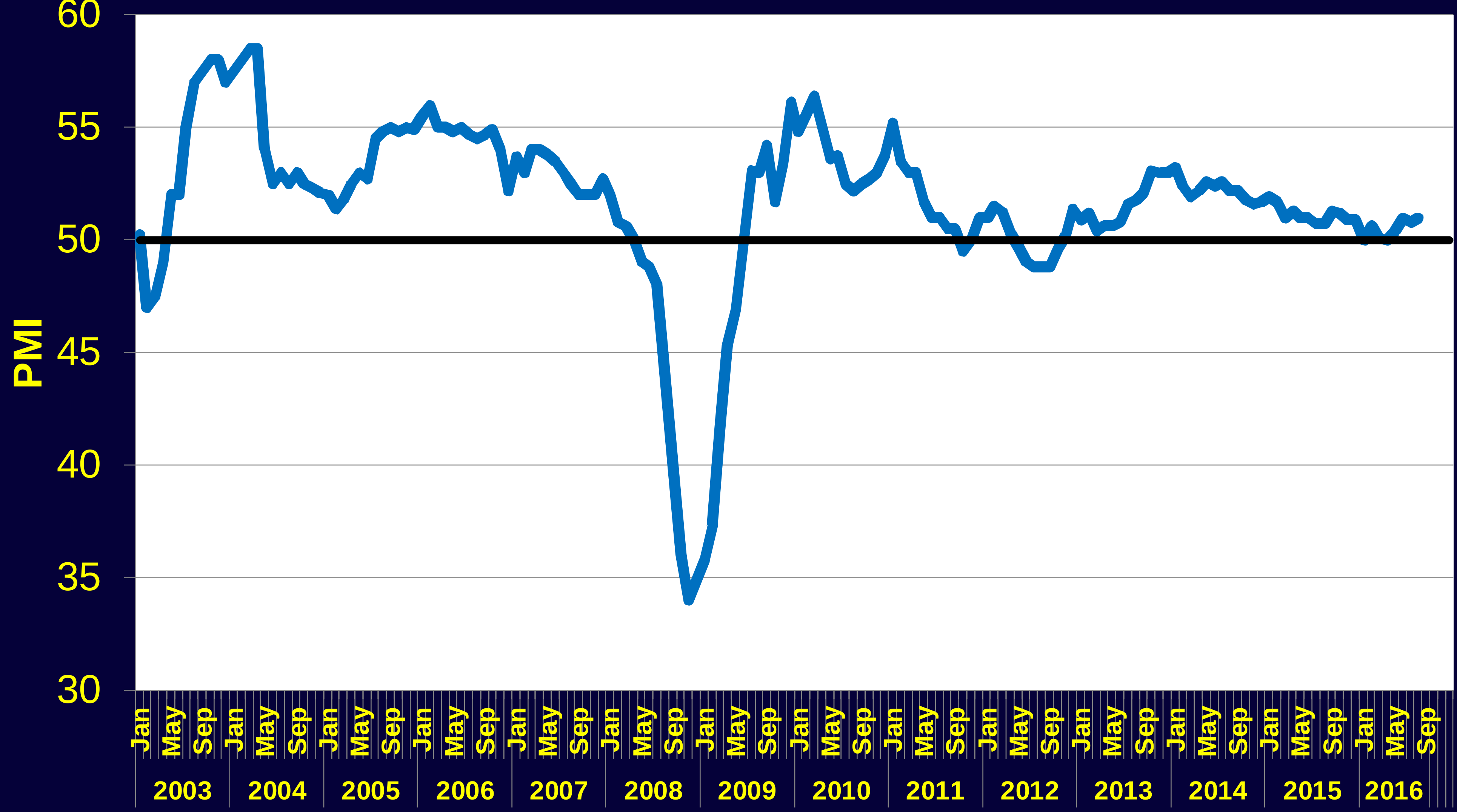
Purchasing Managers Indices

timely measure of manufacturing growth by country

20161102

Global "Purchasing Managers" Index

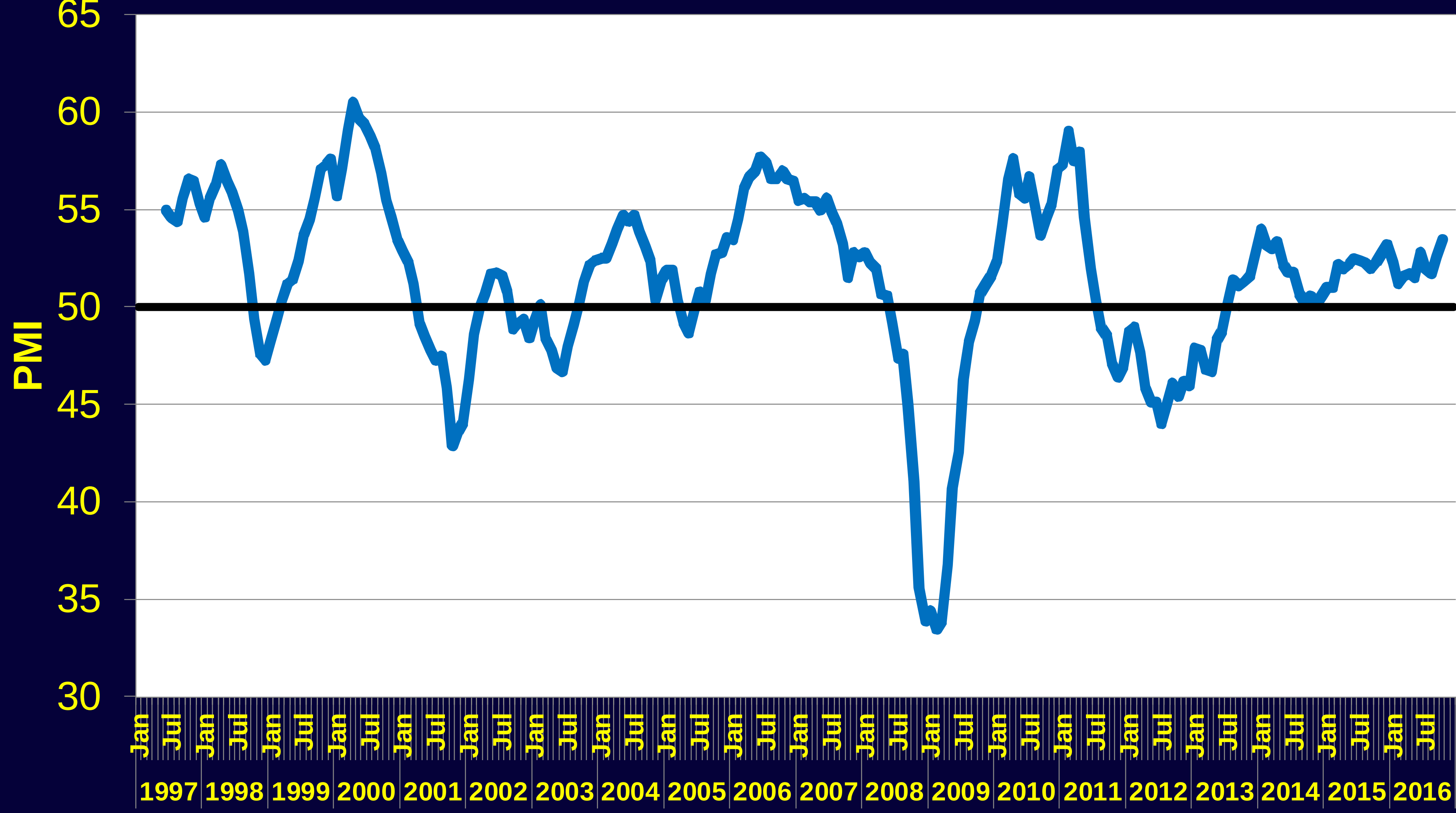
Diffusion Index, >50 = Growth



Markit Economics

Eurozone "Purchasing Managers" Index

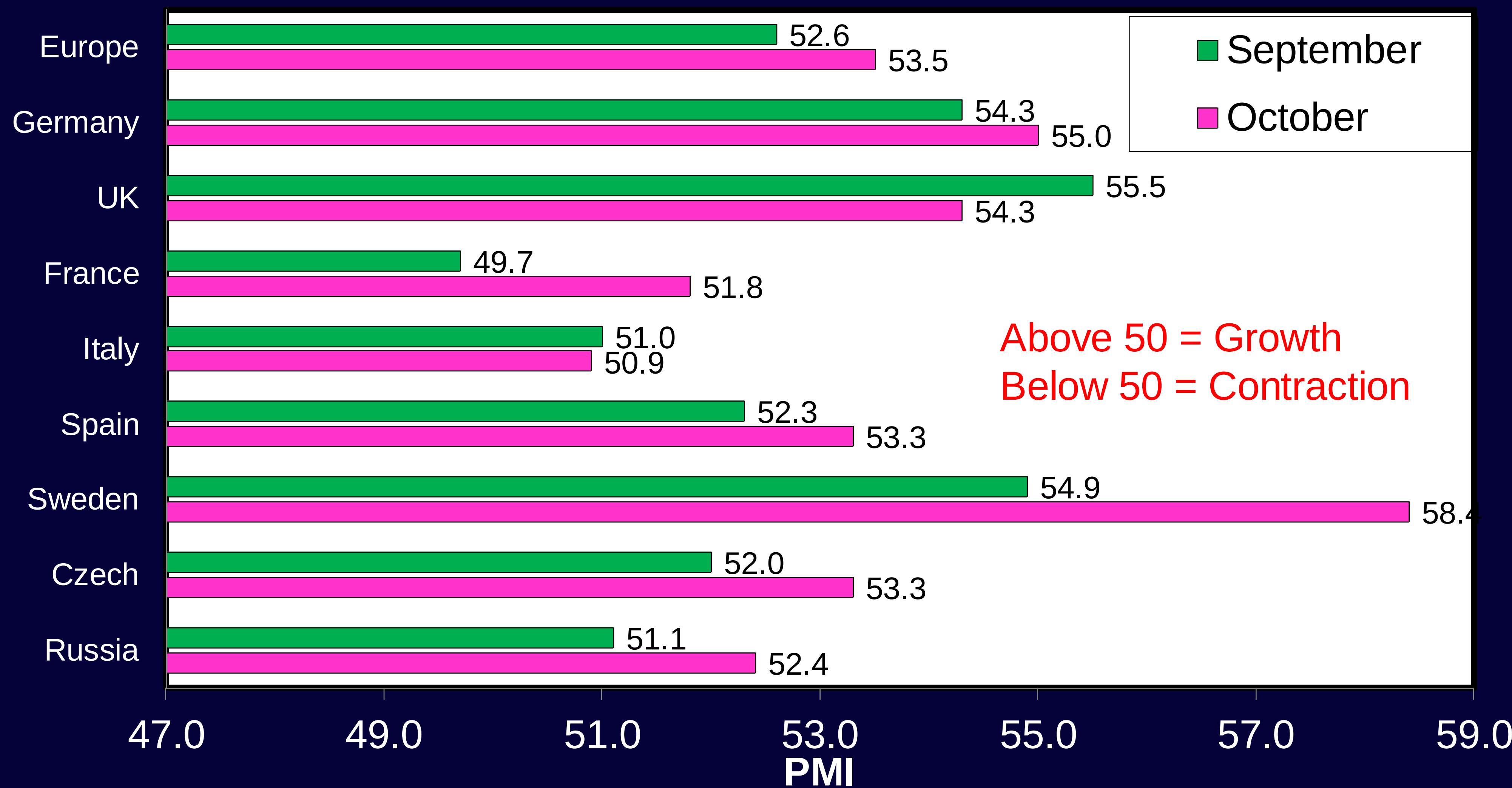
Diffusion Index, >50 = Growth



Markit Economics

European Purchasing Managers' Indices
October vs September 2016

20161102

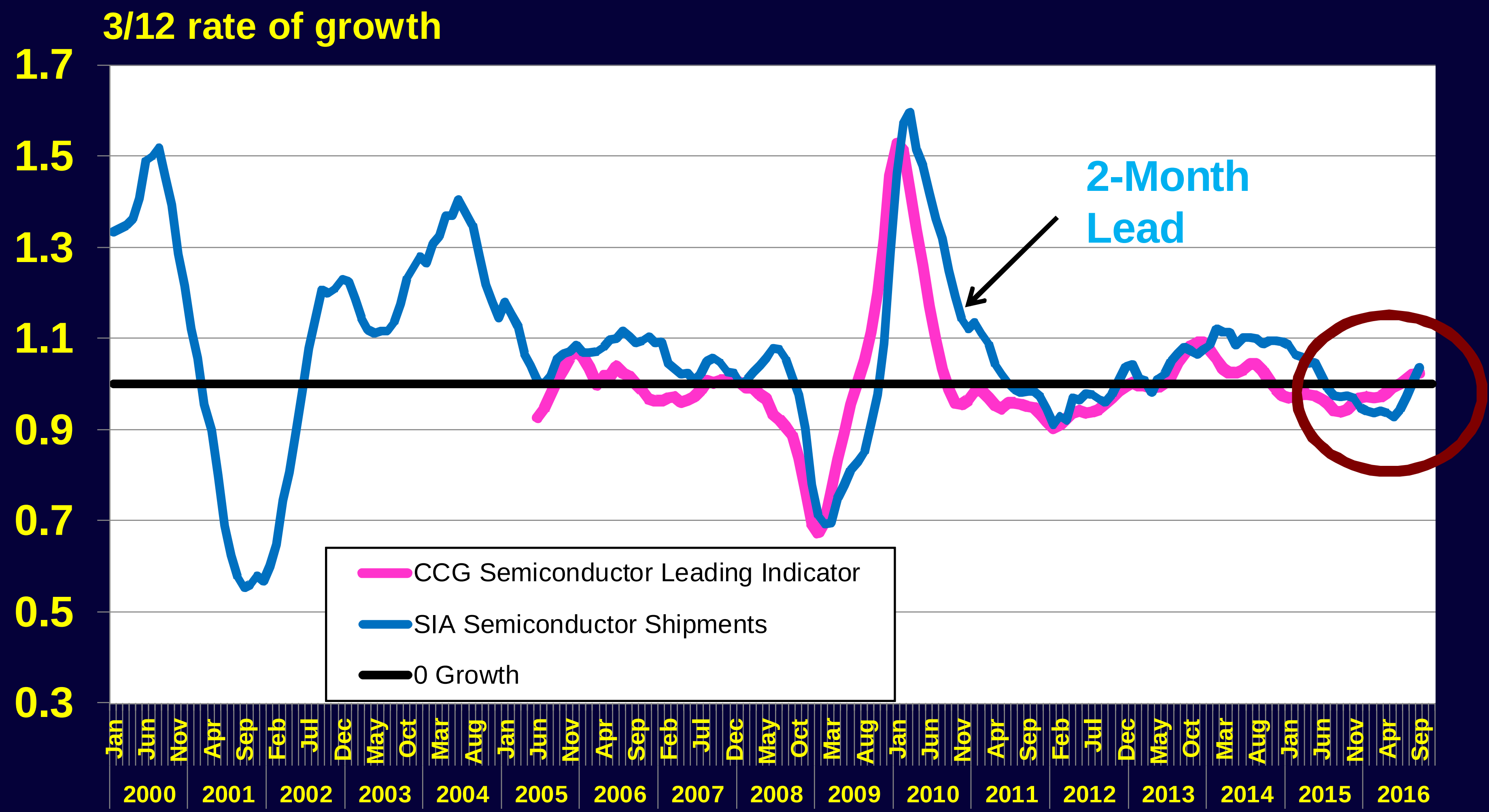


Markit Economics

Purchasing Managers Indices are a 2-6 month leading indicator of electronics growth

CCG Semiconductor Leading Indicator vs. Global Semiconductor Shipments

20161109

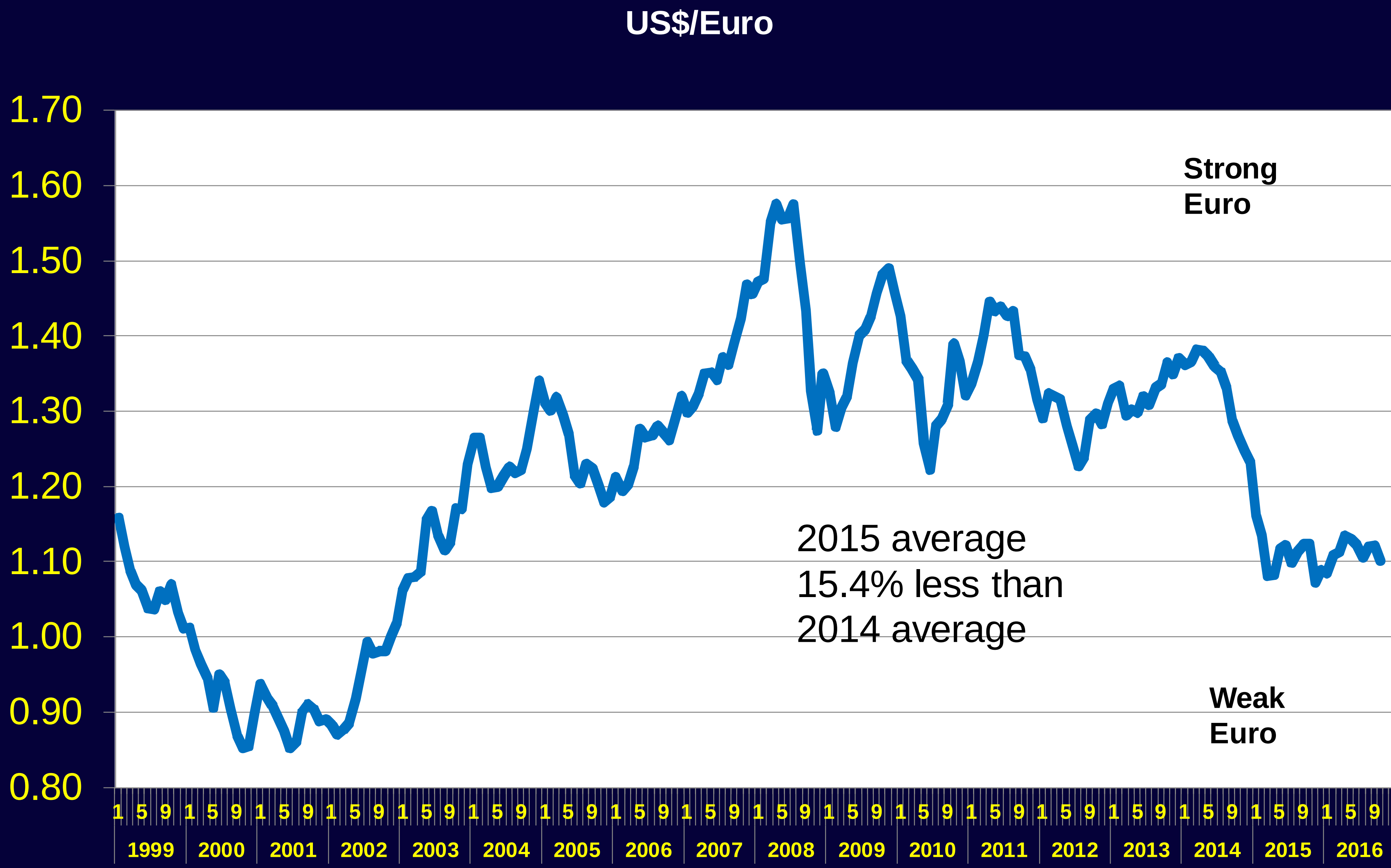


http://www.census.gov/indicator/www/m3/

Exchange Rates
&
Growth calculations

20161101

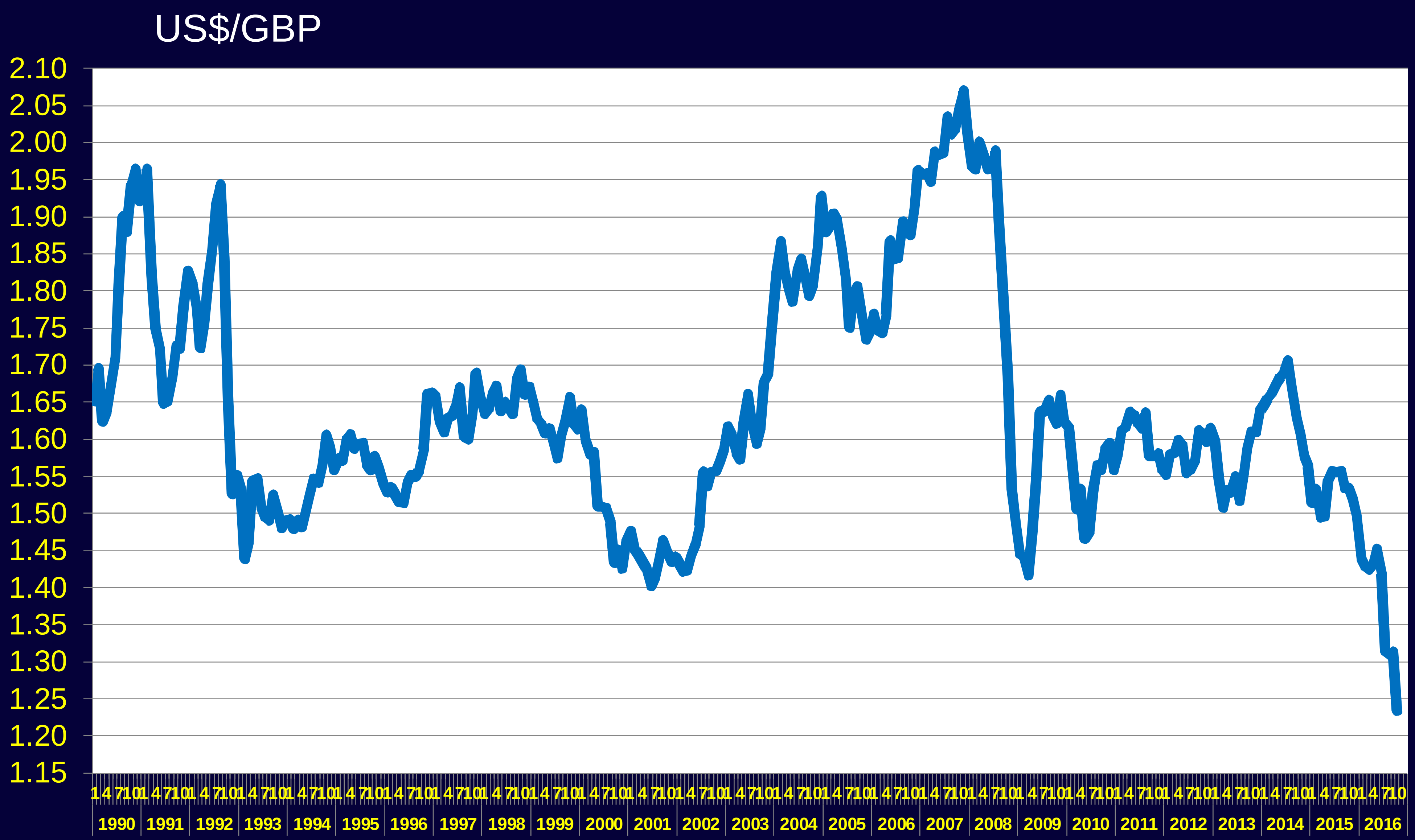
Euro vs. U.S. Dollar



http://research.stlouisfed.org/fred2/series/TWEXBMTH

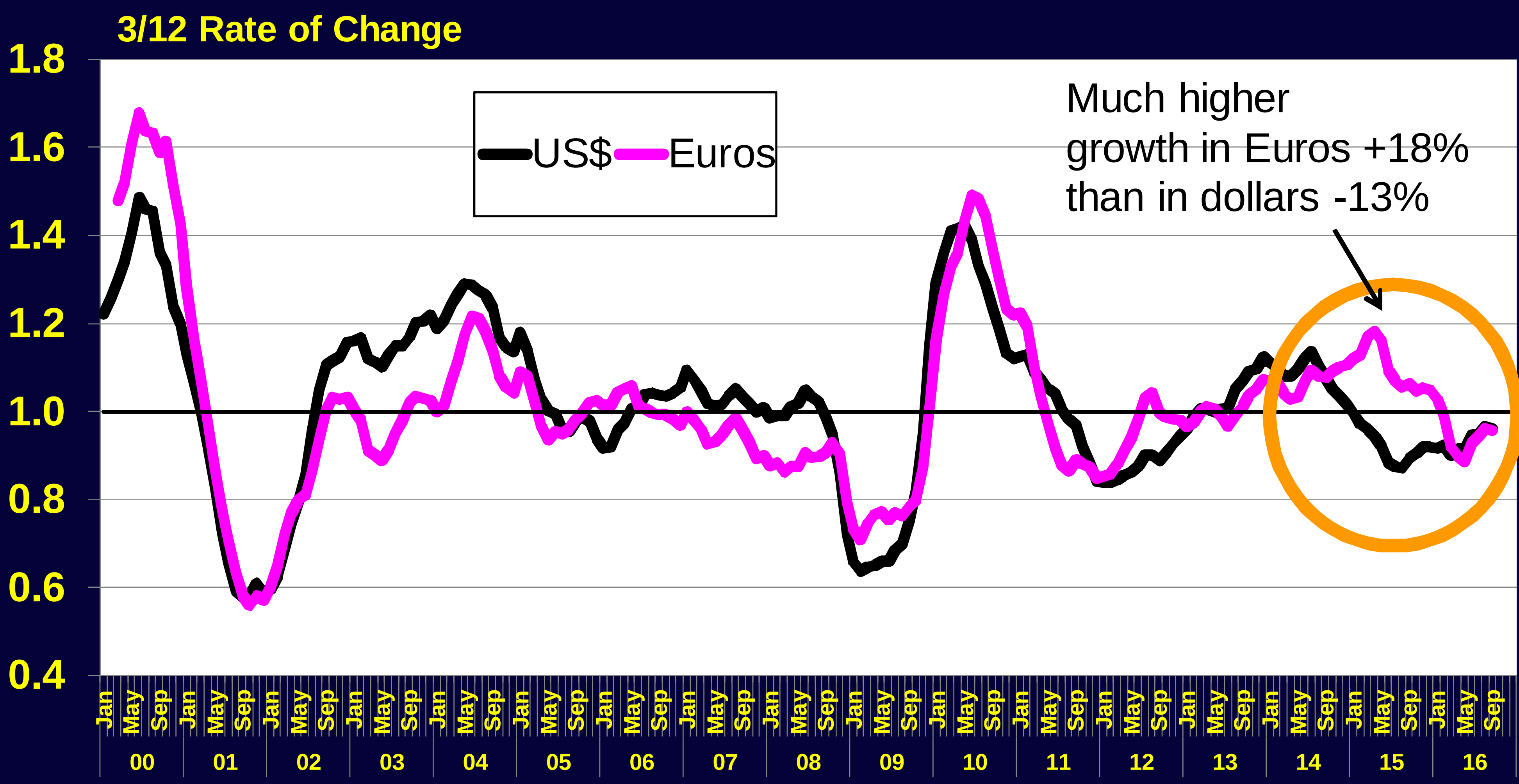
20161101

UK Pound vs. U.S. Dollar



http://research.stlouisfed.org/fred2/series/TWEXBMTH

Effect of Exchange Rates on Semiconductor Shipment Growth to Europe



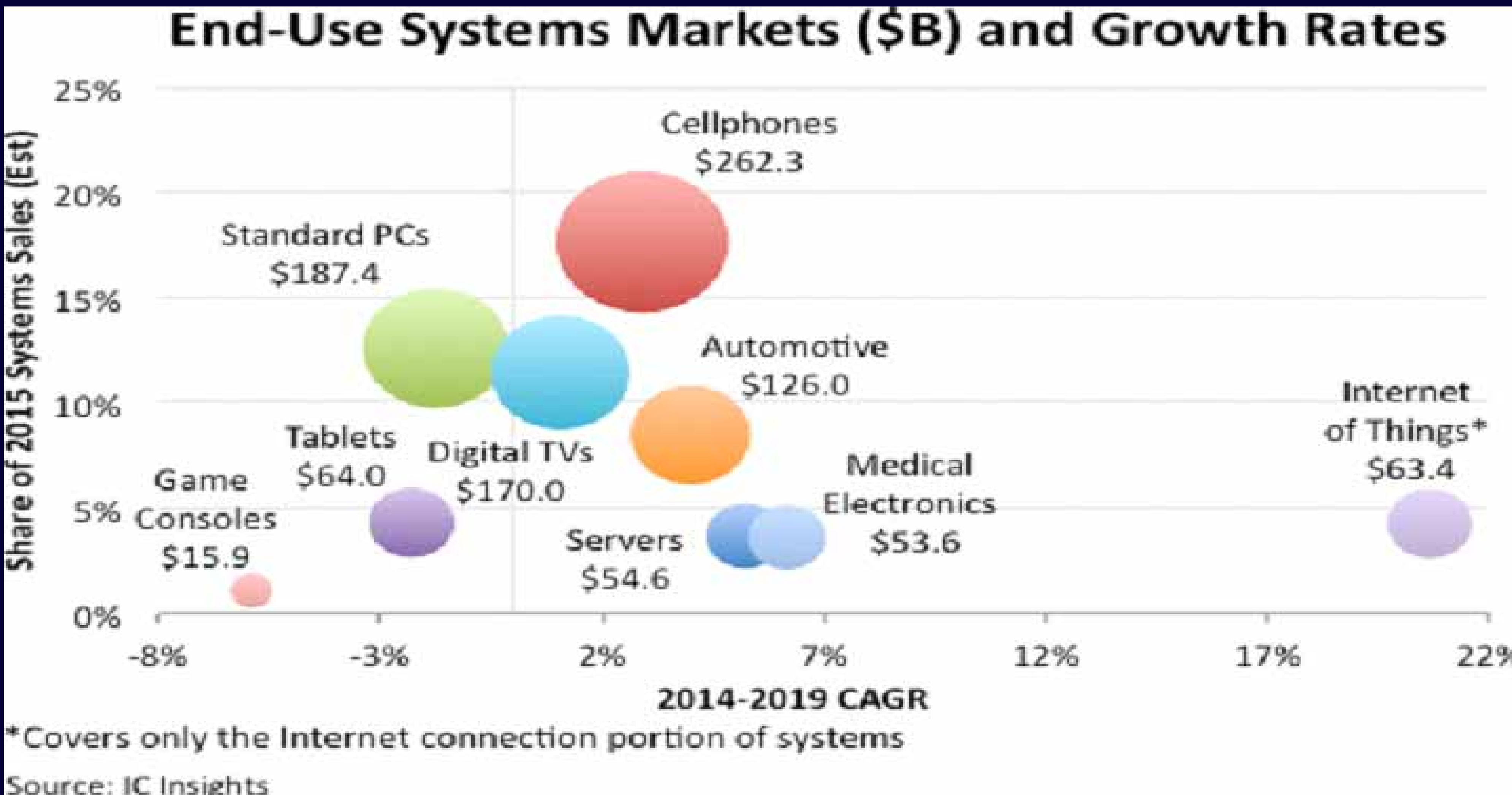
Electronic Equipment

World

20151212

End-Use Markets
Size ($B) & Growth Rates

20150308



Methods to Measure Electronic Industry Growth

Sector composites based upon financial reports of similar companies
- Typically quarterly, semiannually or monthly

Government and trade organization statistics
- Typically monthly

- TIMELY DATA REPORTED ON A CONSISTENT BASIS IS KEY

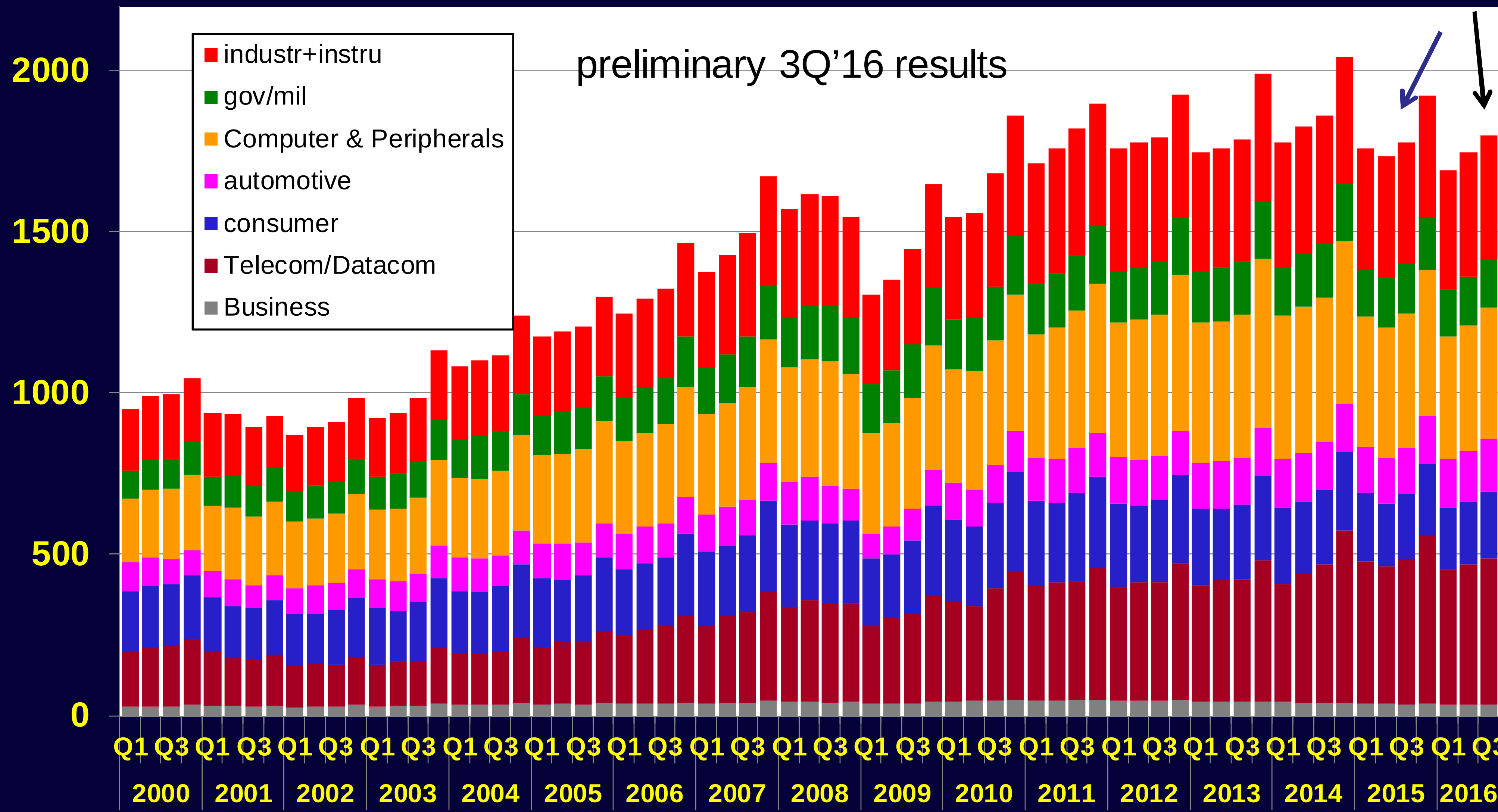
Sector Composites

World Electronic Equipment Production By Type

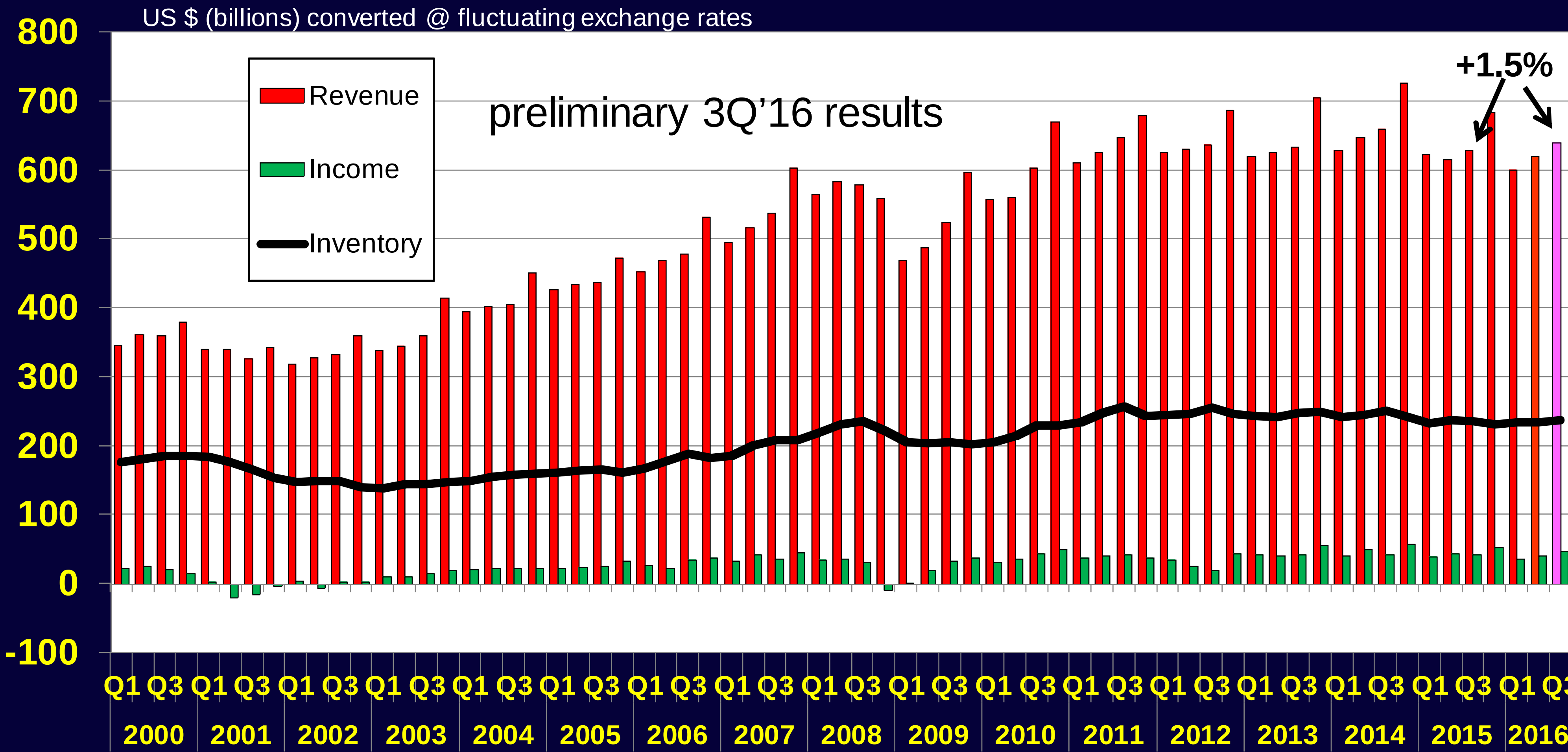
20161104

+1.5%

Annual Rate $B (converted @ fluctuating exchange rates)



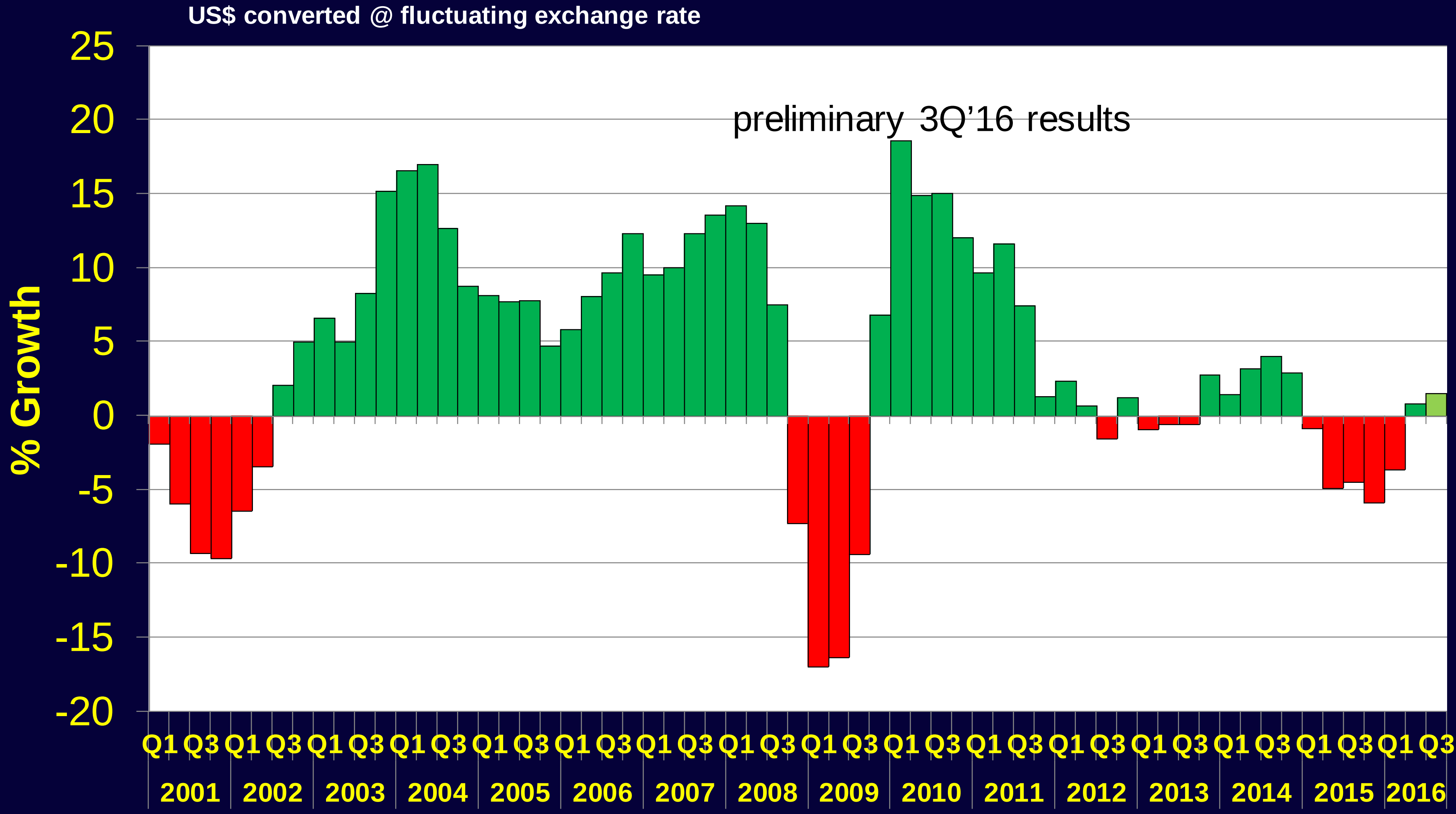
Electronic Equipment Suppliers
Composite of 213 Public Companies
Revenue, Net Income & Inventory



Computer 13, Internet 13, Storage 17, Communication 30, SEMI 40, Medical 21, Instruments 16, Military 21, Business & Office 6, Consumer 21, Automotive 15

20161113

Electronic Equipment Suppliers
Composite of 213 Public Companies
Quarterly Revenue Growth



Regional Data

U.S.

Europe (Eurostat)

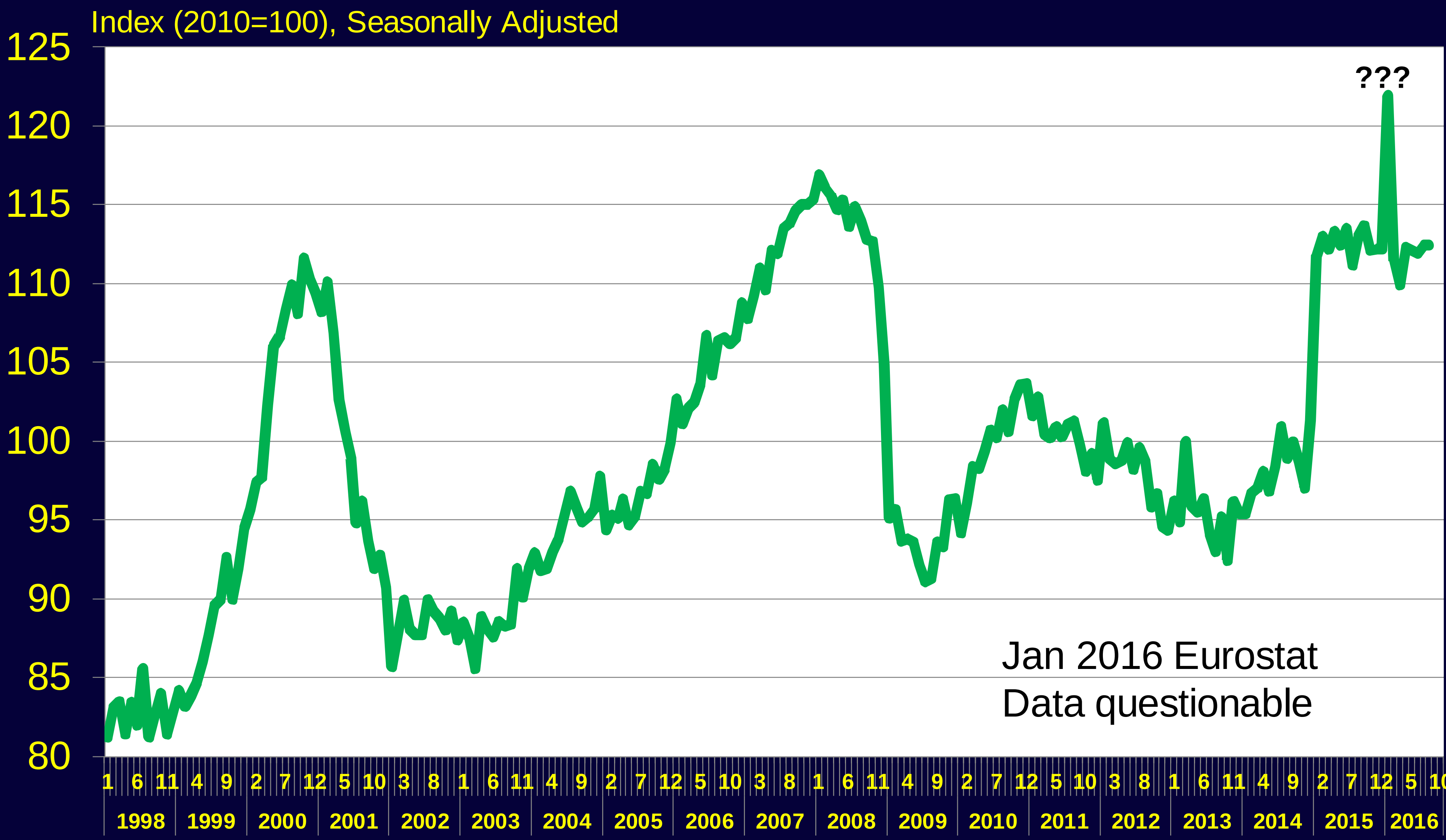
Japan

China/Taiwan

S Korea

20161012

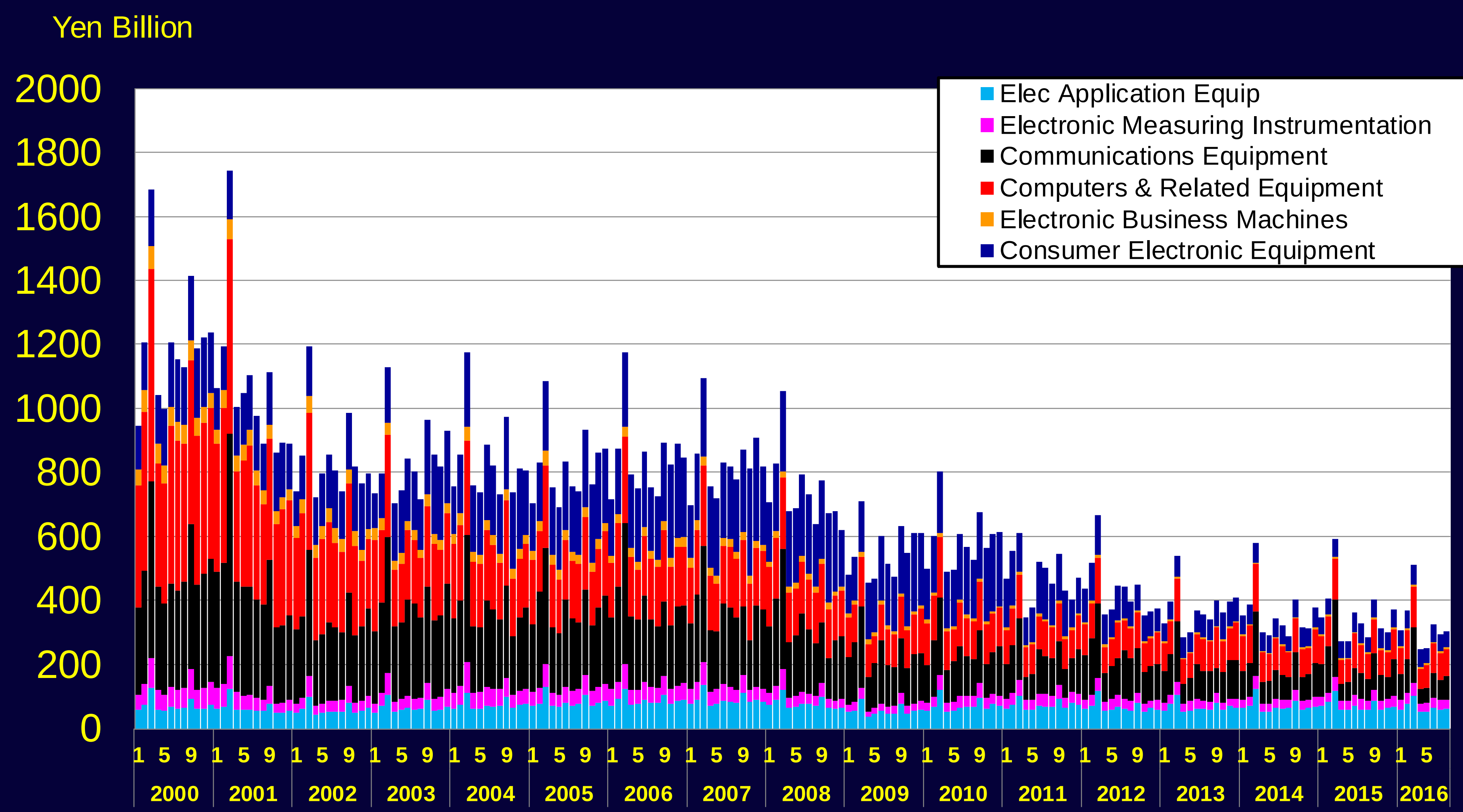
European Computer, Electronic & Optical Products Production



Eurostat, C26 category, EU 28 countries

20161023

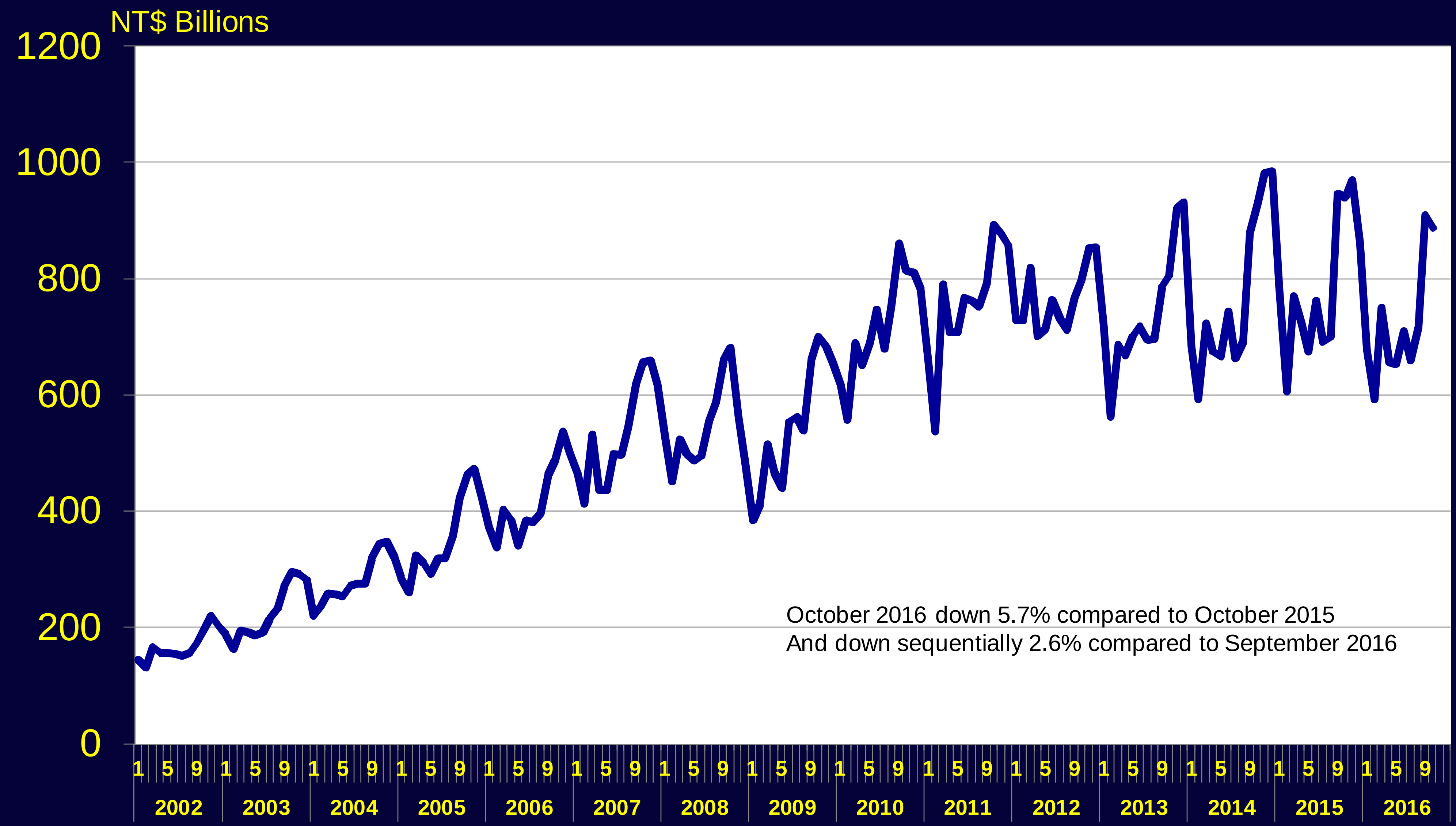
Japan Electronic Equipment Production by Month 2000 to Present



JEITA www.jeita.or.jp/

Taiwan/China Electronic Equipment Producers
Composite of 101 Manufacturers
Consolidated Revenue

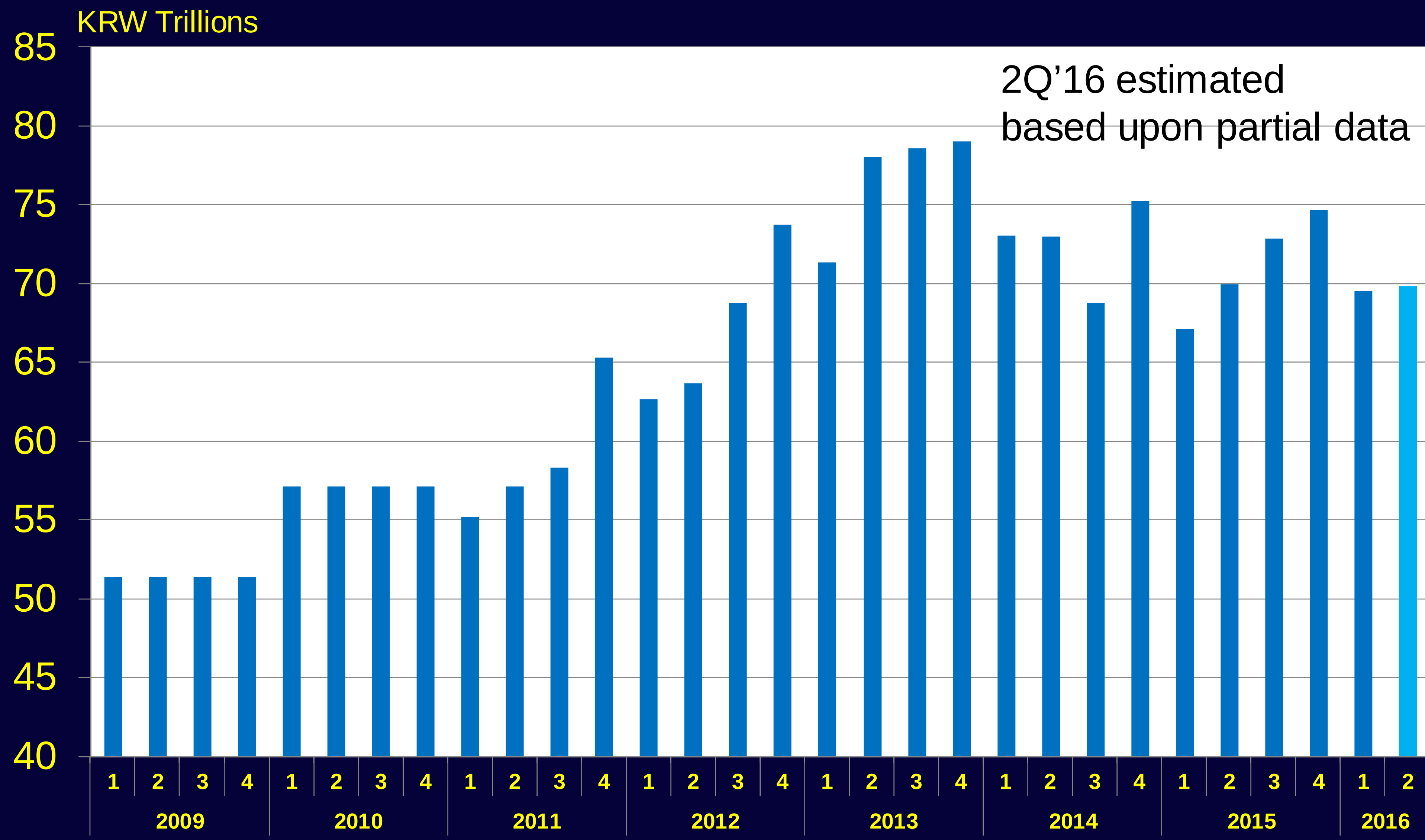
20161012



Taiwan listed companies, often with significant manufacturing in China

20161102

S Korea Electronic Equipment Producers Composite of 7 Manufacturers

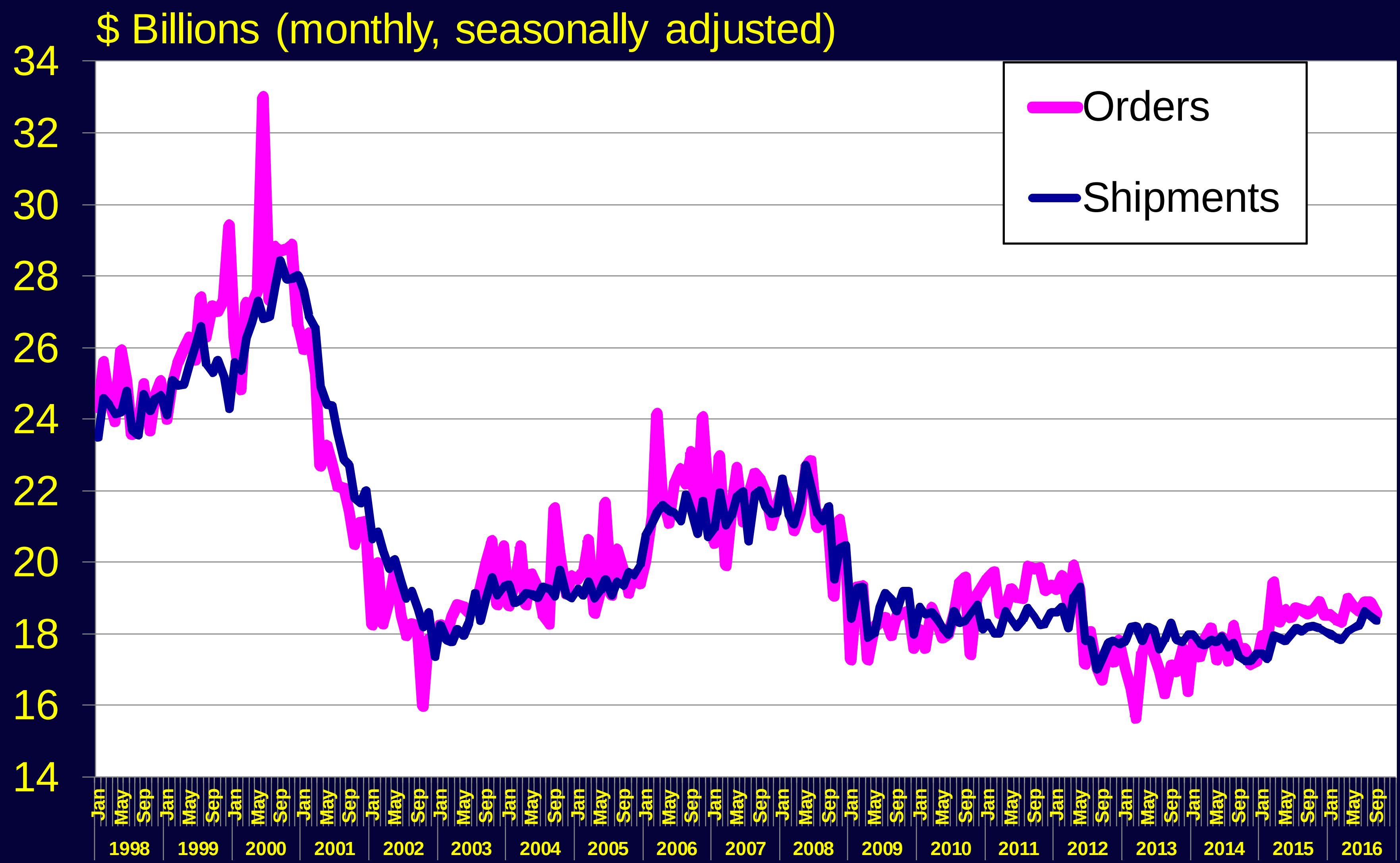


Samsung Electronics, LG Electronics, Daewoo Electronic Components, Samsung SDI, Dongbu Hitek, SK Hynix, KEC Corp

20161103

U.S. Electronic Equipment Orders & Shipments

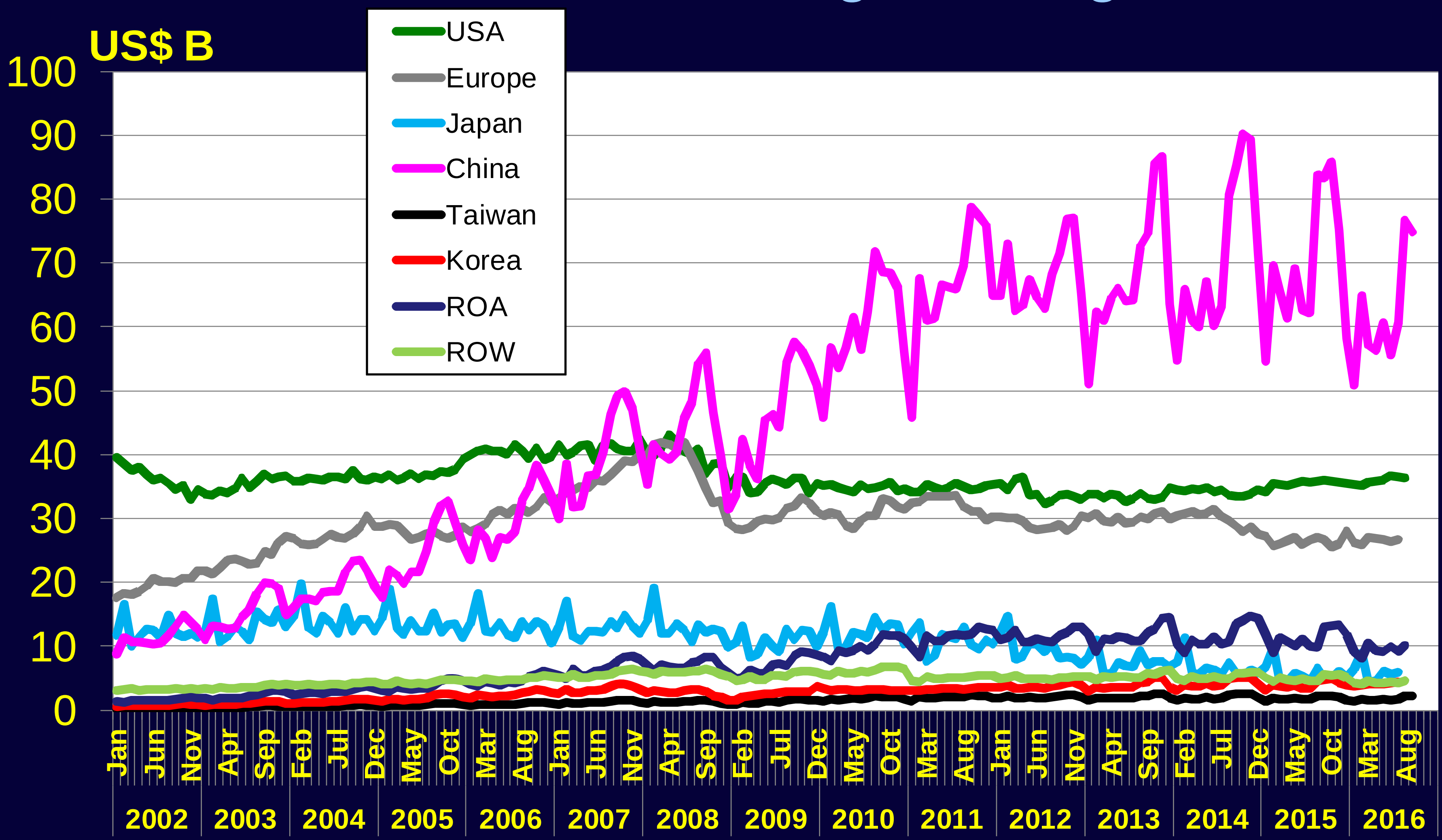
Computer, Communications, Measurement & Control and Military



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

World Electronic Equipment Monthly Shipments

Converted @ Fluctuating Exchange Rates

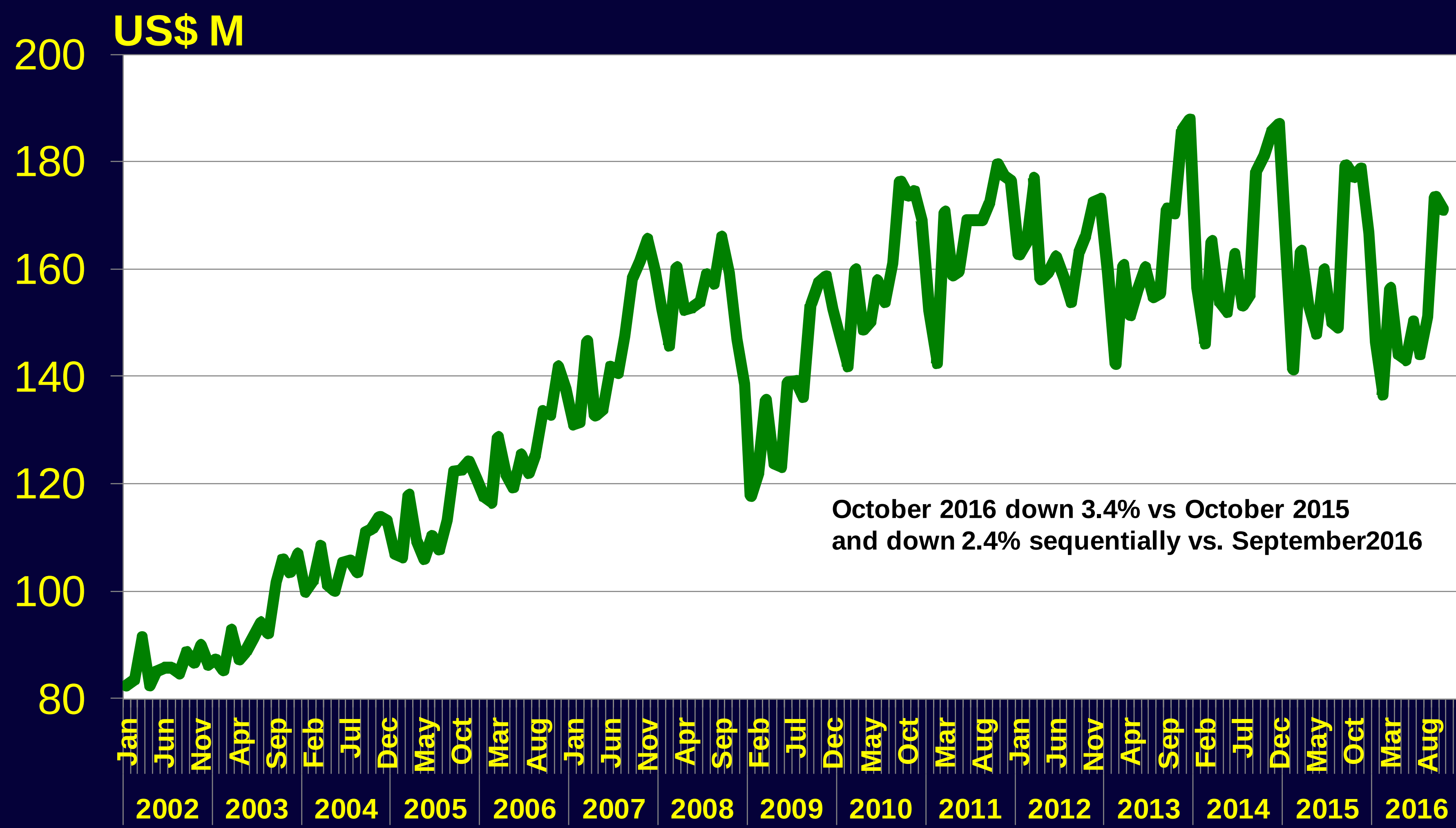


Source: Custer Consulting Group & Electronic Outlook Corp

20161113

World Electronic Equipment Monthly Shipments

Converted @ Fluctuating Exchange Rates



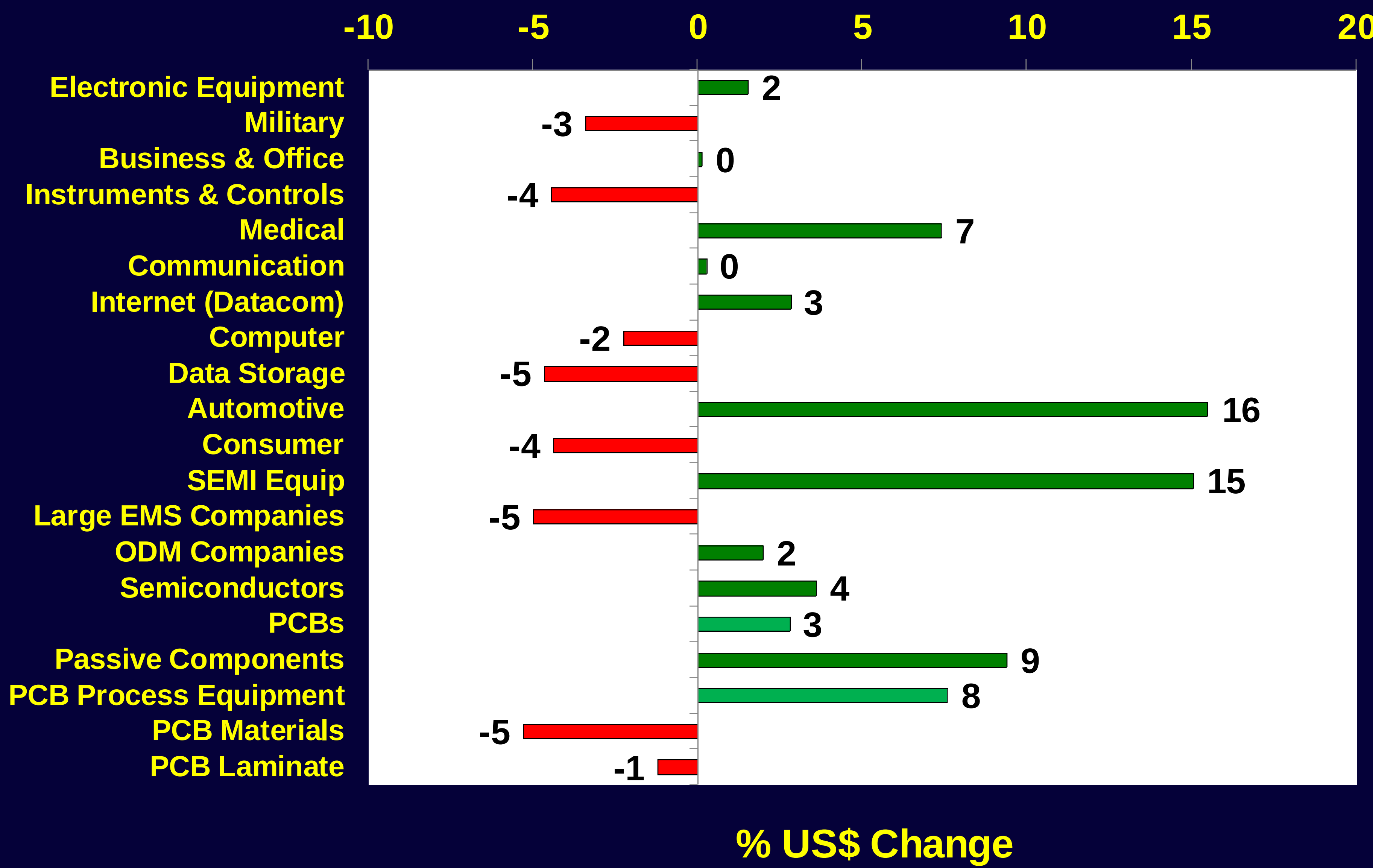
Source: Custer Consulting Group & Electronic Outlook Corp

Electronic Equipment Growth

Europe & World

20161113

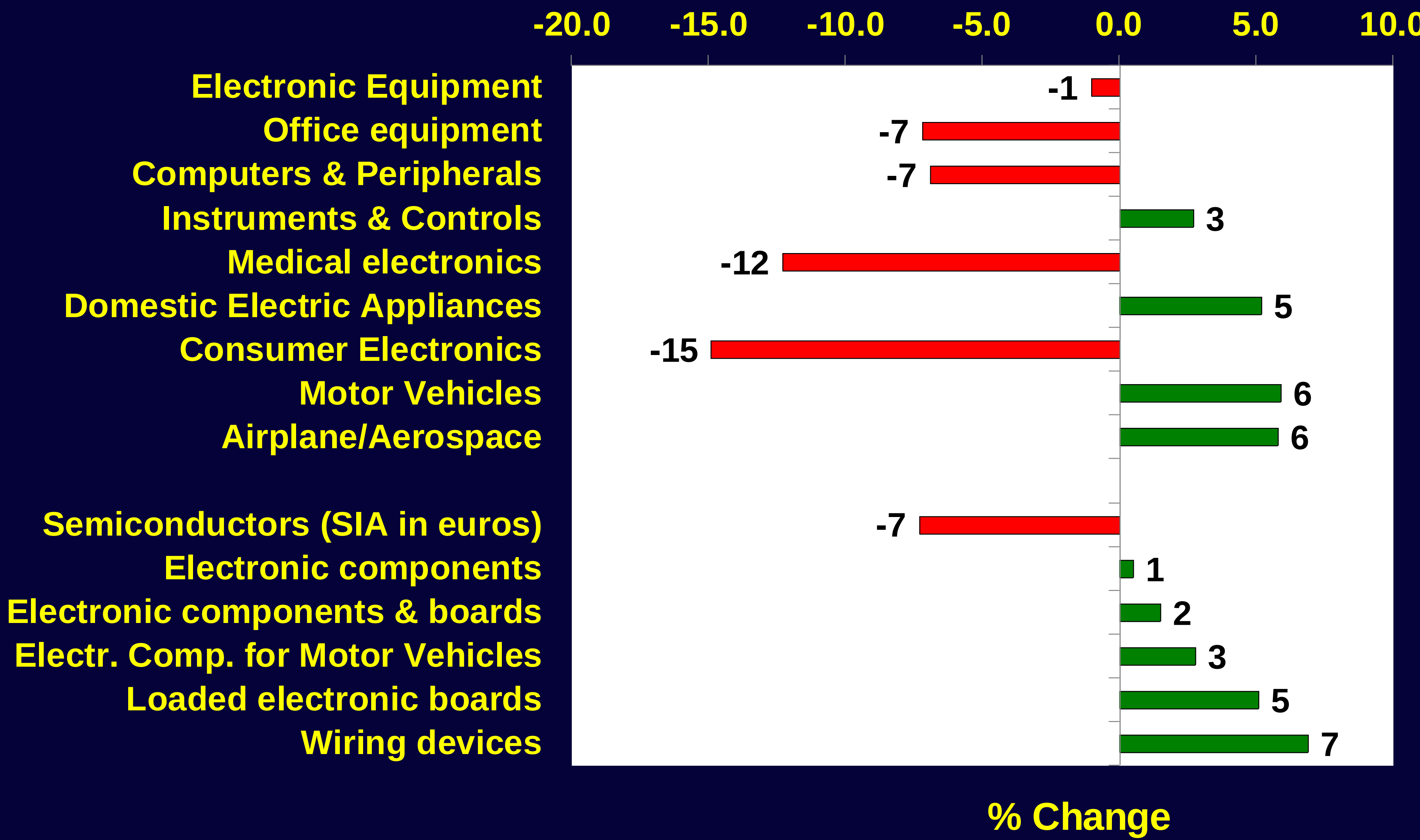
Global Electronic Supply Chain Growth 3Q'16 vs. 3Q'15 (preliminary estimate)



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

20160914

European Electronic Supply Chain Growth
2Q’16 vs 2Q’15



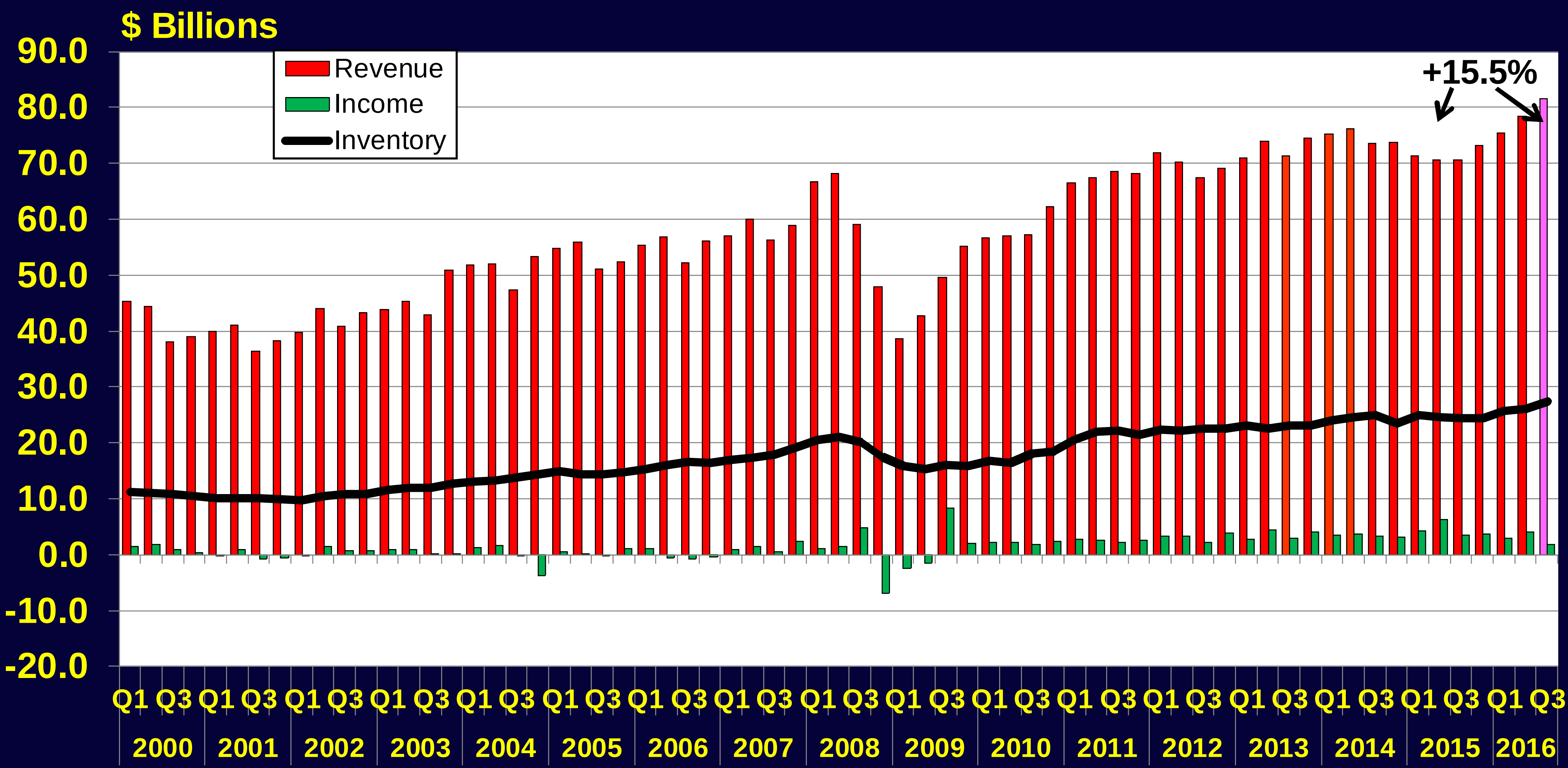
Euro denominated growth rates; Eurostat, SIA & Custer Consulting Group

Markets of European Focus

Automotive Equipment Suppliers
Composite of 15 Public Companies

20161113

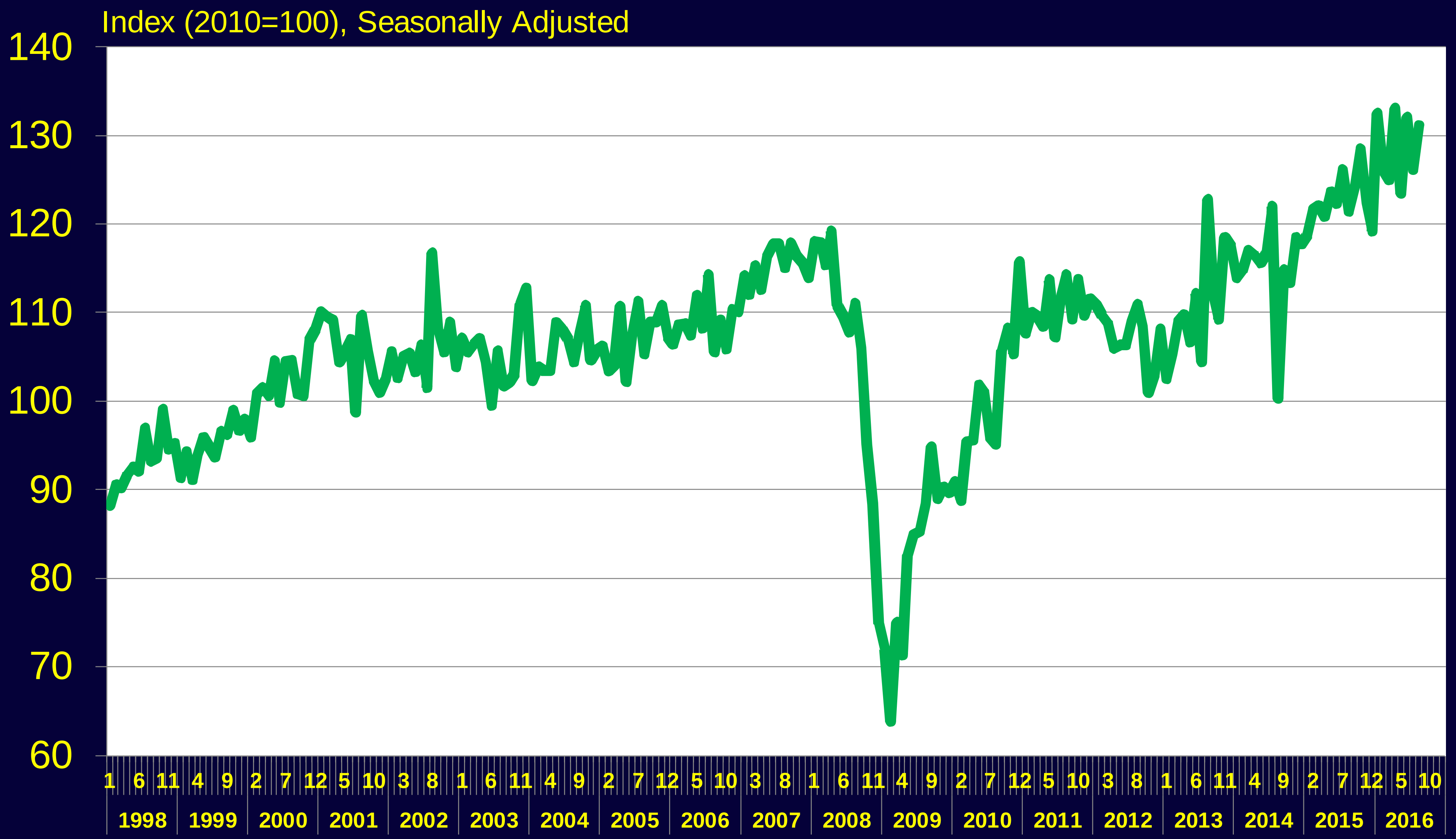
Revenue, Net Income & Inventory



Autoliv, Borg Warner, Continental AG, Delphi, Denso, Federal Mogul, Gentex, Hella, Johnson Controls, Lear, Magna, TRW Automotive, Valeo, Visteon, ZF Friedrichshafen

201610124

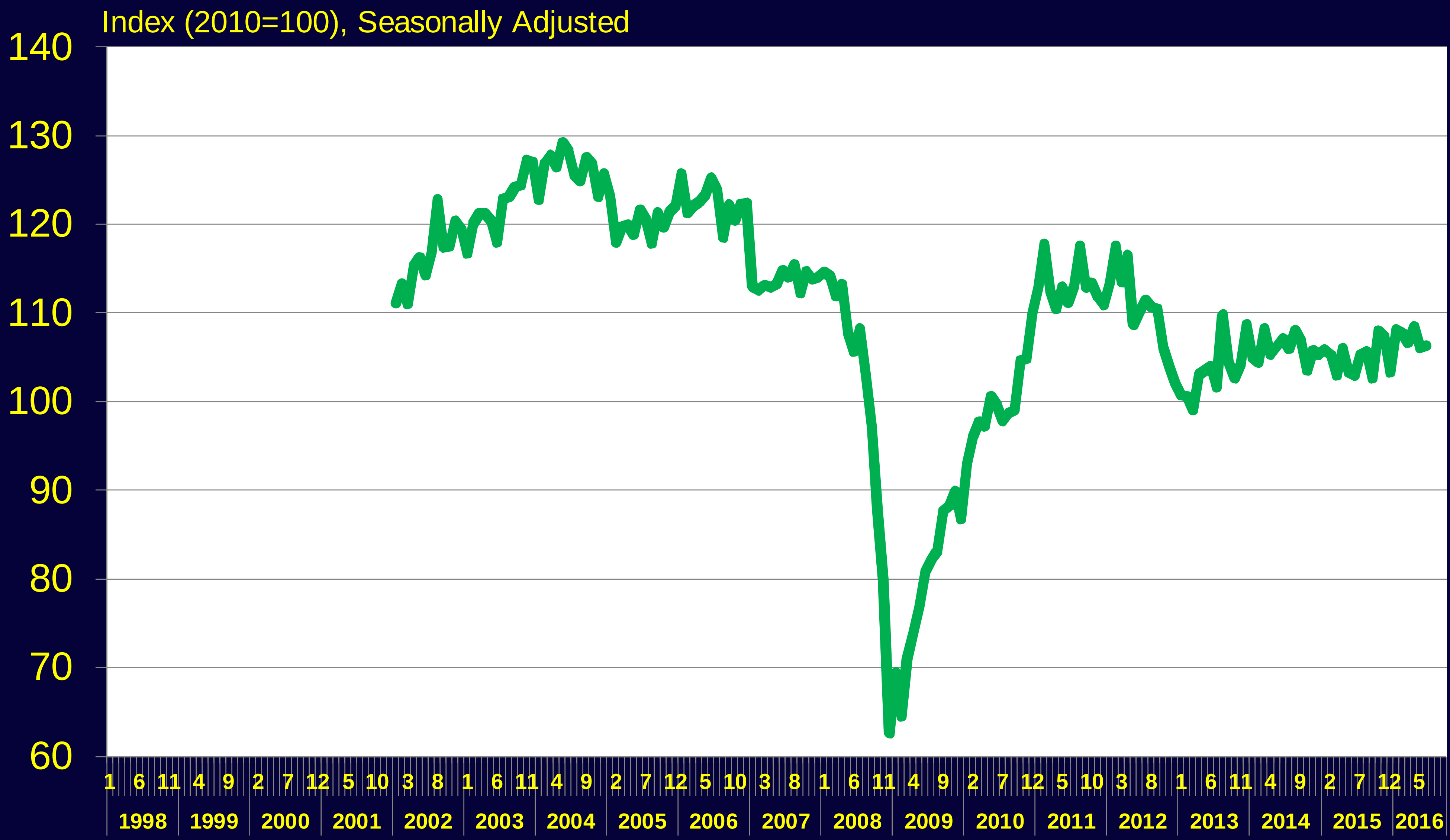
European Motor Vehicle Production



Eurostat, C291 category, EU 27 countries

20160914

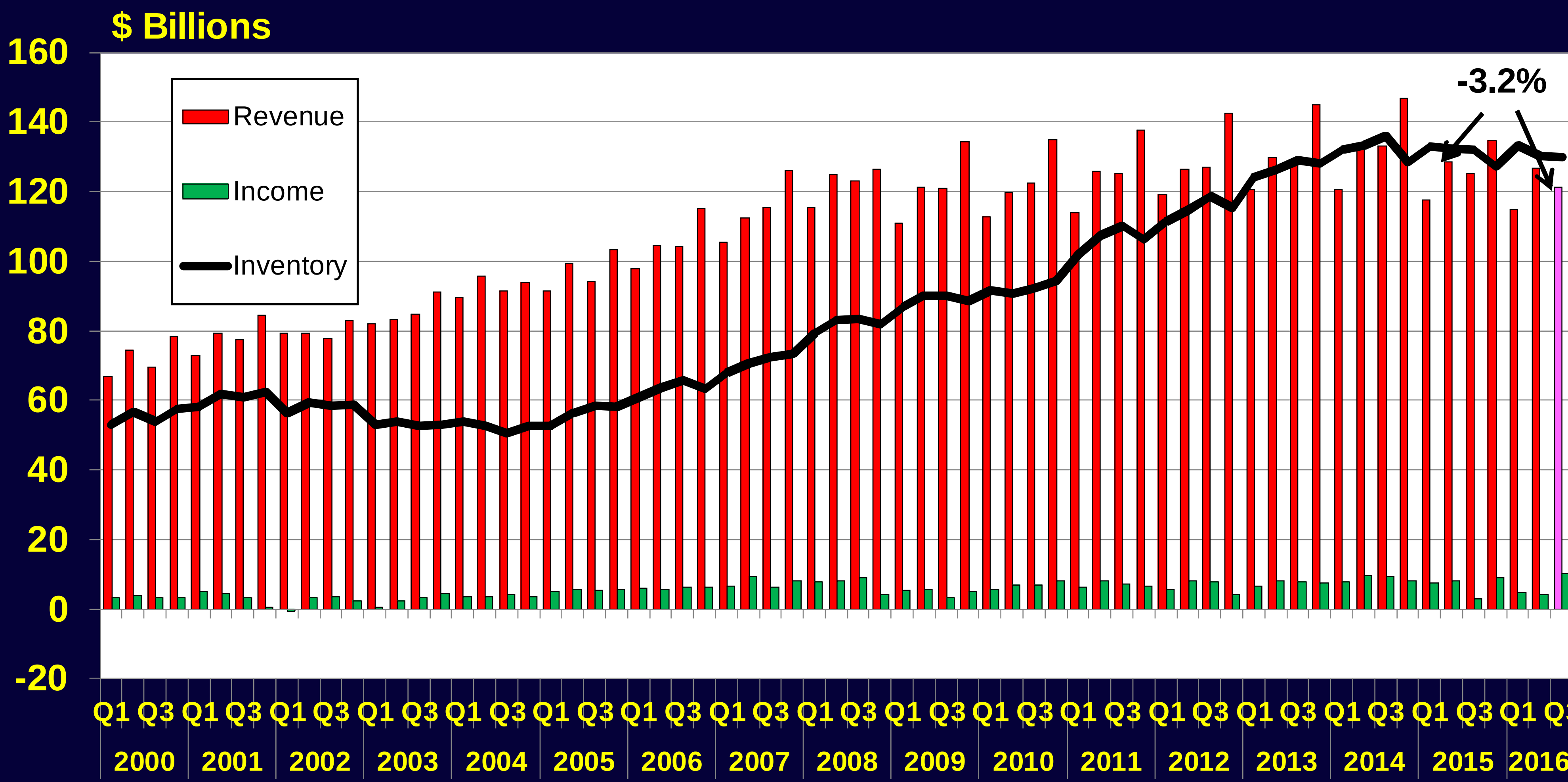
European Electrical Equipment for Motor Vehicles Production



Eurostat, C291 category, EU 27 countries

20161113

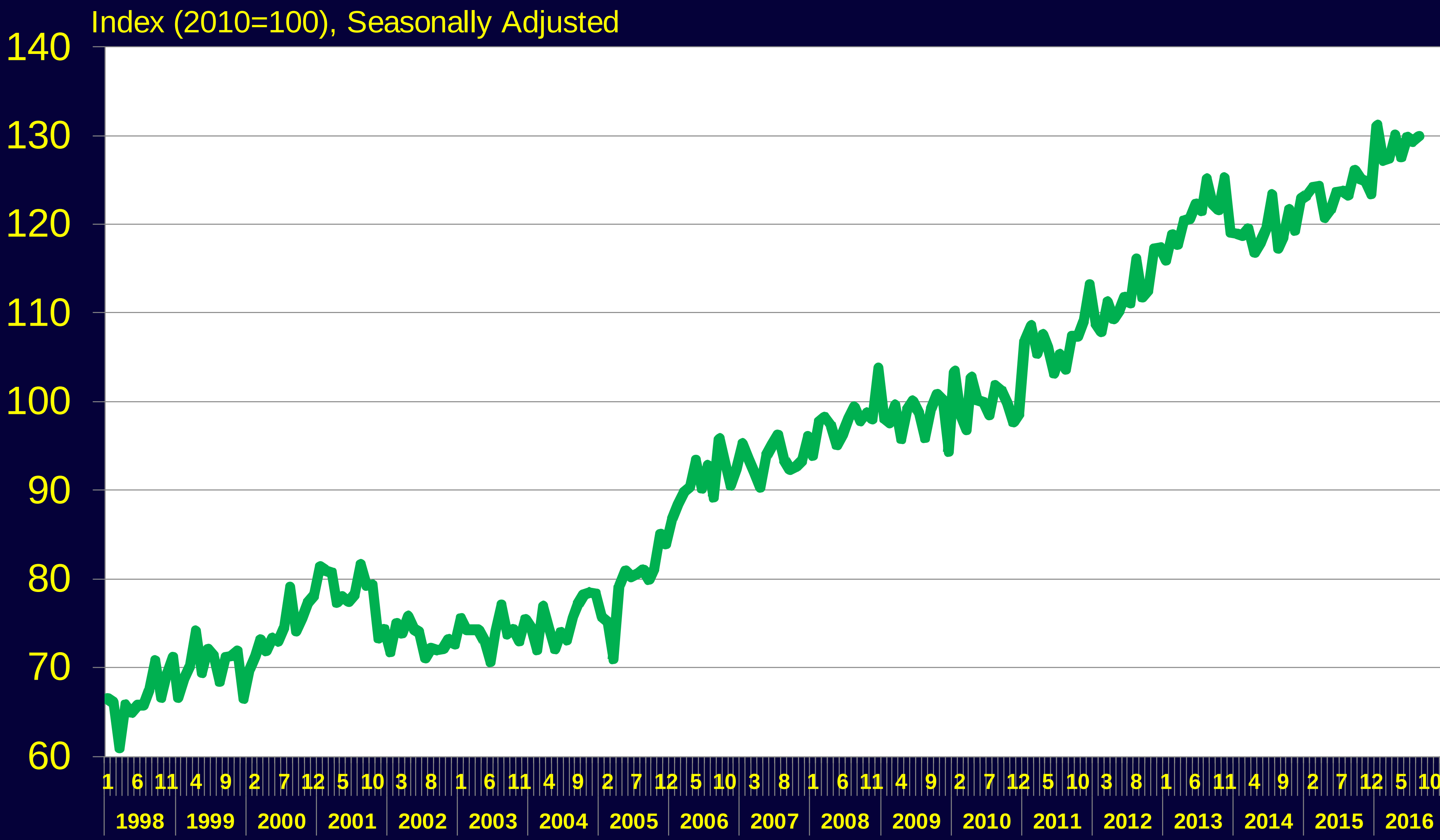
Military & Aerospace
Composite of 22 Public Companies
Revenue, Net Income & Inventory



Boeing, Bombadier, EADS (Airbus), Finmeccinica,General Dynamics, Halliburton, Harris, Honeywell (military portion), L-3 Communications, Lockheed, Moog, Northrop Grumman, Raytheon, Rockwell Collins, Textron, Thales, United Technology

20161012

European Production - Aircraft, Spacecraft & Related Equipment

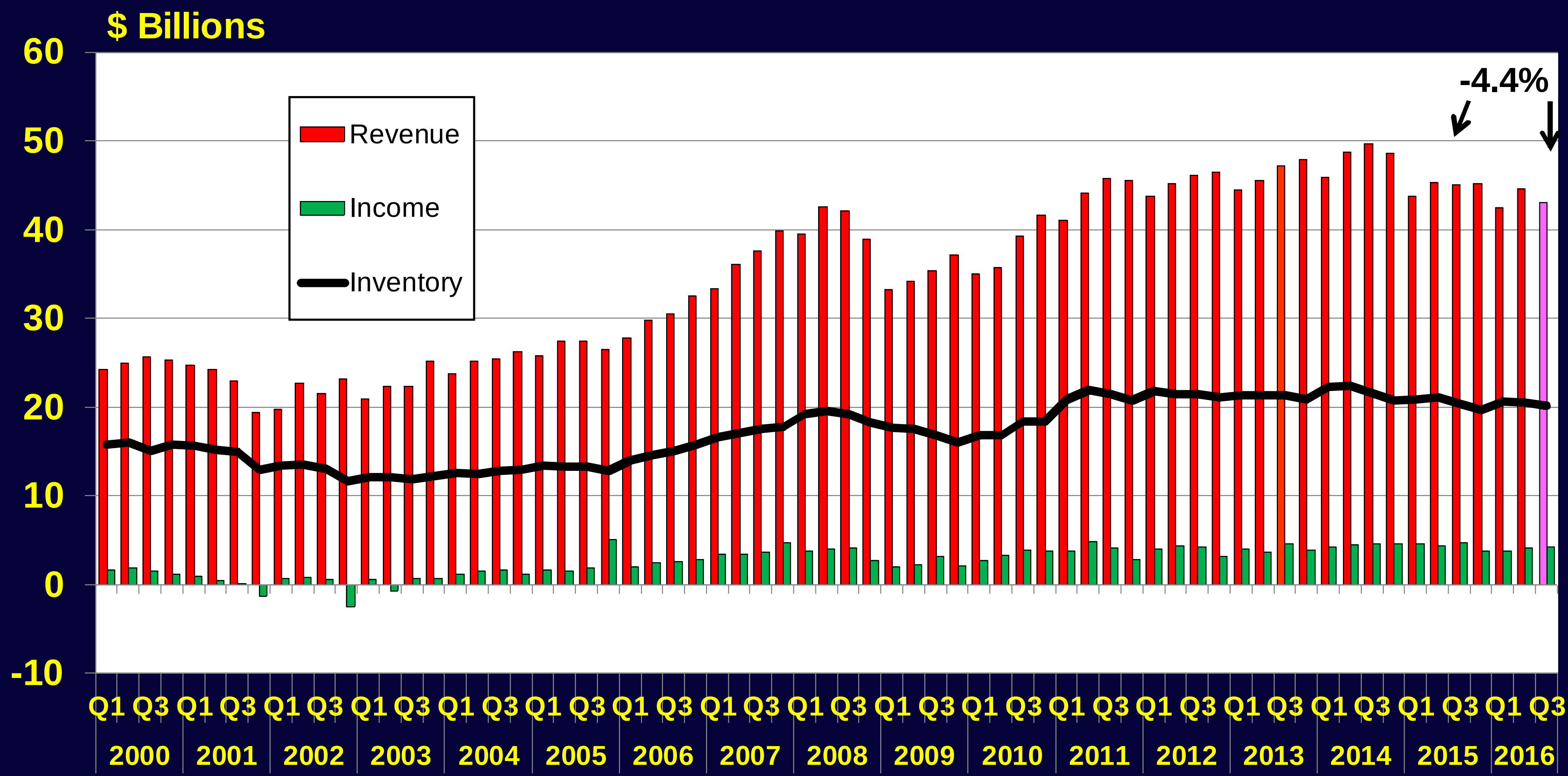


Eurostat, C303 category, EU 27 countries

2016113

Instruments & Control Equipment Composite of 16 Public Companies

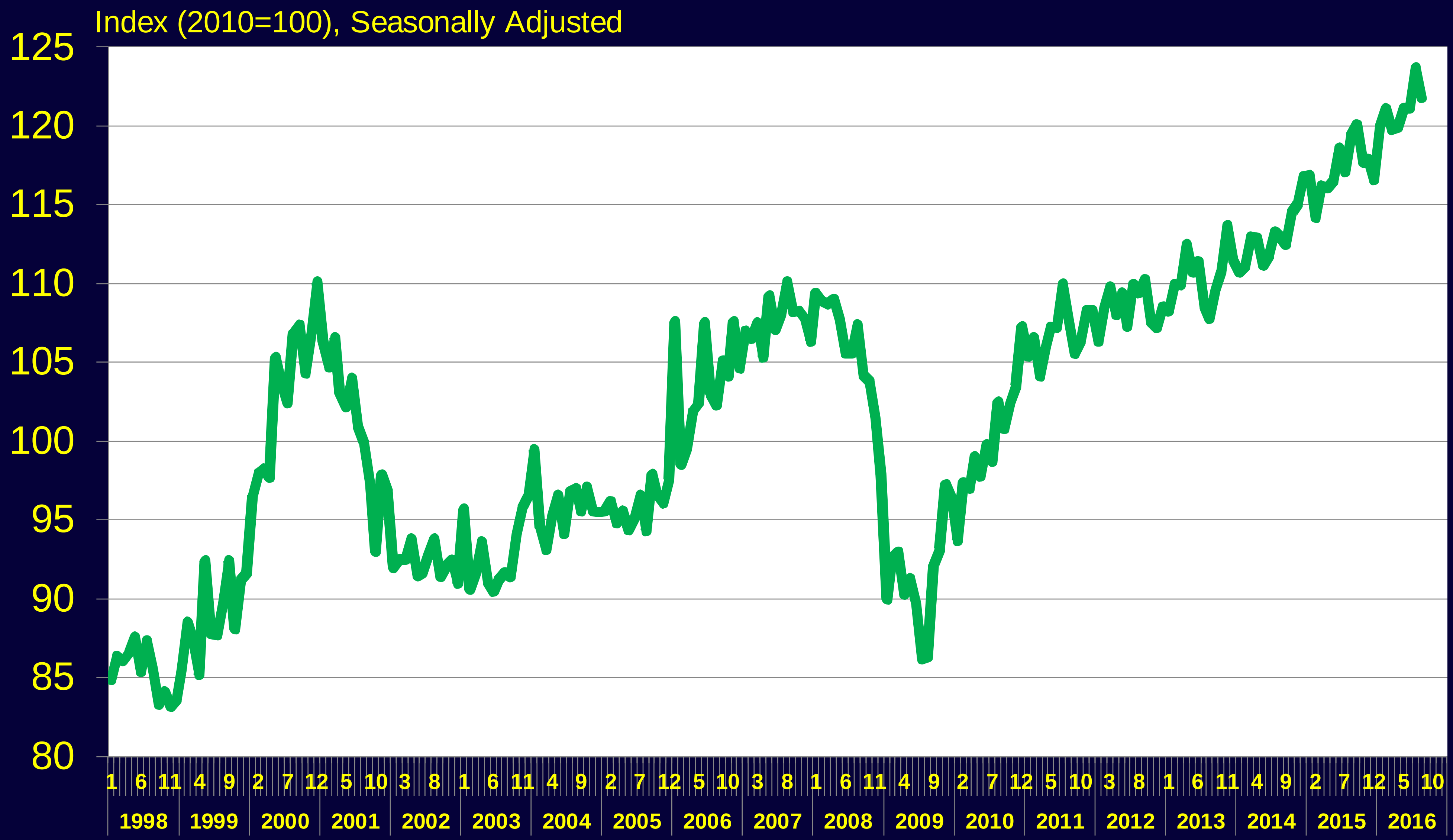
Revenue, Net Income & Inventory



ABB, Agilent, Ametek, Emerson, Itron, Keysight, National Instruments, PerkinElmer, Rockwell Automation, Rotork, Teledyne, ThermoFisher, Woodward Govenor

20161012

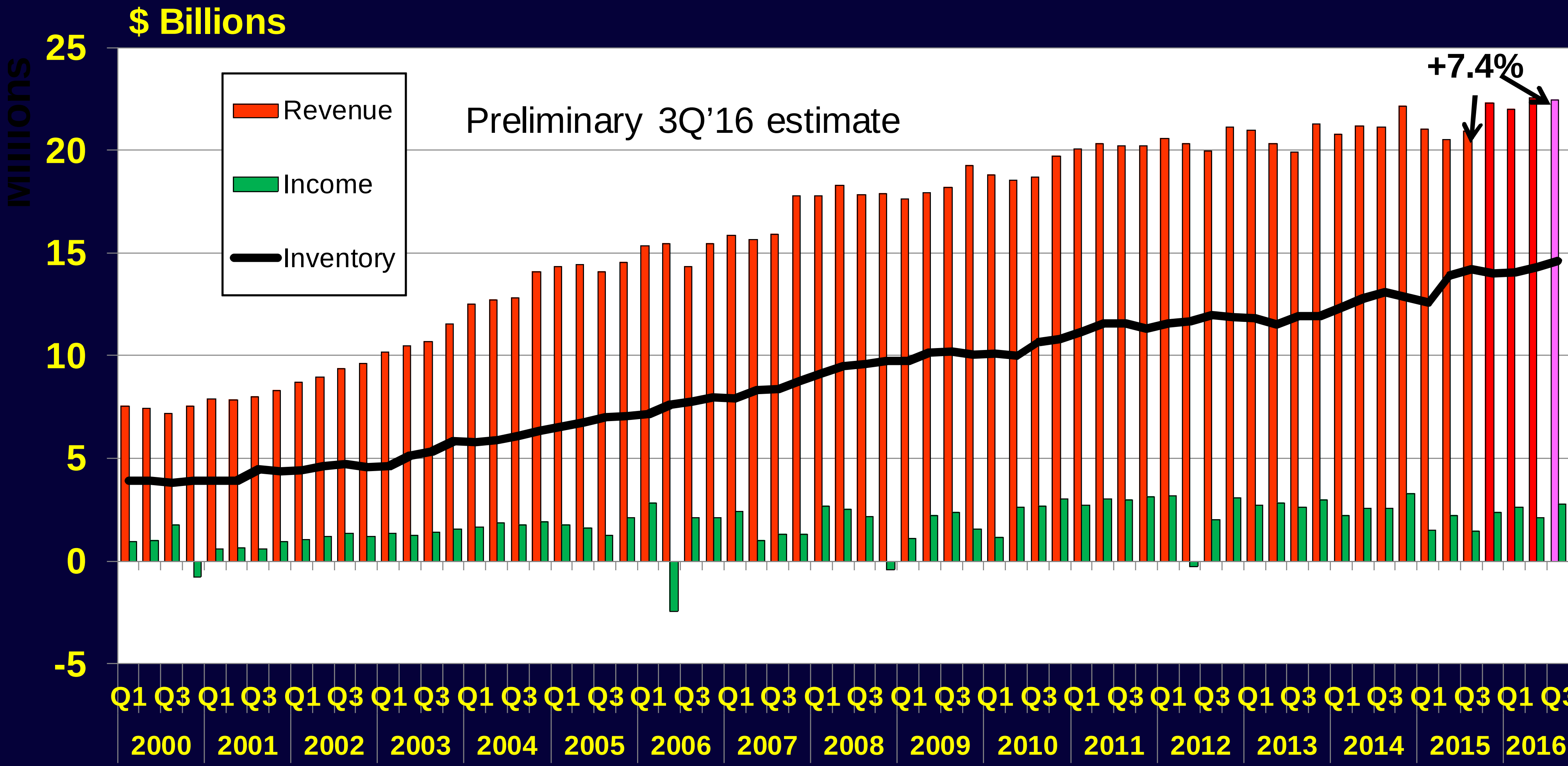
European Production - Instruments & Appliances for Measuring, Testing & Navigation



Eurostat, C2651 category, EU 27 countries

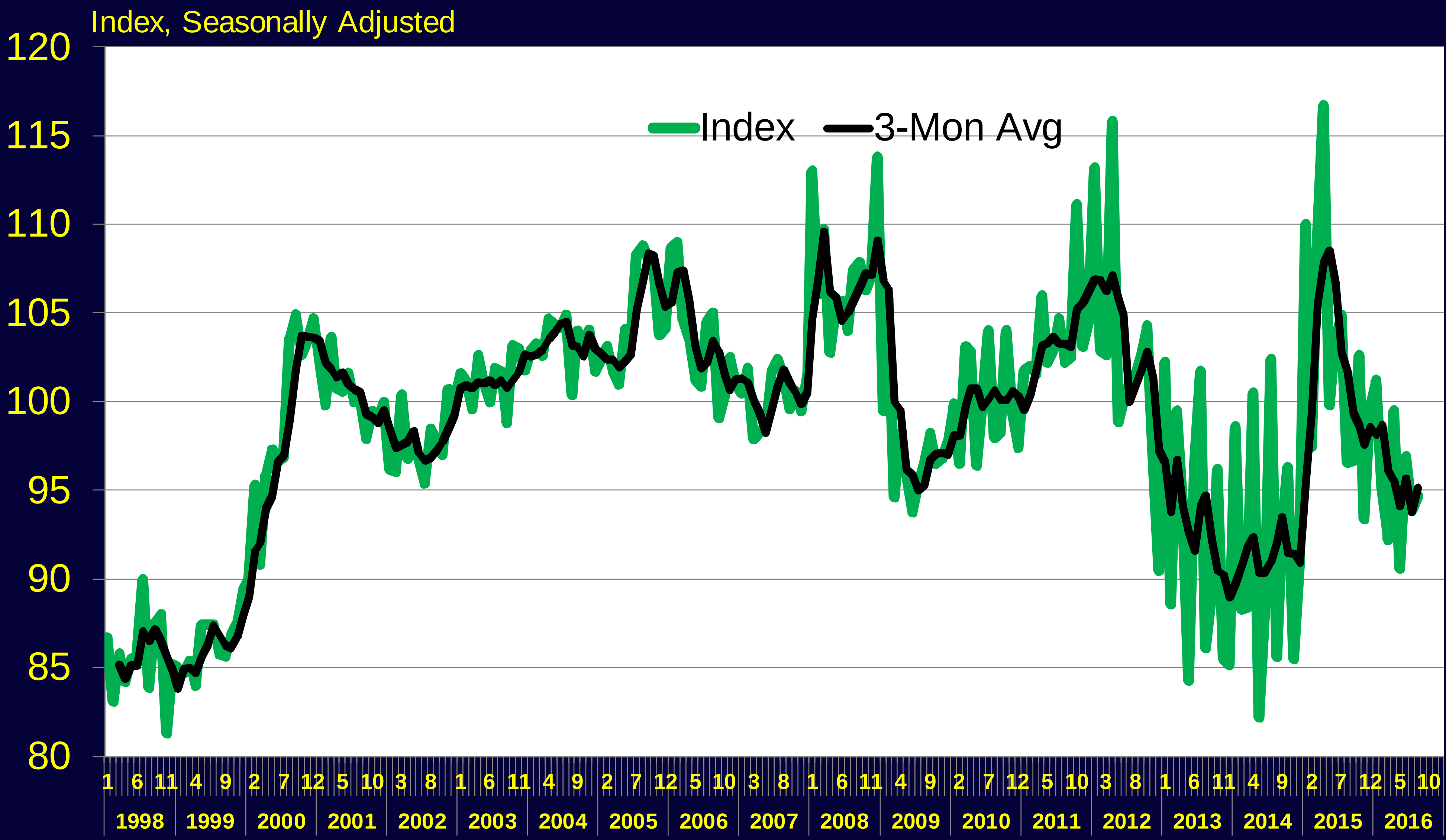
20161113

Medical Equipment
Composite of 21 Public Companies
Revenue, Net Income & Inventory



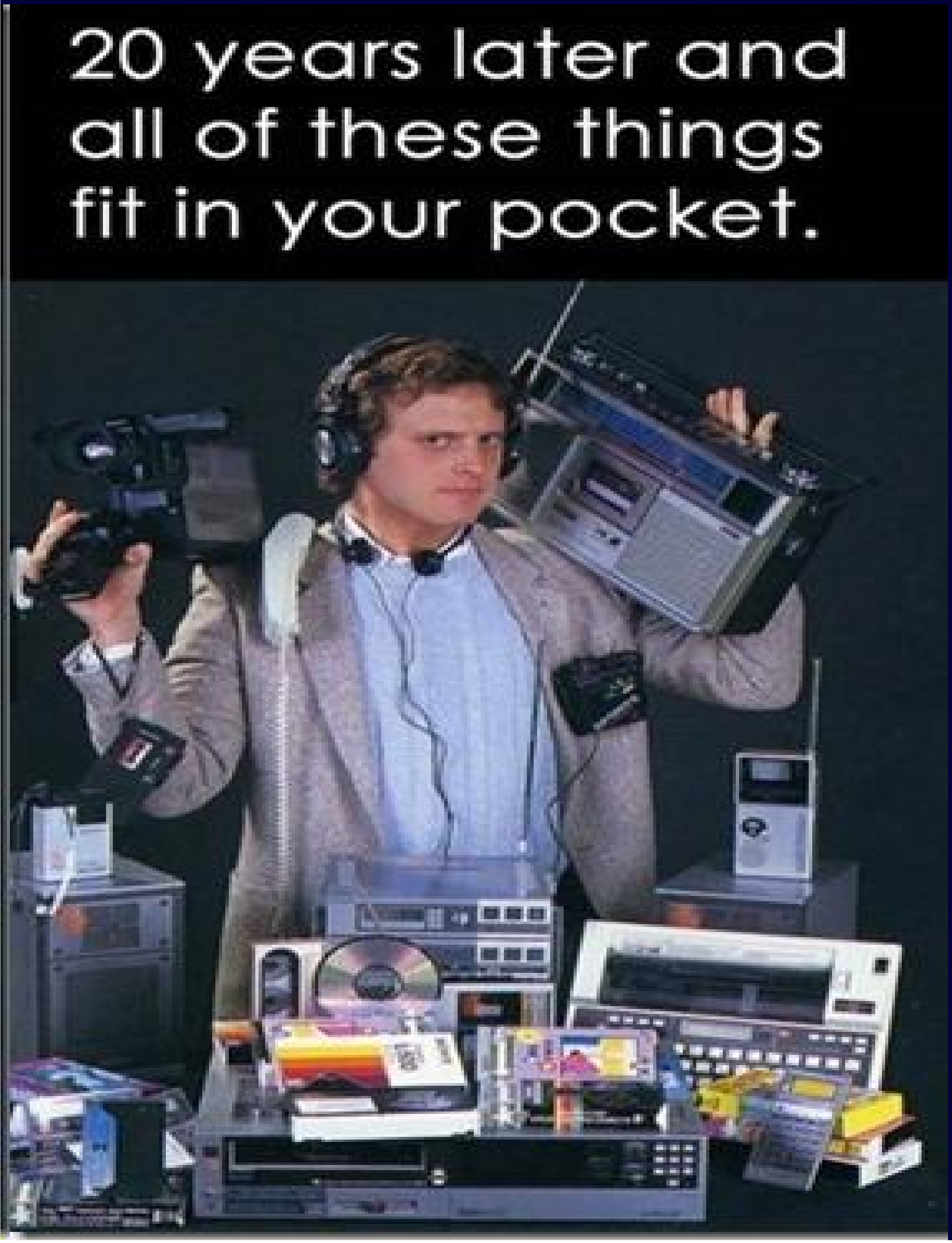
Analogic, Bio-Rad Laboratories, Boston Scientific, Bruker, CareFusion, Covidien, Draeger, Guidant, Hill-Rom, Intuitive Surgical, Invacare, Medtronic, ResMed, St Jude Medical, Smith & Nephew, STERIS, Stryker, Varian Medical, Waters, Zimmer

European Production - Irradiation, Electromedical & Electrotherapeutic Equipment



Eurostat, C266 category, EU 27 countries

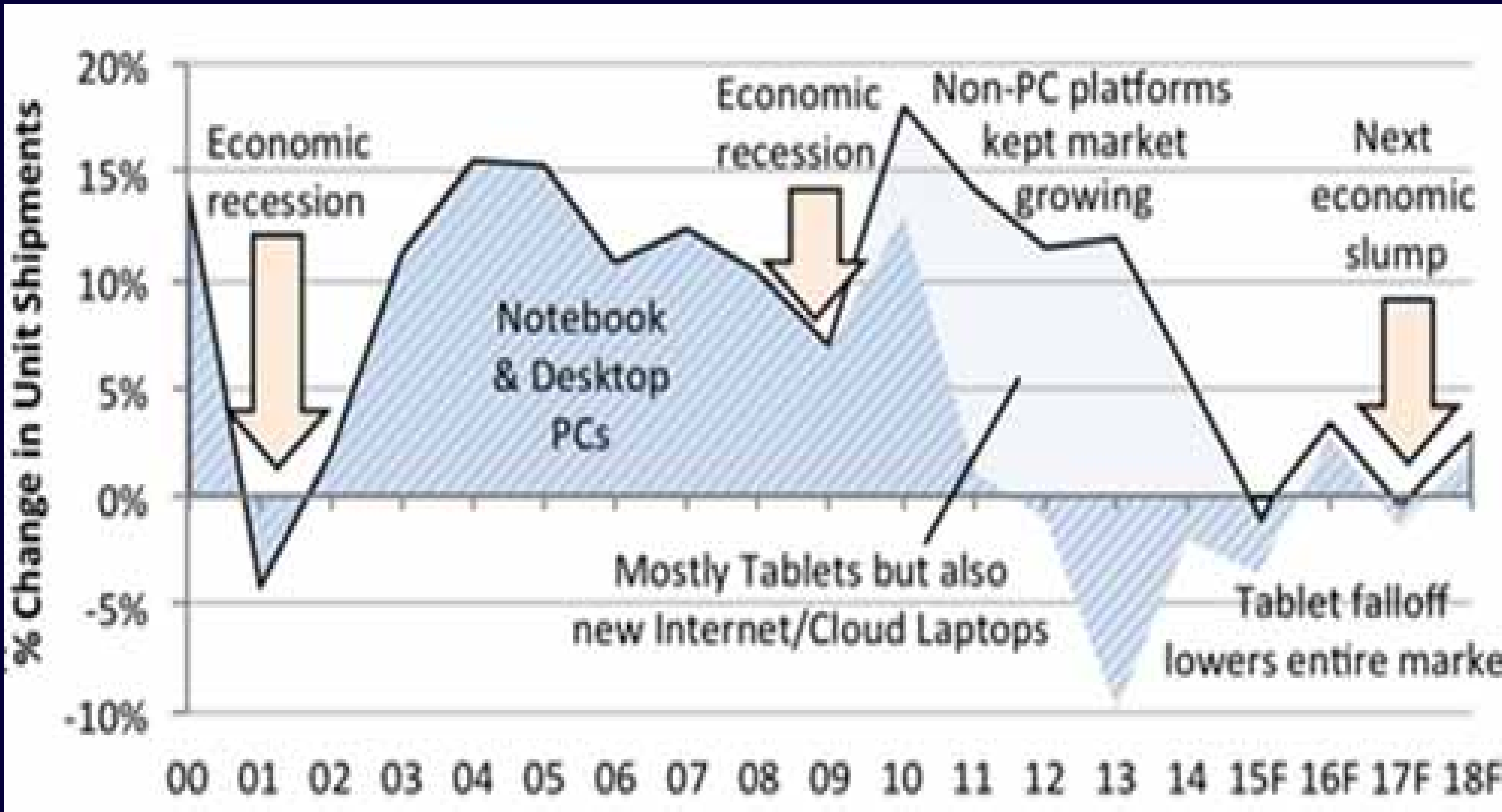
Volume Consumer-driven Products



Changing Electronic Equipment Markets

20150904

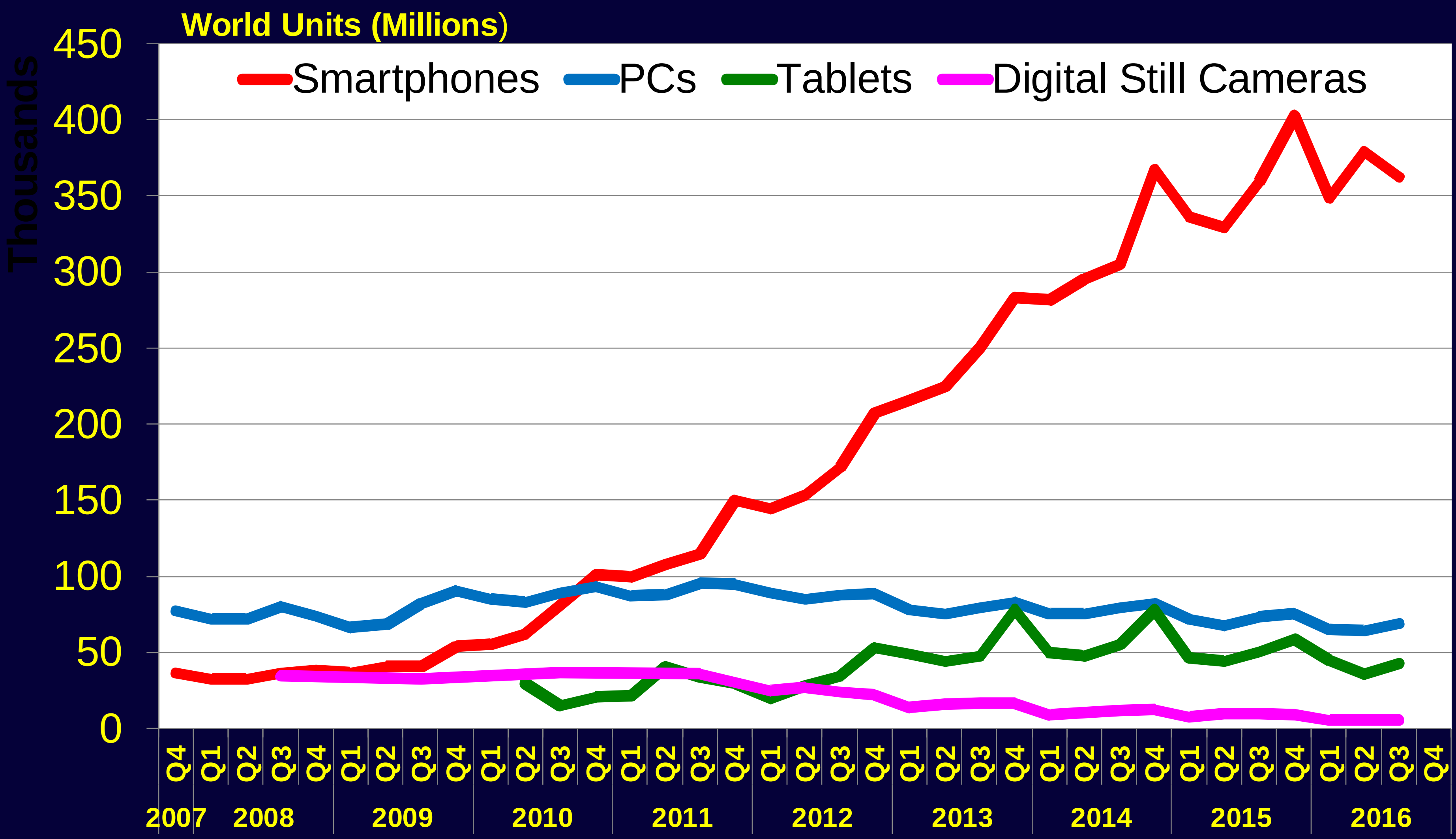
Total Personal Computer Unit Growth



IC Insights 9/15

20161102

Smartphones Cannibalize PCs, Tablets & Digital Cameras

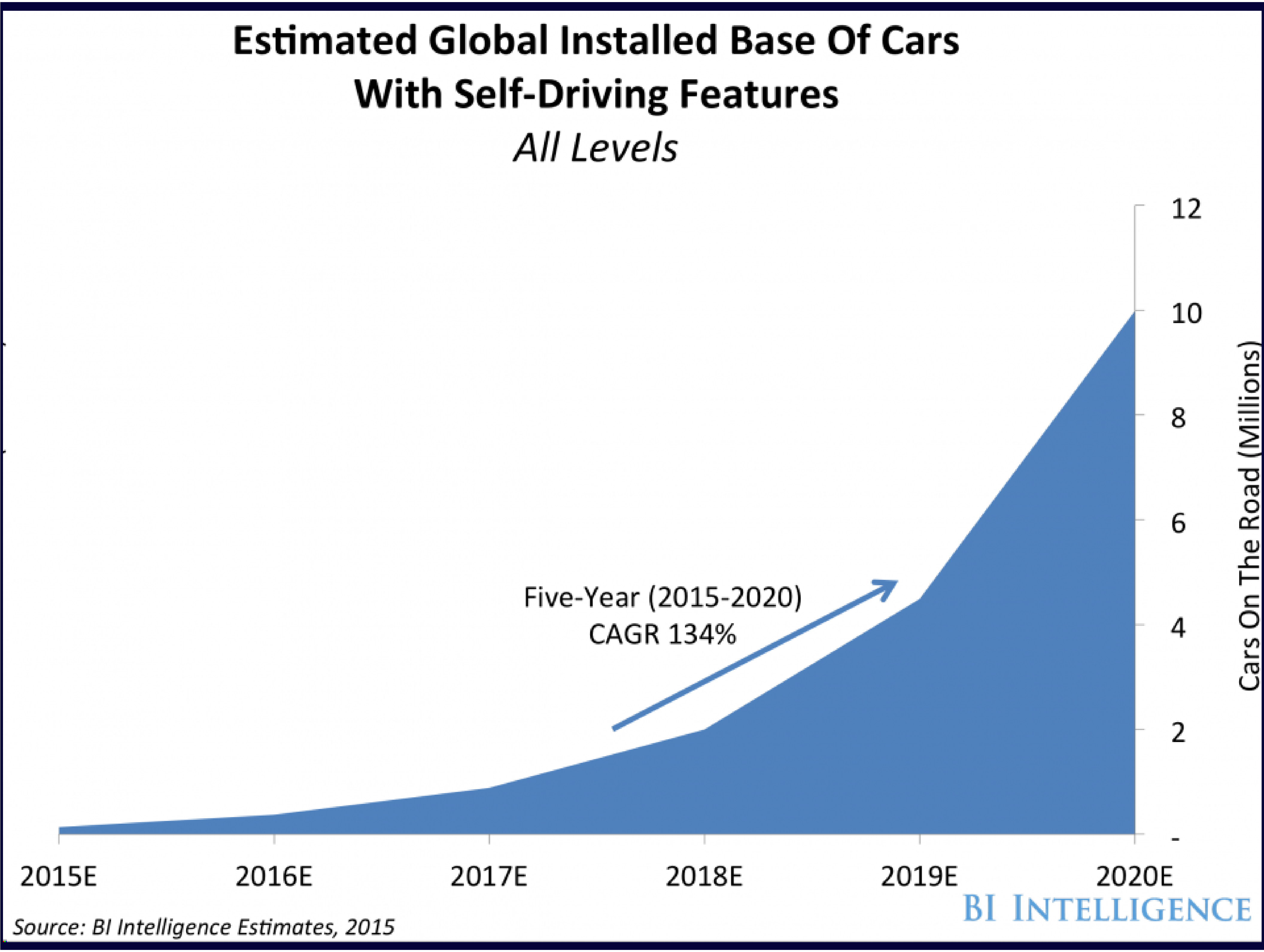


www.gartner.com; www.cipa.jp/; www.icinsights.com; www.idc.com; www.digitimes.com

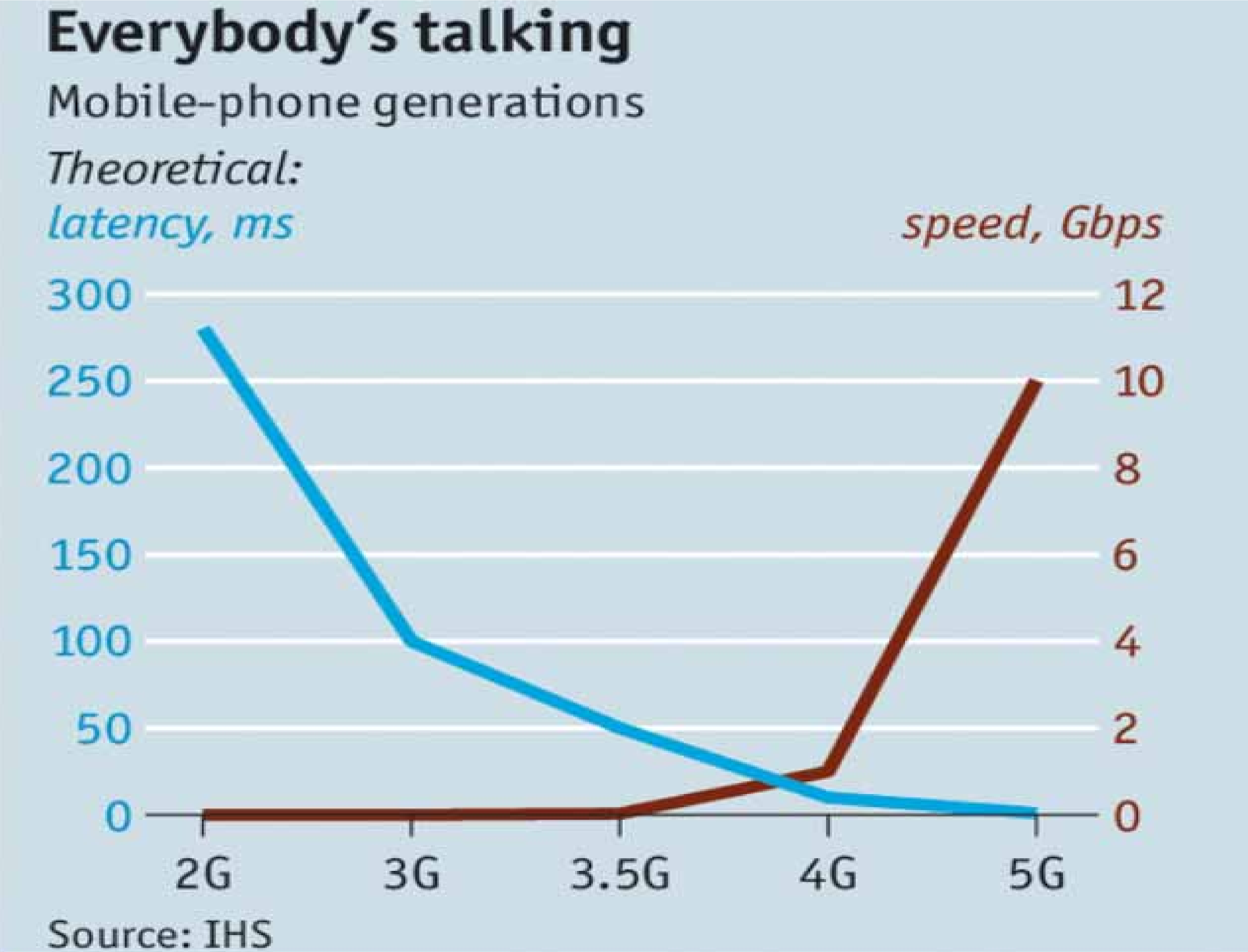
Future High Volume Markets

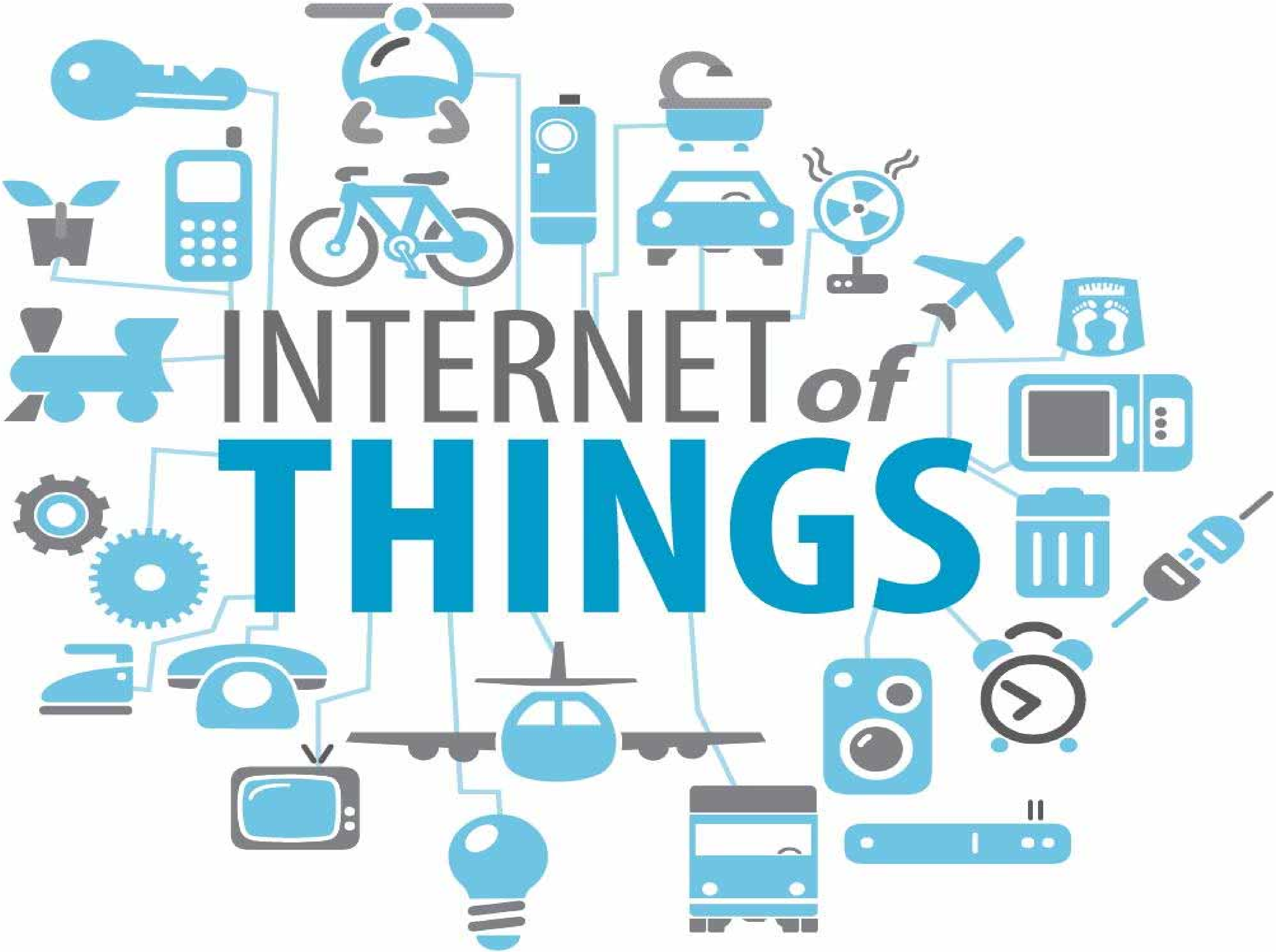
Future Volume Markets

Autonomous cars
Internet of Things
5G Handsets & Infrastructure
Drones
Robots
Wearables



Estimated Global Installed Base Of Cars
With Self-Driving Features
All Levels
Five-Year (2015-2020)
CAGR 134%
Cars On The Road (Millions)
12
10
8
6
4
2
-
2015E
2016E
2017E
2018E
2019E
2020E
BI INTELLIGENCE
Source: BI Intelligence Estimates, 2015


Everybody's talking
Mobile-phone generations
Theoretical:
latency, ms
speed, Gbps
300
250
200
150
100
50
0
12
10
8
6
4
2
0
2G
3G
3.5G
4G
5G
Source: IHS


INTERNET of
THINGS

20160221

Wearable Devices 2015-2017
Millions of Devices

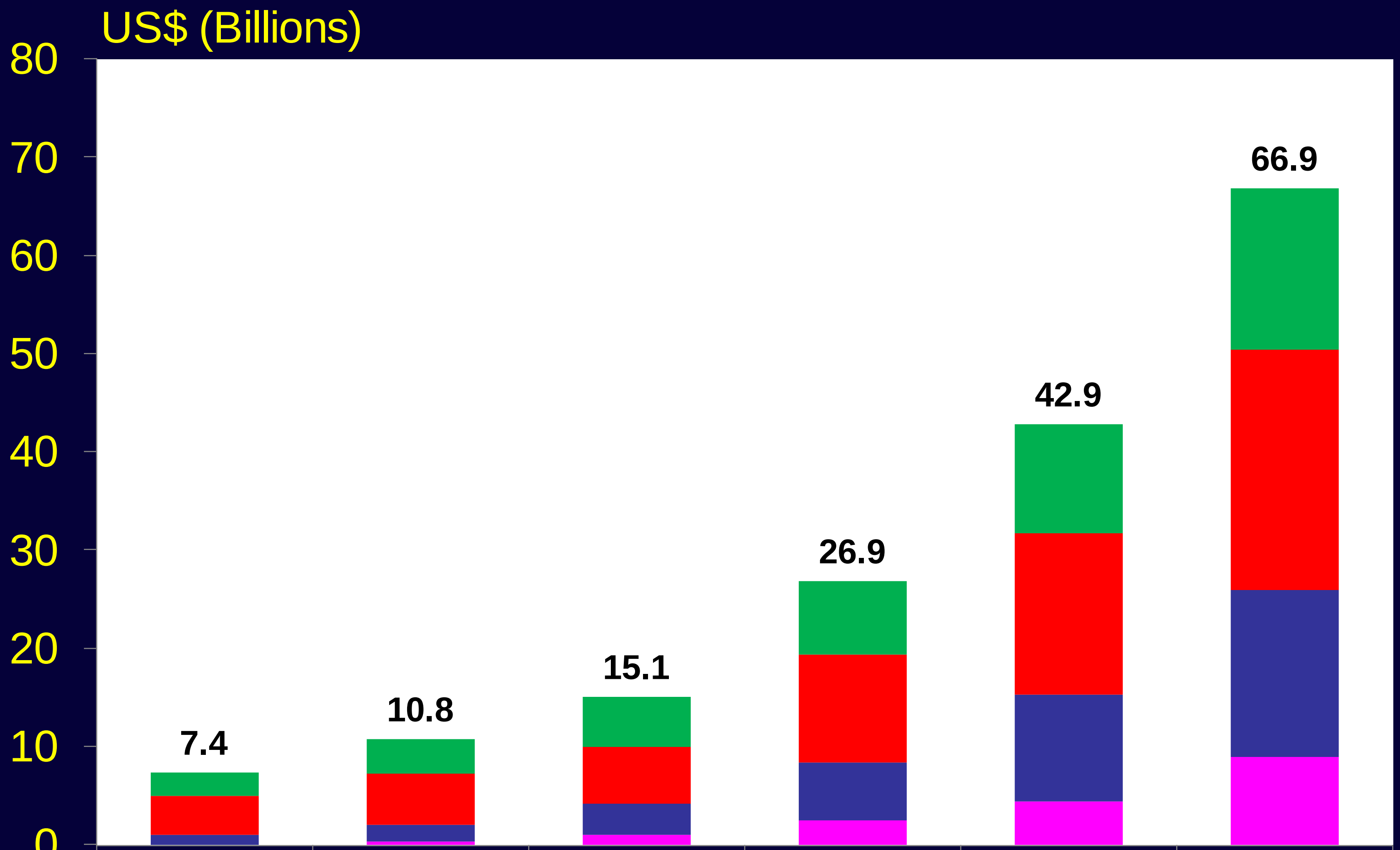
Device	2015	2016	2017
Smartwatch	30.3	50.4	66.7
Head-mounted Display	0.1	1.4	6.3
Body-worn Camera	0.1	0.2	1.1
Bluetooth Headset	116.3	128.5	139.2
Wristband	30.2	35.0	44.1
Smart Garment	0.1	1.0	5.3
Chest Strap	12.9	13.0	8.0
Sports Watch	21.0	24.0	26.9
Other Fitnes Monitor	21.1	21.1	25.1
Total	232.0	274.6	322.7

Gartner 2/2016

Most will take a few years
to develop

A Key Exception

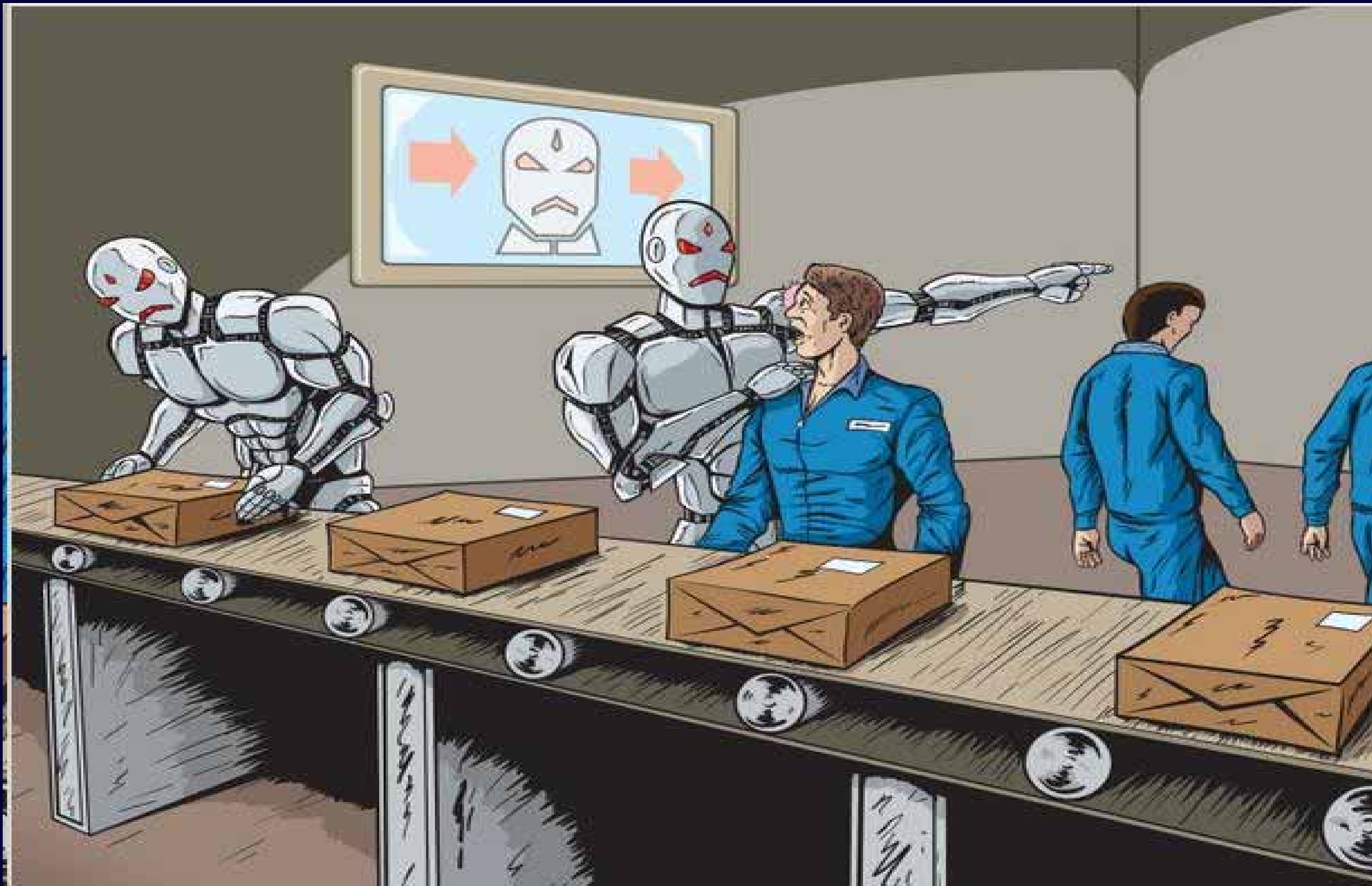
World Spending on Robots



	2000	2005	2010	2015	2020	2025
Total	7.4	10.8	15.1	26.9	42.9	66.9
Military	2.4	3.5	5.1	7.5	11.2	16.5
Industrial	3.9	5.2	5.8	11.0	16.4	24.4
Commercial	1.1	1.7	3.2	5.9	10.8	17.0
Personal	0.0	0.4	1.0	2.5	4.5	9.0

BCG Analysis 9/14, International Federation of Robots, Japan Robot Assoc, Japan Ministry of Economy, Trade & Industry, euRobotics, company filings

Automation has its concerns



Semiconductors

Monthly Semiconductor Shipments
$ Billions (3-month avg in US$)

20161101

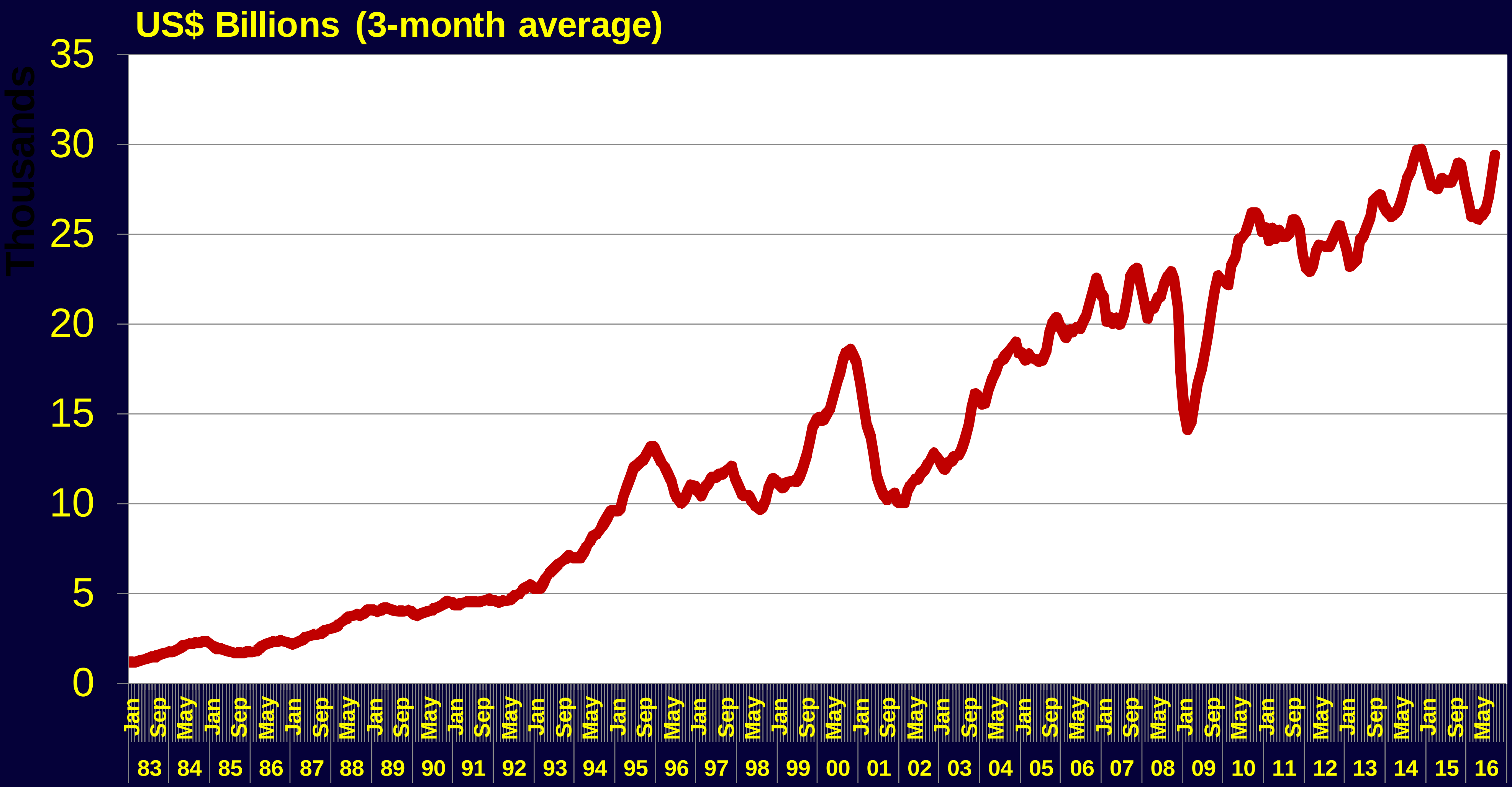
	9/15	9/16	% CH
Americas	5.82	5.68	- 2.4%
Europe	2.87	2.76	- 4.0%
Japan	2.69	2.80	+ 4.2%
China	8.45	9.47	+ 12.0%
Asia Pacific / All Other	8.58	8.73	+ 1.7%
Total	28.41	29.43	+ 3.6%

SIA www.sia-online.org/

World Semiconductor Shipments

20161101

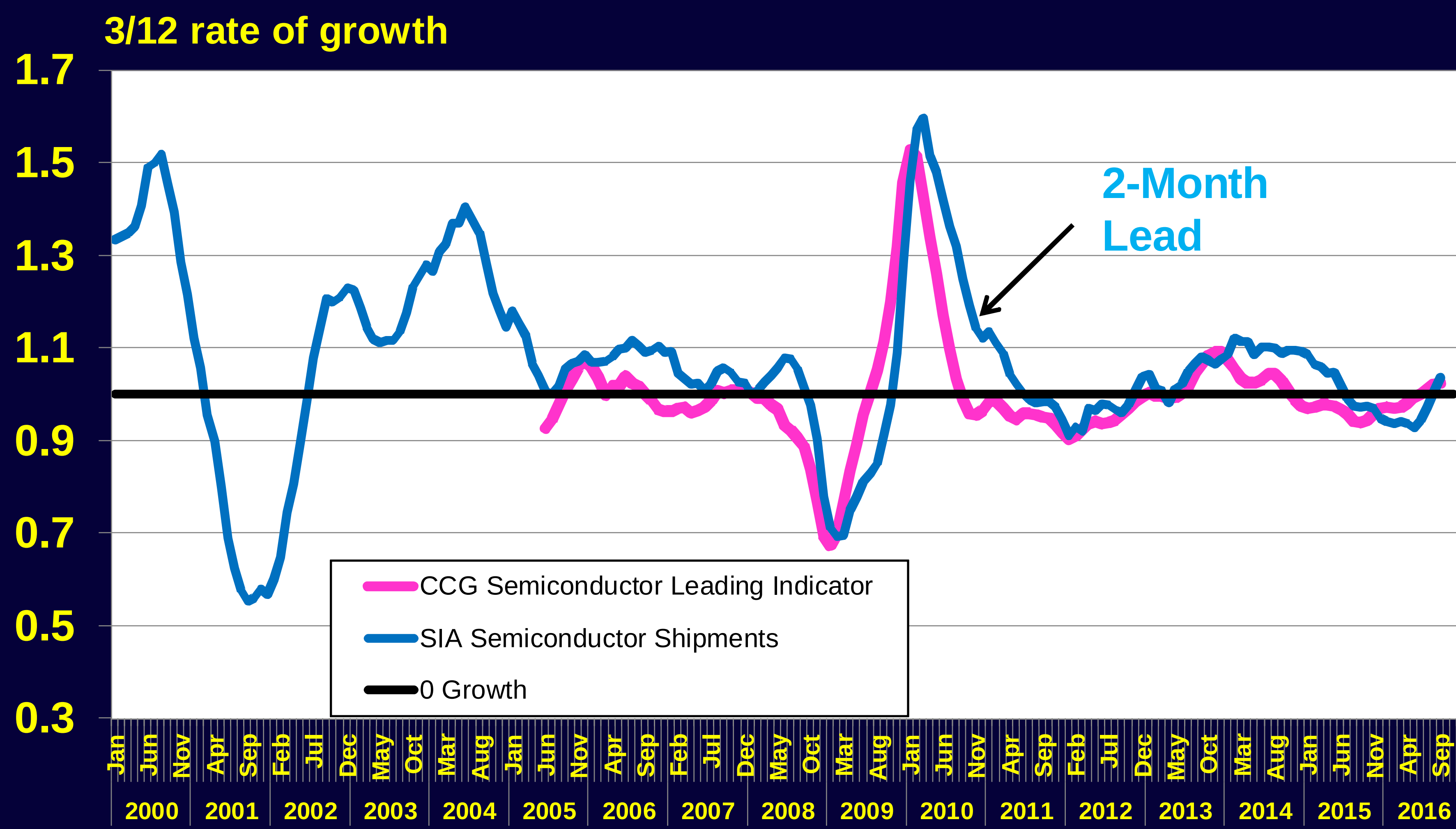
Monthly US$



SIA

CCG Semiconductor Leading Indicator vs. Global Semiconductor Shipments

20161101

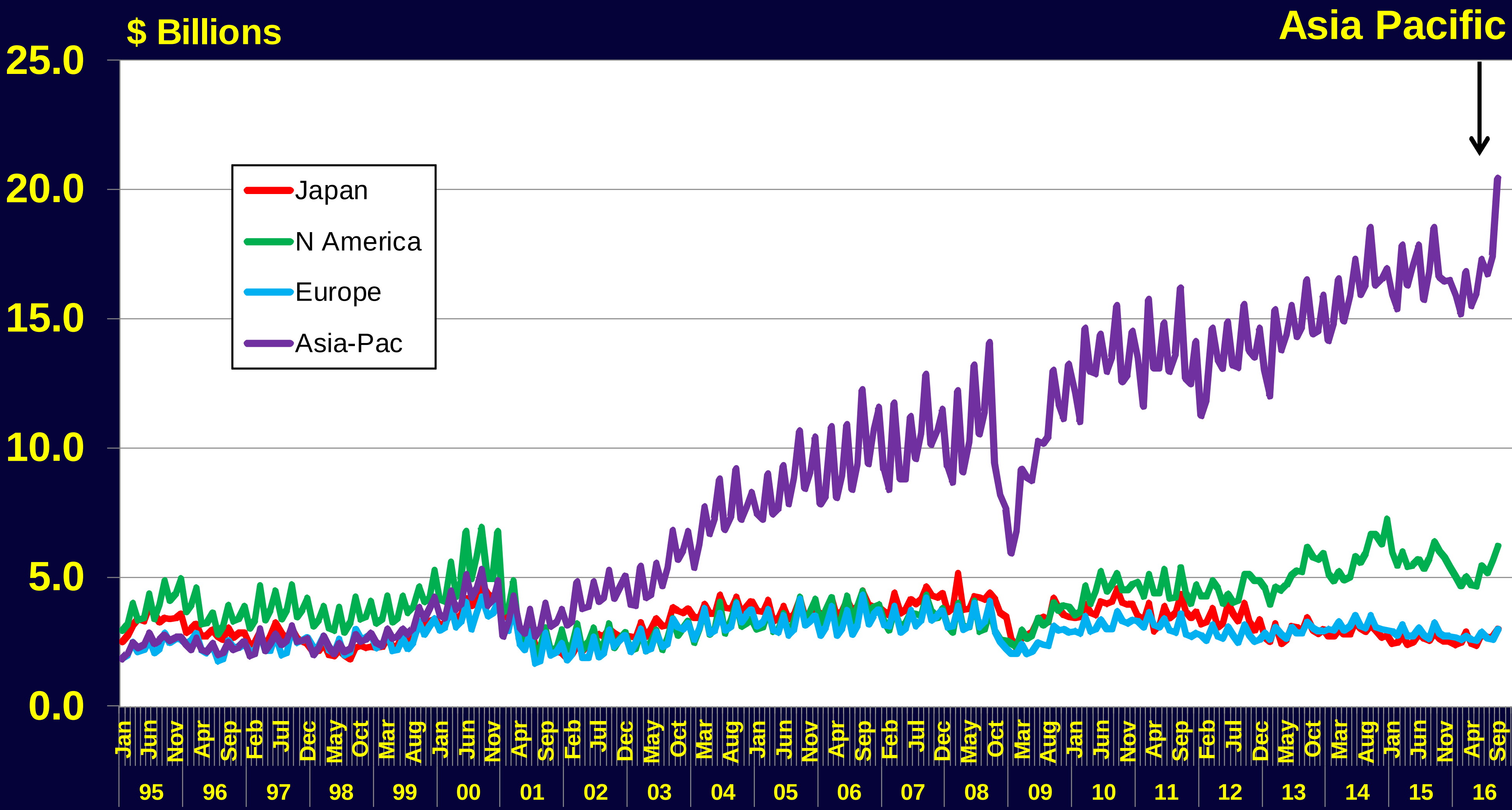


http://www.census.gov/indicator/www/m3/

20161101

Total Semiconductor Shipments to an Area

Monthly Shipments - Reporting Firms

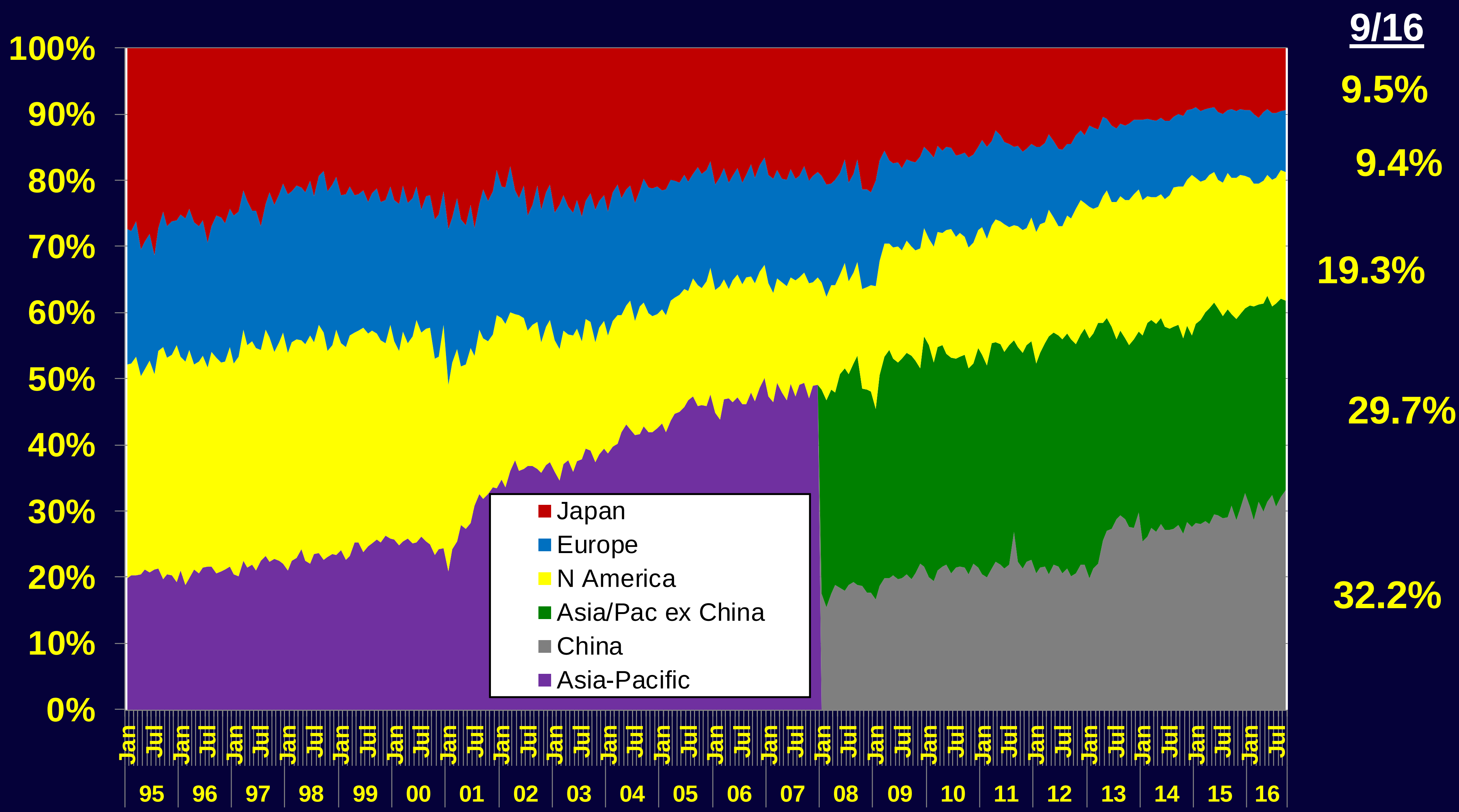


SIA website: www.sia-online.org/

20161101

Total Semiconductor Shipments to an Area

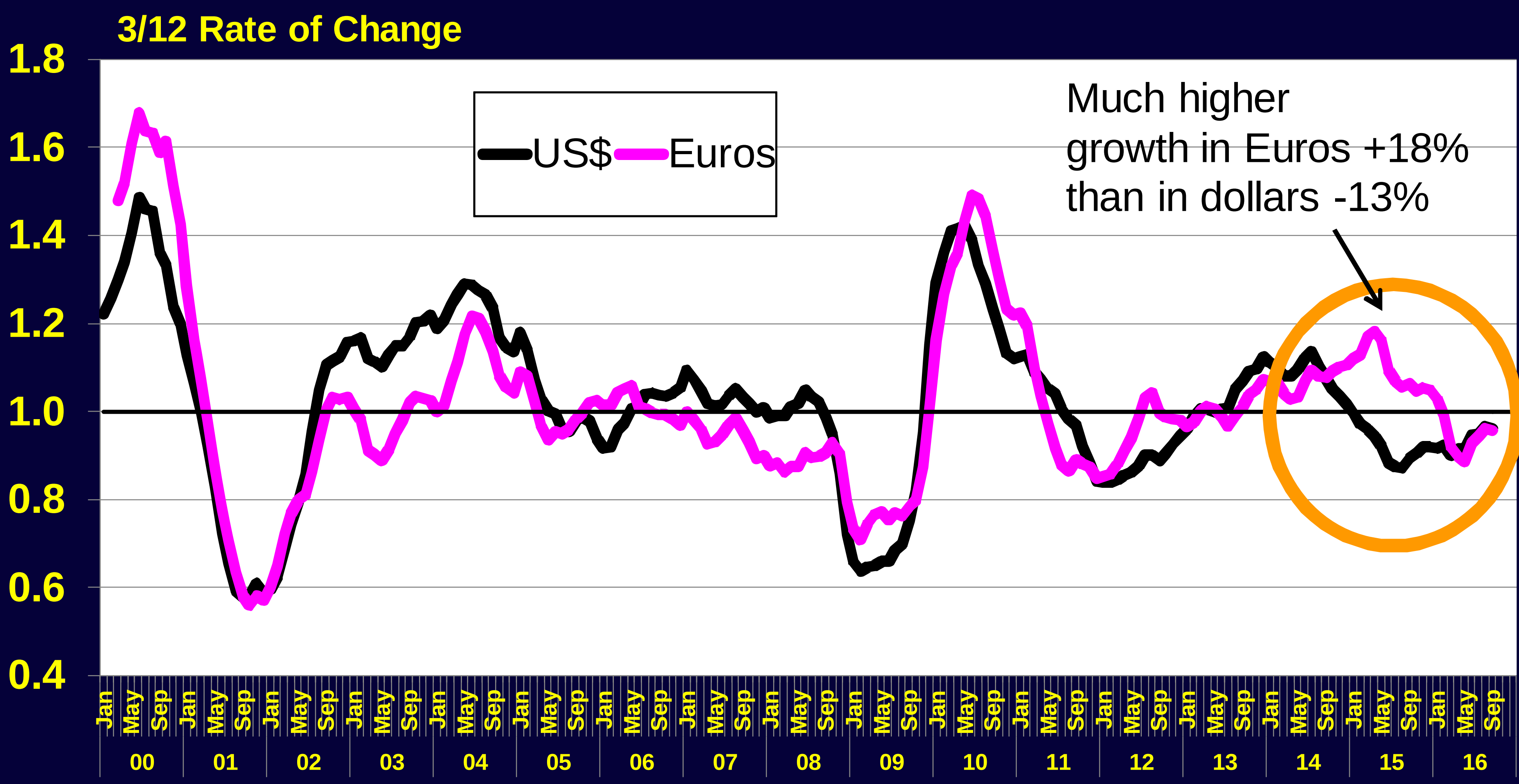
Monthly Shipments - Reporting Firms (showing China)



SIA website: www.sia-online.org/

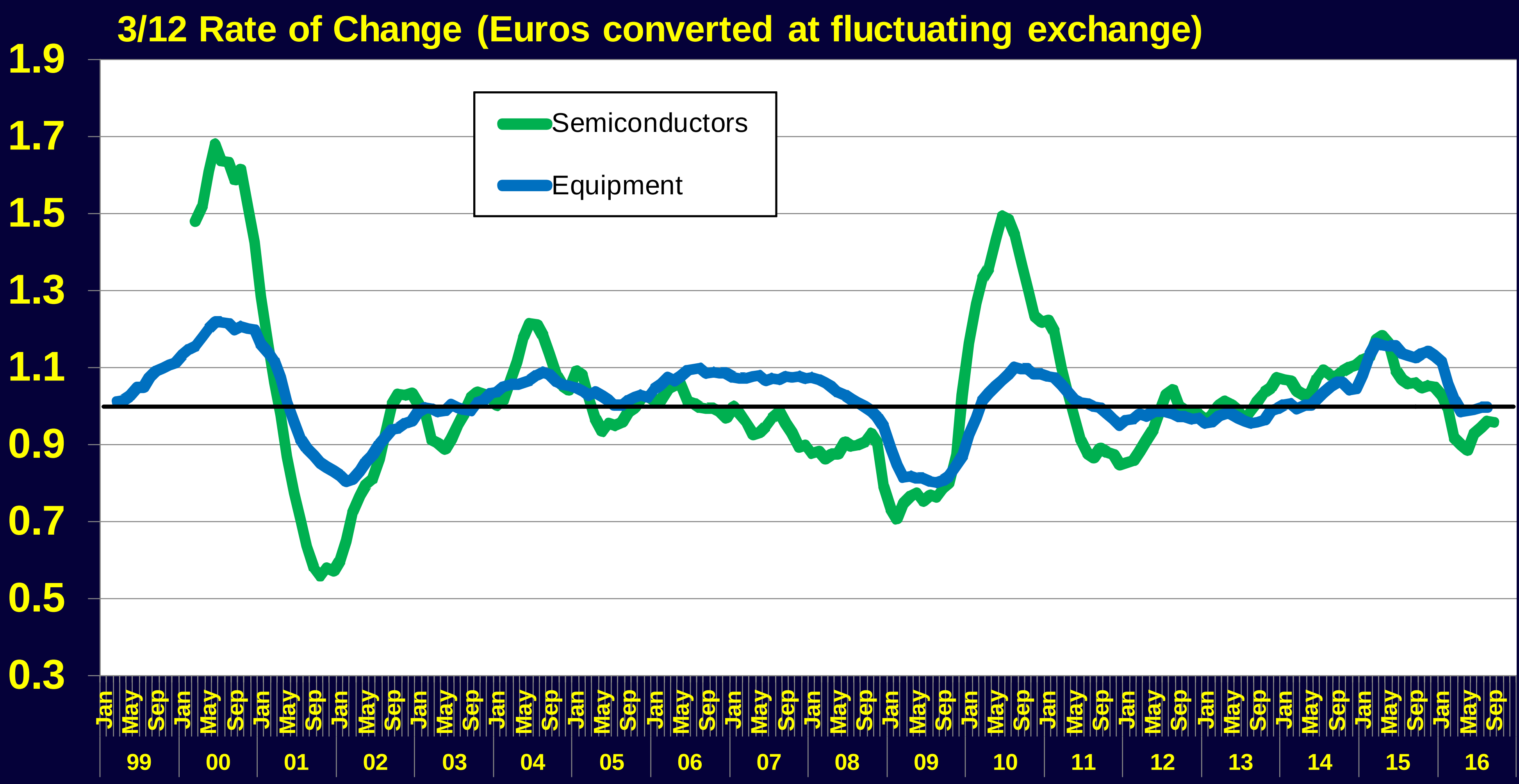
20161102

Effect of Exchange Rates on Semiconductor Shipment Growth to Europe



20161101

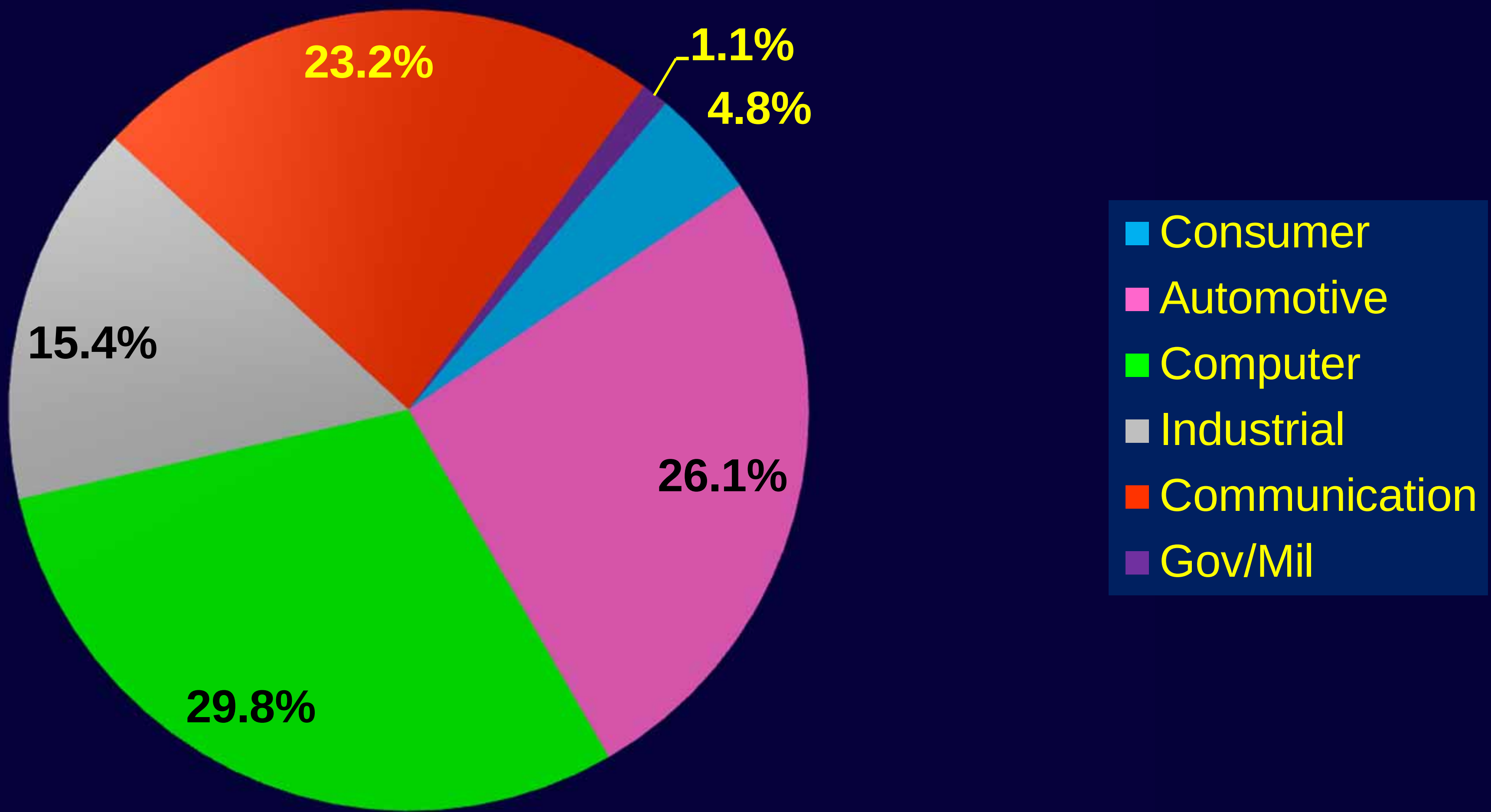
Semiconductor Shipments to Europe vs. European Electronic Equipment Production



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

20160917

Europe IC Usage by System – 2016F

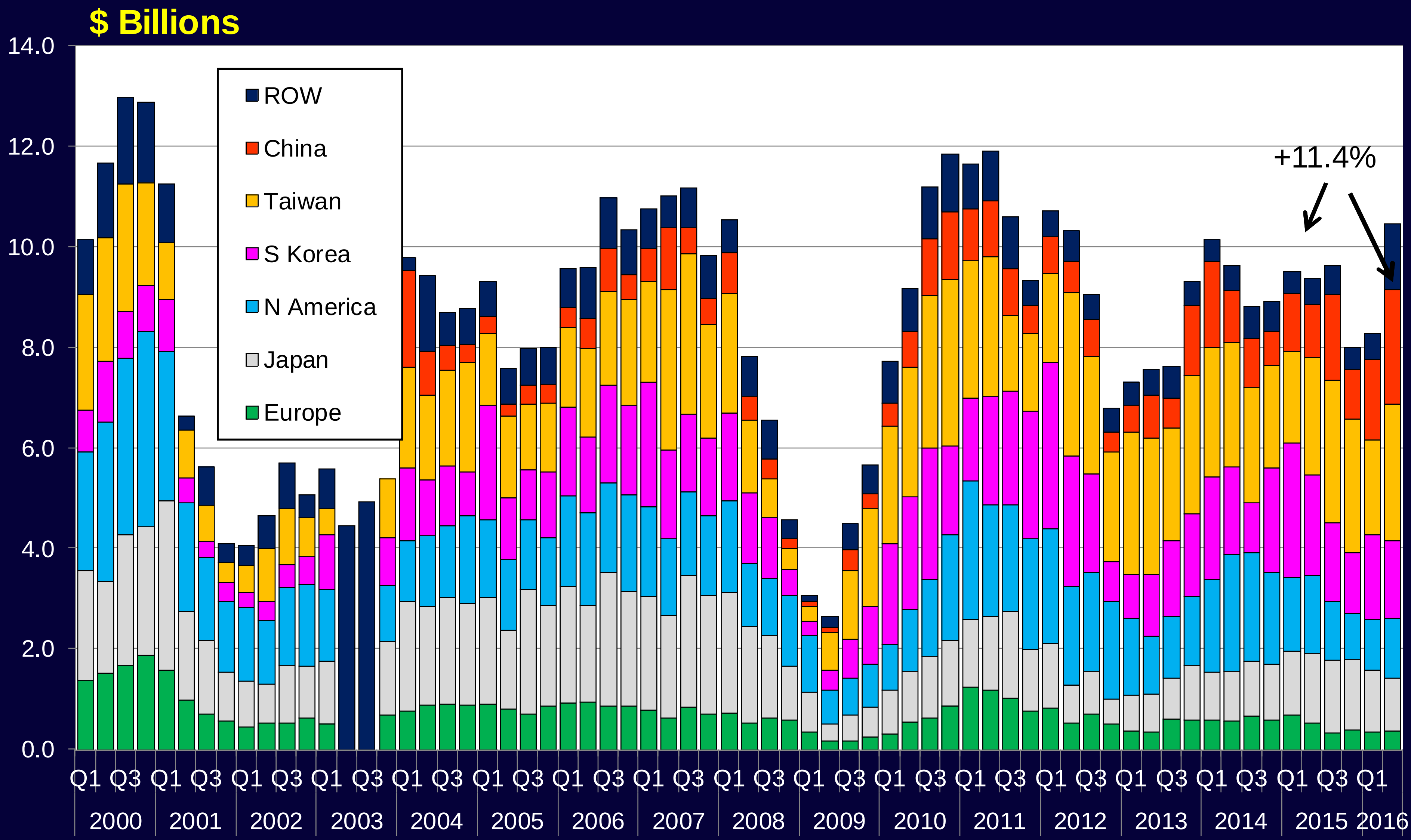


Total: $25.6 Billion

IC Insights 9/16

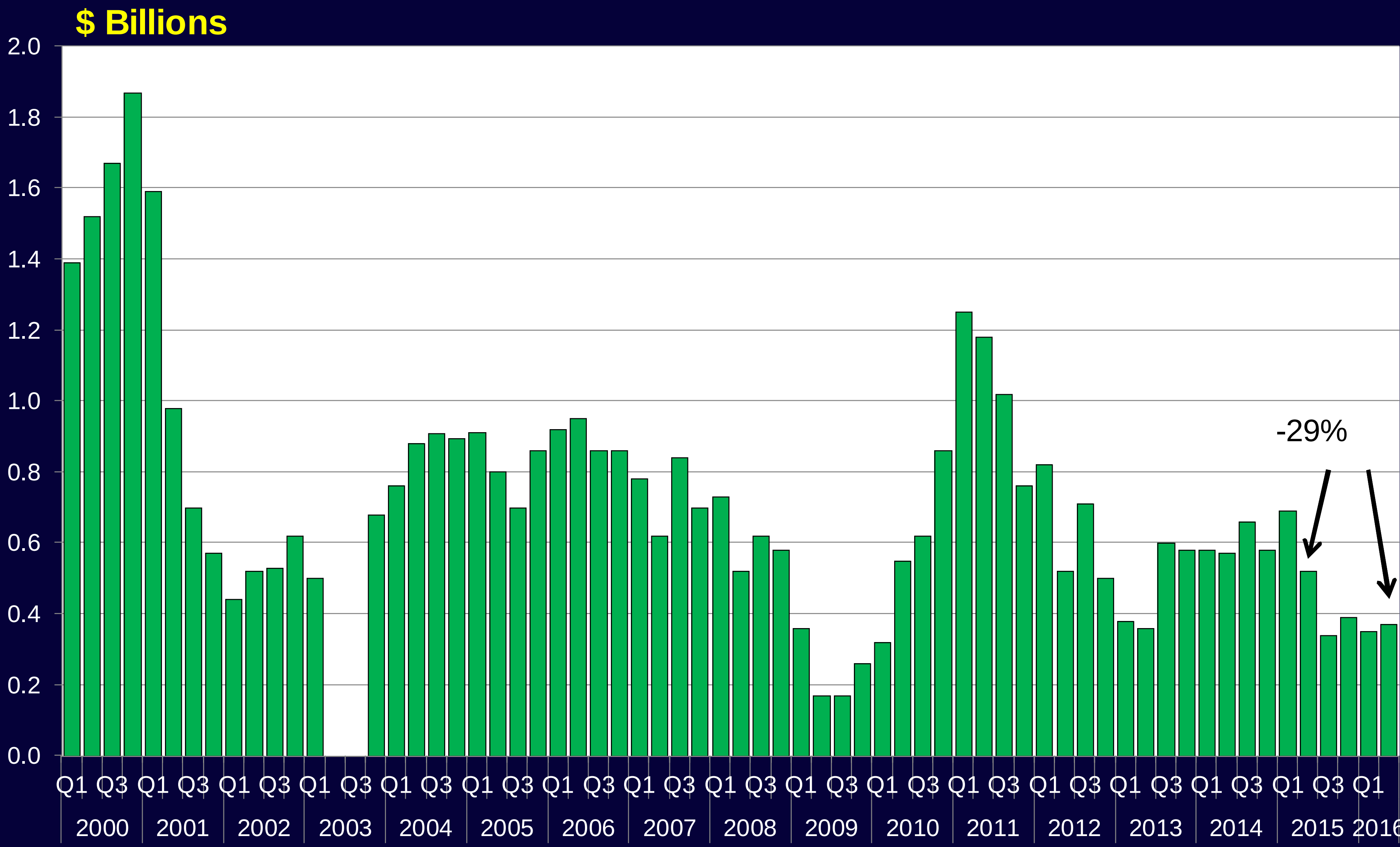
Semiconductor Capital Equipment

Semiconductor Capital Equipment Shipments by Area



www.semi.org, www.seaj.or.jp/ 9/16

Semiconductor Capital Equipment Shipments Europe

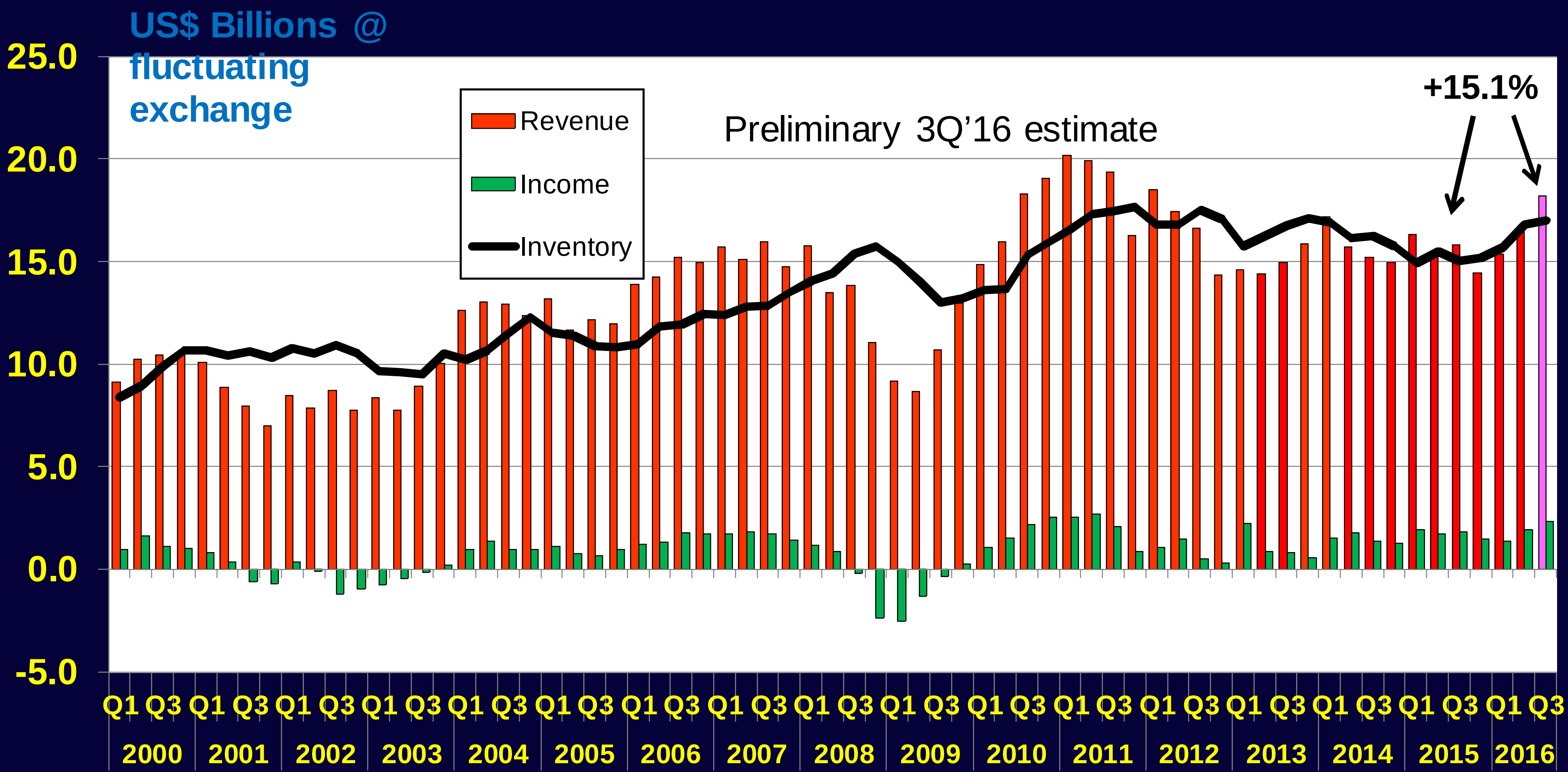


www.semi.org, www.seaj.or.jp/ 9/16

20161113

Semiconductor Fab, Test & Measurement Composite of 40 Public Companies

Revenue, Net Income & Inventory

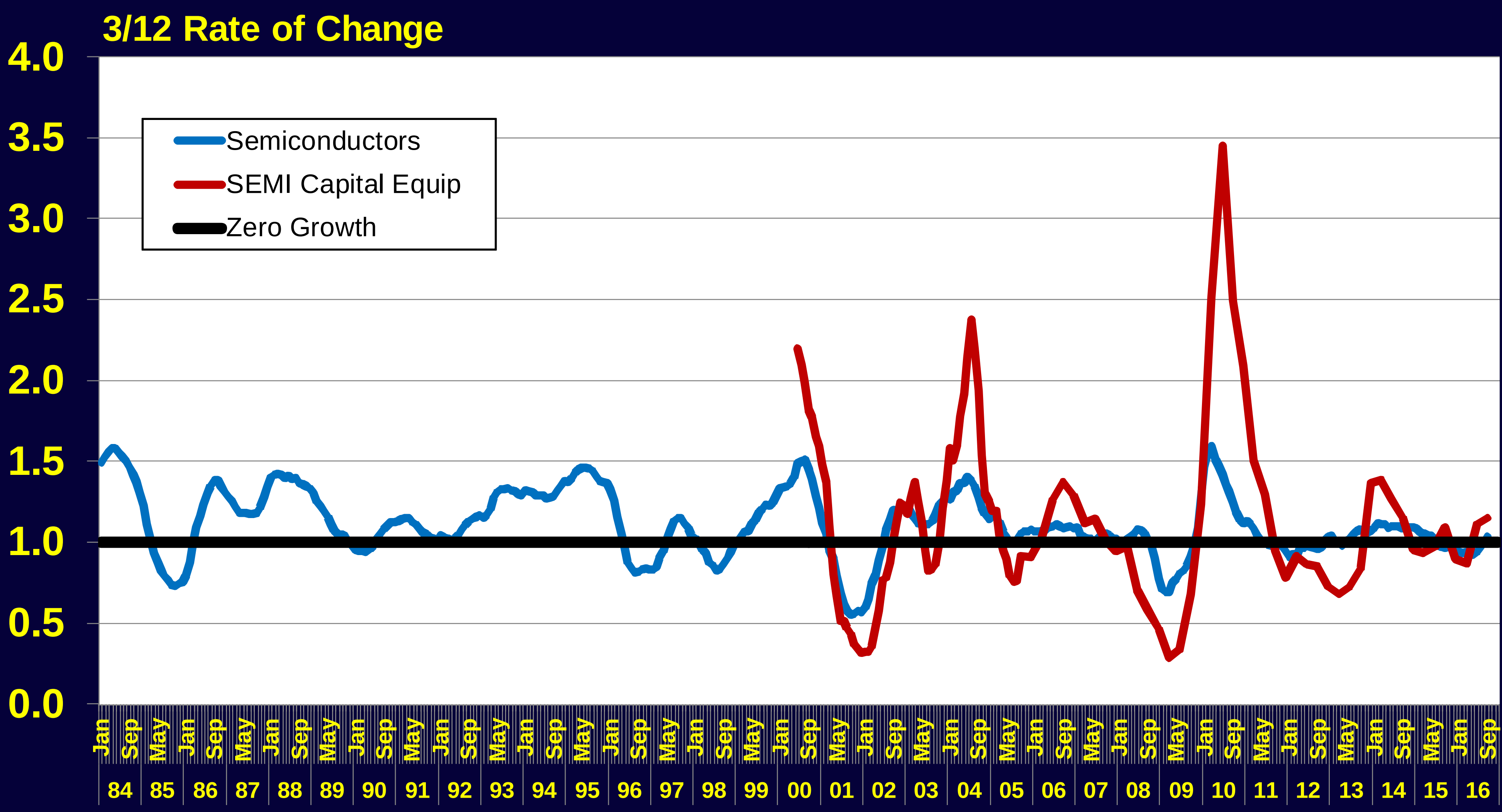


Advantest, Applied Materials, ASM Intl, ASML, Axcelis, Brooks Automation, BTU, Cohu, CollabRx, Dainippon Screen, Disco, Electroglas, Entegris, FEI, FormFactor,FSI, Hitachi Hi Tech, Hitachi Kokosai, KLA-Tencor, Ibis, Intervac, Kulicke & Soffa, Lam Research, Mattson,MKS Instrument, Novellus Systems, Photon Dynamics, Rudolph Technologies, Teradyne, Tokyo Electron, Ultra Clear, Ultratech Stepper, Varian Semiconductor, Veeco, Xcerra (LTX-Credence)

Global Semiconductor & Semiconductor Capital Equipment

3-Month Shipment Growth Rates on $ Basis

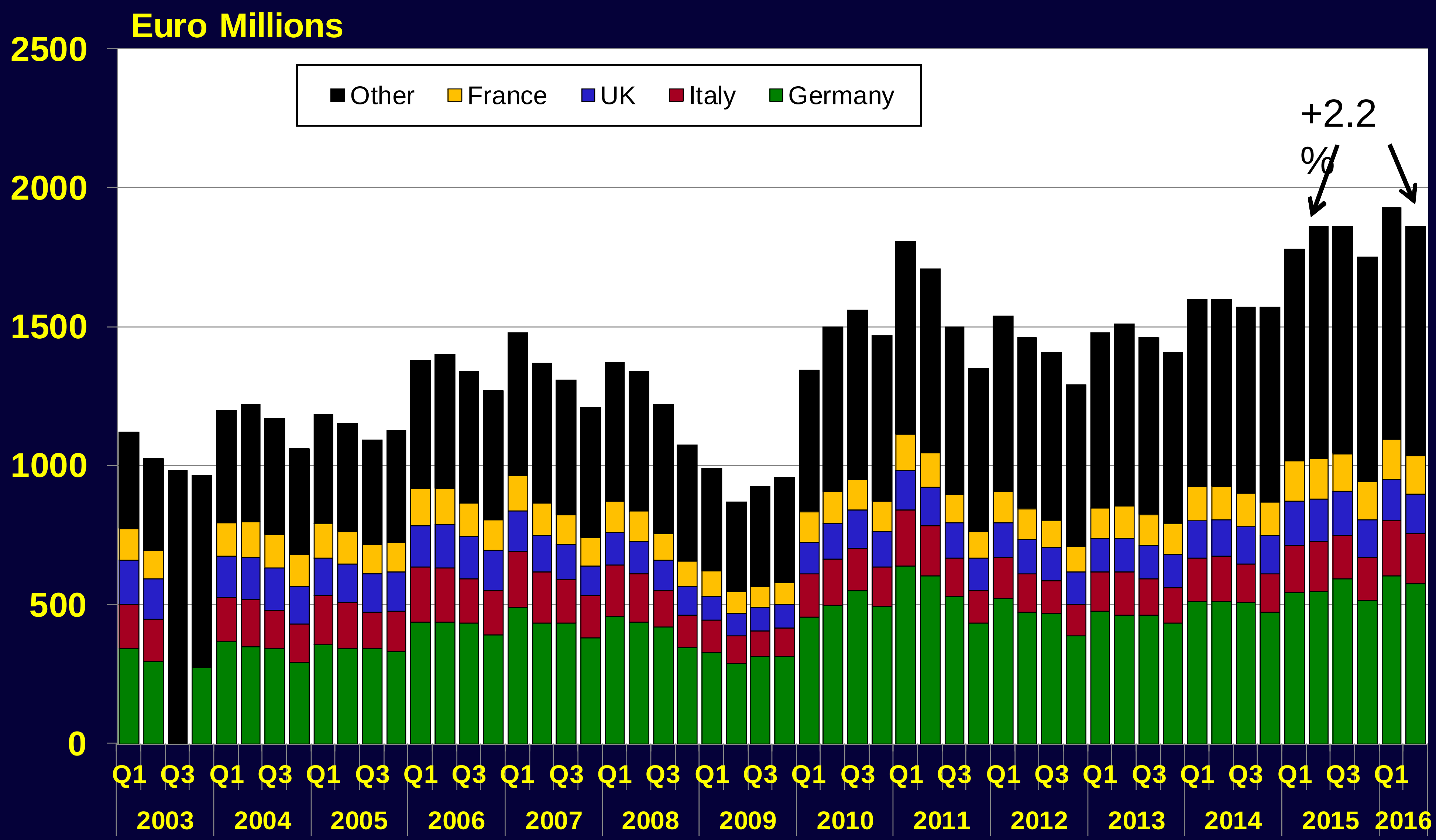
20161113



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

European Component Shipments by Country

DMASS - European Semiconductor Distribution Industry

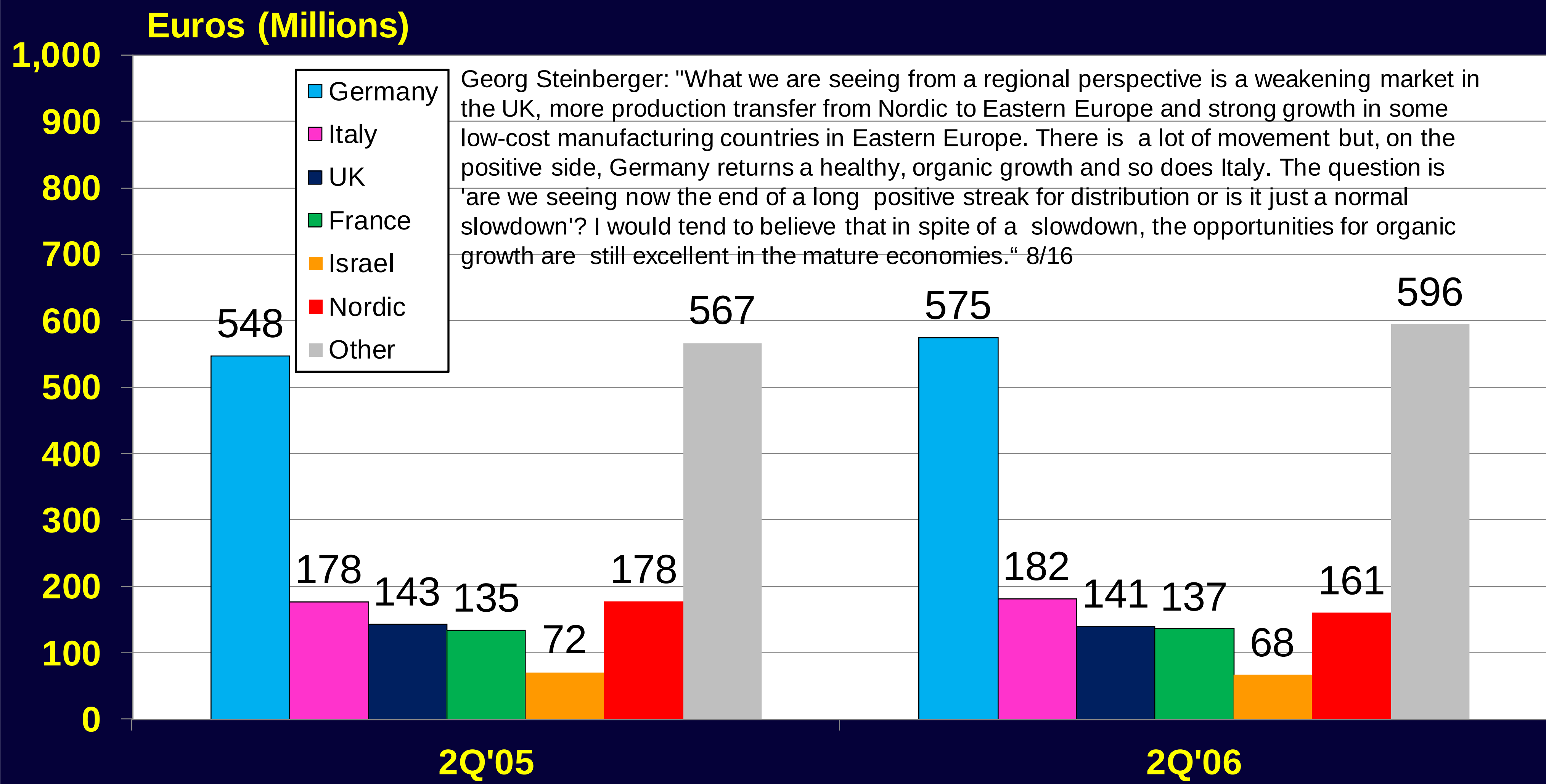


http://dmass.com/ 8/16

20160626

DMASS

European Semiconductor Distribution Industry



"Growth rate for semiconductor distribution slows down through a quiet Spring quarter. Germany and Eastern Europe stay ahead, UK and Nordic decline."

EMS & ODM Companies

20160401

Large Global EMS Providers

2014 vs. 2015 Sales ($M)

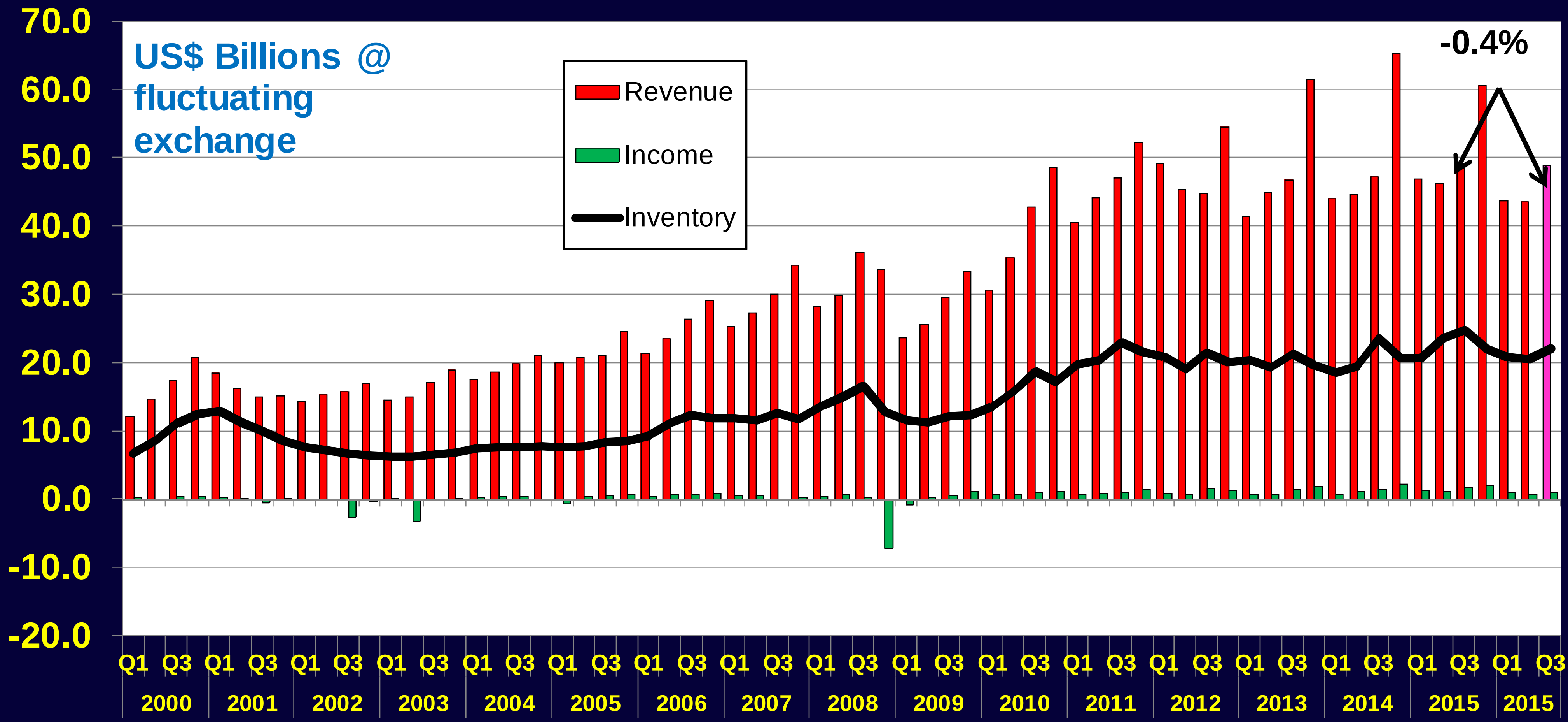
		2014	2015	2015/2014 Growth %
Hon Hai (Foxconn)	Taiwan	138,765	141,717	+2%
Flextronics	Singapore	26,920	24,598	-9%
Jabil Circuit	USA	15,969	18,557	+16%
Sanmina-SCI	USA	6,439	6,238	-3%
Celestica	Canada	5,631	5,639	0%
Benchmark Elec	USA	2,797	2,541	-9%
Plexus	USA	2,509	2,606	+4%
Venture Mfg	Singapore	1,945	1,928	-1%
Sypris	USA	355	145	-59%
Total		201,331	204,291	+1.5%

Sources: Company data

Local currency converted at fluctuating exchange

20161103

Large EMS Providers
Composite of 9 Public Companies
Revenue, Net Income & Inventory

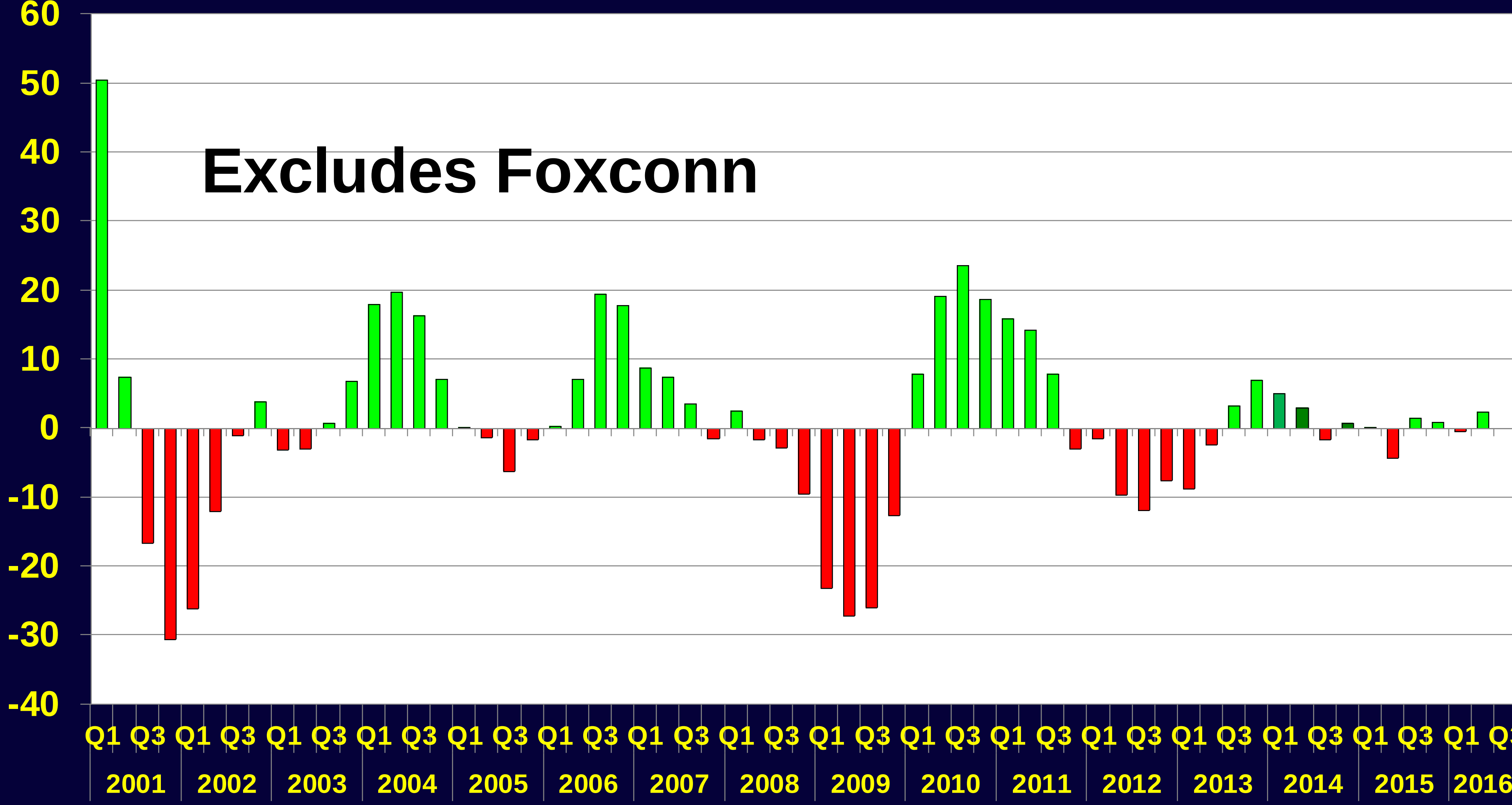


Benchmark+Pemstar, Celestica, Flextronics+Solectron, Foxconn, Jabil, Plexus, Sanmina, Sypris, Venture Mfg

20160903

Large EMS Providers
Composite of 8 Public Companies

Quarterly Revenue Growth



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

20160111

Large Taiwan ODM Providers

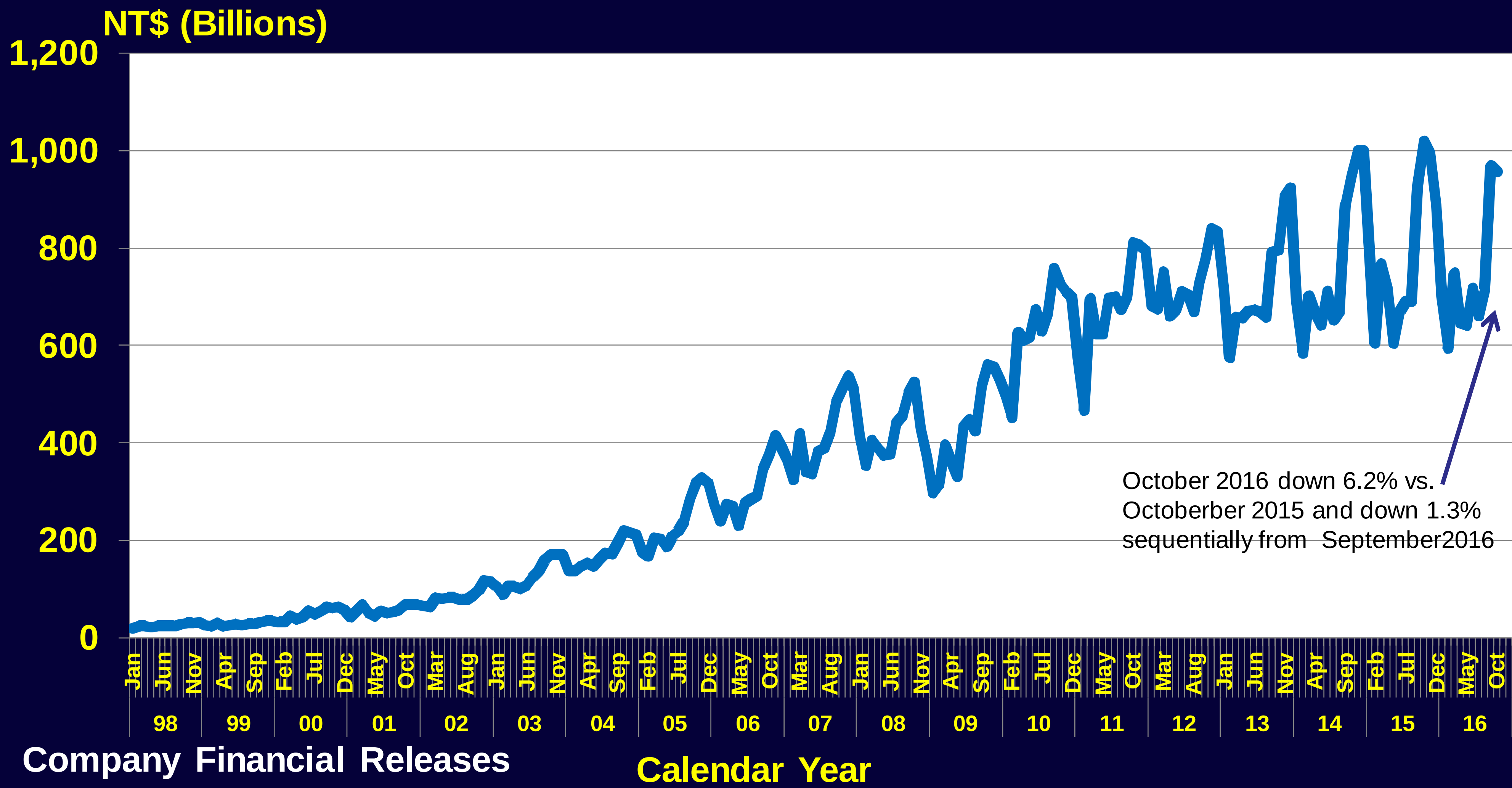
2014 vs. 2015 Sales ($M)

	2014	2015	2015/2014 Growth %
Foxconn (Hon Hai)	139,032	141,202	+1.6%
Pegatron	33,632	38,224	+13.7%
Quanta Computer	30,566	31,726	+3.8%
Compal Electronics	27,909	26,685	-4.4%
Wistron	19,534	19,631	+0.5%
Asustek Computer	15,747	14,875	-5.5%
Inventec	14,376	12,456	-13.4%
Chimei Innolux	14,145	11,469	-18.9%
Lite On Technology	7,611	6,828	-10.3%
Total	302,551	303,094	+0.2%

Source: Company data, NT$ converted at constant avg 2015 exchange (31.75 NT$ = 1US$)
Consolidated company sales

20161113

Taiwan ODM Companies Composite Sales of 11 Large Manufacturers



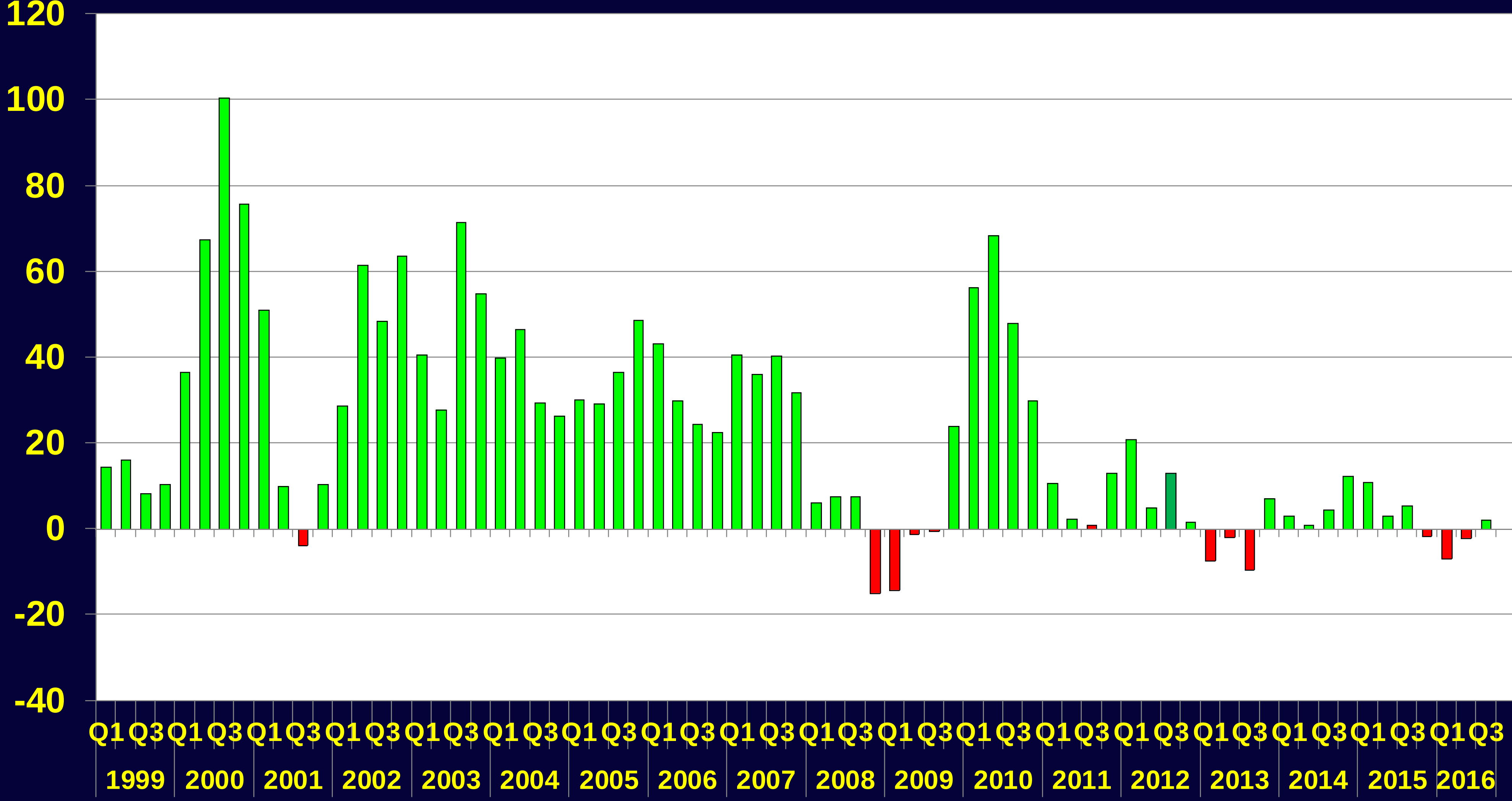
Company Financial Releases

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

20161012

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, Pegatron, Quanta Computer, Wistron

20161012

European Loaded Electronic Board Production

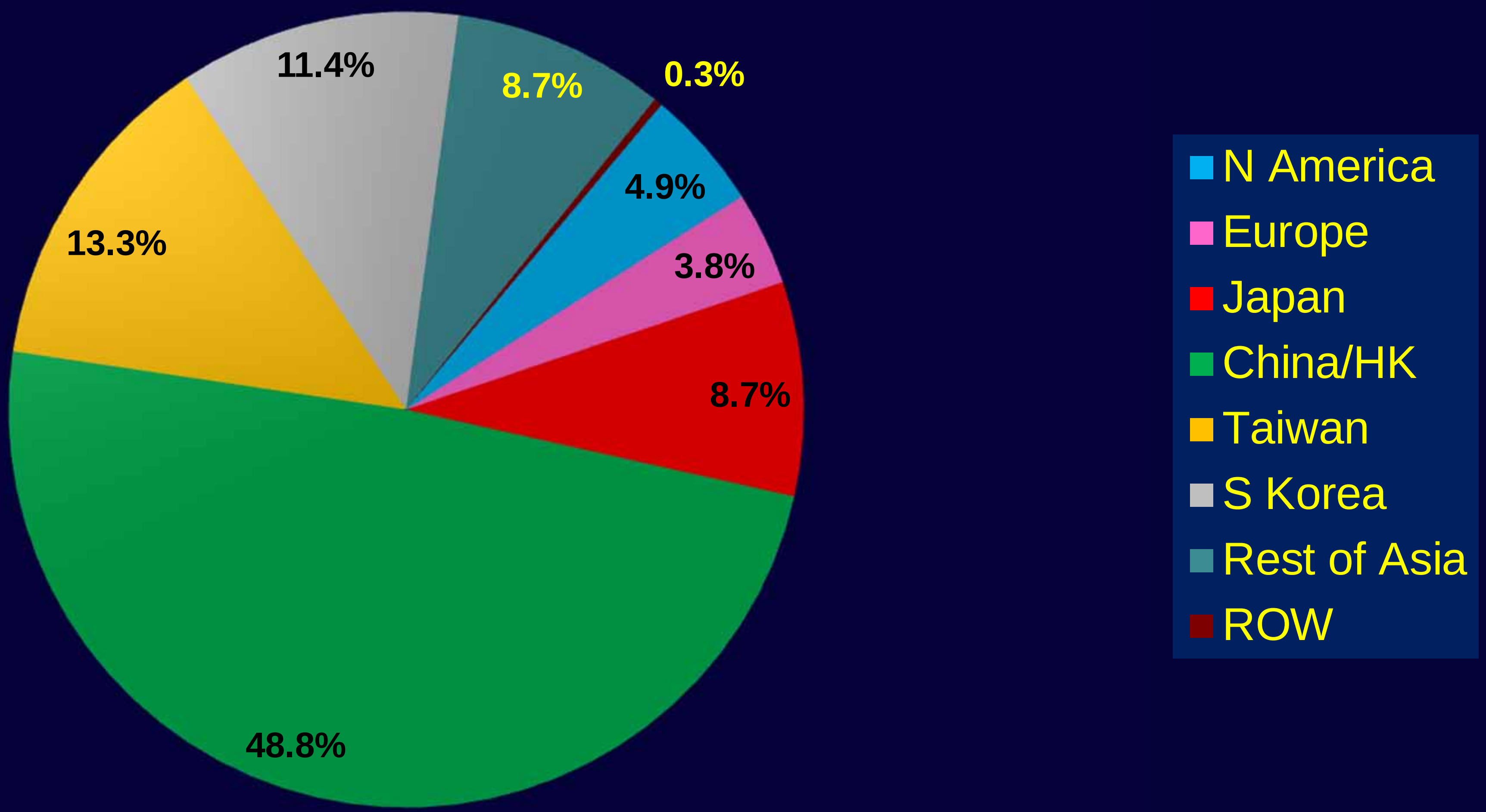
Eurostat, C2612

PCB Fabrication

20161101

2015 World Total PCB Production by Geographical Area

(US$ M @ Average 2015 Exchange)



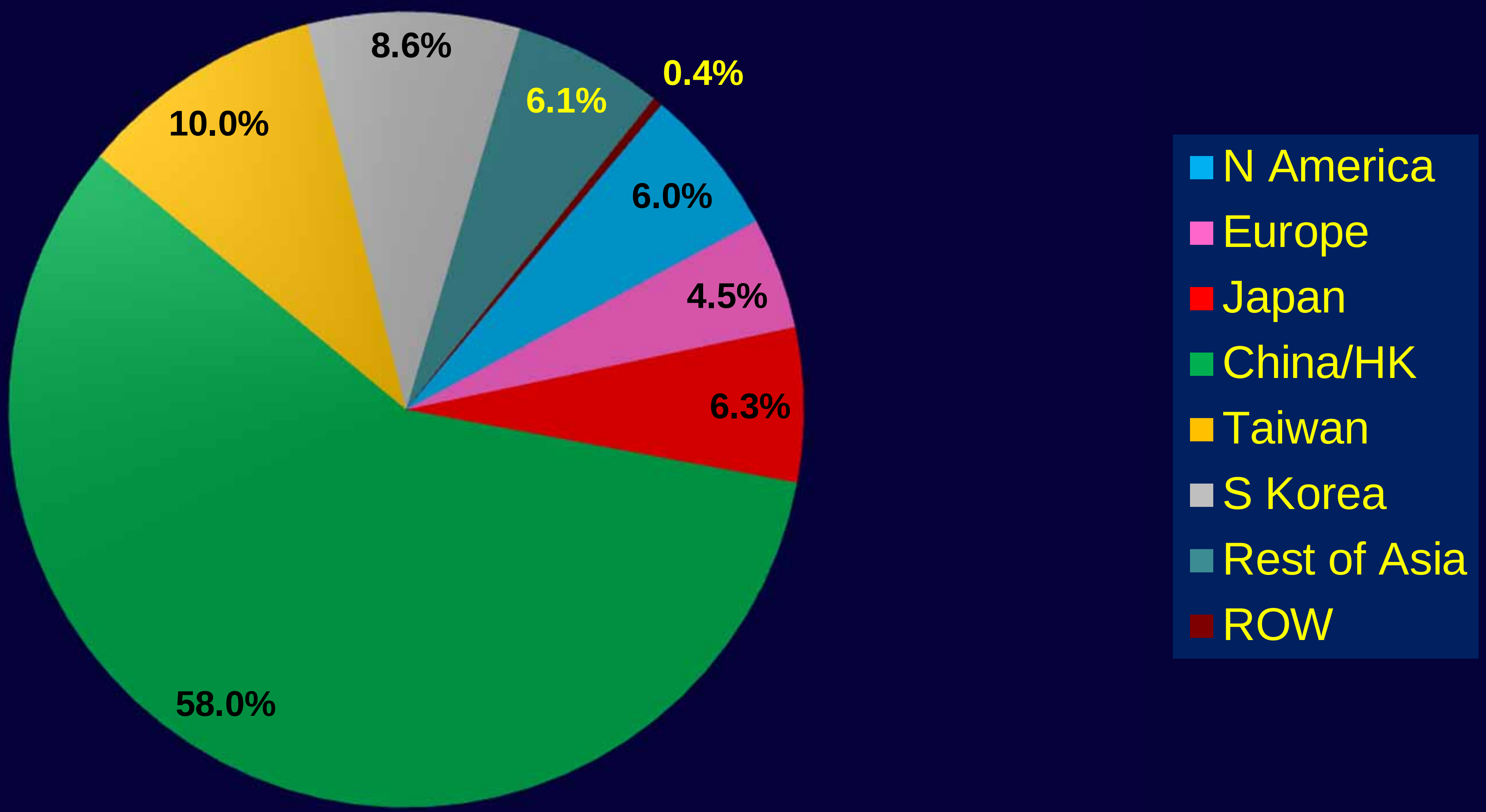
Total: $58.6 Billion

IPC 10/16

20161101

2015 World Rigid PCB Production by Geographical Area

(US$ M @ Average 2015 Exchange)



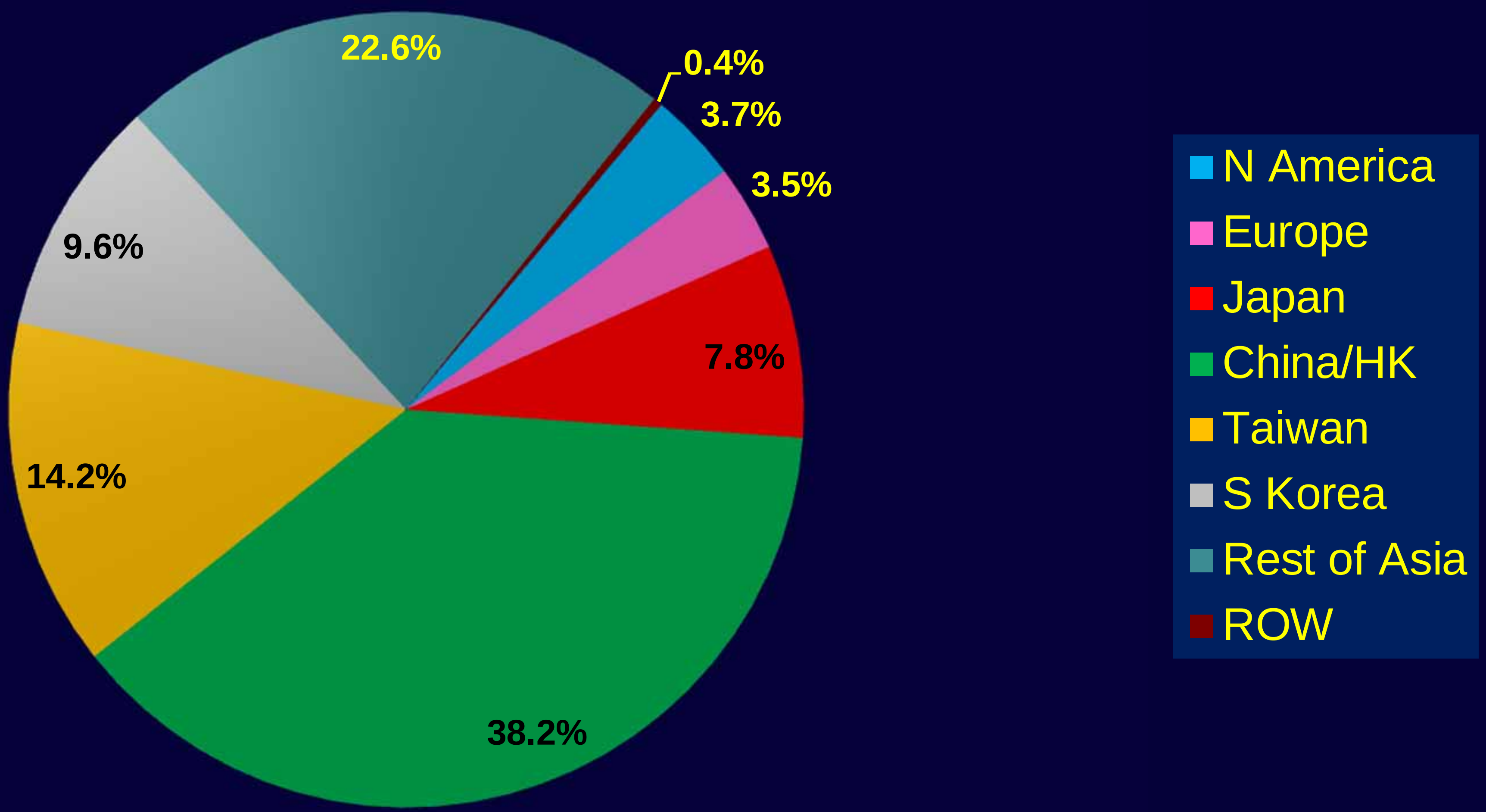
Total: $41.0 Billion

IPC 10/16

2015 World Flex & Rigid Flex PCB Production by Geographical Area

20161101

(US$ M @ Average 2015 Exchange)



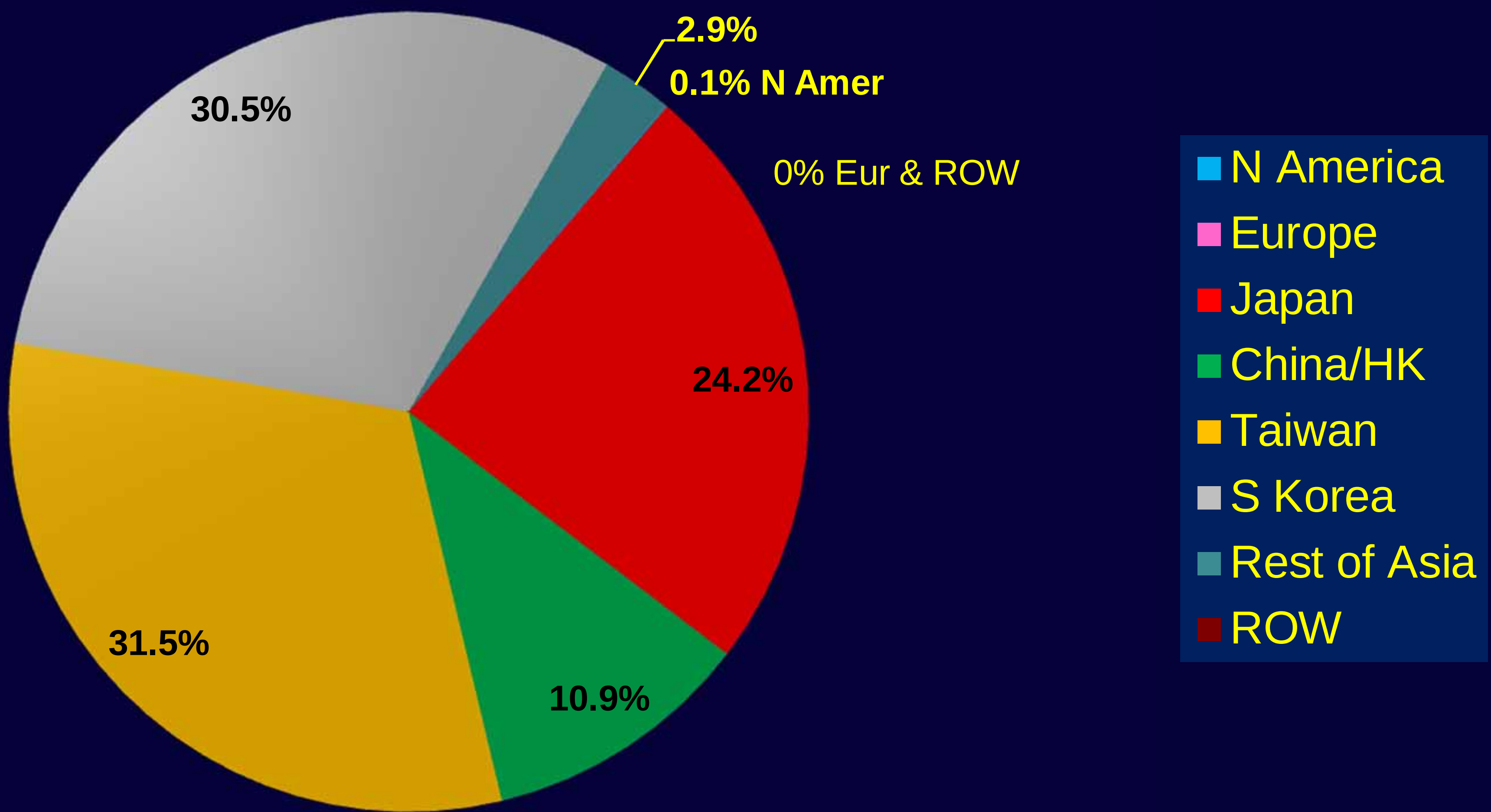
Total: $10.5 Billion

IPC 10/16

20161101

2015 World IC Substrate Production by Geographical Area

(US$ M @ Average 2015 Exchange)



Total: $7.0 Billion

IPC 10/16

20150728

World's Top 25 PCB Companies – 2015

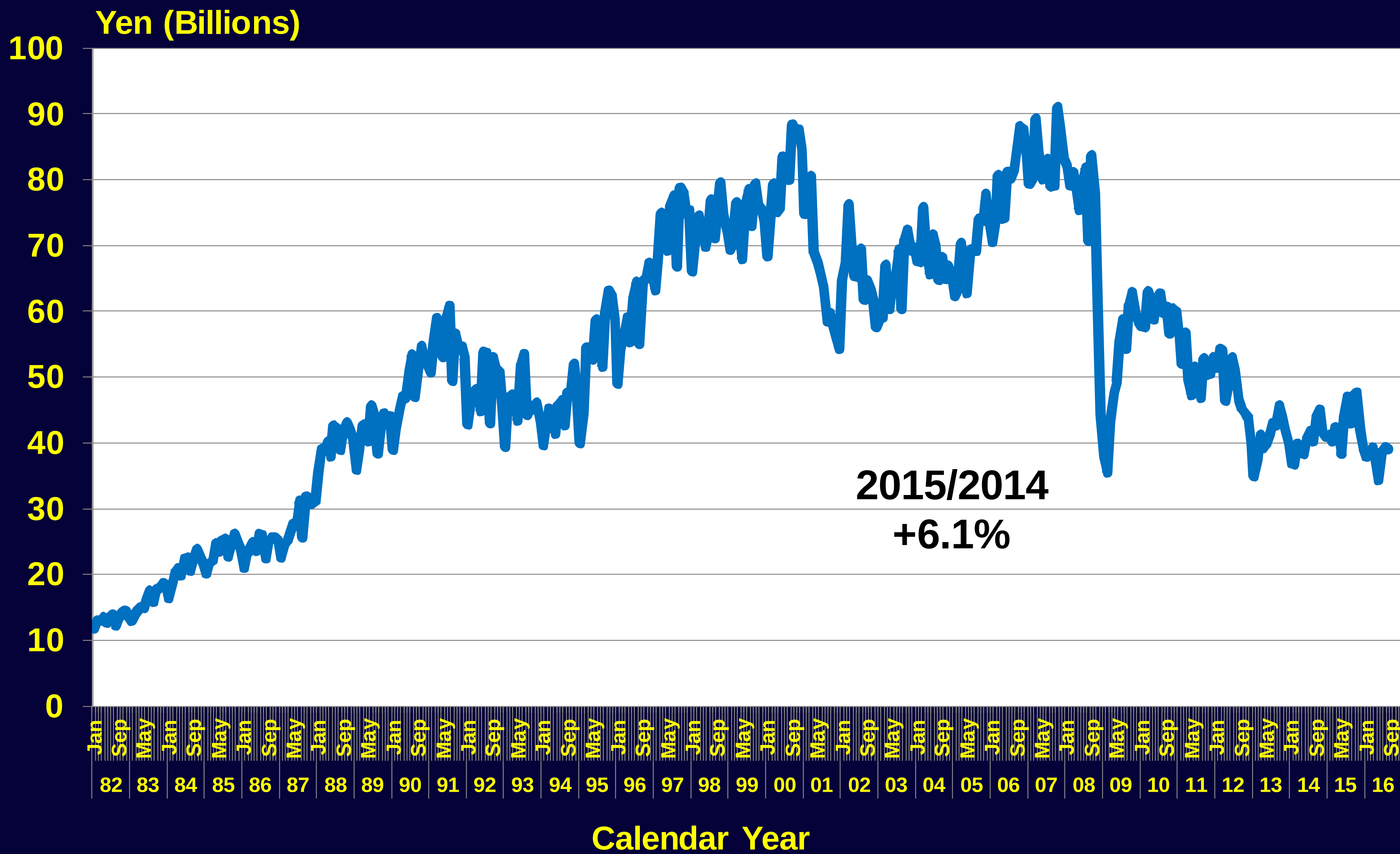
US$M (converted at 2015 exchange rates)

Rank	Maker	Nationality	2014	2015	Growth	Brief Comments
1	Nippon Mektron*	Japan	2957	3414	15.5%	Major customer: Apple
2	ZD Tech*	Taiwan	2390	2698	12.9%	Major customer: Apple
3	TTM Technologies	USA	1326	2450	84.8%	Major customer: Apple
4	Unimicron	Taiwan	2130	2210	3.8%	Uniflex, Subtron, Ruwel, Clover
5	Sumitomo Denko*	Japan	1260	1503	19.3%	Major customer: Apple
6	Compeq	Taiwan	1065	1397	31.2%	Major customer: Apple
7	Tripod	Taiwan	1335	1365	2.3%	Aiming high at automotive
8	Samsung E-M	S. Korea	1445	1364	-5.6%	Shifting to Vietnam
9	Young Poong Group*	S. Korea	1413	1295	-8.4%	Coming back in 2016
10	HannStar	Taiwan	1531	1272	-16.9%	Including GBM/PCBA
11	Ibiden	Japan	1332	1232	-7.5%	Restructuring product lines
12	Nanya PCB	Taiwan	1100	941	-14.5%	Subsrate, automotive
13	KBC PCB Group	China	972	930	-4.3%	Elec & Eltek, Techwise, etc.
14	Daeduck Group	S. Korea	1063	874	-16.8%	Still profitable
15	AT&S	Austria	740	846	14.3%	China, China, China!
16	Fujikura*	Japan	590	810	37.3%	Major customer: Apple
17	Meiko	Japan	756	794	5.0%	Major Field: Automotive
18	Multek	USA	780	730	-6.4%	Inlcuding Minnesota Northfield
19	Kinsus	Taiwan	785	726	-7.5%	Substrate (TW+Suzhou)+Piotek
20	Chin Poon	Taiwan	670	716	6.9%	Major Field: Automotive
21	T.P.T.	Taiwan	751	706	-6.0%	NB Motherboard
22	Shinko Denski	Japan	681	680	-0.2%	Substrate
23	Wus Group	Taiwan	669	671	0.3%	Network/Server, Automotive
24	Simmtech	S. Korea	576	662	14.9%	Buying Eastern?
25	Mflex*	USA	632	637	0.8%	Major customer: Apple

Dr Hayao Nakahara, N.T. Information Ltd 7/2016

20161023

Japan PCB Production

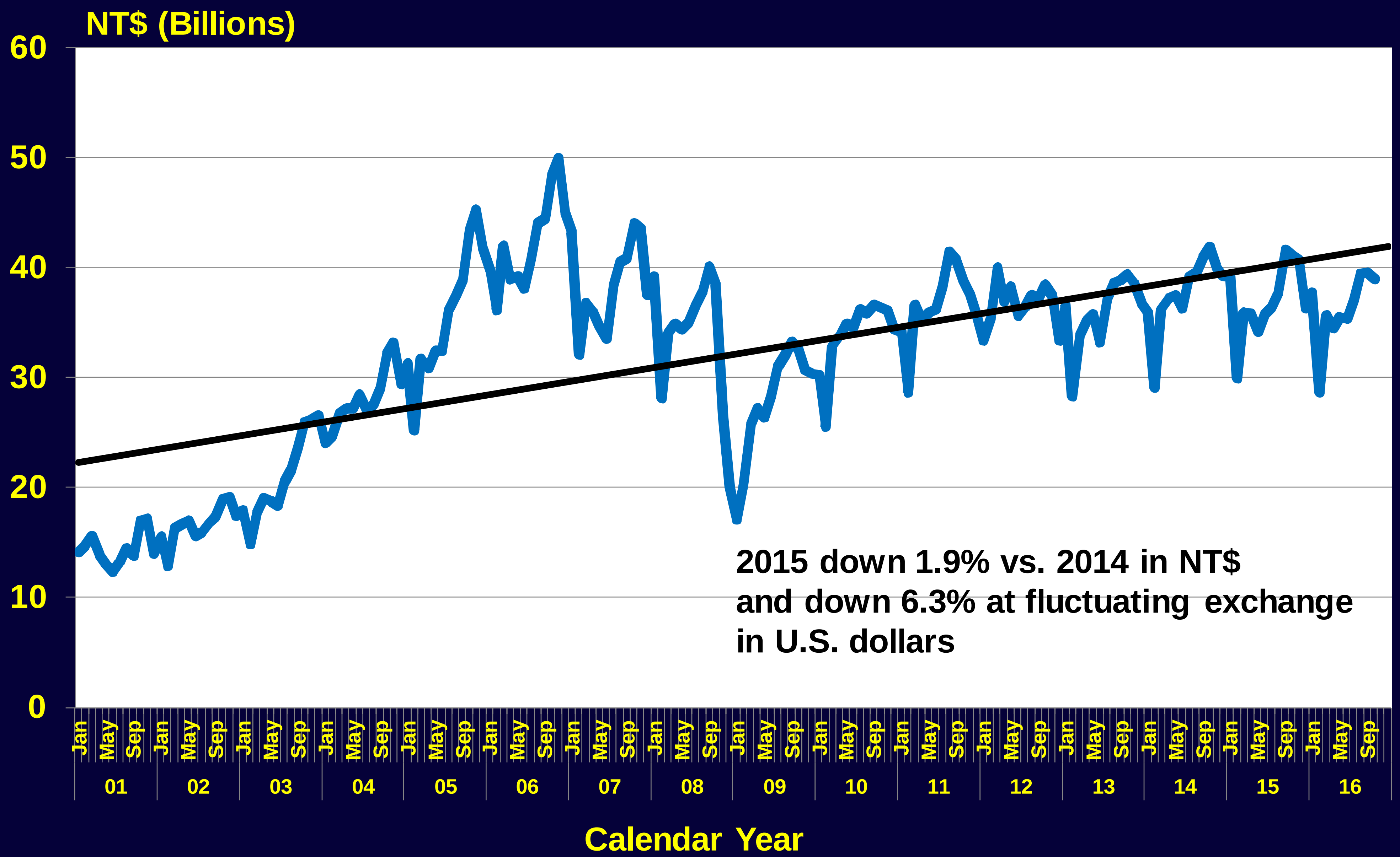


JEITA

20161113

Taiwan Rigid & Flex PCB Shipments

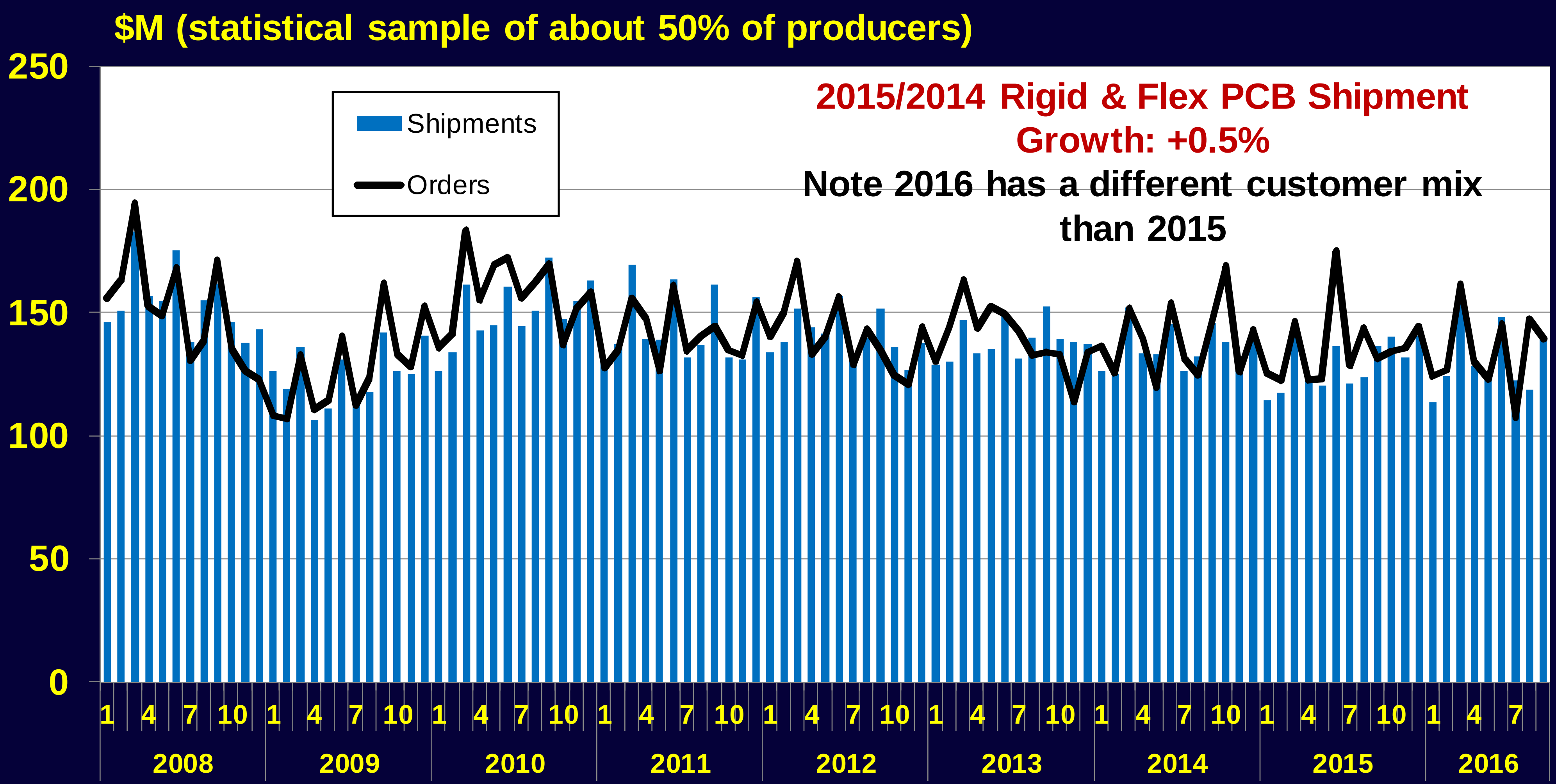
Broad Composite of 46 Taiwan-listed Manufacturers



Company Financial Releases

20161101

N American Rigid & Flexible PCB Shipments & Orders

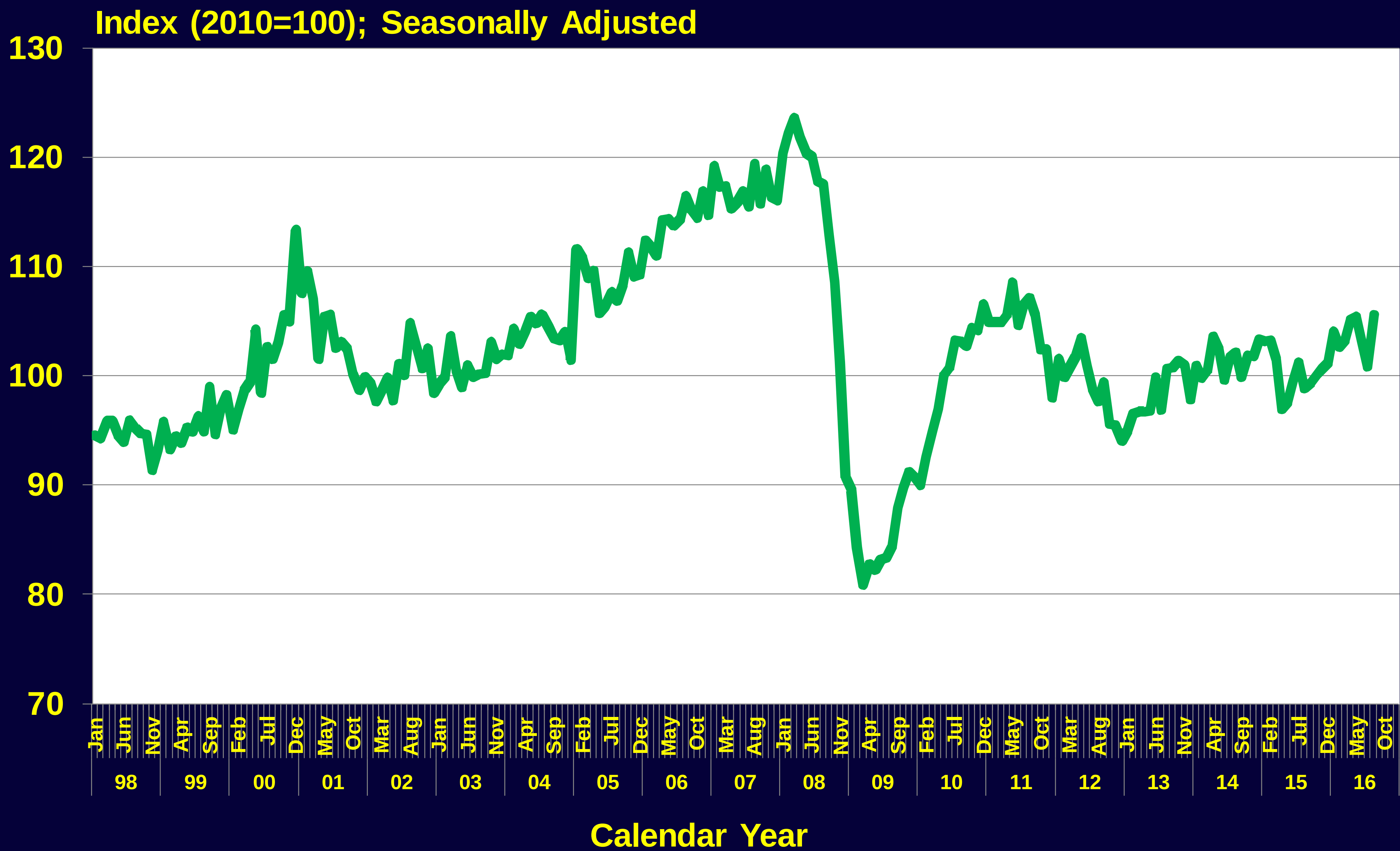


Note: IPC survey captures "market" not domestic production. About 15% of the above represents imported boards resold by N American PCB producers in survey.

IPC

20161012

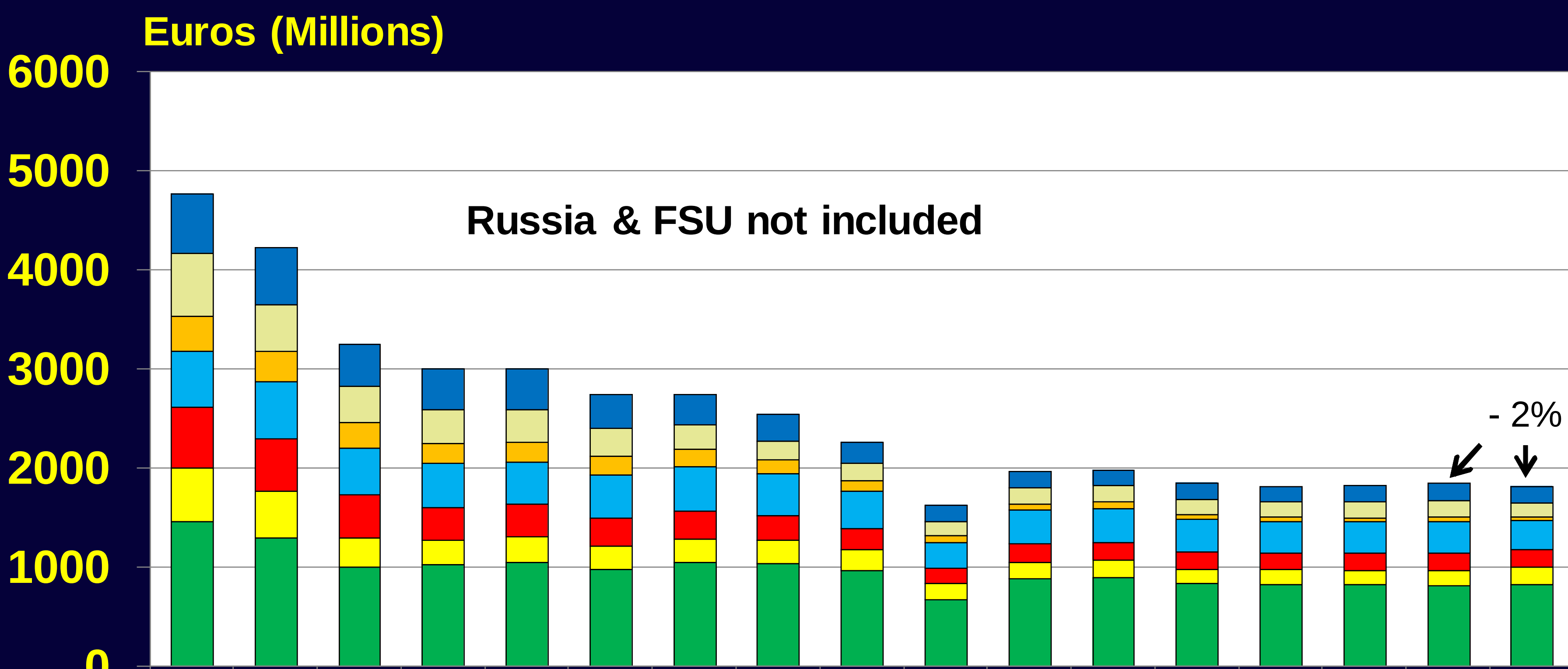
European Electronic Wiring Devices



Eurostat

20160915

European PCB Production

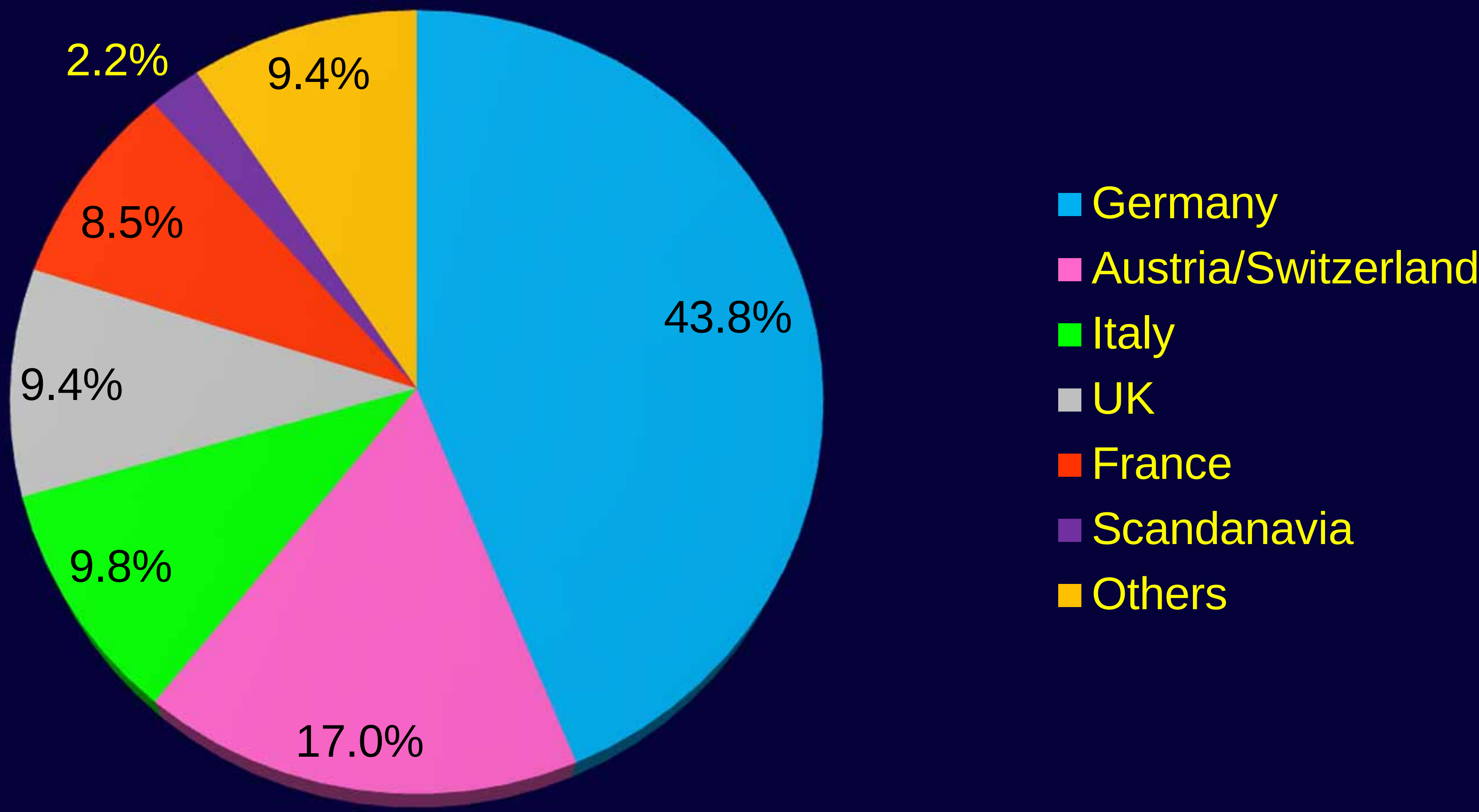


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016 E
Other	601	577	422	408	410	346	309	264	221	169	170	155	157	151	158	174	165
UK	641	478	368	340	330	278	252	197	177	137	165	161	158	153	165	174	140
Scandanavia	351	309	260	201	200	198	169	137	103	64	64	64	50	40	42	40	35
Austria/Switzerland	561	575	463	447	427	427	447	427	378	258	341	343	325	323	312	315	296
Italy	619	530	444	338	324	281	284	248	212	156	181	186	174	168	174	181	180
France	541	465	287	244	266	240	234	231	206	165	170	166	147	148	148	157	173
Germany	1461	1300	1006	1027	1044	981	1054	1039	970	676	883	902	835	828	825	811	825

Data4PCB 9/16

2015 European PCB Production (excludes & FSU Russia)

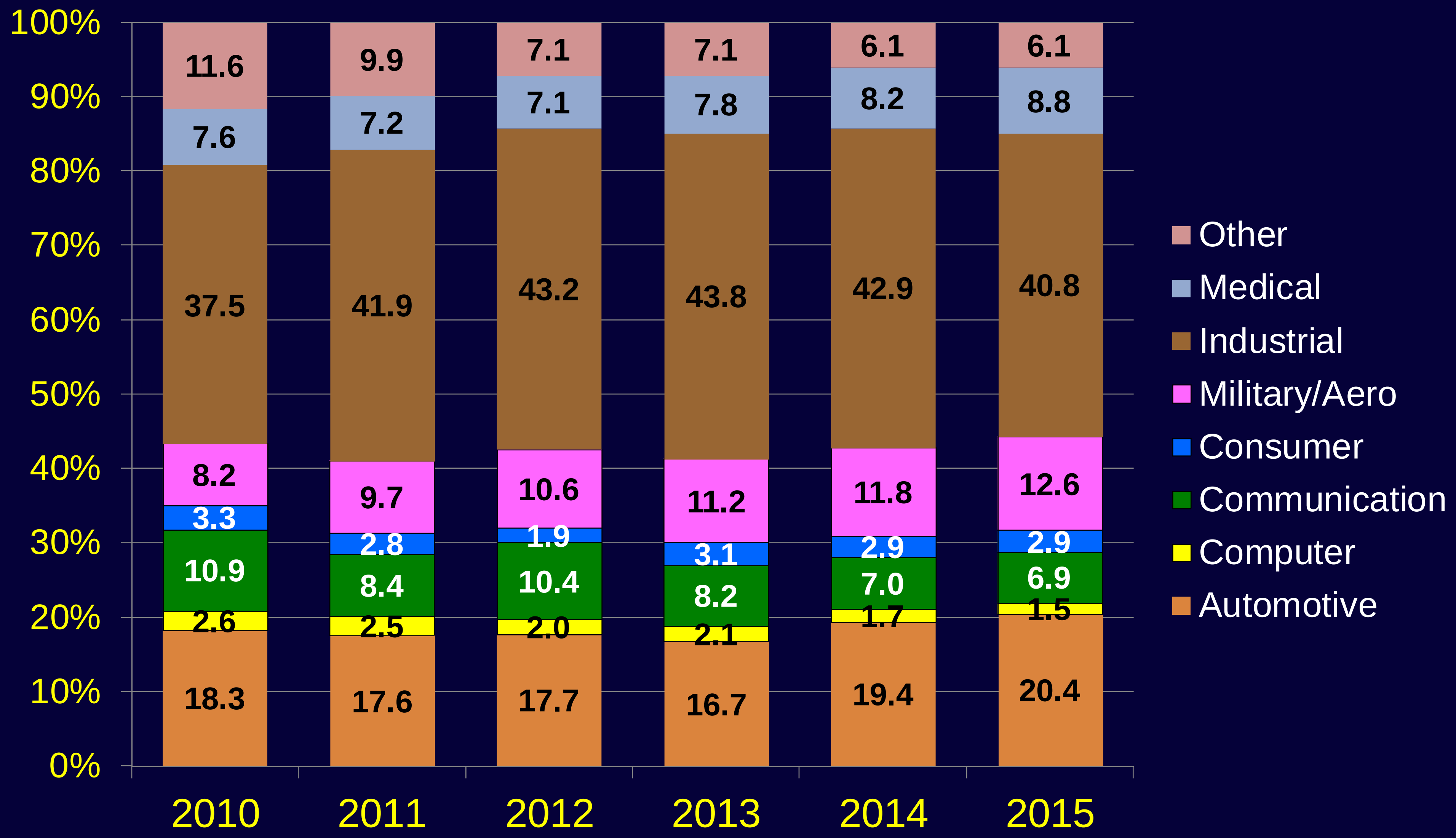
20160502



2015 Total: EUR 1852 million

20160502

European PCB Production by End Market



Data4PCB 4/16

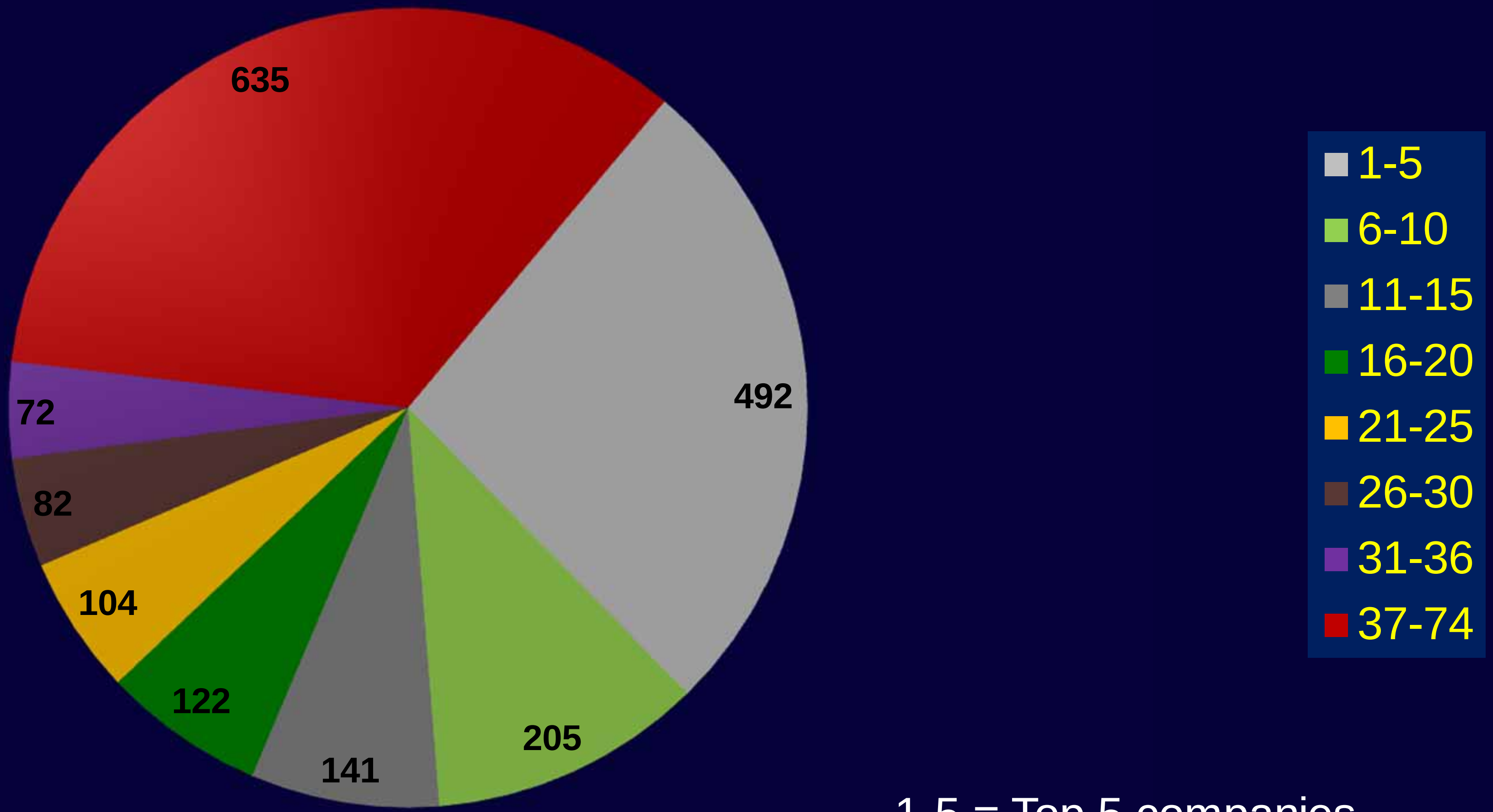
Europe's Top 36 PCB Companies Ranked by 2015 Revenues

Rank	Company	Rank	Company
1	AT&S	19	Schaltungsdruck Storz
2	Würth	20	Schoeller
3	Schweizer Electronic	21	Technomaster Group
4	KSG	22	Cimulec Gruppe
5	Elvia	23	Optiprint
6	Mektec Europe	24	Precoplat
7	Ruwel	25	Eurocircuit Group
8	SoMaCis	26	Rohde & Schwarz
9	GS Swiss PCB	27	Graphic-Group
10	Varioprint	28	Ilfa
11	Elco Group	29	OMR Italia
12	hmp	30	Aspocomp
13	Dyconex	31	Polytron Print
14	Cicor Group	32	Elekonta Marek
15	Cistelaier Group	33	TW Electronik
16	Häusermann	34	Merlin (Falcon) Group
17	Invotec	37	Exception
18	ACB Group	38	Ggp Peters

2015 Top 74 Largest European PCB Companies

(totals for each group)

20160502



1-5 = Top 5 companies
6-10 = Next 5 companies
etc.

Total: 1852 Million Euros

Data4PCB 4/16

European PCB Market Comments

20160502

The number of European manufacturers in 2015 declined just slightly (from 253 to 246) but during the first quarter about 10 companies filed for insolvency or declared a voluntary closure.

European PCB production – in euro-terms – has remained at the same level for a number of years. Whenever companies closed down, in most cases it was smaller facilities and their customer base was absorbed by other manufacturers of similar size.

A group of small to medium-sized manufacturers in Germany which went into receivership were taken over by an American investor (AIAC) to integrate them into an existing network.

The integration of refugees which was a matter of concern last year was better than anticipated but growing nationalism and demagoguery resulted in increasing success of right-wing political movements. This, and completely wrong arguments lead to a referendum in UK to leave the European Community. The majority was slim but politicians are using the result to follow their own agenda. The danger is that other countries may follow.

Michael Gasch, Data4PCB 9/2016

European PCB Market Comments

20160502

Although the "Brexit" still isn't declared, the British pound has suffered already against other currencies (minus 16% against the USD since January).
This makes imports (as well of Asian PCBs) more expensive and whether this helps British manufacturers remains to be seen. A recent court ruling for a decision of the parliament has given some hopes that a "hard" Brexit may not come but the outcome still is open.

The supply base for the electronic industry gets slim and the danger of becoming dependent solely on Asian suppliers rises. The PCB-consuming society still isn't aware that they are cutting the branch on which they sit.

A problem for the PCB-industry may arise out of the success of e-vehicles.
Suppliers of copper foil in Asia already rededicated about 20% of their capacity for battery purposes. And the political aim of China is to push e-transport (buses, cars, scooters, bicycles) by stipulating a growing percentage of cars from 2018 onwards may lead to shortages and price-increases (in fact, laminate prices in Asia are rising already and validity of prices is short).

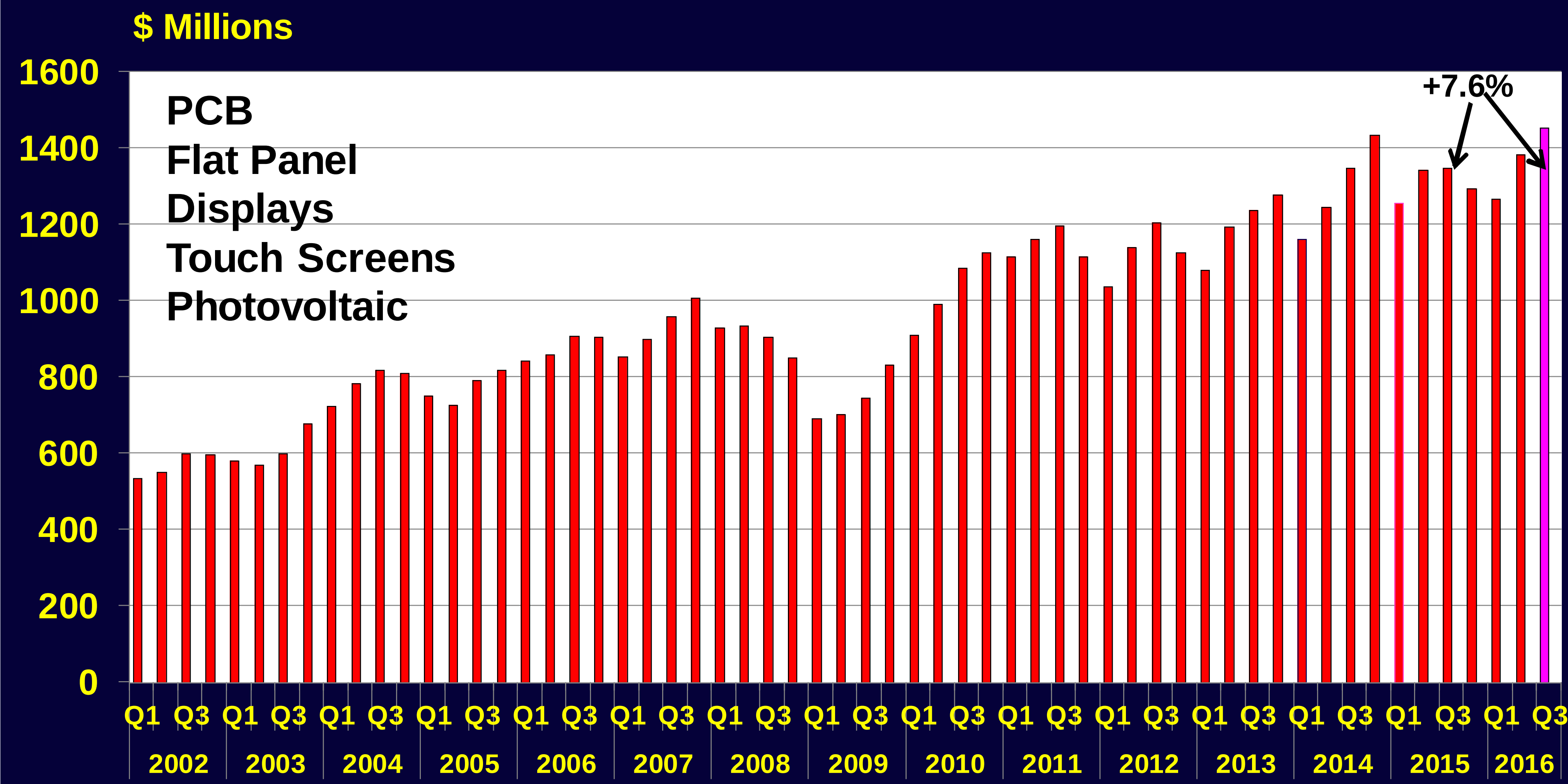
Michael Gasch, Data4PCB 9/2016

Process Equipment, Laminate & Materials Suppliers

Process Equipment Related Suppliers Composite of 10 Companies

20161113

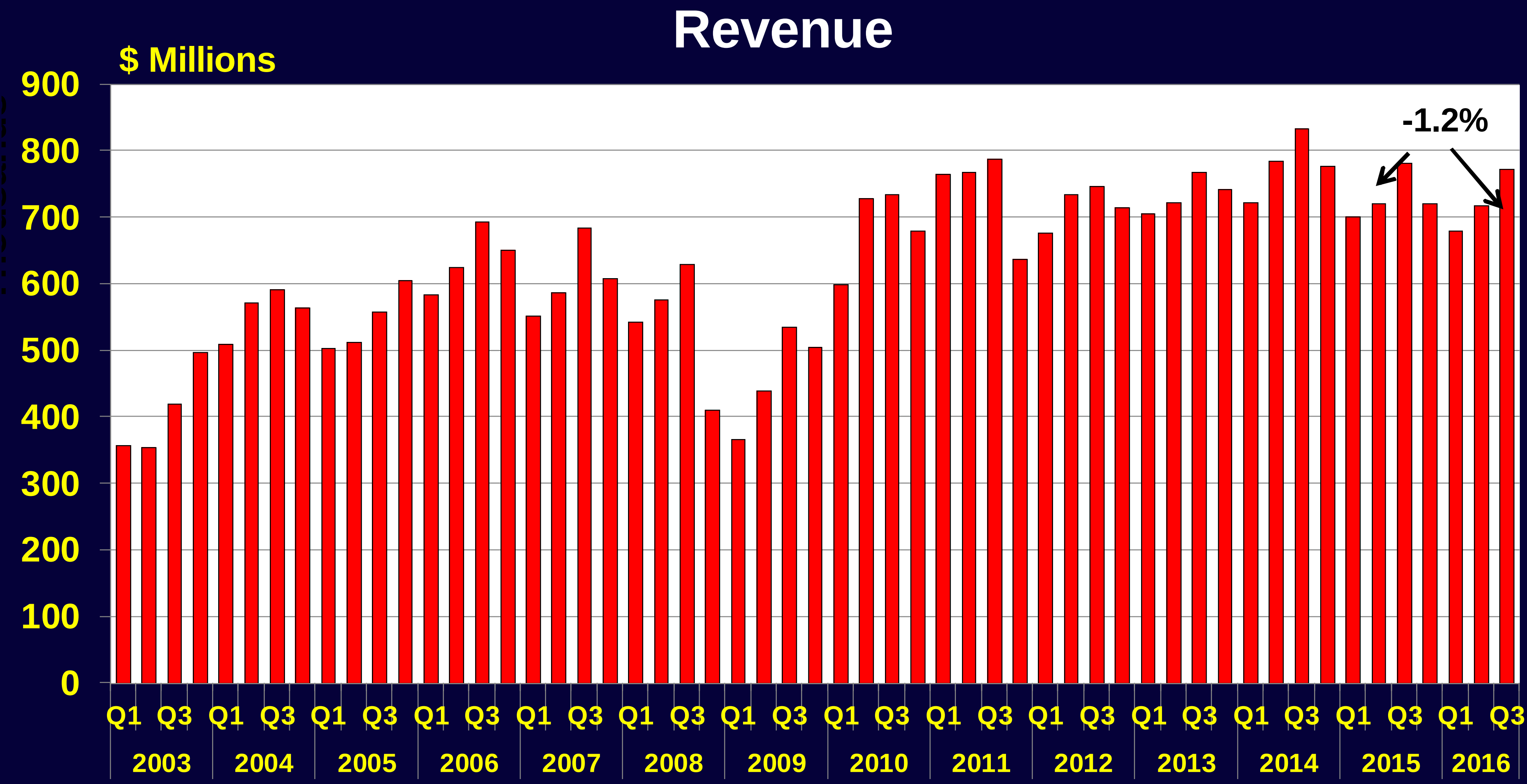
Revenue



C-Sun,Tailing Technology, Camtek, ESI, GSI Group, Mentor Graphics, Nordson, Coherent, Orbotech, Data I/O

20161104

Rigid & Flex Laminate Suppliers
Composite of 13 Companies

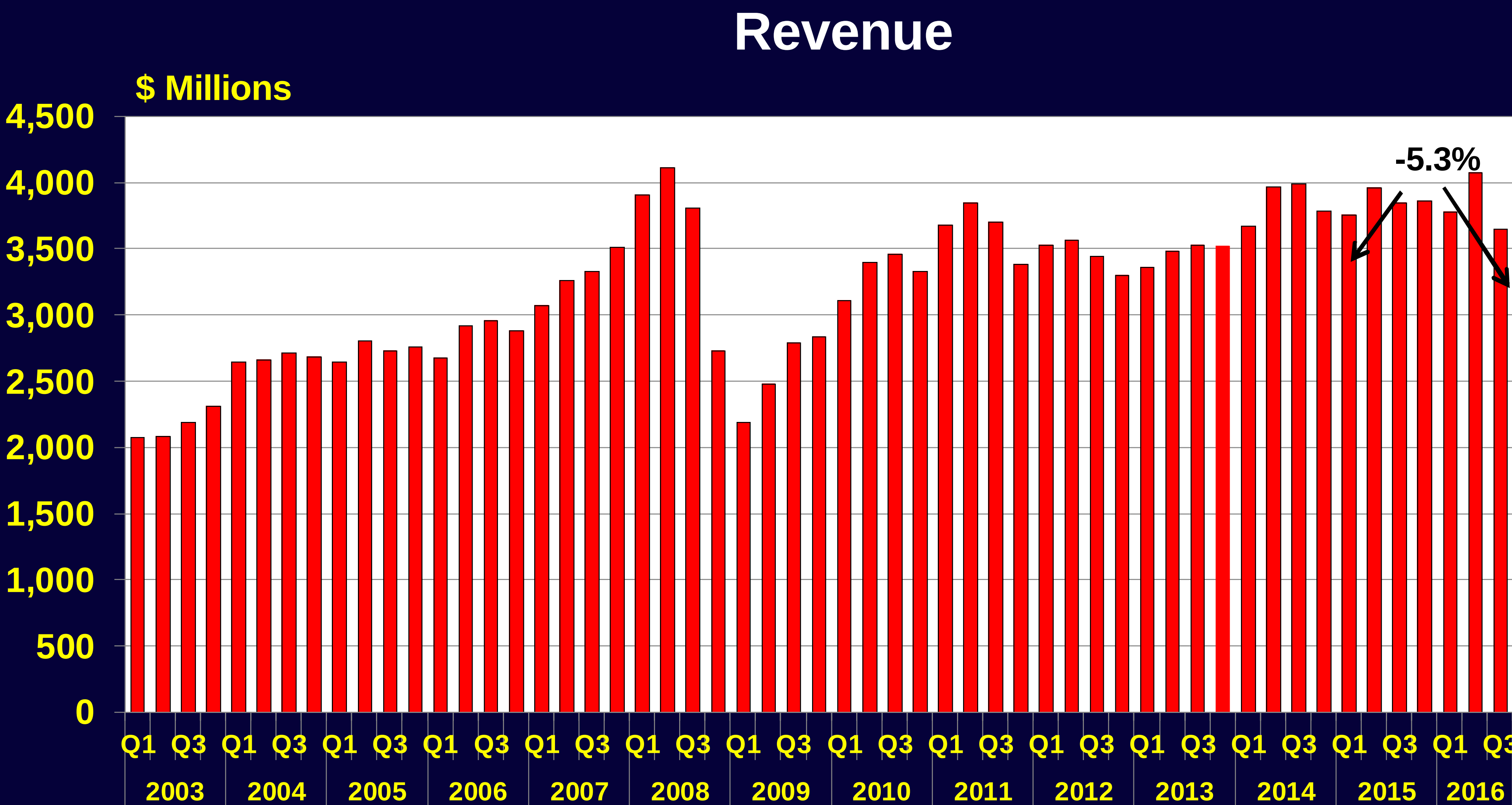


Arisawa, Arlon Electronic Materials, Elite Materials, Hwa Woei, Iteq, Microcosm, Park Electrochemical, Rogers, Shinemore, Taiflex, Thinflex, Top Union, Uniplus

NT$ converted at fluctuating exchange

Material Suppliers (excluding laminate) Composite of 14 Companies

20161113



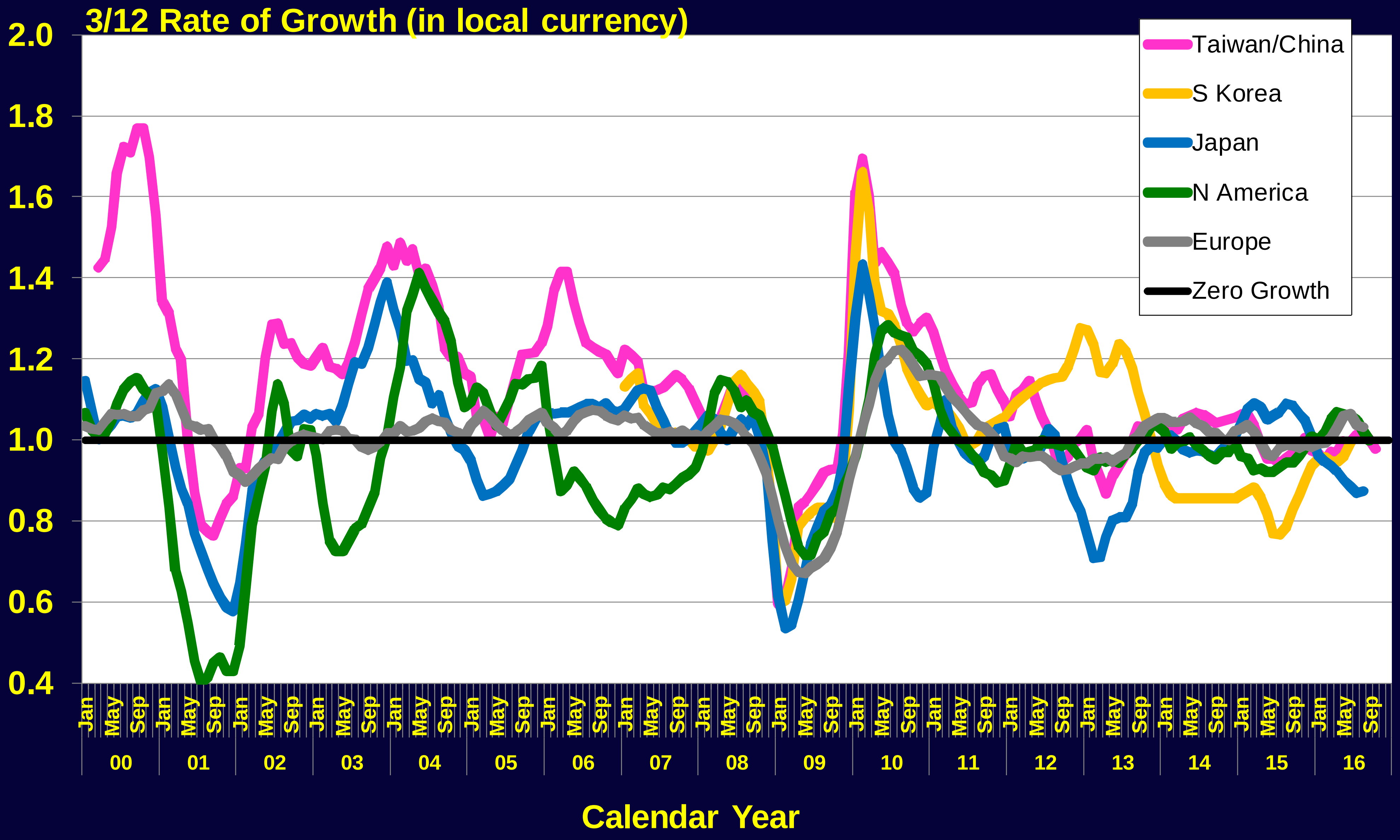
Momentive, OM Group, Taiwan Glass, Baotech, Glotech, Shenmao, Wahlee,Topoint, Cabot Micro, Cookson Elec, Eternal Chemical, Hexcel, Chang Wah, Platform Specialty Products

NT$ & GBP converted to US$ at fluctuating exchange

World PCB Model

20161113

Regional PCB Shipment Growth

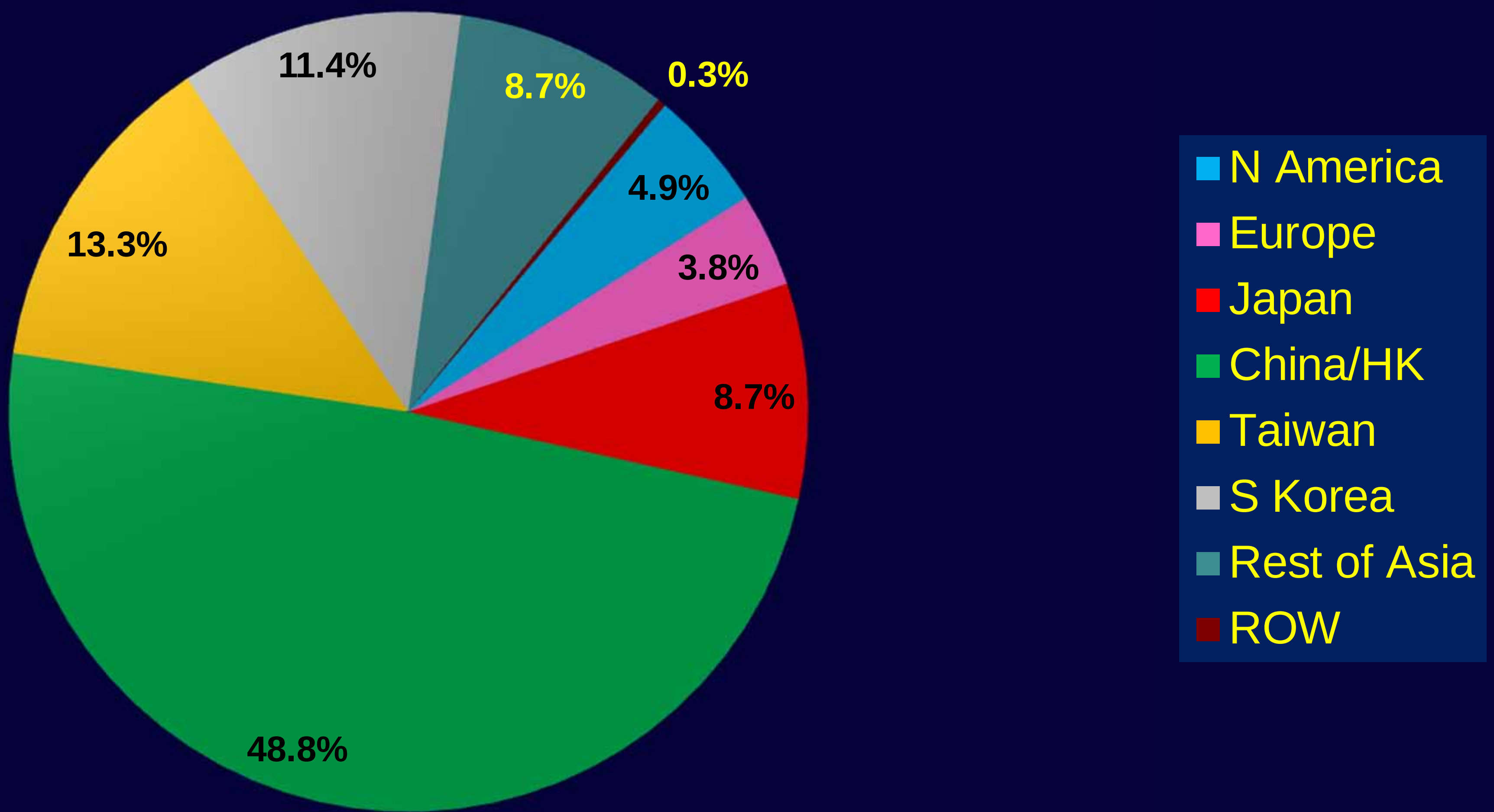


Sources: IPC, JPCA, Taiwan/China composite; Eurostat "wiring devices" for Europe

20161101

2015 World Total PCB Production by Geographical Area

(US$ M @ Average 2015 Exchange)



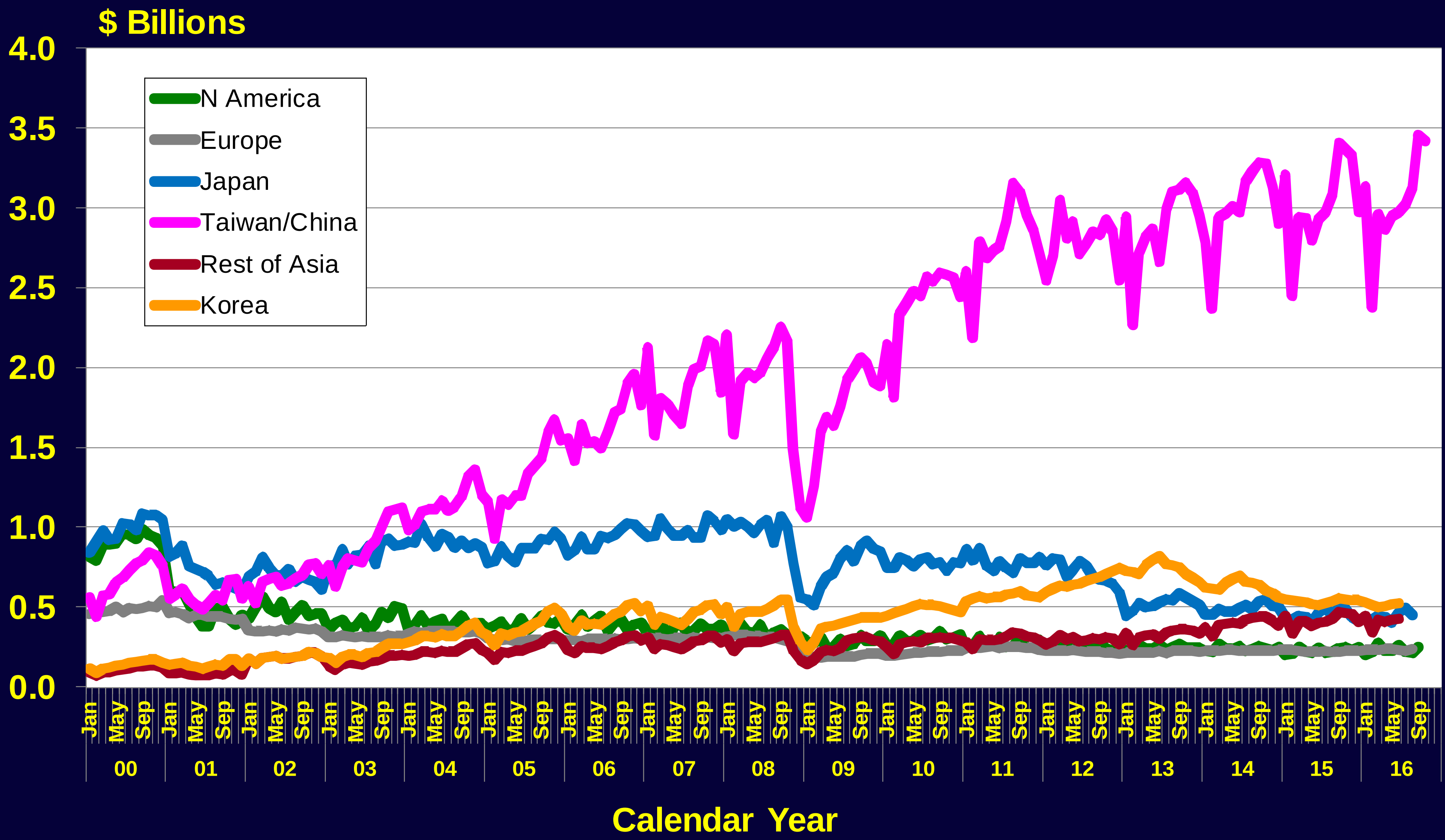
Total: $58.6 Billion

IPC 10/16

20161113

World PCB Monthly Shipments

Converted @ Fluctuating Exchange Rates

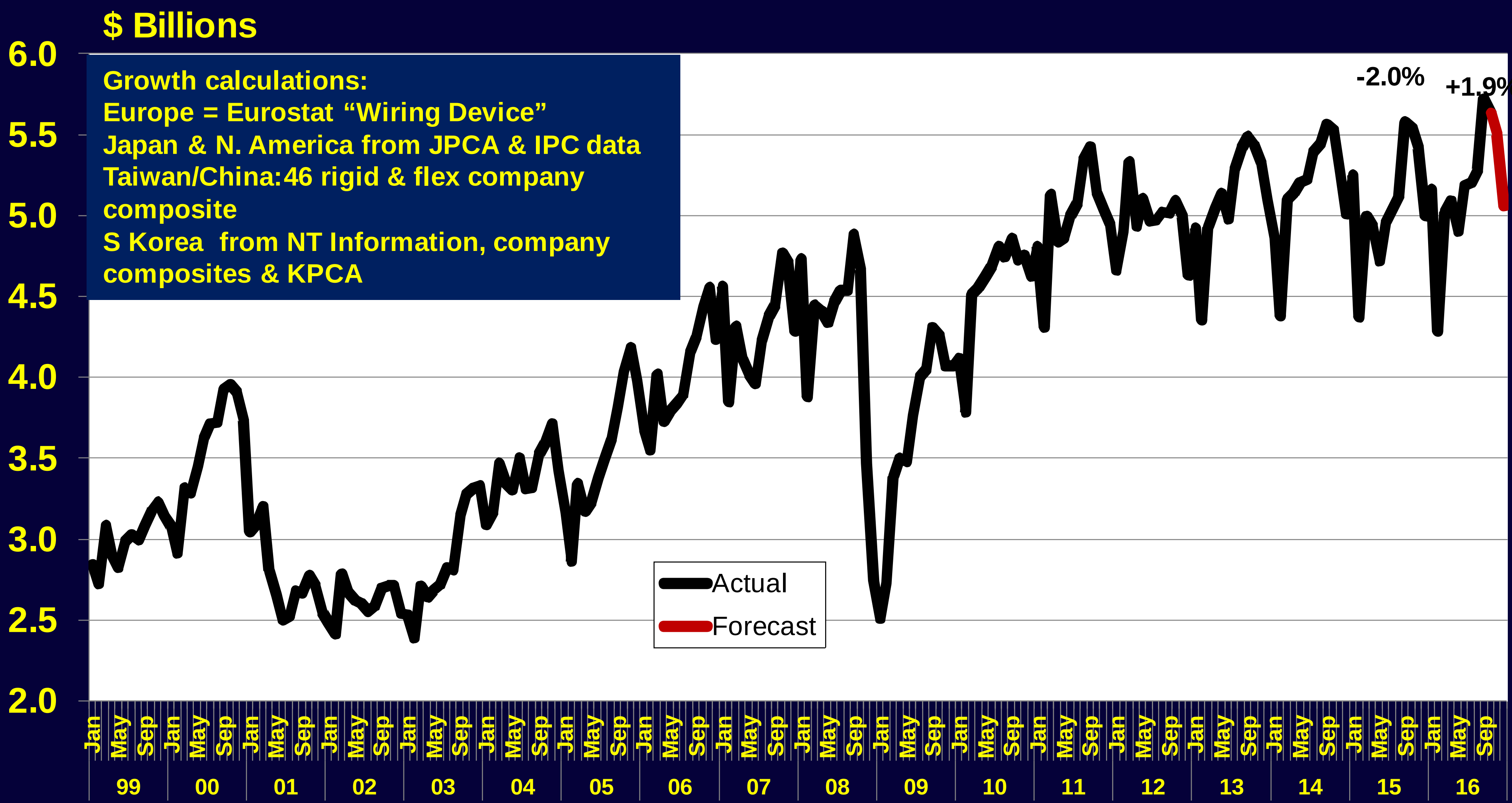


Source: Custer Consulting Group

20161113

World PCB Shipments (with forecast)

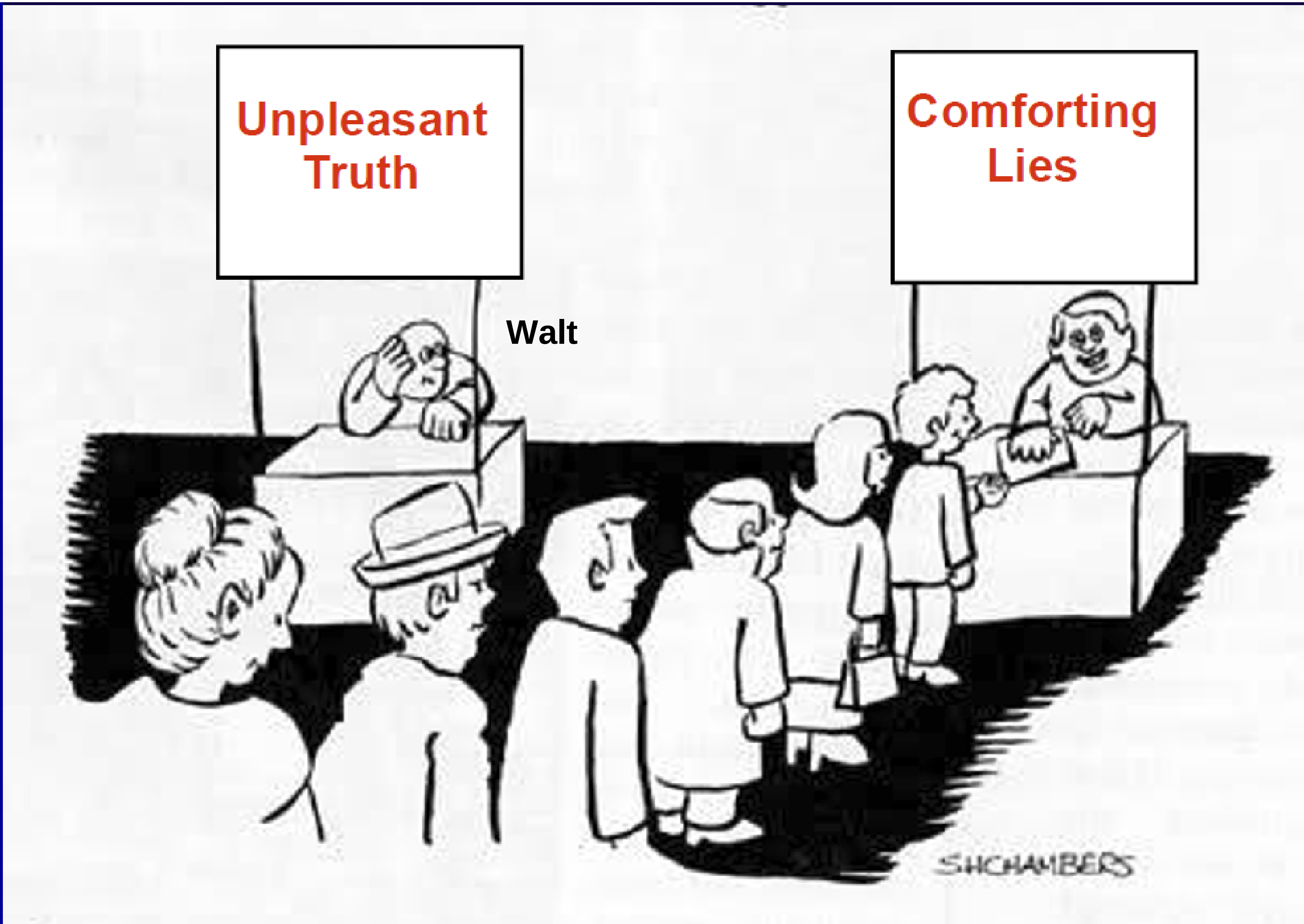
Converted @ Fluctuating Exchange Rates



Calendar Year

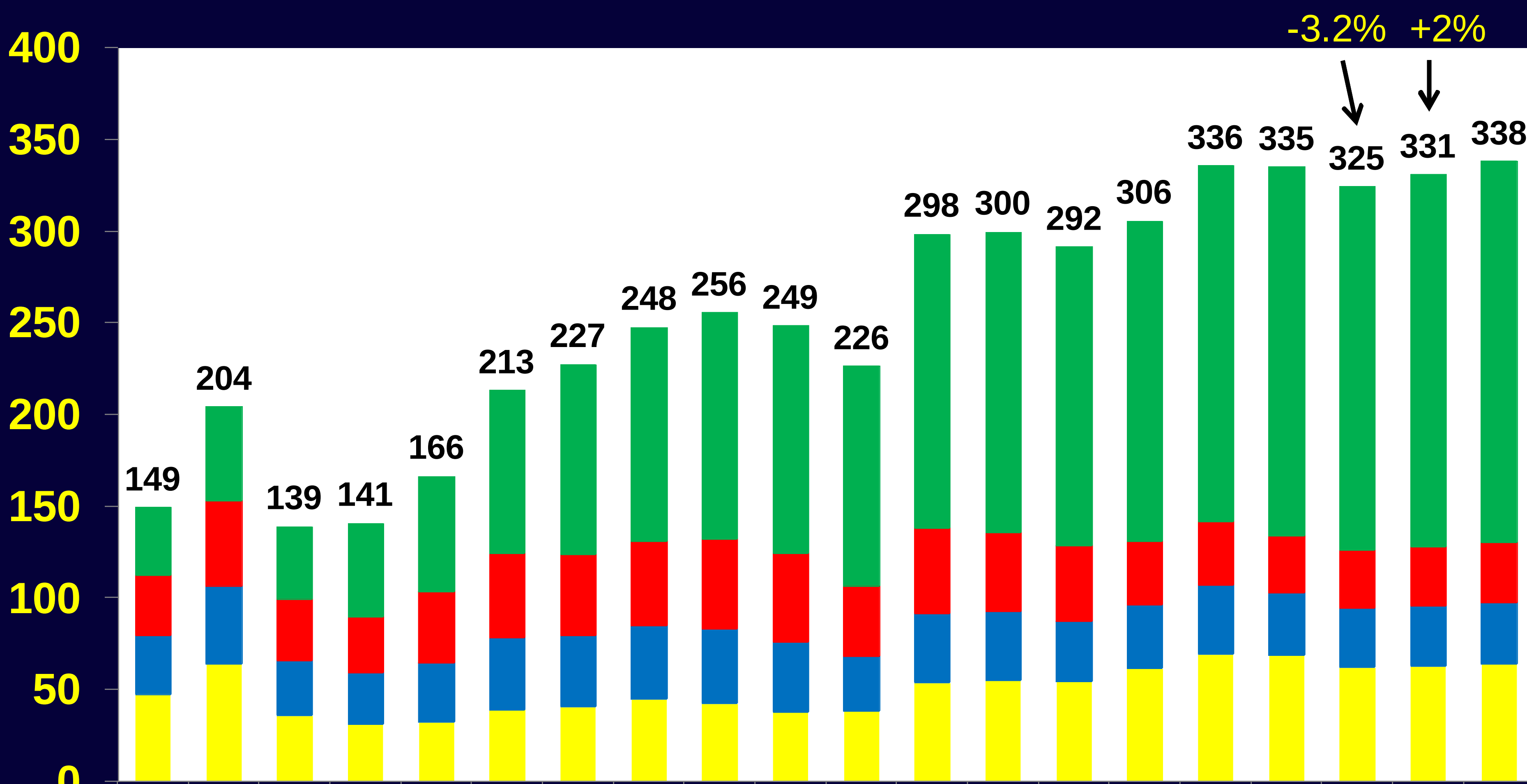
Source: Custer Consulting Group - 2010 base year expanded by monthly growth of N. American, European, Japanese, Korean & Taiwan/China monthly PCB shipments

Forecasts


Unpleasant Truth
Walt
Comforting Lies
SHCHAMBERS

20160901

Worldwide Semiconductor Market by Geography
WSTS Forecast

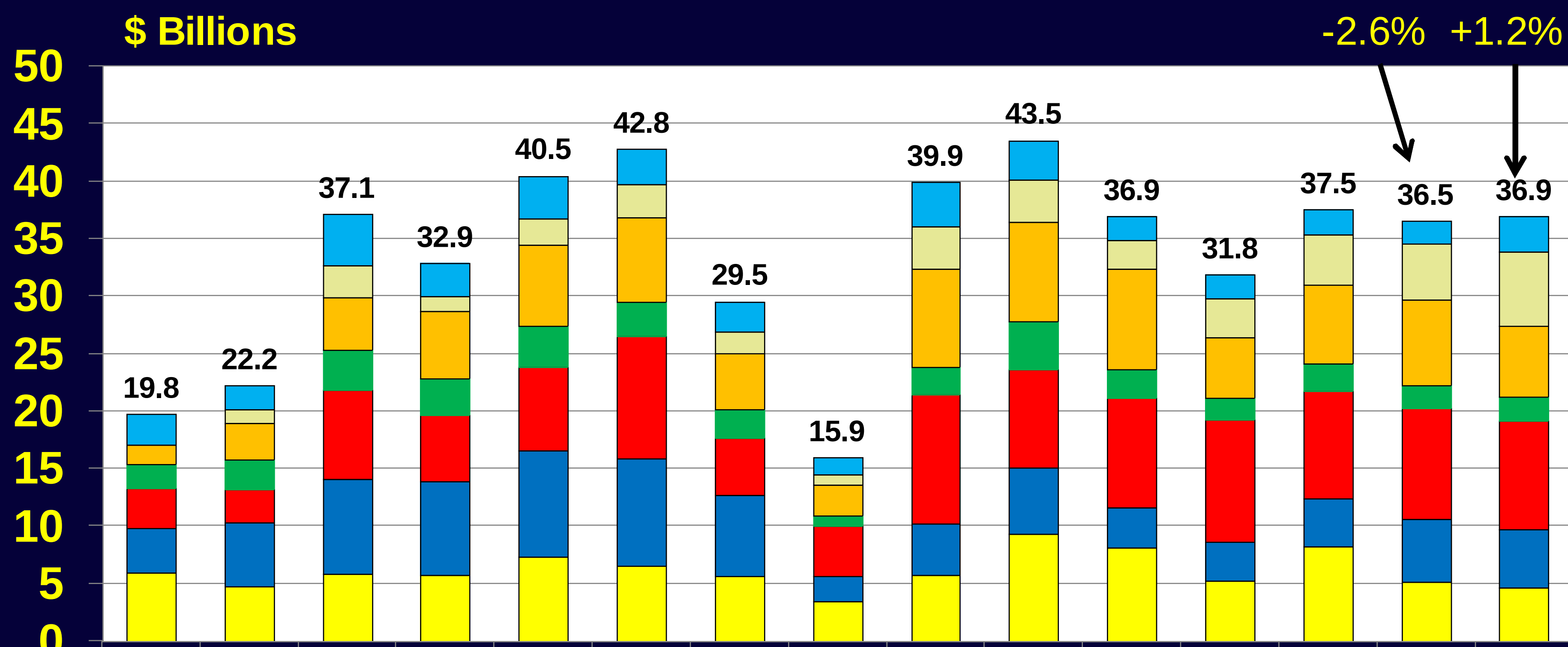


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	149.4	204.4	138.9	140.8	166.3	213.1	227.4	247.7	255.6	248.6	226.3	298.3	299.5	291.6	305.6	335.8	335.2	324.6	331.0	338.3
Asia Pacific	37.2	51.3	39.8	51.2	62.8	88.8	103.5	116.5	123.5	124.0	119.6	160.0	164.0	163.0	174.4	194.2	201.1	198.6	203.3	208.1
Japan	32.8	46.7	33.1	30.5	38.9	45.8	44.1	46.4	48.8	48.5	38.3	46.6	42.9	41.1	34.8	34.8	31.1	31.3	32.1	32.6
Europe	31.9	42.3	30.2	27.8	32.3	39.4	39.1	39.9	41.0	38.2	29.9	38.1	37.4	33.2	34.9	37.5	34.3	32.5	32.8	33.5
Americas	47.5	64.1	35.8	31.3	32.3	39.1	40.7	44.9	42.3	37.9	38.5	53.7	55.2	54.4	61.5	69.3	68.7	62.1	62.8	64.1

WSTS 9/16

20160717

Worldwide Semiconductor Capital Equipment Market by Geography (with forecast)



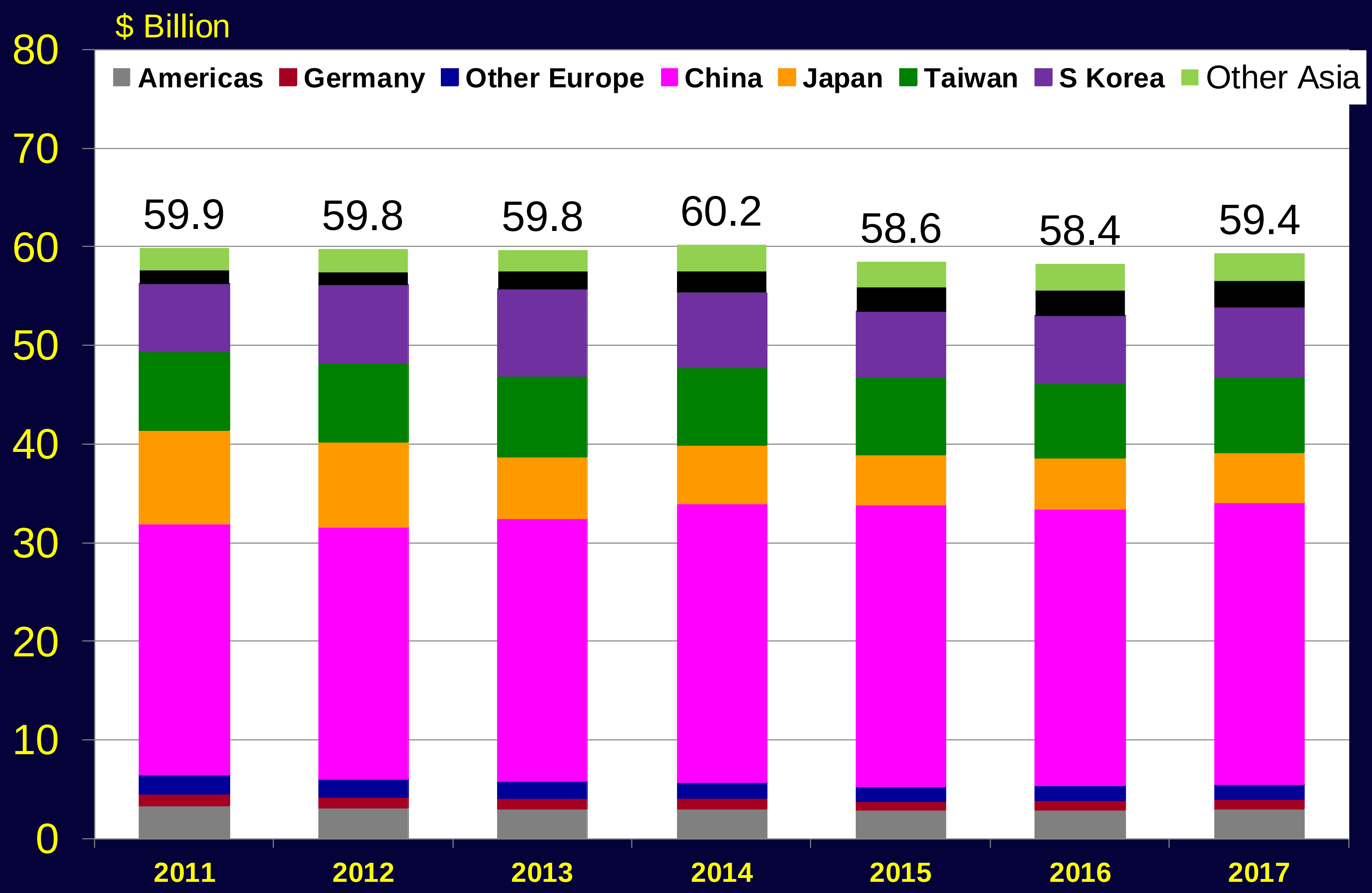
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016F
Total	19.8	22.2	37.1	32.9	40.5	42.8	29.5	15.9	39.9	43.5	36.9	31.8	37.5	36.5	36.9
ROW	2.7	2.1	4.5	2.9	3.7	3.1	2.6	1.4	3.8	3.4	2.1	2.1	2.2	2.0	3.1
China		1.2	2.7	1.3	2.3	2.9	1.9	0.9	3.7	3.7	2.5	3.4	4.4	4.9	6.4
S Korea	1.7	3.2	4.6	5.8	7.0	7.4	4.9	2.6	8.6	8.7	8.7	5.2	6.8	7.5	6.2
Europe	2.1	2.6	3.4	3.3	3.6	2.9	2.5	1.0	2.3	4.2	2.6	1.9	2.4	2.0	2.1
Taiwan	3.5	2.9	7.8	5.7	7.3	10.7	5.0	4.4	11.3	8.5	9.5	10.6	9.4	9.6	9.5
Japan	3.9	5.6	8.3	8.2	9.2	9.3	7.0	2.2	4.4	5.8	3.4	3.4	4.2	5.5	5.1
N America	5.9	4.7	5.8	5.7	7.3	6.6	5.6	3.4	5.8	9.3	8.2	5.3	8.2	5.1	4.6

SEMI 7/16 (and prior reports)

20161101

World Rigid & Flex PCB Production

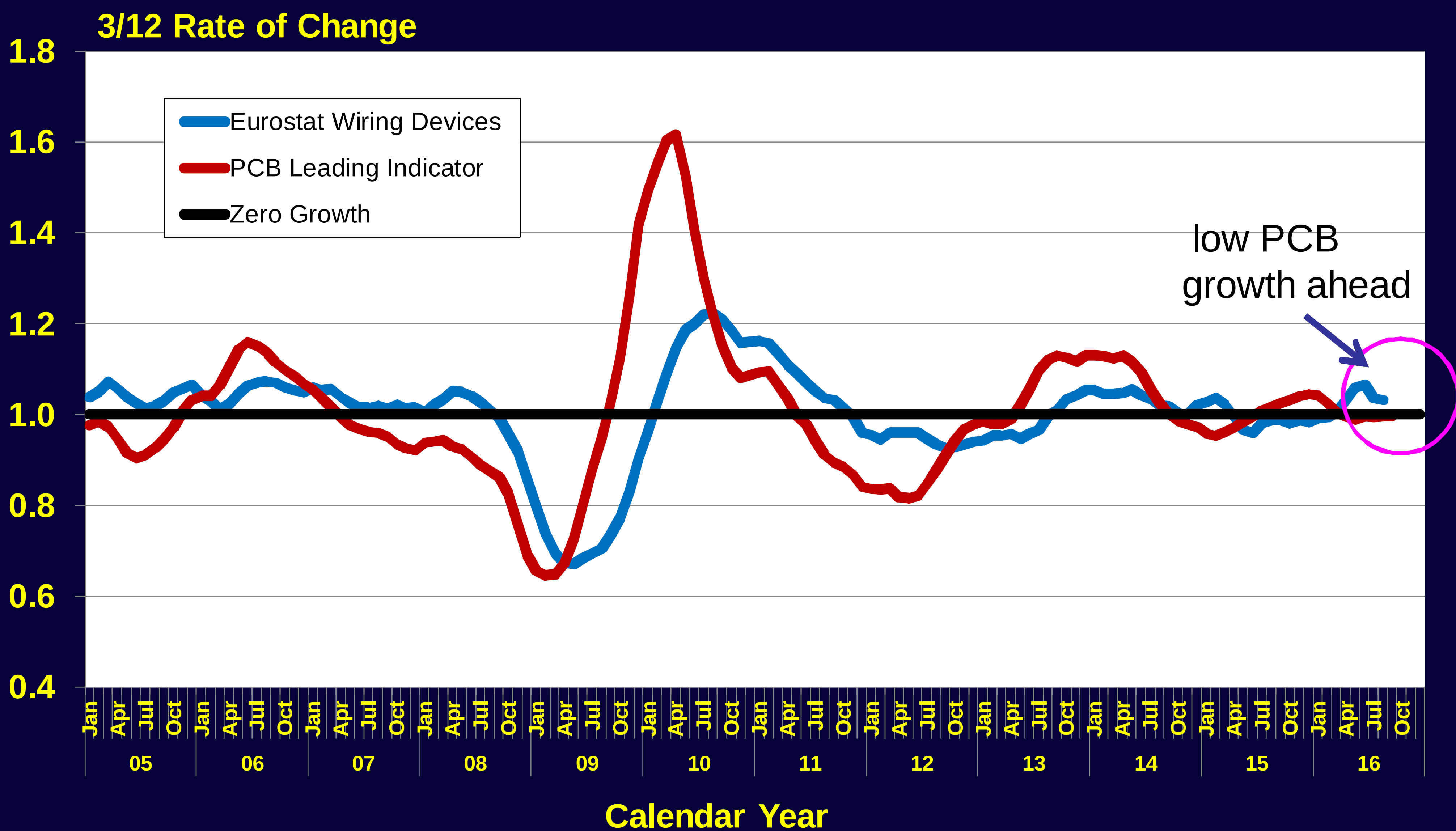
2016 calculated at 9/16 exchange rates



H Nakahara 9/16

Europe PMI Leading Indicator vs. Europe Wiring Devices

20161012

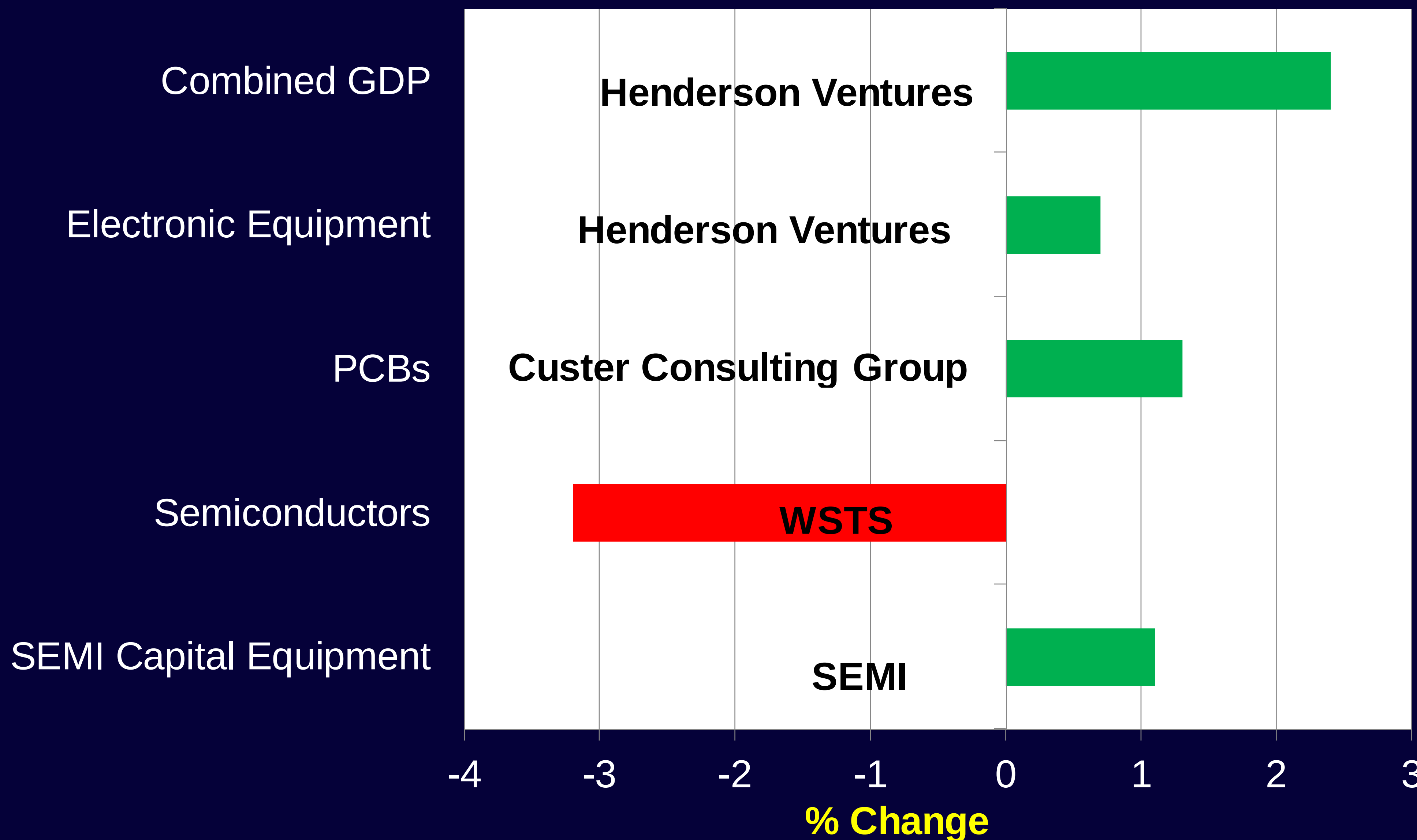


Source: Custer Consulting Group

20160909

Global Electronic Supply Chain Forecast

2016 vs. 2015



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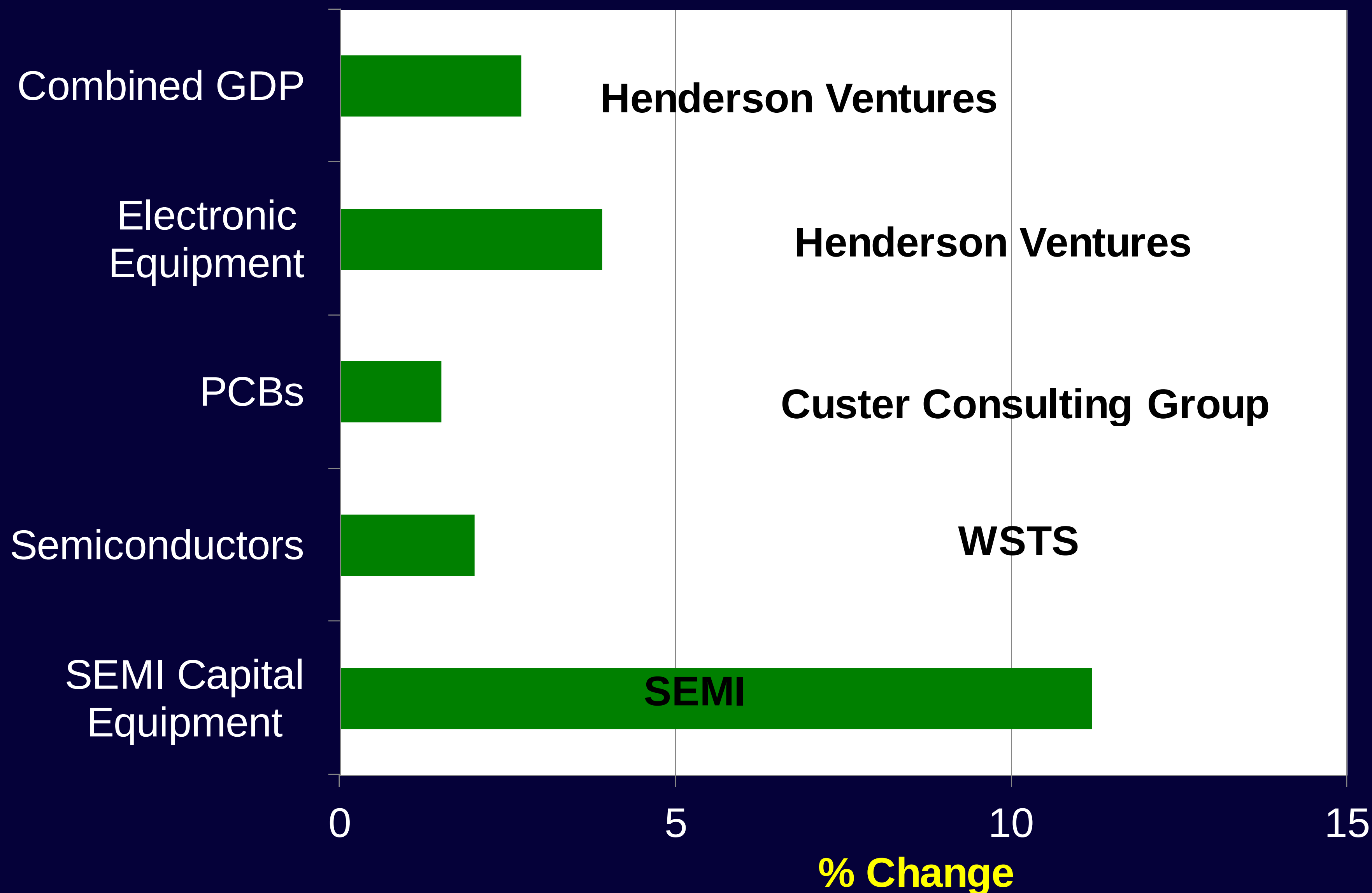
Global Electronic Supply Chain Forecast

2017 vs. 2016



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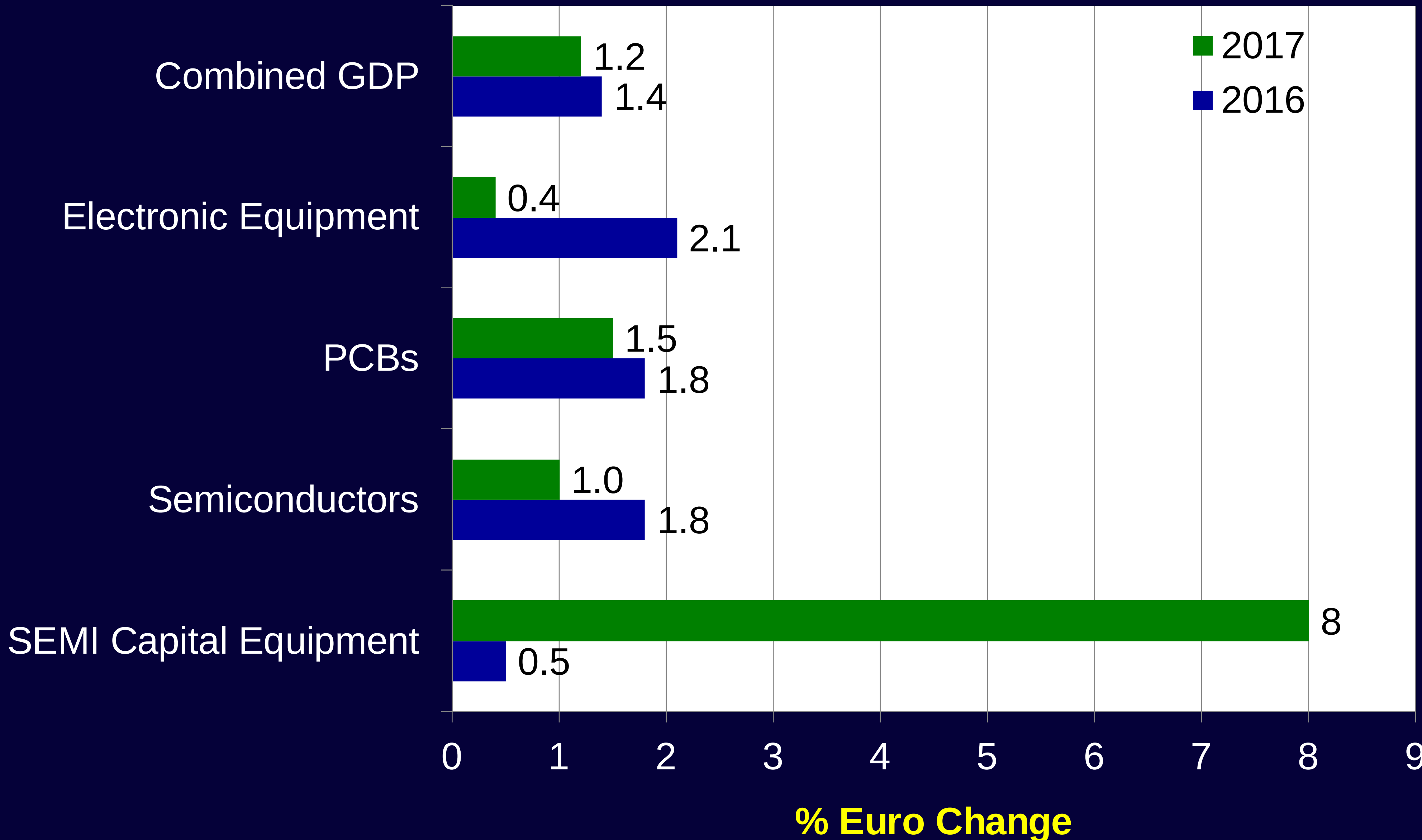
Europe Electronic Supply Chain Growth

2016 vs. 2017



2016 Summary

Global electronic equipment volume markets <u>excluding automotive, medical & SEMI equipment </u>are stagnant; emerging markets are not yet large

European main end markets (automotive, industrial, mil/aero) more stable than SE Asia's consumer markets.

Political uncertainty is widespread. Brexit impact looms & USA now uncertain.

Purchasing Managers' Indices are good leading indicator.

Europe growth resuming

20111007

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

Forecasting Methodology & Tools

Tools

Economic Indices - GDP, Industrial Production

Industry Indices – Electronic Equipment, PCBs, Semiconductors, Laminate & other PCB Materials

Leading Indicators – Purchasing Managers Indices, Other composite indices

Industry Forecasts – PCBs, Semiconductors

Your company sales

Forecasting Your Company Sales

- Organize monthly or quarterly sales in spreadsheet
- Obtain related industry time series for same time period
- Compare industry data and/or leading indicators to your sales using 3/12 growth rates
- Determine lead times vs. your data
- Forecast your sales based upon lead times
- Estimate your market share gains/losses by comparing your company growth to a related industry sector

- Custer Consulting Group can assist by providing:
    - Historical industry data
    - Help with analysis