



IHS Markit™

TV Display supply chain and competition analysis

2016.11.2 for IHS Technology Korea Display Conference

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Content

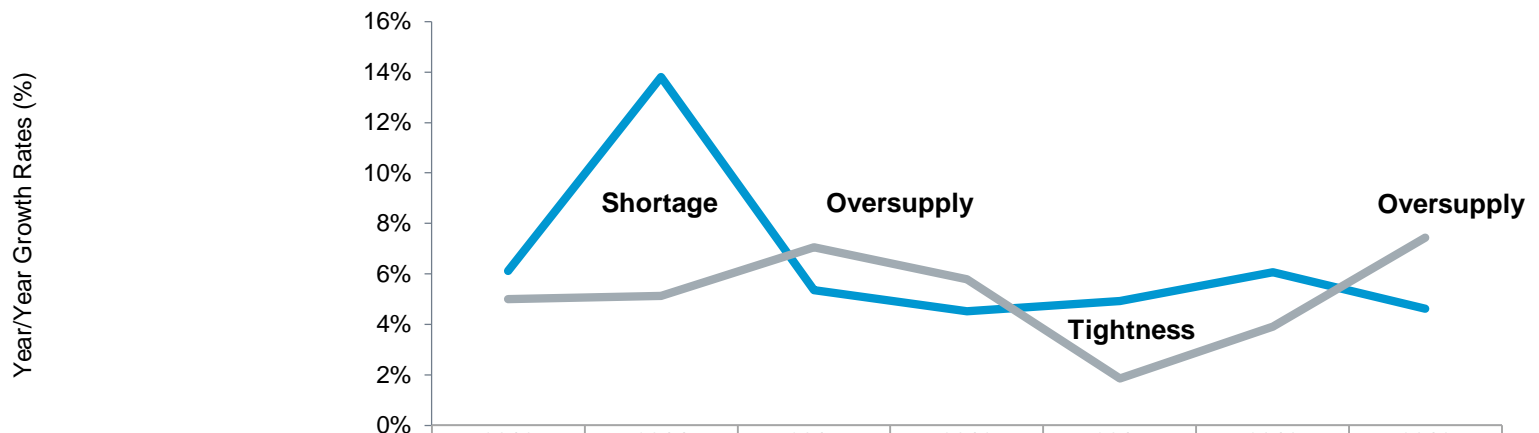
- Supply chain dynamics
- Competition landscape

Supply chain dynamics

H2 2016 and 2017–18 display supply/demand swings to tightness

The total capacity growth and demand growth will be relatively tied throughout the forecast years, which means supply and demand will be affected by any change including the end-of-life of old fabs and a new wave of area growth triggered by lower prices and a new replacement cycle.

Display demand area growth vs. capacity area growth



	2013	2014	2015	2016	2017	2018	2019
LA LCD, AMOLED, AMEPD Demand Y/Y%	6%	14%	5%	5%	5%	6%	5%
TFT Capacity for AM Applications Y/Y%	5%	5%	7%	6%	2%	4%	7%

Inventory carried over from previous year

New TV size/area demand
Old fab restructure/shutdown

Source: IHS

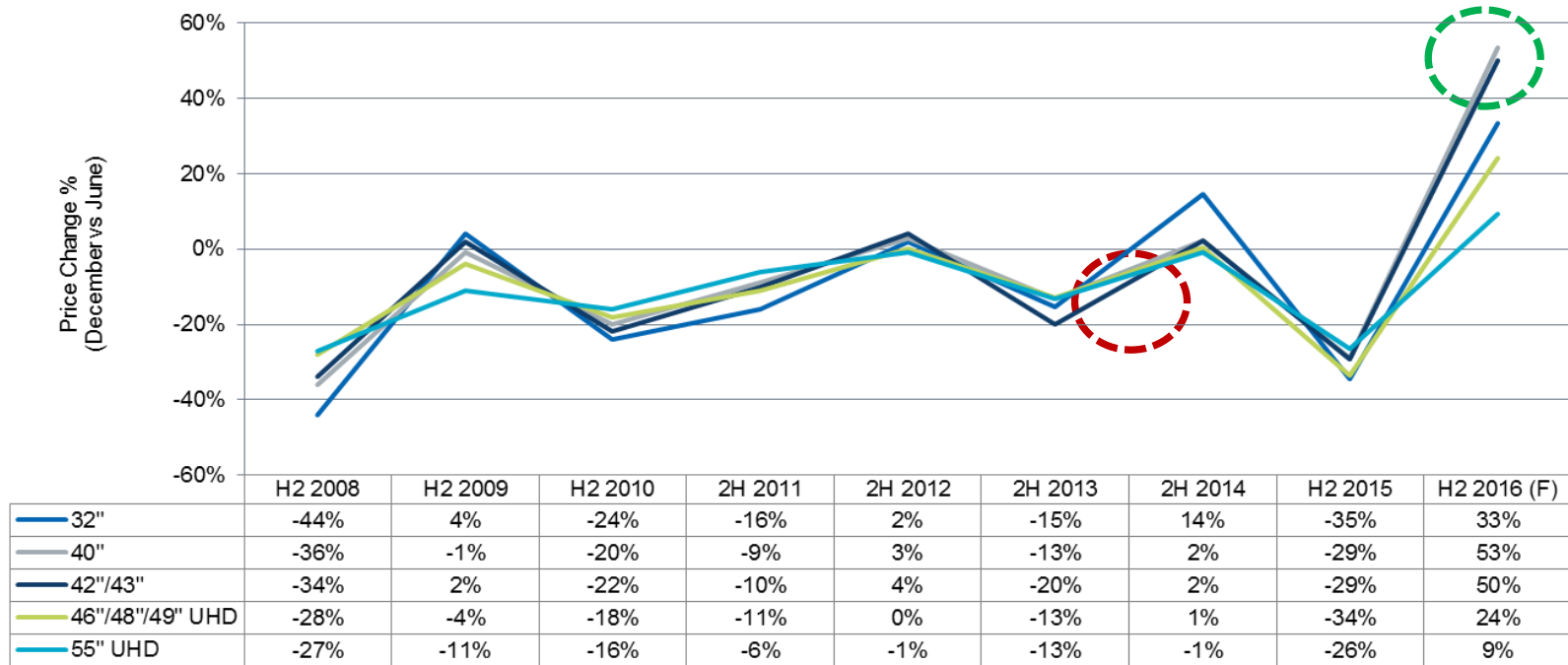
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TV panel prices fluctuation turns wide

After over-killed, price hikes begin skyrocketing

Except for 32inch, after aggressive price hike in Q3'16 the price level will still be much lower than a year ago, in particular for 50-inch and larger.

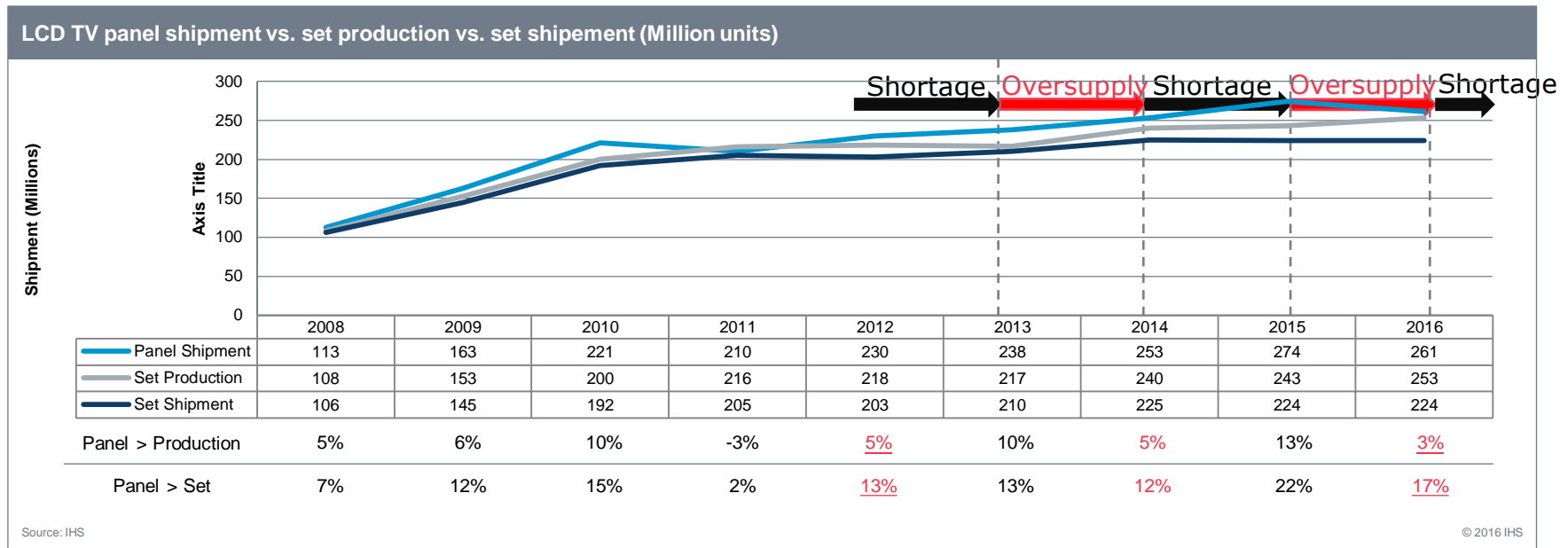
Panel price changes during H2, 2008-2015 (HD/FHD/UHD, open cell), October 2016 update



Notes: 1) 2H price erosion of historical years is based on the price change between June and December. 2) From January 2016, prices of 49" and 55" are with the resolution of UHD. Source: IHS

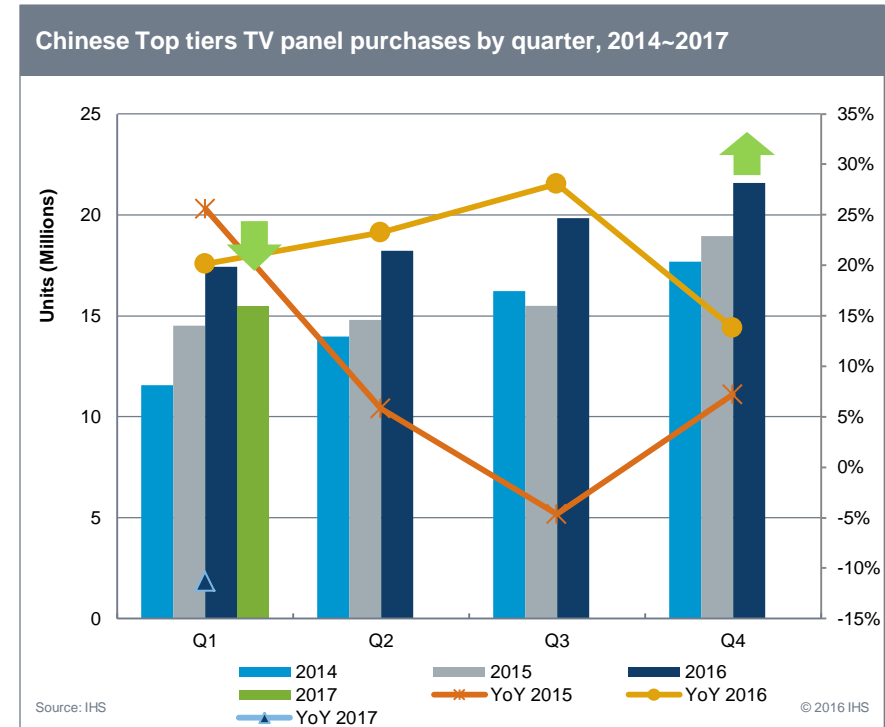
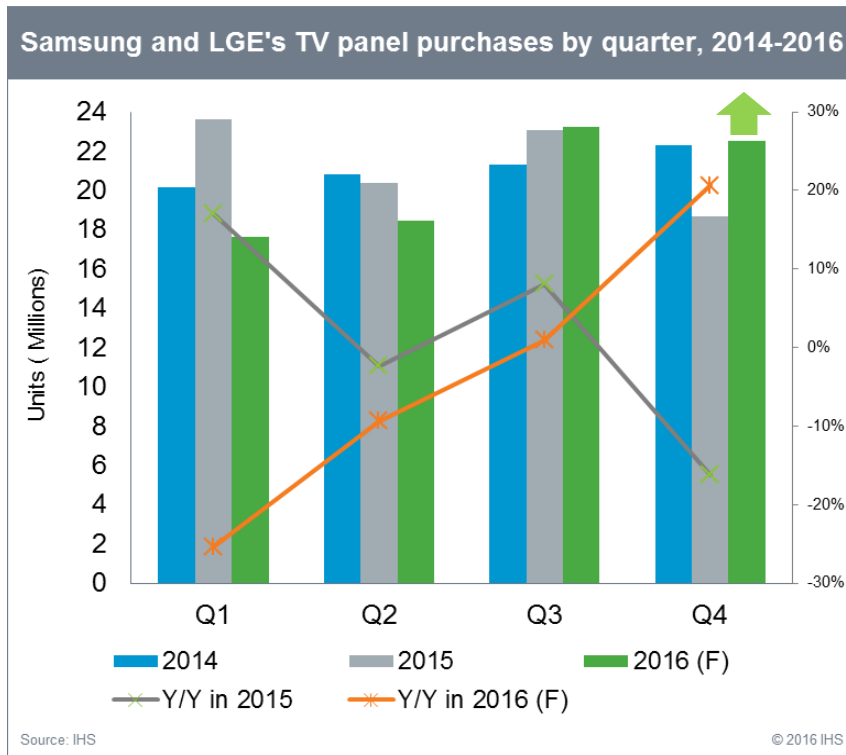
LCD TV panel vs. set production and shipments

- In the chart below, LCD TV panel shipments are compared to LCD TV set production (private label brands supplied by TV OEM makers are included) and to LCD TV set sell-in based shipments (based on surveyed LCD TV brands).
- The supply chain is less efficient when the market exceeds 200 million annually. Brands have to increase the supply chain buffer for open-cells and semi-finished TV sets to boost business plans. Size variation is also responsible for such a large gap.
- In 2016, panel shipments are 5% greater than set production while panel shipments are 17% greater than set shipments. This means set makers are more aggressively buying panels than selling TVs. The panel supply became constrained during the hot season for supply chain players even with TV set inventories piling up in the pipelines.



TV brands have stronger buying plans for Q3 2016 Adding bubble demand in Q4 2016?

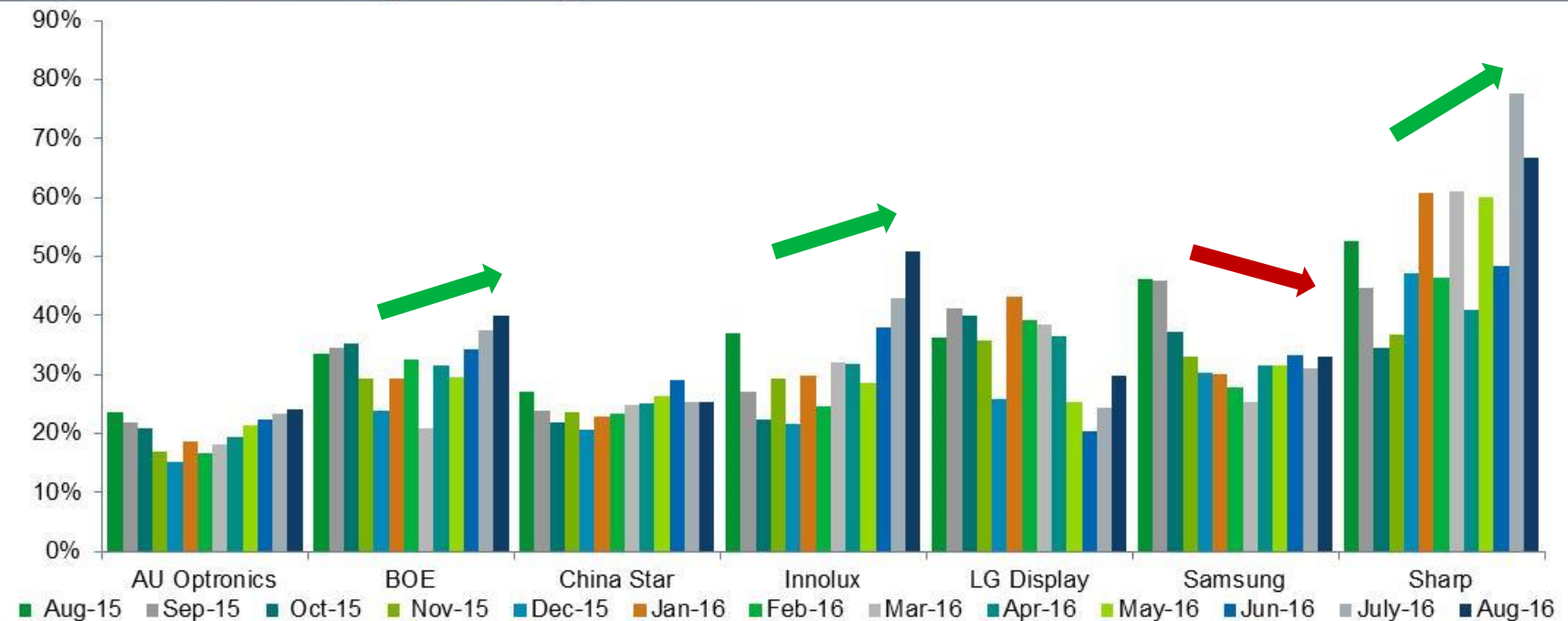
What keeps TV makers buying is strategic reasons to mitigate risks of future panel supply constraints and to achieve aggressive shipment targets, in particular for Chinese TV brands



Samsung's purchasing attitude has been a critical factor Who will obtain or lose supply chain bargains?

TV makers keep close eyes on Samsung's move, becoming a swing factor for panel S/D. Under panel supply constraint, panel supply relation may extend to more TV OEM in 2017?

Shipment share to Samsung and LGE by panel maker

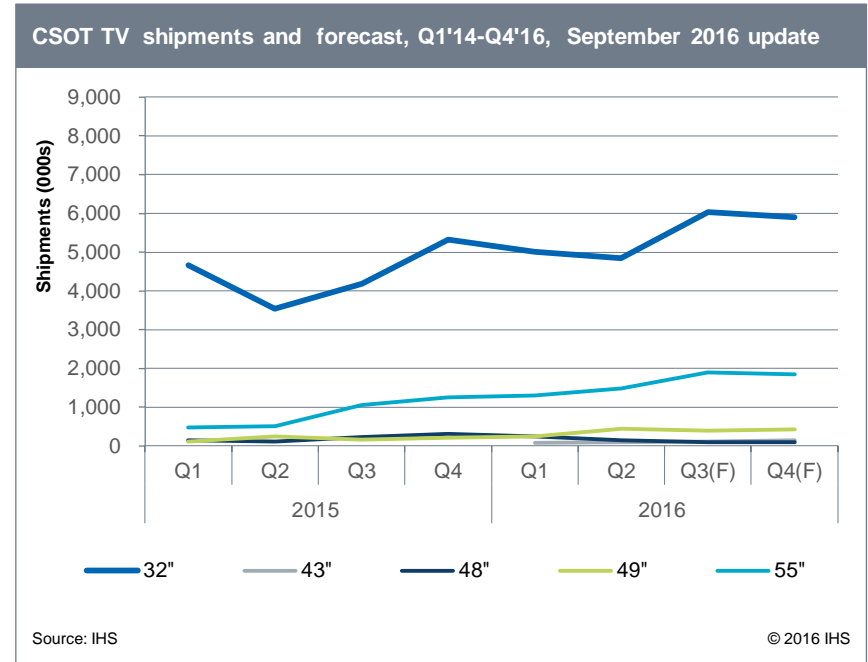
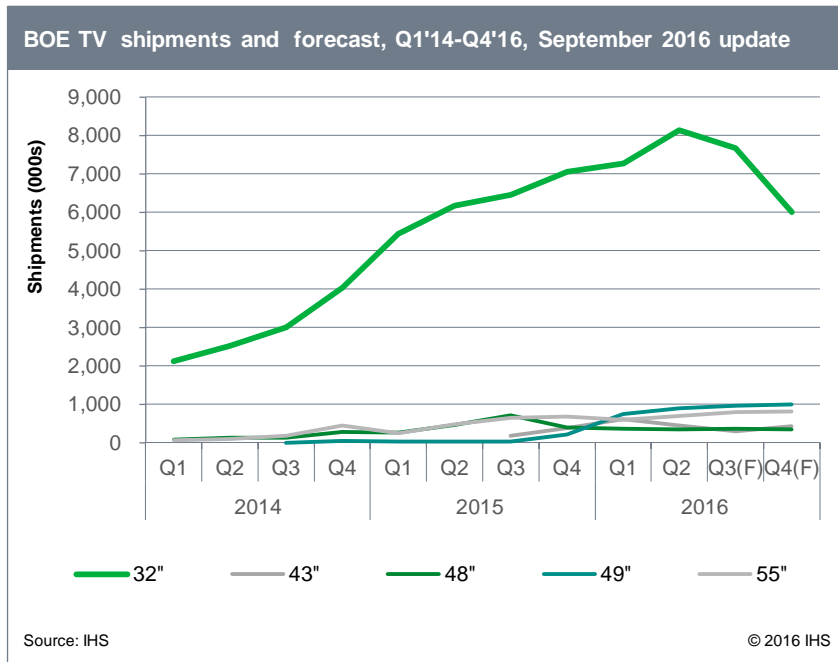


Source: IHS

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Chinese panel makers want to lead the market not only with capacity but also clever strategies

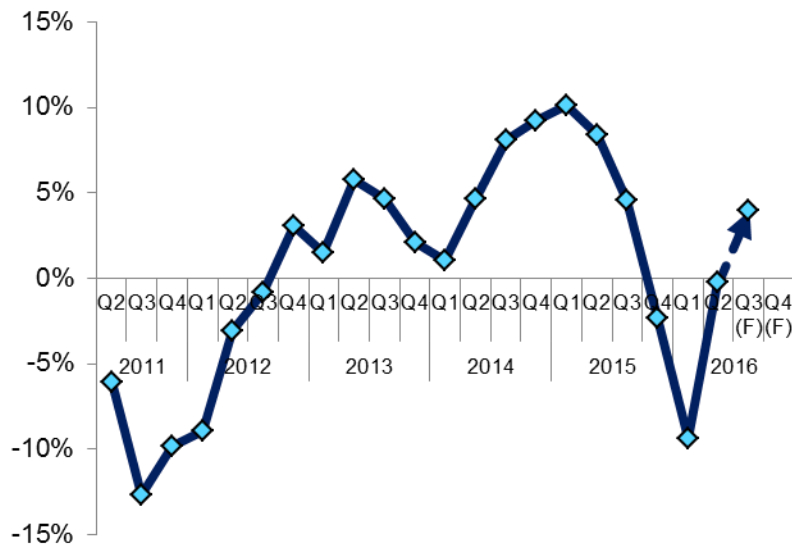
Chinese panel makers led the panel price hike, and shipped the record high on 32-inch in Q3'16. Moving forward, BOE plans to cut 22% Q/Q in Q4 and shifts the capacity to NB and smart phone panels. BOE is no longer chasing the world No. 1 maker for TV panel but wants to be the most profitable company.



Profit margin is limited across entire supply chain It's about margin re-distribution over the time

Panel makers and TV makers' can hardly share P & L, but each strives for survival.
What to do when low margin became "The New Normal" for the supply chain participants?

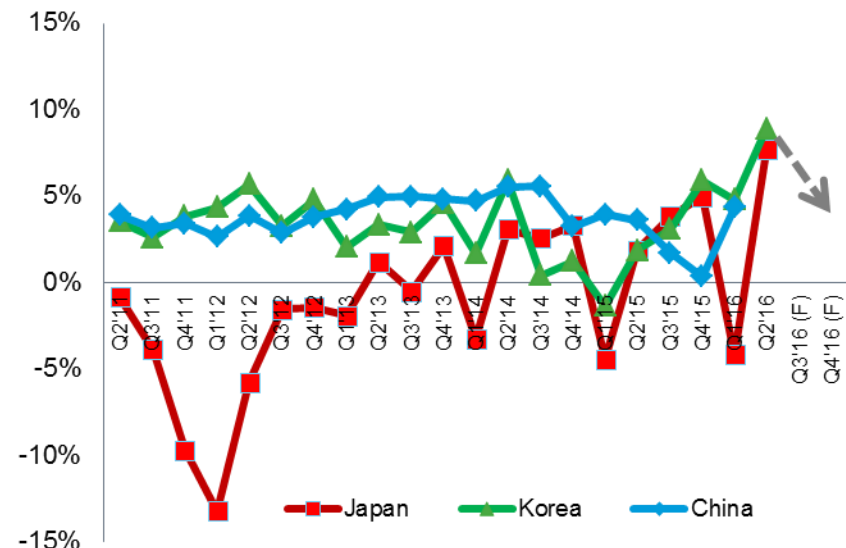
Large area FPD supplier profit margin and forecast



Source: IHS

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Profitability of global TV brands - by brand origin



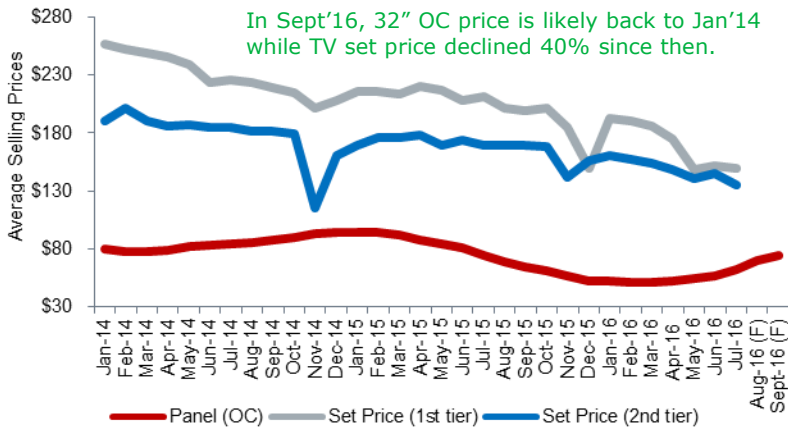
Source: IHS

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Brand competition drives TV market, but hard to follow LCD crystal cycle

Panel prices rose but ASP of TVs never return! TV makers need to add features to justify TV price increase. Otherwise, profits have to follow crystal cycle which is hard to manage.

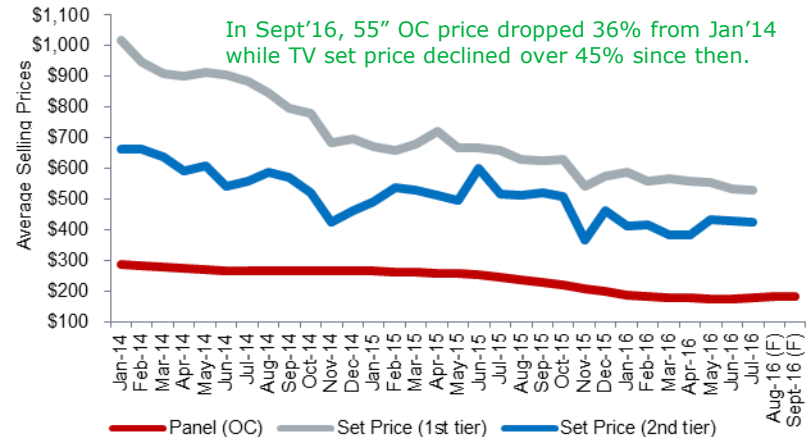
32-inch HD LCD TV - panel price vs ASP of TV brands in N. America, 2014 ~ 2016 by month



Source: IHS

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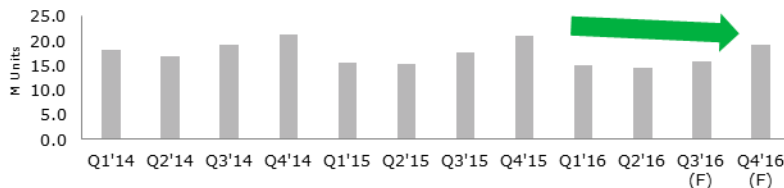
55-inch FHD LCD TV - panel price vs ASP of TV brands in N. America, 2014 ~ 2016 by month



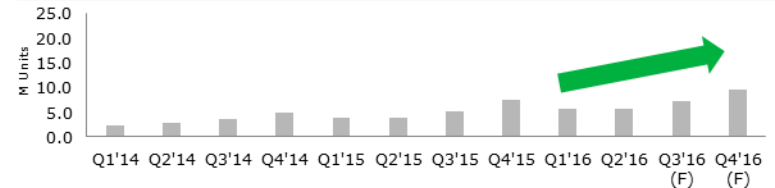
Source: IHS

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32-inch LCD TV shipment & forecast, Q2 2016 forecast



55-inch LCD TV shipment & forecast, Q2 2016 forecast



Note: ASP is weighted Average selling prices of 1st tier (Samsung, LGE, Sony and Vizio), and 2nd tier (Hisense, TCL, Element, Emerson and Insignia) in North America market

Cost comparison - the need to drive larger size migration

❖ 43-inch Cost of TV Brand in China

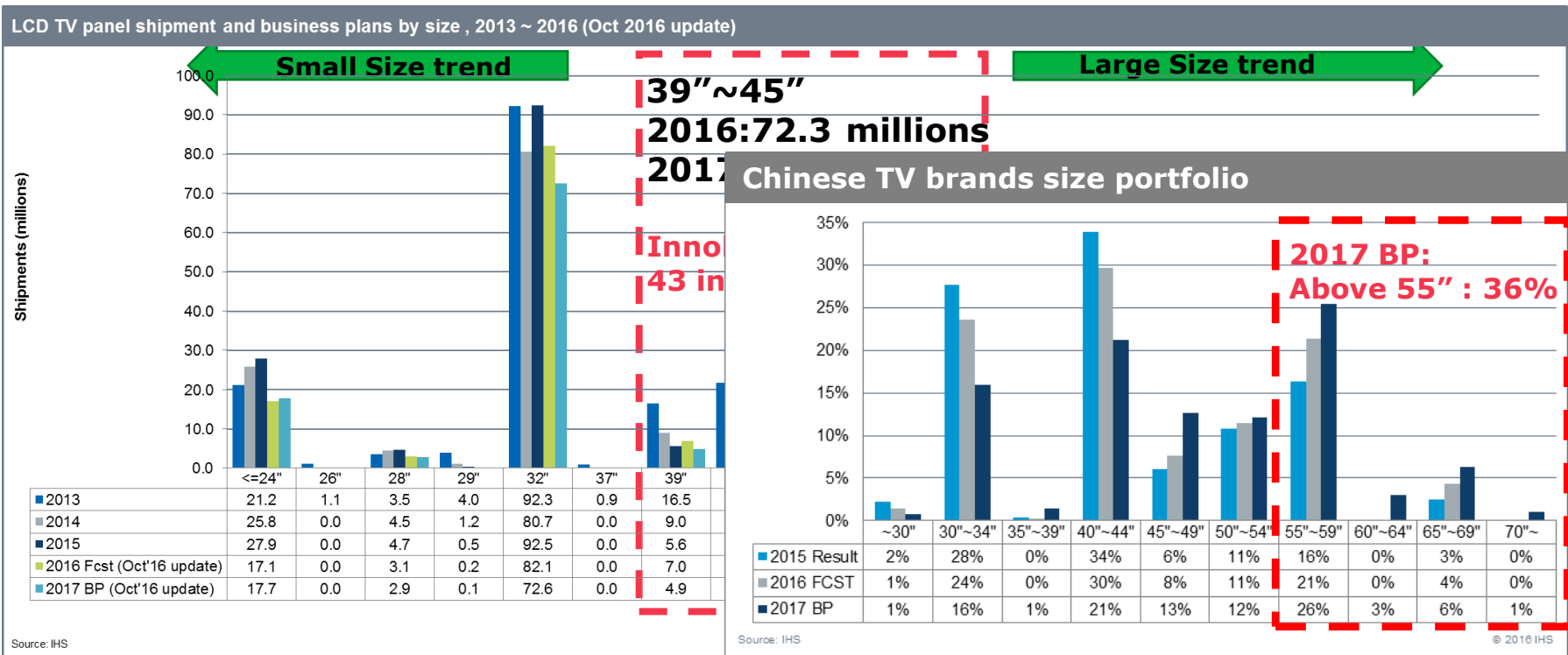
43"(FHD)	Jan'16	May'16	July'16	Oct'16
Panel Price	\$ 95	\$ 93	\$ 95	\$ 135
Cost of Except Panel(Brands)	\$ 75	\$ 74	\$ 73	\$ 71
Cost of Except Panel(OEM)	\$ 62	\$ 61	\$ 61	\$ 60
Exchange ratio (end of each month)	6.5771	6.5833	6.637	6.7702
Channel (E-Commerce)	10%	10%	10%	10%
Add-value tax	17%	17%	17%	17%
Tariffs	5%	5%	5%	5%
Others (least value)	10%	10%	10%	10%
TV Set Total Cost (for Brands)	¥1,627	¥1,600	¥1,623	¥2,039
TV Set Total Cost (Out sourcing)	¥1,506	¥1,479	¥1,510	¥1,934
TV Set Price(JD.com)	¥1,699	¥1,699	¥1,699	¥1,999

❖ 32-inch Cost of TV Brand in China

32"	Jan'16	May'16	July'16	Oct'16
Panel Price	\$ 50	\$ 60	\$ 70	\$ 73
Cost of Except Panel(Brands)	\$ 46	\$ 44	\$ 43	\$ 41
Cost of Except Panel(OEM)	\$ 35	\$ 34	\$ 33	\$ 31
Exchange ratio (end of each month)	6.5771	6.5833	6.637	6.7702
Channel (E-Commerce)	9%	9%	9%	9%
Add-value tax	17%	17%	17%	17%
Tariffs	5%	5%	5%	5%
Others (least value)	10%	10%	10%	10%
TV Set Total Cost(for Brands)	¥909	¥988	¥1,085	¥1,117
TV Set Total Cost(Out sourcing)	¥807	¥896	¥992	¥1,022
TV Set Price(JD.com)	¥999	¥999	¥1,099	¥1,199

TV makers are on verge of decision regarding 40-45", supply base management is far too critical

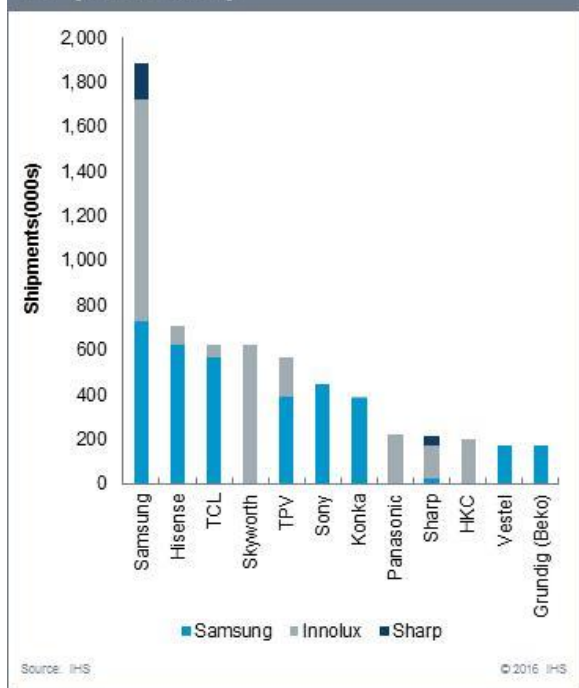
In 2016, panel supply base undergoing drastic changes, in particular 32". Panel makers are flexible to adjust capacity arrangement. To TV makers, plan more for larger screens is safer than smaller sizes, but it's not the game for all.



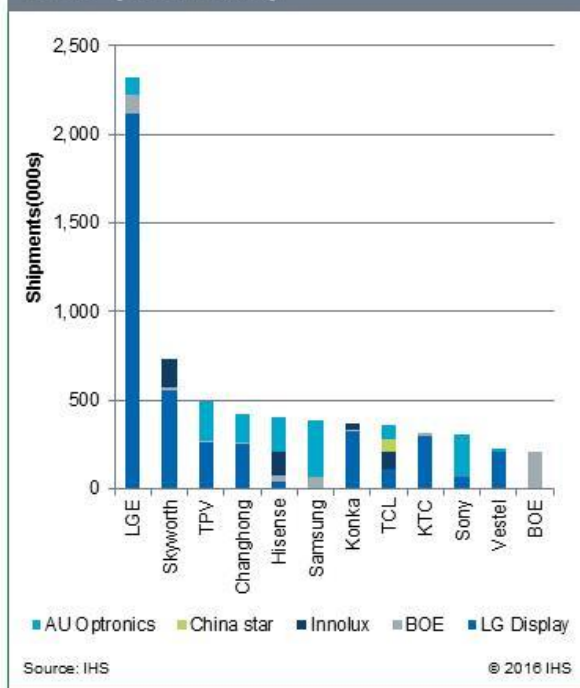
Who should be worried about the 40-inch supply? Top tier are aggressive to lock in strategic sizes

Main size for top brands, all are striving for sufficient and efficient supply base.
40"-43" supply/demand mis-match, any possible change on the supply chain relation legacy?

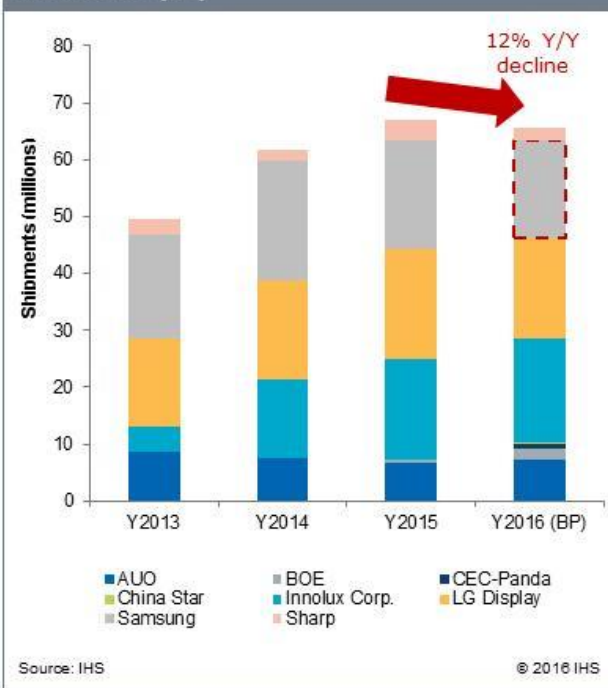
Top TV OEM Shipments & panel supply base :
40" (Q1'16 result)



Top TV OEM shipments & panel supply base:
42-43" (Q1'16 result)



40"/42-43" TV panel shipments by vendor,
2013-2016 (BP)



Competition landscape

Chinese TV brands lead the growth, Japanese brands return to market through licensing

From “made-in-China” to “made-from-China”, Chinese need deep pocket and strategy to become “global”.

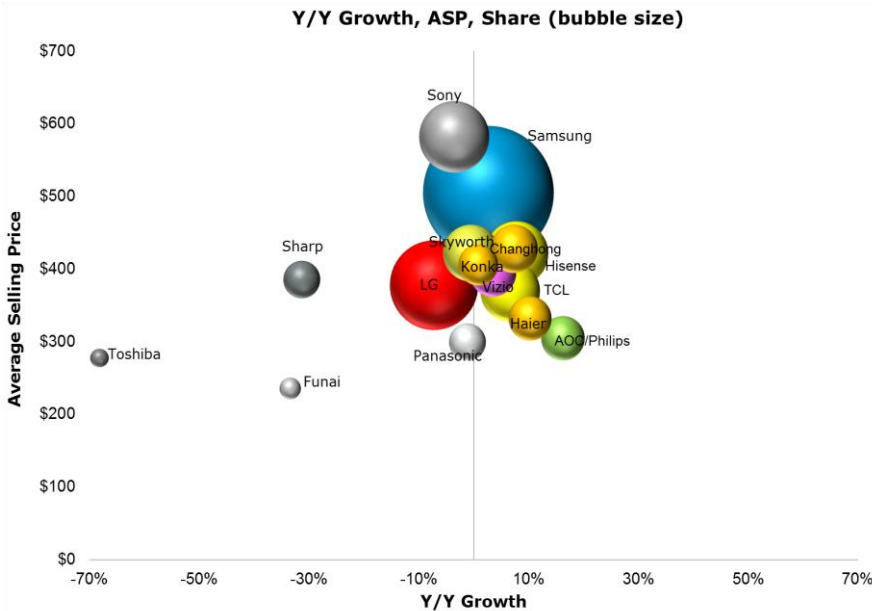
LCD TV shipment results and targets , (ranked by 2015 result, millions), October 2016 forecast

Brand	2013	2014	2015	2016 (F)	2017 (F)	2014 Y/Y	2015 Y/Y	2016 Y/Y (F)	2017 Y/Y (F)
Samsung	43.1	48.9	47.5	48.0	49.0	13%	-3%	1%	2%
LGE	29.1	31.9	28.1	28.0	28.0	10%	-12%	0%	0%
Hisense*	9.9	11.6	12.6	15.2	17.0	17%	9%	21%	12%
TCL*	13.6	12.2	12.6	13.5	14.0	-10%	3%	7%	4%
Sony	13.1	14.6	12.5	12.0	12.0	12%	-14%	-4%	0%
Skyworth*	9.3	9.3	10.4	12.1	13.5	0%	12%	16%	12%
PHILIPS/AOC	8.5	7.6	8.5	8.8	10.5	-11%	11%	4%	19%
VIZIO	6.4	7.0	7.8	8.2	9.5	10%	10%	5%	16%
Changhong	7.0	6.3	6.8	6.8	7.6	-9%	8%	0%	12%
Panasonic*	8.2	8.4	6.5	5.8	6.0	2%	-22%	-11%	3%
Haier	4.9	4.8	6.5	7.0	7.5	-2%	37%	8%	7%
Sharp	7.9	7.3	6.4	4.8	6.0	-8%	-12%	-25%	25%
Konka	6.2	5.6	5.2	5.3	6.0	-10%	-8%	2%	13%
Tongfang	2.8	3.2	4.1	4.5	4.8	14%	29%	10%	7%
Funai	6.1	4.8	4.1	4.5	4.5	-21%	-14%	10%	0%
Toshiba	8.8	7.6	3.6	1.0	1.0	-14%	-53%	-72%	0%
LeTV	0.2	1.5	2.9	5.8	8.0	900%	91%	100%	38%
Xiaomi			0.9	1.0	1.5			11%	50%
Top-17 Subtotal	184.9	192.6	186.9	192.3	206.4	4%	-3%	3%	7%

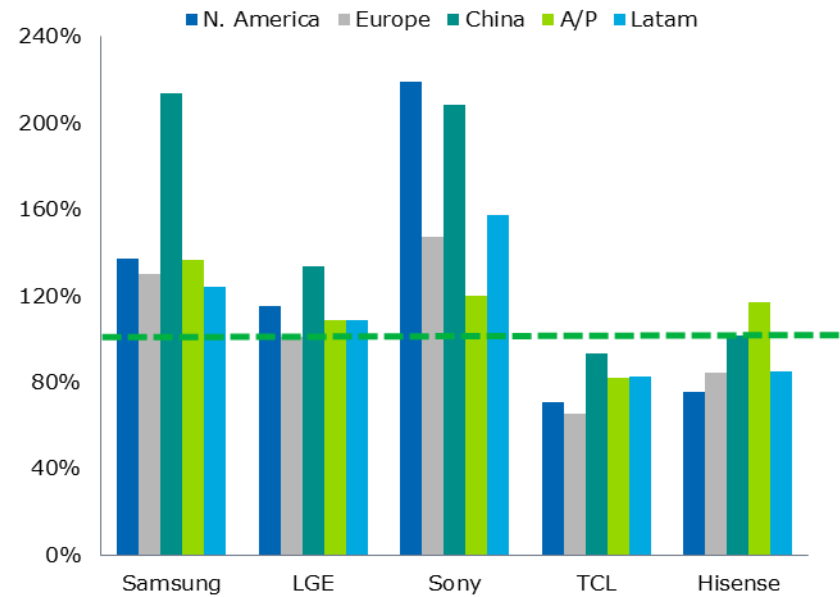
Global top tier have higher brand index Chinese needs improving product mix and brand value

Samsung, LGE and Sony have about 50% revenue share. For share growth, Chinese brands go brand Licensing or channel-brand OEM; exploring EE, AP, LA and MEA markets.

Global LCD TV revenue share by brand, H1 2016 result



Top TV brand Index (value share/volume Share) in H1 2016

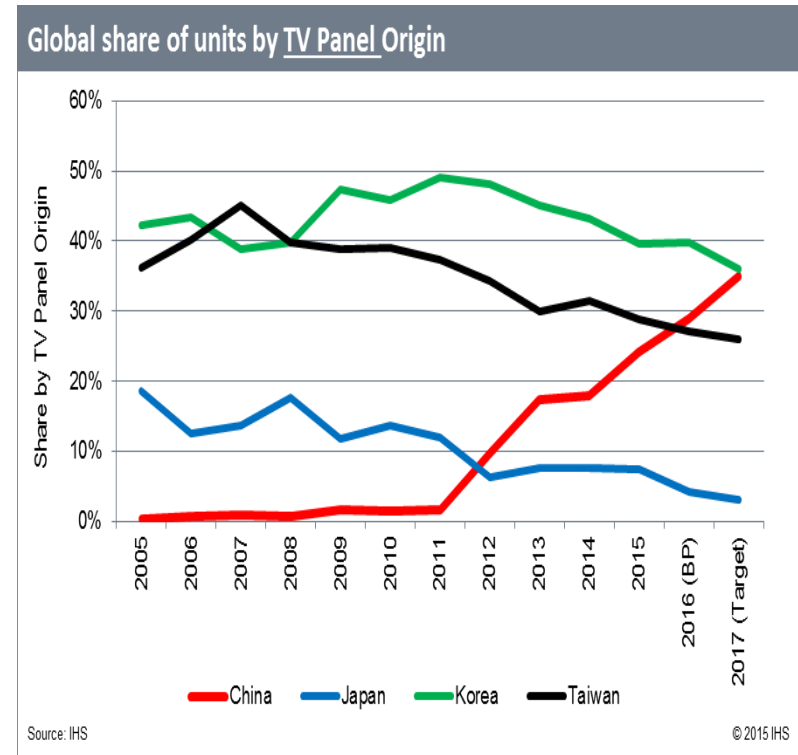
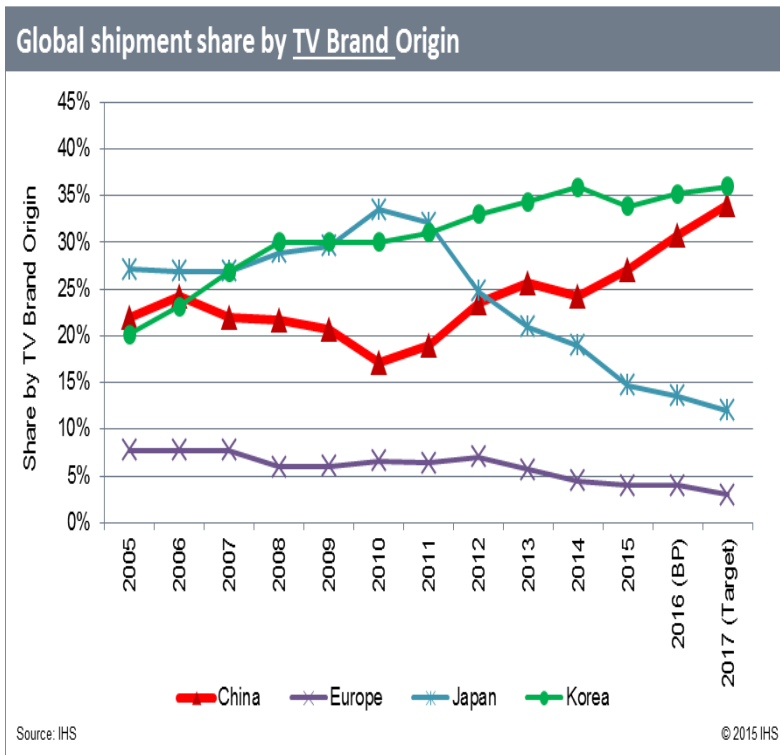


Source: IHS

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Race to the bottom competition China buys market share, but has it reached a limit?

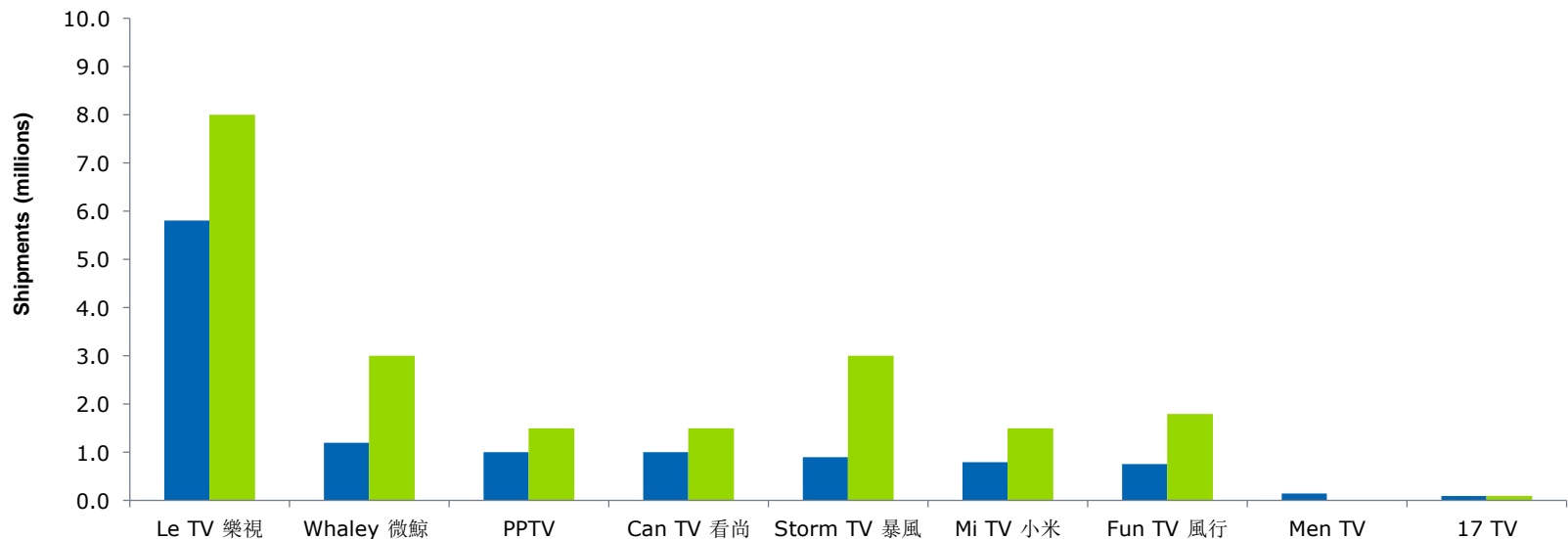
Rise of China FPD Industry - capitalize on government support to make greater foray into global market - breakthrough in global has not happened yet!



LeTV leads and many others follow with similar business models in China

The constraint on the TV panel supply is becoming a critical issue for TV makers in the third quarter and it will likely continue through the fourth quarter. They outsource their TVs to Taiwan TV OEMs and low-tier TV makers in China, which are struggling to secure panels and are under intense pressure to raise prices due to the significantly increased cost of panels.

Chinese streaming TV brands 2016 shipment targets & 2017 BP (M units)



Source: IHS

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Intending to change the rules of the game? LeEco - Buy content get a TV for free!

Rise of E-Commerce & TV ecosystem are changing the margin structure and distribution. Integrated strategy: hardware, content and platform.

LeTV 65" 4K Curved LCD TV BoM (Dec'15) vs ASP at CNY 6,999				
Category	Items	Parts	Cost RMB(Tax-inclusive)	Total(Unit: RMB)
Monitor	Module EE	65" Curved module	¥7,262.98	¥10,055.71
		FRC		
		FRC DDR		
		Himax		
		Panasonic		
		Silicon Image		
Monitor power				
Mechanical	base	¥1,016.16		
Cables	Cable & others			
Main Board	2.4G			
	PCBA			
	4GB DDR4			
	65GB EMMC			
WIFI Board	WIFI PCBA	¥781.99		
Bluetooth	BT BD			
Power Board	PB			
Speaker	SHC Speaker assy			
IR Board	RC PCB Board			
Cables	Cable & others			
ME& Packing	Plastic components	Woofer	¥788.26	
		Back Cover		
		Key pad		
		IO Board		
		Label		
		USB Cover		
	Label2	¥206.32		
	AC Holder			
	Mylar			
	Soundbar ME			
	Carton box			
	Packing			Plastic bag(EPE+PE/PE) Others
Accessories	Accessories	DTMB Module	¥206.32	
		Lightning protection plug superlink & connector		
		USB Cabel		
		Power Cable		
		Cable holder box		
		Accessories box Super RC 3		
RC				

LeEco promotion in China on April 14, 2016



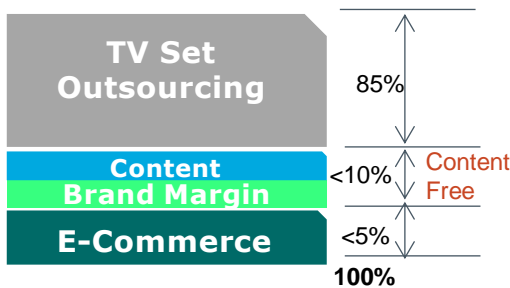
Streaming TV brands run different business models When subscription pays for hardware...

LeTV has most disruptive business model using its own e-commerce outlet. The content portal has original content and requires a two-year subscription.

Different business models among streaming TV brands

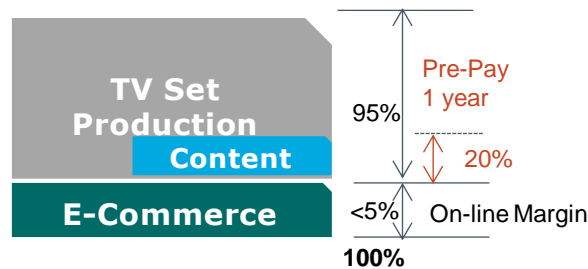
Model 1: MiTV, 17TV

PRICE =
+ TV Set Cost
+ Brand Margin
+ E-Commerce



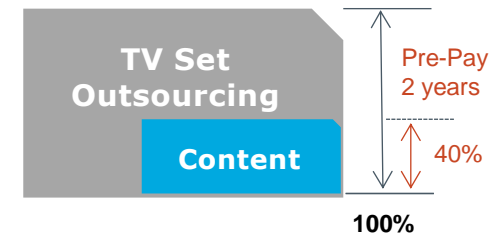
Model 2: Whaley, Fun TV, Storm TV

PRICE =
+ TV Set Cost
+ E-Commerce
+ Paid Video Subscription



Model 3: LeTV

PRICE =
+ TV Set Cost
+ Paid Video Subscription



Source: IHS

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Does it make sense for LeEco to acquire Vizio?

The LeEco acquisition of Vizio

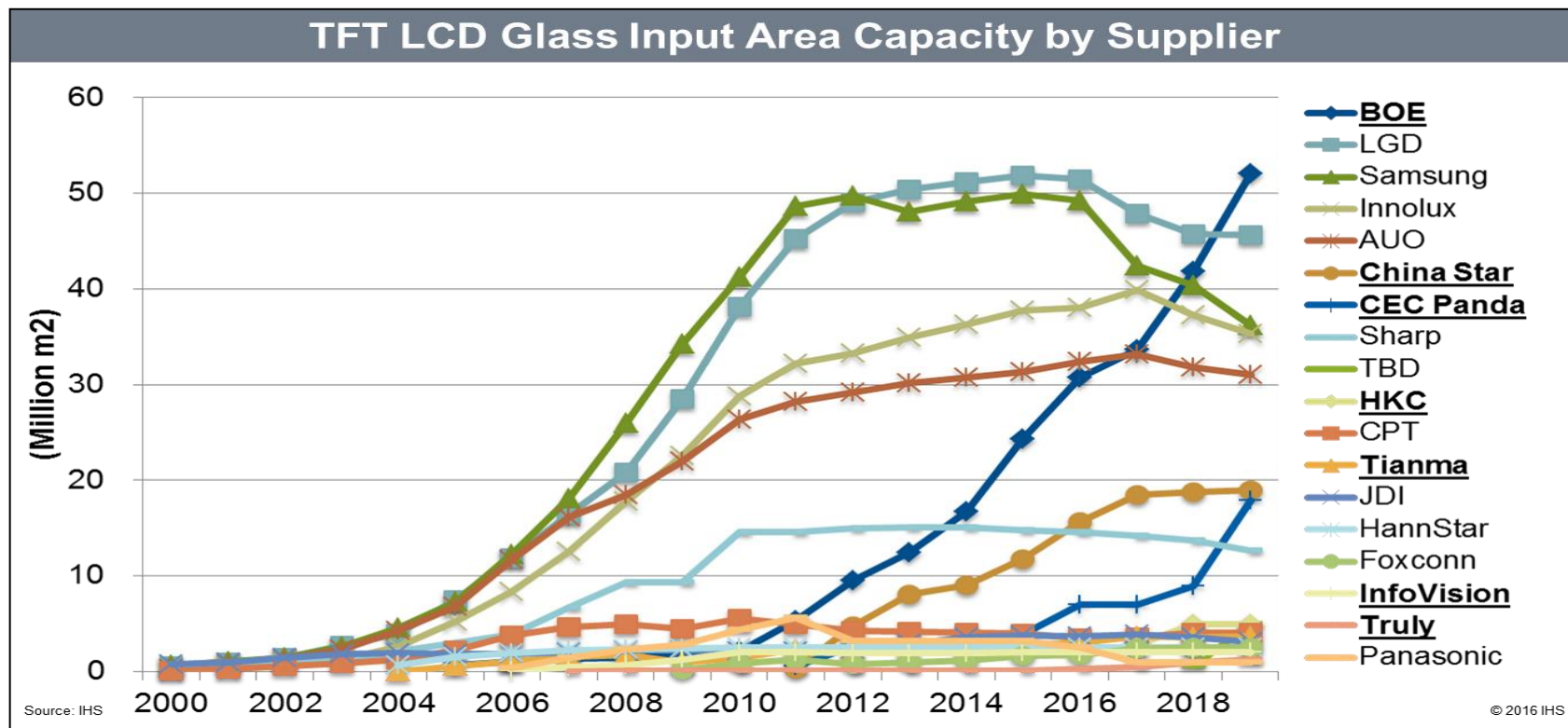
Channel																										
Main Market	<p>China No. 7 in 2015 (behind China top-6, ahead of Samsung) Want to penetrate N. America, AP (India)</p>	<p>N. America No. 2 in 2015 (behind Samsung) Struggling to penetrate overseas market</p>																								
Business	<p>2015 Revenue Structure</p> <p>LCD TV Product Mix (%), Q1'16</p> <p><50" : 35 % >50" : 65 %</p>	<p>2015 Revenue Structure</p> <p>LCD TV Product Mix, Q1'16</p> <p><50" : 69 % >50" : 31 %</p>																								
Branding																										
Finance	<table border="1"> <thead> <tr> <th>Company</th> <th>LeEco</th> </tr> </thead> <tbody> <tr> <td>Core business</td> <td>Online video, internet TV content provider, TV and smart phone business</td> </tr> <tr> <td>Revenues 2015</td> <td>CNY 13.0 billion</td> </tr> <tr> <td>Net profit after tax</td> <td>CNY 573 million</td> </tr> <tr> <td>% of net profit</td> <td>4.4%</td> </tr> <tr> <td>Market capitalization (middle of Dec '15)</td> <td>About CNY 110 billion</td> </tr> </tbody> </table> <p><i>Cash Injection</i></p>	Company	LeEco	Core business	Online video, internet TV content provider, TV and smart phone business	Revenues 2015	CNY 13.0 billion	Net profit after tax	CNY 573 million	% of net profit	4.4%	Market capitalization (middle of Dec '15)	About CNY 110 billion	<table border="1"> <thead> <tr> <th>Company</th> <th>Vizio</th> </tr> </thead> <tbody> <tr> <td>Core business</td> <td>TV business</td> </tr> <tr> <td>Revenues Q1-Q3 2015</td> <td>USD 2.2 billion</td> </tr> <tr> <td>Net profit after tax Q1-Q3 2015</td> <td>USD 44 million</td> </tr> <tr> <td>% of net profit</td> <td>2%</td> </tr> <tr> <td>Market capitalization (middle of Dec '15)</td> <td>N.A.</td> </tr> </tbody> </table> <p><i>Investment (8% stake)</i></p>	Company	Vizio	Core business	TV business	Revenues Q1-Q3 2015	USD 2.2 billion	Net profit after tax Q1-Q3 2015	USD 44 million	% of net profit	2%	Market capitalization (middle of Dec '15)	N.A.
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TV OEM Share	<p>Q1'16 Result</p>	<p>Q1'16 Result</p>																								

Source: IHS

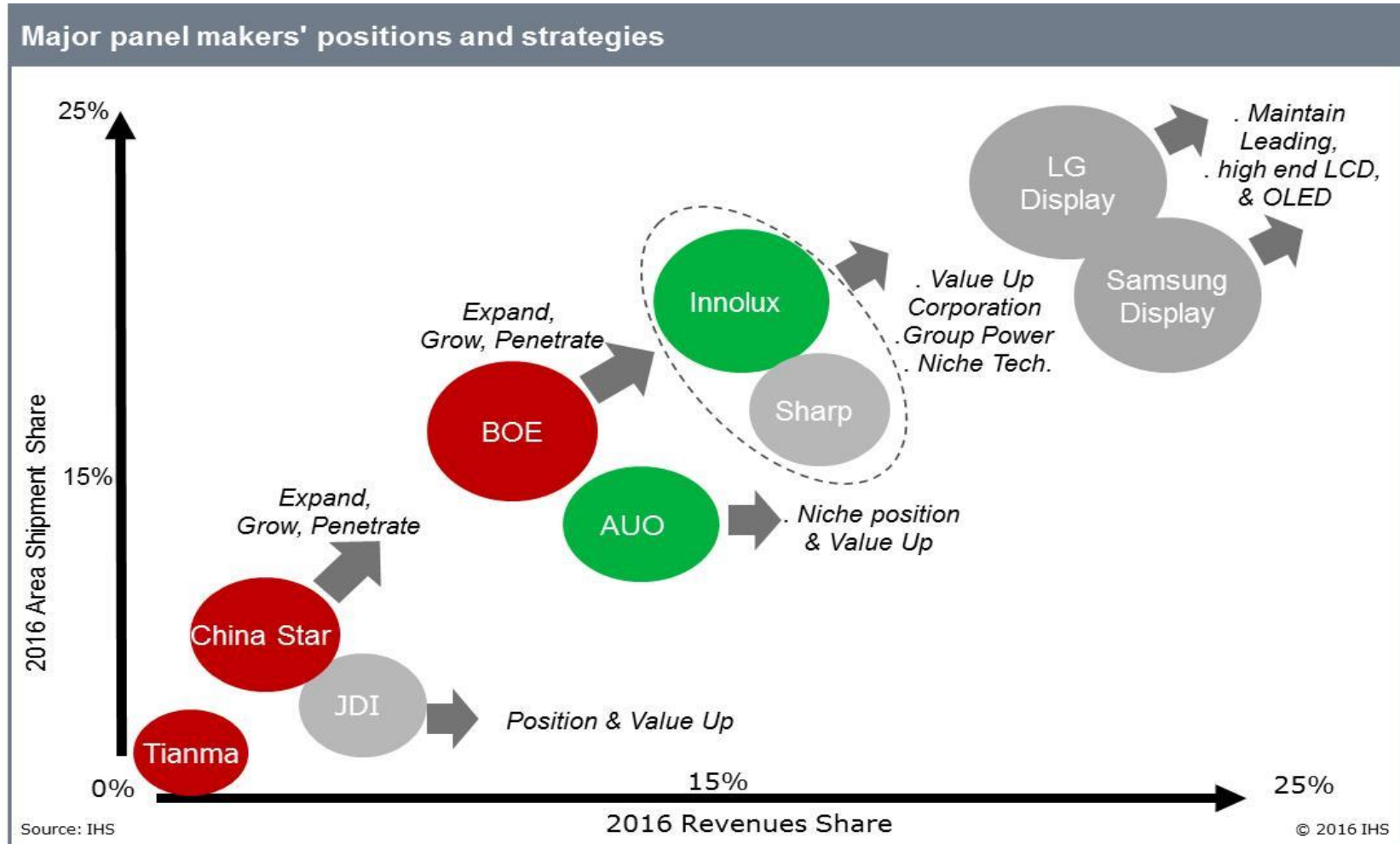
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BOE No.1 TFT LCD in 2019

Foxconn (Century, Innolux, Sharp) has the largest TFT LCD capacity in 2017. Samsung Display continue to reduce its TFT LCD capacity. Gen10.5 will be the kick off for BOE to become No.1 W/W TFT LCD capacity owner.

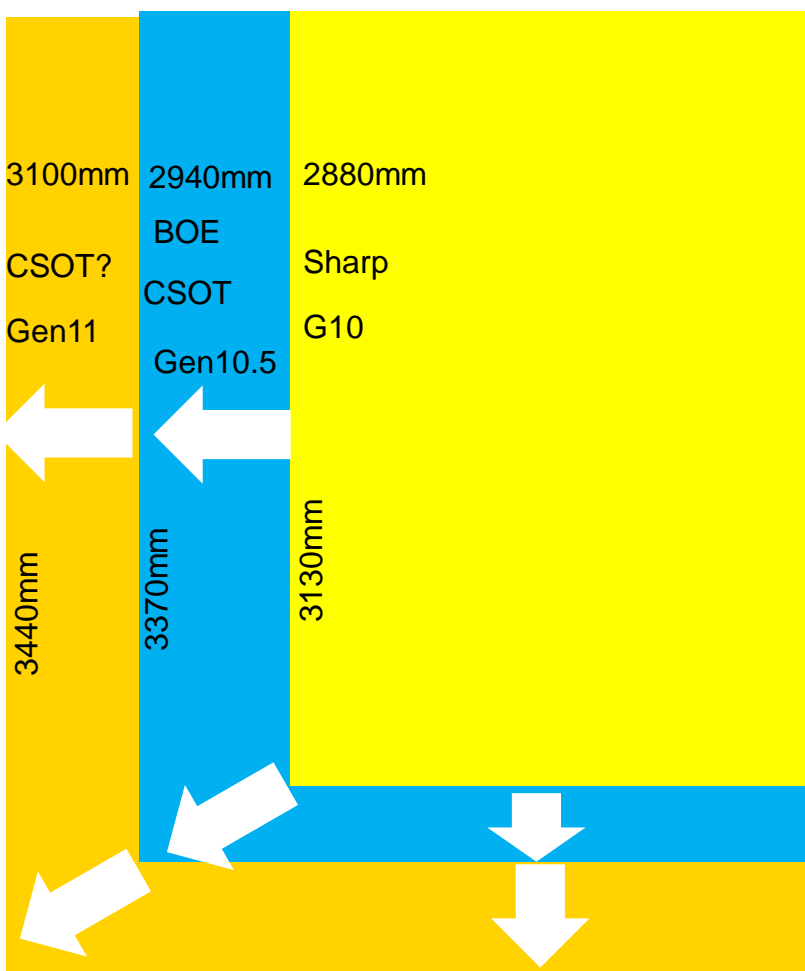


Major panel makers' positions and strategies



Gen10, 10.5 and Gen11

Gen 10 → Gen11 : Sharp vs. BOE vs. ChinaStar



Source: IHS

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Sharp Gen10 vs. BOE Gen 10

	Sharp Gen 10	BOE Gen 10.5	Gen11
X Side (mm)	3130	3370	3440
Y Side (mm)	2880	2940	3100
Capacity	72K / M	90K / M	90K/M (Plan)
Tech.	VA	IPS/FFS	VA
MP Timing	Q3'09	Q1'18	Under Discussion
Technology	a-Si	a-Si	a-Si/Oxide+OLED
Economical Panel Cut	32", 40", 60", 70", 80"	43", 49", 65", 75", 61" (21:9), 70" (21:9)	45", 49", 65", 78", 88"

Source: IHS

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Gen10.5 Economical cut per panel

Panel Size	Economical Cut	Glass Efficiency
43"	18	96%
49"	12	82%
65"	8	96%
75"	6	96%
61" (21:9)	10	93%
70" (21:9)	8	91%

Source: IHS

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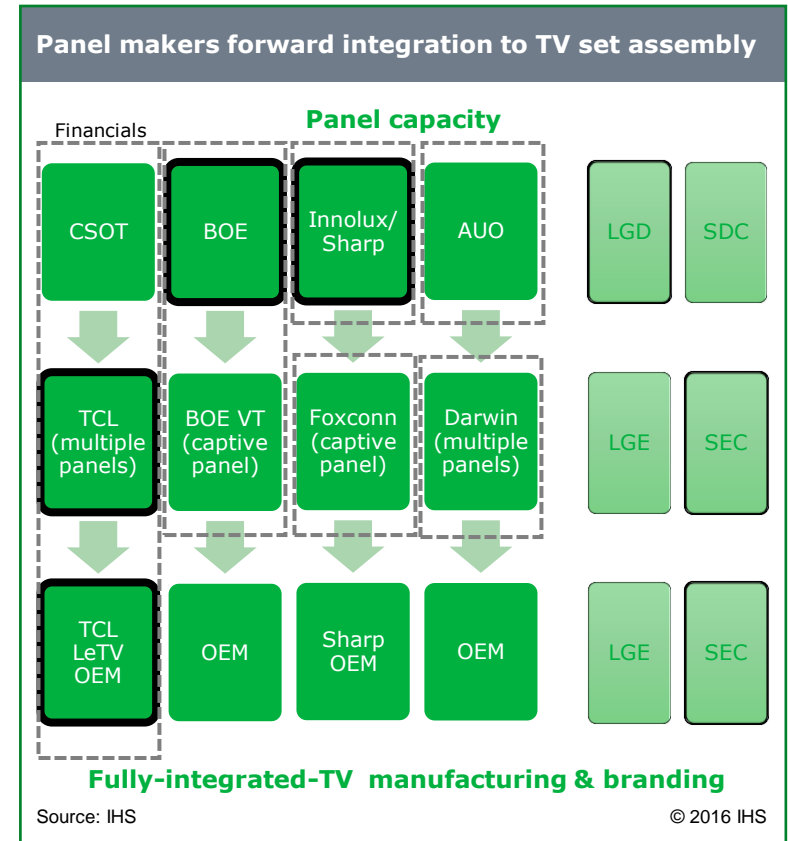
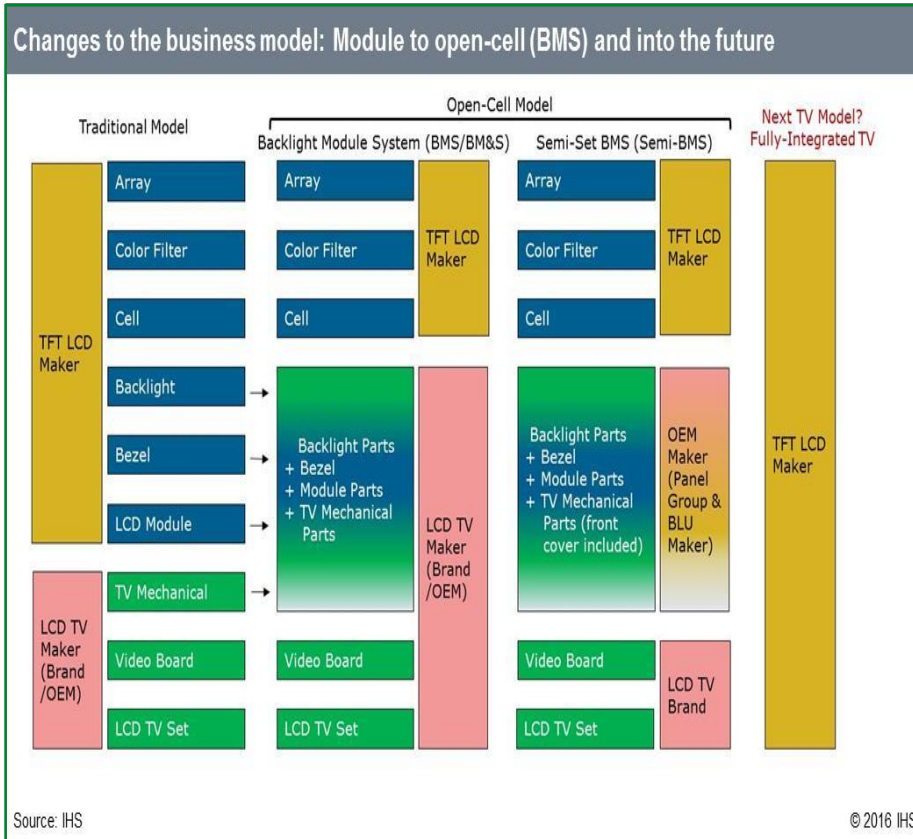
Gen11 Economical cut per panel

Panel Size	Economical Cut	Glass Efficiency
45"	18	97%
49"	15	95%
65"	8	89%
77"	6	96%
88"	3	62%













Source: IHS

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Module -> Open-cell (BMS) -> Panel makers making FIT Who can do better job? Supply chain cost optimization



Foxconn/Sharp/Innolux: Super Combo of Value Chain Integration

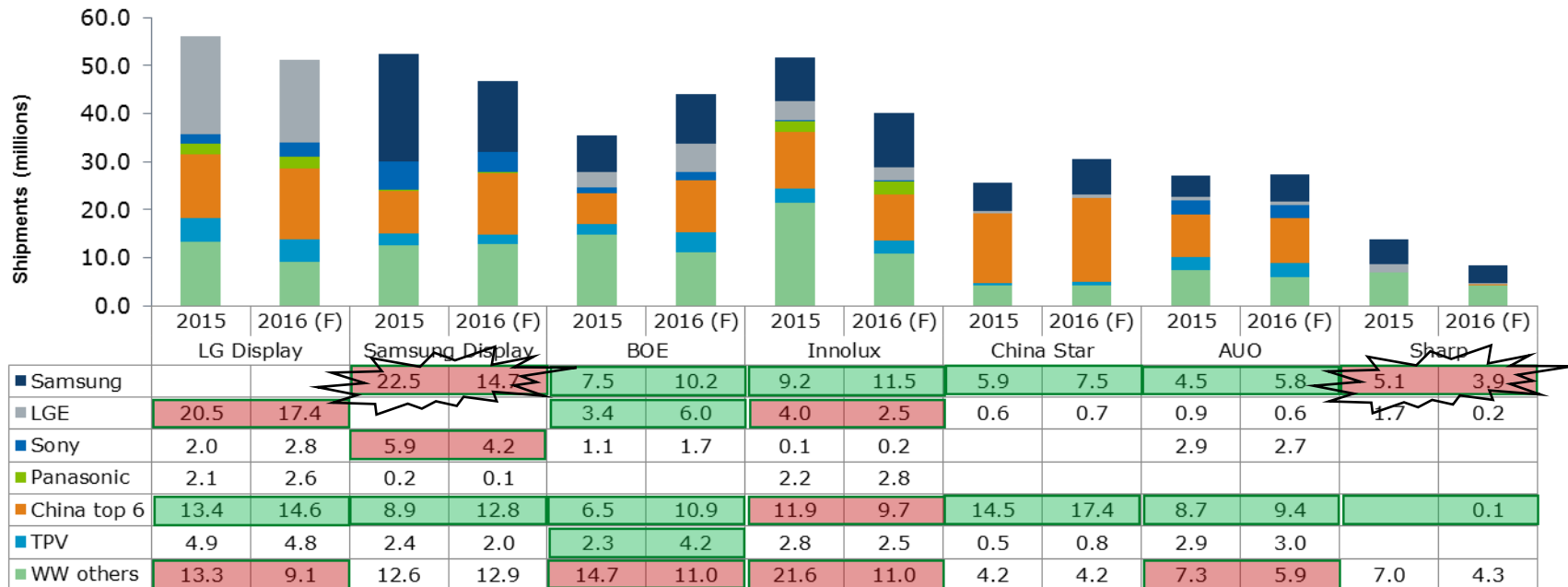
Display	Sharp LCM InnlouX LCM Century LCM Chimei Materials - Polarizer G-tech - ITO GIS - TSP	  	ICT	Application ·NB ·Tablet ·Monitor ·Smartphone ·TV	Customers Apple, Vaio Apple, Nokia, Huawei Apple, HP, Dell, Acer, Lenovo Apple, Xiaomi, Sony, Hauwei Sony, Vizio, LeTV, Haier, Xiaomi	
	Semiconductor	Power management CCD/CMOS for camera Optoelectronics LEDs/Laser Diodes RF Components Sensor			Home Appliances	·Refrigerators ·Steam Ovens ·Air Conditioners ·Washing Machines ·Vacuum Cleaners ·Air Purifiers ·Robotic Appliances ·TV ·BD Players ·Home Theater
						
Display	Samsung -Corning Samsung -Display		ICT	·NB ·Tablet ·Monitor ·Smartphone ·TV	In-house	 
	Semiconductor	Dram/Flash Exynos Processor CIS DDI/TCON Touch Controller			Home Appliances	·Refrigerators ·Microwave Ovens ·Air Conditioners ·Washing Machines ·Vacuum Cleaners ·BD Players ·Home Theater

Brand/Panel power game shift

Choosing strategic or commercial partner?

Dilemma if the business is dominated or locked by a few very strong players. Chinese came to power, riding on wave of popularity in supply chain.

LCD TV panel allocation & plan 2015-2016, by panel maker

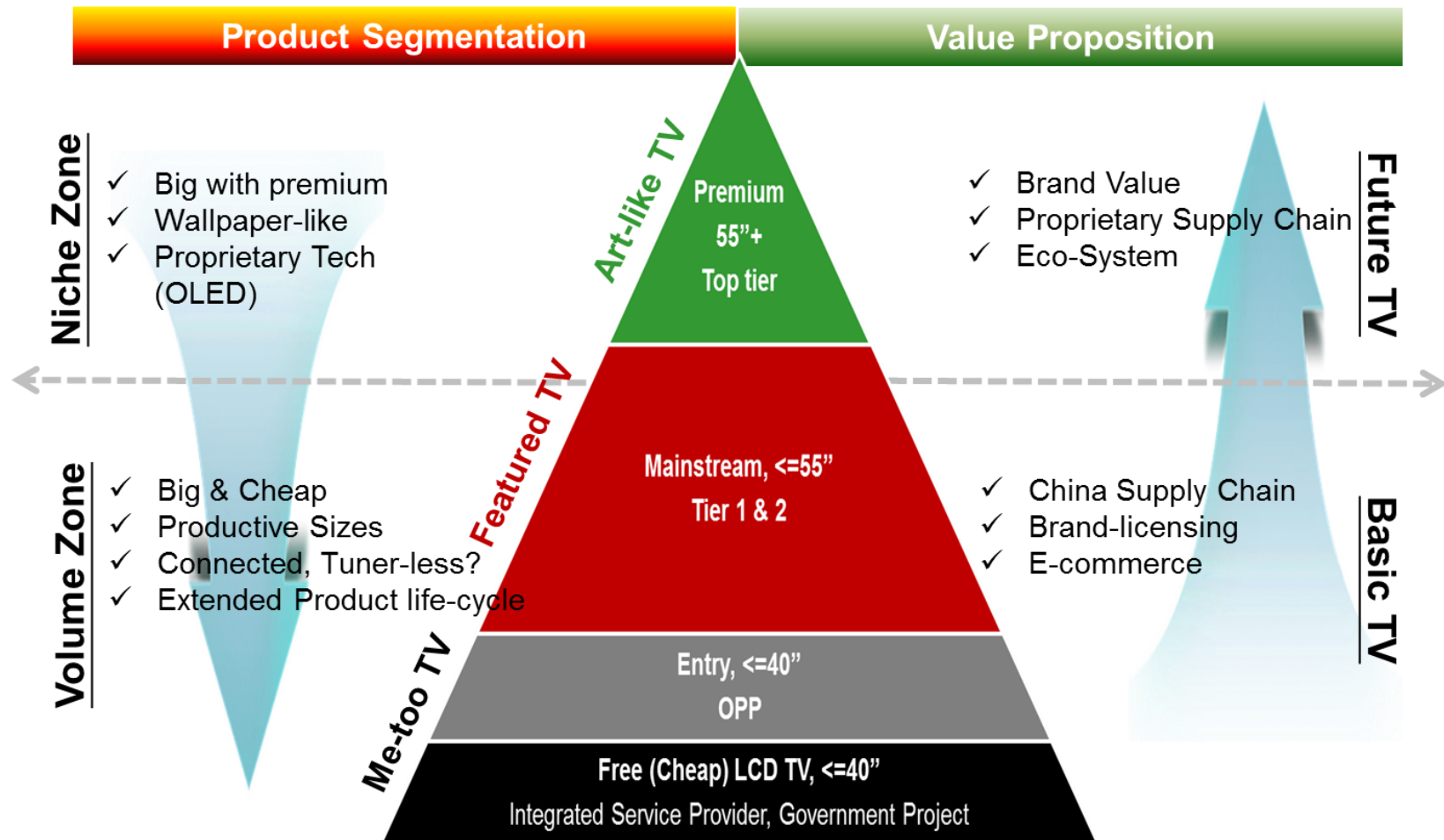


Source: IHS

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Low margin, idled capacity, crazy competition

Balancing your business TV portfolio, be part of TV ecosystem





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Thank You

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