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Invest Different



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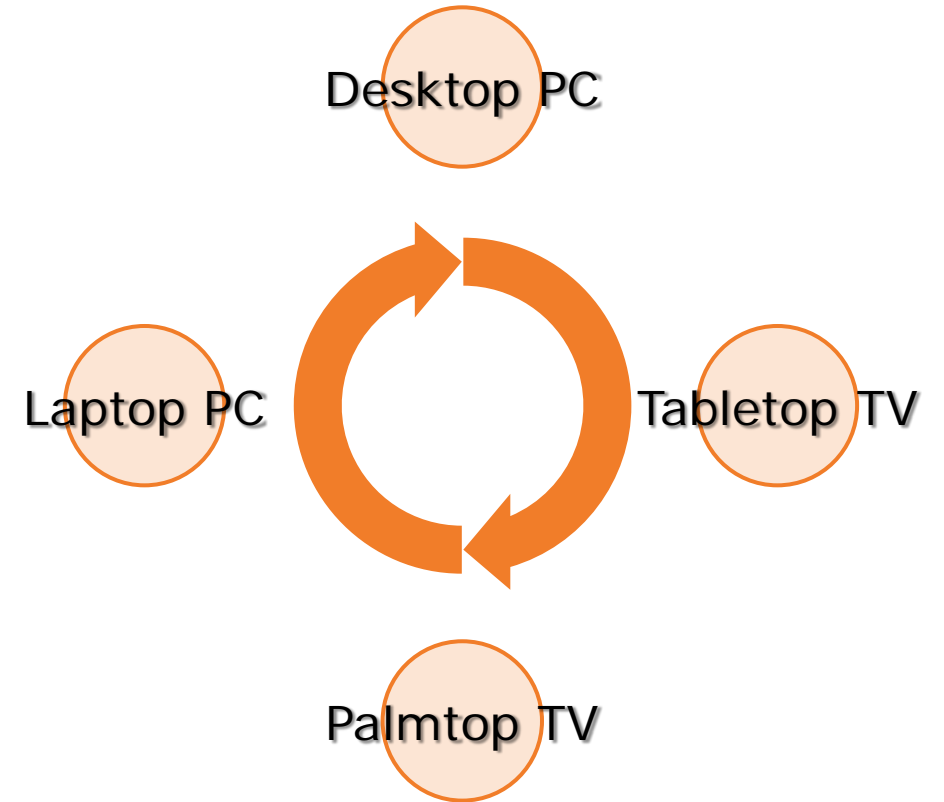
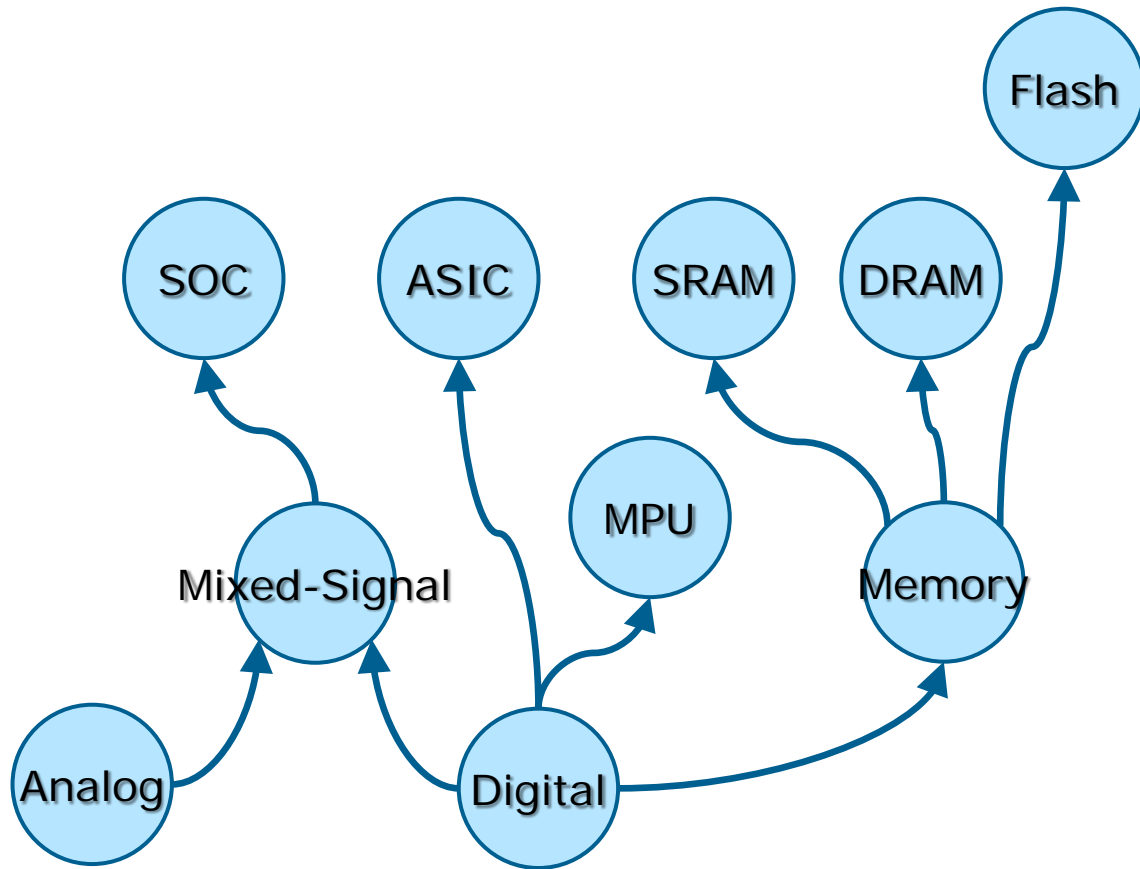


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IC producers differentiated processes and products... LCD producers have not

IC companies evolved to serve distinct markets with leaders in each

LCD companies serve the same markets with four leaders and many followers





6 Notebook Panels
10.4" diagonal
2 X 3 array
Gen-3 glass

- **Fungible:** production assets can serve a variety of applications and markets
- More capacity means more potential supply in all market segments
- More potential supply means more potential price pressure



238 iPad Panels
9.7" diagonal
14 X 17 array
Gen-10 glass

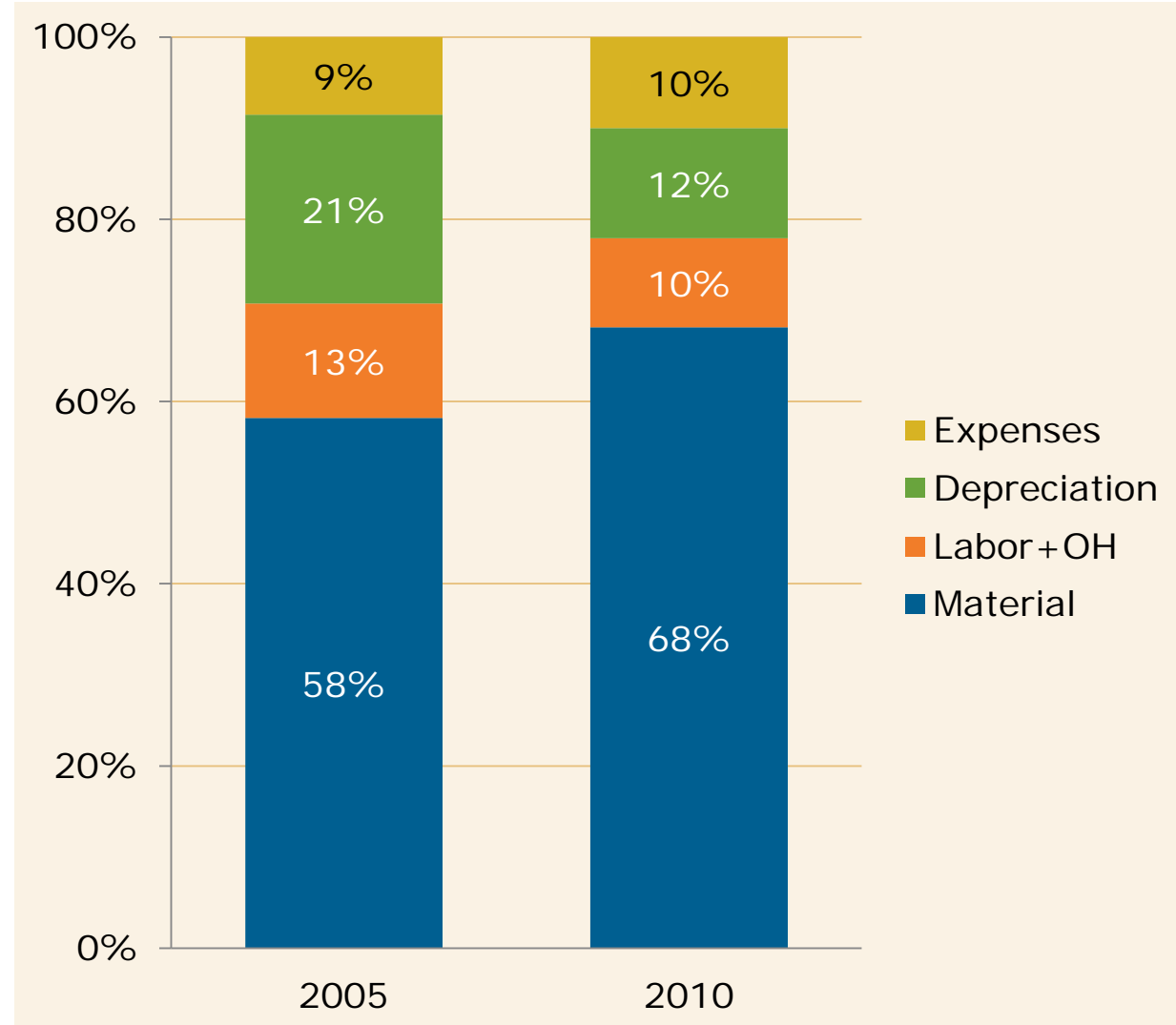
More panels on larger glass have made costs more variable

Purchased materials are 87% of cash-COS* and 68% of COP (total cost)

- Producers have become material resellers
 - LGD numbers show area-related materials became a greater portion of cash-COS from 2005 to 2010
 - Backlights from 23% to 26%
 - Substrates from 16% to 22%
 - Polarizer films from 8% to 12%
 - Electronics (e.g. IC and PCB) and labor costs became a smaller portion of cost
- Producer's technology has contributed less value over time, not more
- Producers' profitability has depended more on sustaining a mix with some premium products
- ... but premiums decline toward zero in 3 years

*Cost of sales (COGS) less depreciation

Cost of Product (COP) structure for LG Display
(disclosures, BizWitz analysis)

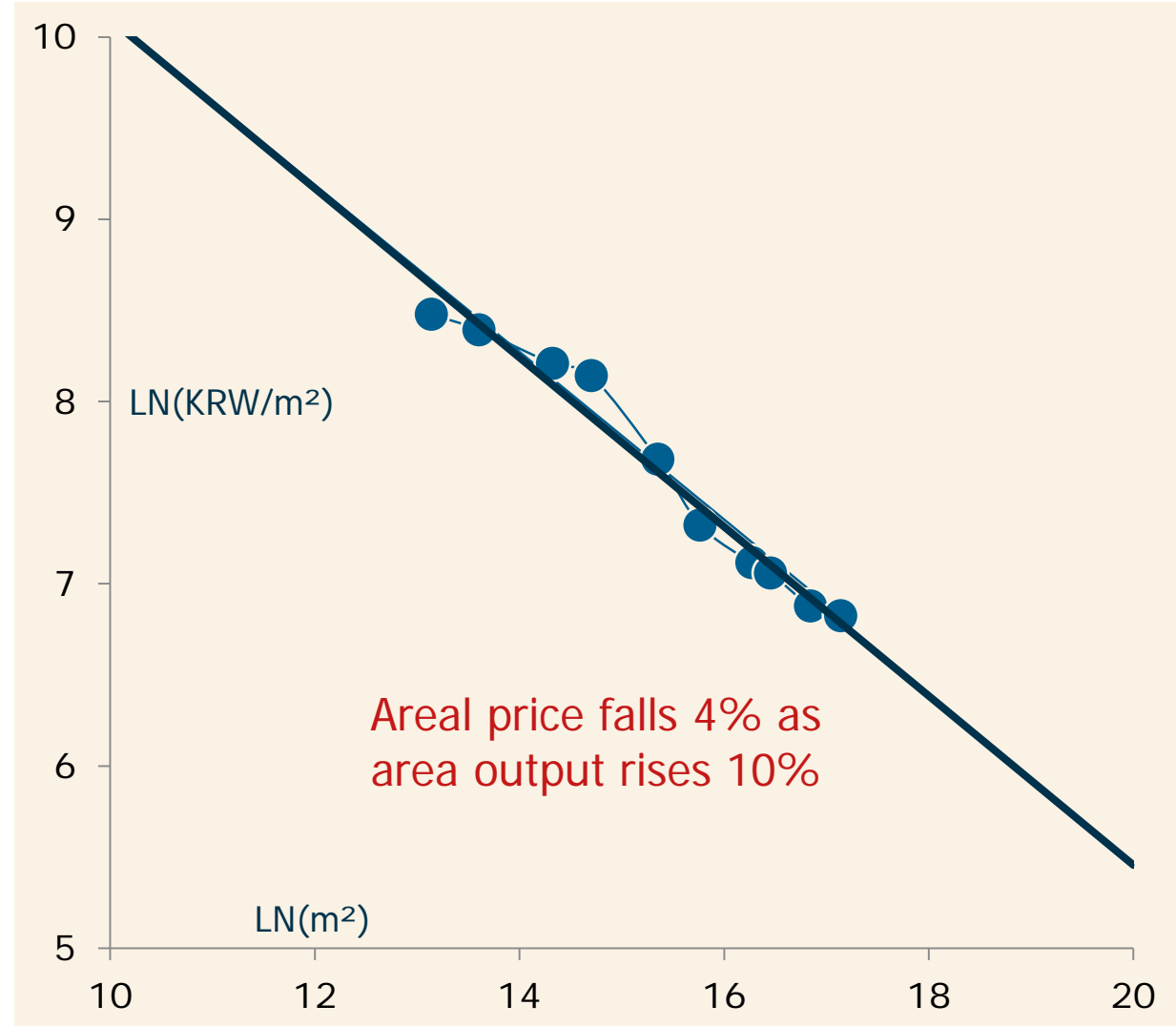


Everyone offers premium products but no one gets premium prices

There's always a premium product
... but there's never a premium overall

- LG Display discloses more than most and it performs better than most
- Still, we see that revenue/area decreases as area increases
- What about all those premium products?
 - Monitors, then TVs then PNDs then Tablets...
 - Wide formats, then IPS then Cu-bus then LTPS...
- Producers use similar materials in similar processes to make similar products for similar customers
- ... their results are similar

Price/m² versus m² of Area Shipped by LGD
(disclosures in KRW 2001–2010, BizWitz analysis, Log-Log)

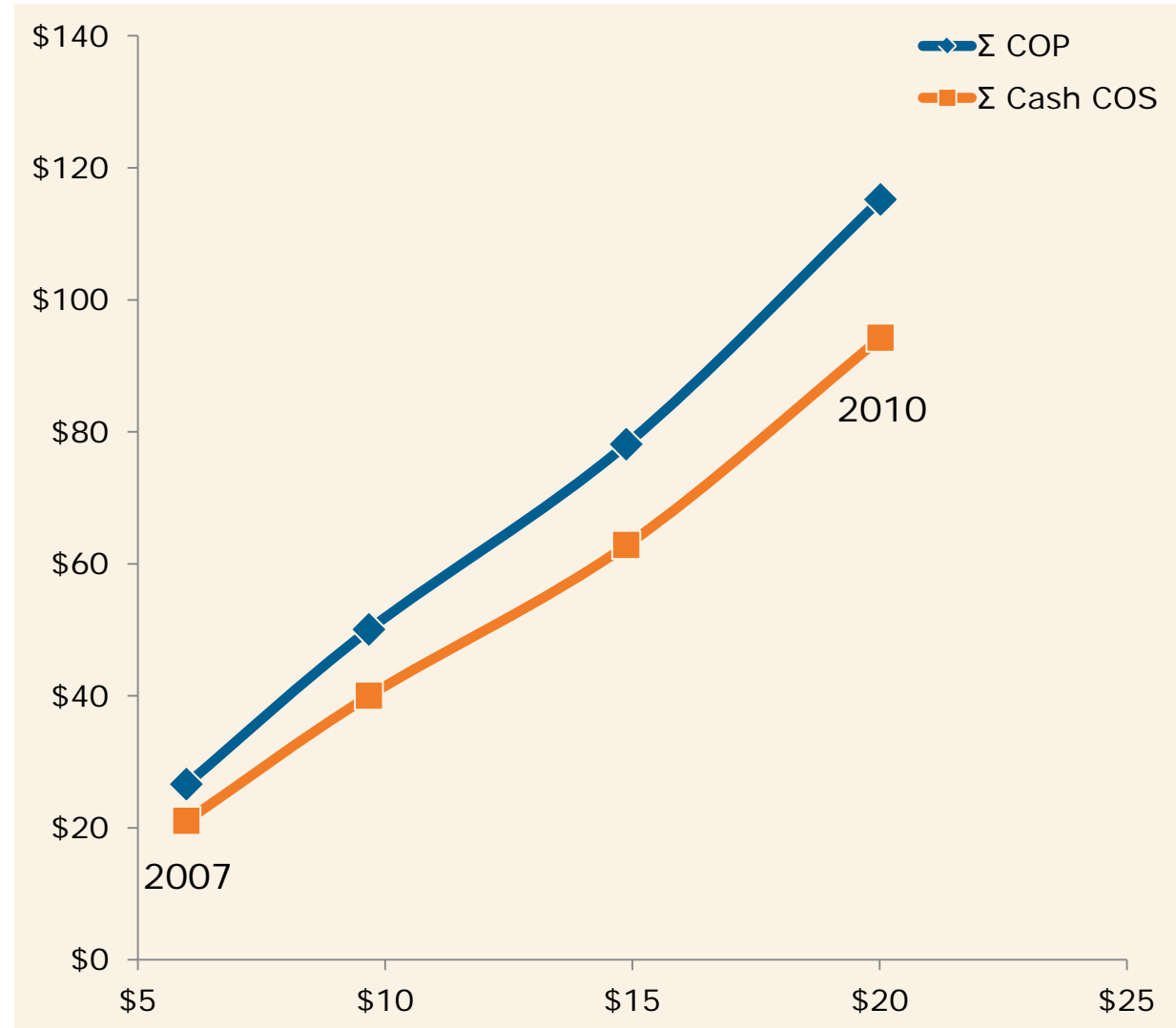


Fabs have gotten bigger but not better

Cost follows CapEx because LCD is a materials business

- The chart shows strong linear relationships between cumulative costs and capital spending
 - $COP = 6.22 \times CapEx$
 - $Cash\ COS = 5.13 \times CapEx$
- Linear means no scale advantage
 - Any producer can stay in business if it covers its material cost and manages its cash flow
 - Leading producers can offer a broader product range to bigger customers but they cannot drive competitors away with scale power
- Linear means no margin protection
 - Prices can fall faster than costs
 - More investment assures more cost
 - ... but not more profit

Cumulative Costs versus Cumulative CapEx
(AUO and LGD disclosures, BizWitz analysis in \$billions)



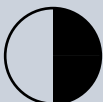
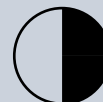



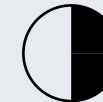

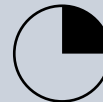




Play with other peoples' money

- This is the choice for producers with limited resources: reduce the cost of capital
 - Form joint ventures in China or other countries where policies support funding
 - Trade know-how for capital from partners
 - Co-locate or share infrastructure
- Recent examples
 - Business combinations such as CMI
 - Project funding effort by Sharp (Sony deal)
 - Chinese JV deals by AUO, LGD or Samsung

Change the game

- This is the choice for producers with affiliates who can supply or buy
 - Create a new industrial structure and an affiliated supply chain (e.g. Samsung in AMOLED)
 - Place real-option bets on future capacity (e.g. LGD option on LCD or wOLED with a color filter)
 - Forward integrate; become an ODM (perhaps CMI)
- This is the natural result of reaching the end-game in any mature industry
- A transition from LCD to another display industry is as natural as the transition from gas engines to electric cars
- ... and as unpredictable!

China is the most likely place for expansion of legacy LCD capacity over the near term

| Nation | Policy | Economy | Technology | Proclivity |
|--------|--|--|--|---|
| Brazil |  Learning and becoming more realistic |  Rising expectation and inflation |  Needs better academic-industrial coordination | Managed social development with JD/JV support |
| China |  Stimulates investment and supplies capital |  Constrained long term but strong mid term |  Dependent on outside expertise a while longer | National-regional conflicts over tech priorities or rules |
| Europe |  Strong support for new-tech consortia |  Aging population and environmental activism |  Strong in product, weaker in process | National champion clusters with small risk appetites |
| USA |  Avoids picking winners; hopes for the best |  Favorable demographics but many challenges |  Overconfident and underfunded | Shock & awe: asset-lite ventures |

AMLCD: optimize assets so they are not fungible

- Reduce fab flexibility and constrain supply for target application market
- Past example: alter flows for transfective mobile phone panels and adjust fab loading with demand-price
- Potential example: alter flows to integrate touch functions than do not serve large-panel applications, then modulate utilization

AMOLED: dominate through scale

- Structure costs 2:1 fixed to variable instead of 1:2 as with AMLCD
- Stimulate competition among non-affiliated suppliers; constrain oligopoly formation
- Lever financial resources to gain a sustainable leadership position
- Go “all-in” as Samsung did in DRAM



There may be simple answers but not easy ones
BizWitz analysts are ready to help: db@bizwitz.com