

Asia Pacific Technology

Device Explosion: Smartphone Shipments to Hit 1.1bn in 2013

- **Smartphone volumes to soar** – With quality improving rapidly, and prices eroding faster than expected, we see huge upside to shipments of low-end smartphones. Also, internet companies, accepting zero margins on hardware devices in order to sell content/services, are compressing prices of high-spec smartphones to US\$250-300. As such, we now expect 1.1bn smartphone units to be shipped in 2013, about 25-30% higher than the market is expecting. *In this report, we also set out our roadmap of how we see the smartphone industry evolving over the next three years.*
- **Smartphone market faces dramatic structural changes** – At the high end (US\$500-plus), Apple and Samsung will continue to dominate. At the lower end, internet/software companies will lead in US\$200-300 phones and Chinese brand and whitebox players will annex the sub-US\$200 segment. Shrinking dramatically will be sales at US\$300-500, likely accelerating the pace of sector consolidation.
- **Whitebox and internet companies to wipe out mid-price segment...** – Quality is improving significantly at whitebox players, which will launch quad core & 4.5 inch qHD smartphone at US\$150 and 1GHz & 3.5 inch HVGA EDGE smartphone at below US\$50 (already at US\$55-60) in 1H13. Xiaomi is offering ultra high end QCOM 8064 quad core processor plus 4.3 inch HD display (comparable to iPhone's Retina display) at US\$310, and we expect Amazon to launch a smartphone based on QCOM 8960 Pro (better processor than Samsung uses in its LTE Galaxy S3) at below US\$300 in June 2013. Given the rising competition, we expect many traditional US\$200-500 smartphones to be wiped out in the next few years, leaving little future for companies that lack high-end exposure.
- **...but winners in the space are emerging** – On our thesis of massive volume upside and ever-greater polarization of the market, *Apple* and *Samsung* are the only investable smartphone brands. *TSMC* should be a primary beneficiary, as higher semi content in sub-US\$150 smartphones should significantly boost 28nm / 40nm demand in 2013. We see *FIH* (upgraded to Buy) as poised for an earnings turnaround on a ramp-up in its iPhone, Xiaomi and Amazon business, in turn further benefiting parent *Hon Hai* (Apple's principal smartphone/tablet supplier). We are also bullish on *Chipbond*, which is a packager for LCD driver IC, as we expect a migration in whitebox smartphone display resolution from HVGA to WVGA and qHD.

Figure 1. Citi Projection: 1.1bn in Smartphone Shipments in 2013

Unit: million	2011	2012E	2013E
Citi Smartphone Forecast	481	738	1,100
Developed Markets	229	286	342
Emerging Markets	253	452	758
Gartner Smartphone Forecast	472	649	818

■ Industry Overview

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See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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Executive Summary

Chinese whitebox and brand makers to ship 450M units in 2013 (not just in China but globally), up from 220M in 2012

Smartphone volume to hit 1.1bn units in 2013

Due to rapid price declines and quality improvements of whitebox smartphone, user conversion from feature phones to smartphone should further accelerate in 2013. We expect Chinese whitebox and brand smartphone makers to ship around 450M units in 2013 (not just in China but globally), up from 220M in 2012, driving overall smartphone shipments to hit 1.1bn units in 2013, 25-30% higher than market expectation. On a three-year view, we expect 1) industry profitability to decline, 2) multiple players to exit the market, 3) the semi industry to flourish given a substantial increase in semi content in handsets, and 4) handset ODM / EMS to grow strongly owing to expansion of their addressable markets.

Whitebox to dominate sub-US\$200 segment in emerging markets

A whitebox smartphone with quad core processor, qHD display and 8MP camera will cost only US\$150-200 by 1H2013, in our view. A lower end model with dual core processor, WVGA display and 5MP camera could cost only US\$100-120 by 1H2013. For the sub-US\$100 segment, smartphones will come with 1 GHz processor and 3.7-4 inch HVGA display. Most global brands are absent from the sub-US\$100 market and are unlikely to make a re-entry given i) they are twice as expensive in the retail channel as similar phones from whitebox makers; ii) buyers of low-end smartphones are generally price sensitive (esp. in emerging markets).

Figure 2. Smartphone Winners and Losers By Market Segment

Price Segment	Key Players	Competitive positioning	Margins
US\$500-above	Apple, Samsung	Strong brands, first movers	Very high but under pressure
US\$300-500	HTC, LGE, Motorola, Nokia, RIMM	Squeezed on quality and price	Already loss-making but could lose significantly more
US\$200-300	Internet / software companies	High quality, low prices	Very low to zero, as per business model
US\$200-below	Chinese brand and whitebox players	Low prices, improving quality	Ultra low but sustainable

Internet / software companies to dominate US\$200-300 market

We expect a wave of smartphone launches from software / internet companies such as Amazon, Google, Baidu and Tencent. Such phones generally have hardware specs almost comparable to those of iPhone or Samsung's high-end Galaxy series, but at half the retail price due to business models that accept low to zero margins in order to drive sales of content or proprietary services. Most at risk from these entrants are mid-price US\$300-500 smartphones from branded companies, which will struggle to compete in terms of price and/or hardware specs.

Apple / Samsung high-end duopoly getting harder to challenge

Carriers around the world (especially in developed markets) have been trying to develop reliable third or fourth players outside of Apple and Samsung, believing greater competition would drive down the cost of subscriber subsidies. However, carrier initiatives with HTC, Motorola, Nokia and even Huawei / ZTE have borne little fruit – most lacking the scale, vertical integration and marketing power to take market shares from Apple and Samsung.

Semiconductor and handset EMS companies to benefit

We expect semiconductor companies to be the primary beneficiaries of these trends in the smartphone space. Low or zero margins for whitebox makers and internet / software companies allow them to sell smartphones with extremely high semi content at very low retail price. Moreover, handset EMS also should be big beneficiaries. Owing to the dominance of Apple and Samsung, the addressable market for handset EMS has been dwindling for many years. The emergence of smartphones from internet / software companies (which have zero in-house capacity) presents handset EMS with a golden opportunity to grow their business.

Figure 3. Gainers on Smartphone Theme

	Ticker	Price	Rating
Chipbond	6147.TWO	NT\$51.20	Buy
FIH	2038.HK	HK\$2.70	Buy
Hon Hai	2317.TW	NT\$89.80	Buy
Samsung Elec.	005930.KS	W1,310,000	Buy
TSMC	2330.TW	NT\$89.20	Buy

Prices as of Nov. 1, 2012 Source: Citi Research

Emergence of Zero-margin Hardware Business Model

Driven by high end hardware specs and extremely low price, Google and Amazon have quickly become leading tablet players within just a year, outselling all the traditional PC players on tablet volume. We believe both Google and Amazon have plans to launch their own-brand smartphone, along with Microsoft, Baidu, Tencent and many others. This is likely to materially impact industry profitability and market share allocation. Driven by high end hardware specs, low price and strong brand recognition, we believe that internet / software companies could take meaningful share in the middle to high end smartphone segment.

The economics – No brand margin and lower retail margin

Amazon and Google do not attempt to make money on hardware. The goal is to achieve breakeven on hardware and generate profit through services, advertisements and on-line sales of books, music and even groceries. We believe Google and Amazon have small OP loss on lowest priced product (like the 8GB Nexus 7) and small operating profit from higher priced product (the higher NAND density and bigger screen product such as 16GB Nexus 7 and Kind Fire 8.9 HD). For example, Google sells 8GB Nexus 7 for US\$199 but 16GB model at US\$249. 8GB of additional NAND flash adds to the cost by less than US\$10 but Google charges an extra US\$50.

Google and Amazon have become two of the top 4 tablet makers within just one year of product launch

Given zero brand margin and lower retail margin (many of those devices are sold through Google / Amazon's own websites), these tablets are sold at more than 30% below those of traditional branded companies. Given the strong brand awareness of Google and Amazon, consumers generally are not worried about their hardware quality and see these low priced tablets as bargains. As such, Google and Amazon have become two of the top 4 tablet makers (the others being Apple and Samsung) within just one year of product launch.

Figure 4. BOM Cost Analysis of Kindle Fire HD

Amazon Fire HD 7"		Amazon Fire HD 8.9"	
Housing (plastic) + 2x Antenna + MVA + 2x speakers	\$25	Housing (plastic) + 2x Antenna + MVA + 2x speakers	\$25
PCBA (excl. main chip and memory)	\$25	PCBA (excl. main chip and memory)	\$28
7" LCD HD (1280x800) IPS	\$35	8.9" LCD HD (1920x1200) IPS	\$55
Touch Module G/G 7" full lamination	\$30	Touch Module G/G 8.9" full lamination	\$45
TI OMAP 4470	\$15	TI OMAP 4470	\$15
16GB NAND Flash	\$10	16GB NAND Flash	\$10
1GB RAM (Mobile DDR)	\$9	1GB RAM (Mobile DDR)	\$9
WiFi 802.11 b/g/n, 2.4Ghz/5Ghz and MIMO + Bluetooth	\$8	WiFi 802.11 b/g/n, 2.4Ghz/5Ghz and MIMO + Bluetooth	\$8
Lithium-polymer battery (single cell - 4325mAh)	\$12	Lithium-polymer battery (single cell - 4325mAh)	\$12
Front facing 1.2 megapixel camera	\$2	Front facing 1.2 megapixel camera	\$2
power adapter & cable	\$5	power adapter & cable	\$5
Packaging	\$2	Packaging	\$5
Android OS payment to MSFT	\$5	Android OS payment to MSFT	\$5
Total BOM Cost	\$183	Total BOM Cost	\$224
Warranty	\$20	Warranty	\$20
Logistic (sea) and operating center cost	\$5	Logistic (sea & larger size) and operating center cost	\$7
Total COGS	\$208	Total COGS	\$251
Amazon gross margin	-5%	Amazon gross margin	16%
Retail Channel margin	0%	Retail Channel margin	0%
Price at retail Store	\$ 199.00	Price at retail Store	\$ 299.00

After deducting OPEX, blended OP margin of the high end and low end product is likely to be close to zero

Source: Citi Research

Figure 5. BOM Cost Analysis of Nexus 7

Nexus 7	
Housing (plastic) + Antenna + MVA	\$22
PCBA (excl. main chip and memory)	\$20
7" LCD HD (1280x800) IPS	\$35
Touch Module SGS 7" full lamination	\$25
NVDA Tegra 3	\$20
8GB NAND Flash	\$5
1GB RAM (Mobile DDR)	\$9
WiFi 802.11 b/g/n + Bluetooth	\$5
Lithium-polymer battery (single cell - 4325mAh)	\$12
Front facing 1.2 megapixel camera	\$2
Power adapter & cable	\$5
Packaging	\$2
Android OS	\$5
Total BOM Cost	\$167
Warranty	\$20
Logistic (sea ship) and operating center cost	\$5
Total COGS	\$192
Google gross margin	4%
Retail Channel margin	0%
Price at retail Store	\$ 199.00

16GB version gross margin is around 15%

After deducting OPEX, blended OP margin of models with different NAND density likely to be around breakeven level

Source: Citi Research

Both Kindle Fire HD and Nexus 7 have higher spec processors and higher display resolution than for iPad 2, and yet both are 50% cheaper

The selling point – high quality & low price

Both Kindle Fire HD and Nexus 7 have higher spec processors and higher display resolution than that of iPad 2 (both Kindle Fire HD and Nexus 7 have 216ppi vs iPad 2's 132 ppi). However, both devices are sold at 50% price discount vs. iPad 2. The 8.9 inch Kindle Fire HD has a 254ppi display and a US\$299 price tag which is 25% cheaper than iPad 2 (only 132 ppi) and 40% cheaper than new iPad (264 ppi). The combination of high end hardware specs and extremely low price points not only helped Google and Amazon erode Apple's market share but will gradually force traditional branded PC companies to exit the Android tablet market. Since Amazon and Google's entry into the tablet market, most branded PC players have started to de-focus the Android tablet market as almost no one could make money.

Internet / software companies likely to play a big role in the mid- to high-end smartphone market

The zero margin hardware business is nothing new for smartphone. Xiaomi Technology already started to do this last year. Xiaomi also just announced its MI2, recently. MI2 is based on QCOM's first quad core processor, MSM 8064 (definitely the most powerful mobile processor in the world right now), with 2GB of mobile DDR, 4.3 inch HD quality display (342 ppi vs iPhone 5 of 326ppi and HTC One X of 312 ppi) and 8MP BSI camera sensor with aperture of f/2.0. From a pure hardware perspective, MI2 probably has the most advanced hardware in the world. However, the smartphone is priced at only US\$310, around half of the retail price vs.

smartphones with comparable hardware specs. According to Xiaomi, the total cost of MI2 is US\$370.

Figure 6. Spec Comparisons

	Xiaomi	Apple	Samsung	HTC
	MI2	iPhone 5	Galaxy S3	One X
Price	\$310	\$600-700	\$550-600	\$500-550
Connectivity	3G	3G/ LTE	3G/ LTE	3G/ LTE
Display technology	IPS	IPS	AMOLED	Super LCD 2
Screen resolution	4.3" 1280x720 (342ppi)	4" 1136x640 (326ppi)	4.8" 1280x720 (306ppi)	4.7" 1280x720 (312ppi)
Rear Camera	8MP, f/2.0	8MP, f/2.4	8MP, f/2.6	8MP, f/2.0
Front facing Camera	2MP	1.2MP	1.9MP	1.3MP
Processor	Qualcomm APQ8064 - 1.5GHz Quad core	Apple A6 - 1.3GHz Dual core	Samsung Exynos 4 - 1.4GHz Quad core	Nvidia Tegra 3 - 1.5GHz Quad core
Battery	2,000 mAh	1,440 mAh	2,100 mAh	1,800 mAh
Memory	2GB	1GB	1GB/ 2GB	1GB
Internal Storage	16GB	16, 32 or 64 GB	16, 32 or 64 GB	32GB
OS	Android	iOS	Android	Android

High-end hardware spec with low price

Source: Companies and Citi Research

Baidu, Tencent and Alibaba all have plans to launch own-brand smartphones

We believe that Microsoft will have a smartphone in 1H13. Amazon will have a smartphone in June / July 2013 using QCOM's 8960 Pro processor (the upgraded processor for the one that Samsung uses in its LTE Galaxy S3). Google is also very likely to have a smartphone in late 3Q13. Besides, Baidu, Tencent and Alibaba all have plans to launch own-brand smartphones.

With advanced hardware, low price and strong brand recognition, we believe software companies like Amazon and Google could play a big role in the mid to high end segment. We also expect their US\$250-300 models not only to wipe out the US\$200-300 models from branded players but also to cannibalize the US\$300-500 segment in a big way.

The consumer case – super high-end hardware spec and low price

We believe the internet / software companies have a good shot to repeat their success in the tablet market with their zero hardware margin business model for a very clear reason - providing consumers with high end hardware specs at roughly half the price of those from traditional hardware makers.

In our view, an Amazon smartphone may not have a big impact on a premium model like iPhone as iPhone users tend to be aspirational customers and rather insensitive to price points. Android phone users tend to be much more price sensitive. The high end Android phone users for Samsung Galaxy S or HTC One X series may be less sensitive to price. However, people who buy mid-end Android model are surely price sensitive (otherwise, they would have bought a high-end model instead). With respectable brands such as Amazon launching smartphones with comparable hardware specs to high end Android model and lower price than even the mid end Android models, we believe most of the mid end Android users could potentially turn to smartphone launched by Amazon or other internet / software companies.

The carrier case – more competition for Apple / Samsung

The carriers around the world (especially in developed markets) have been trying to develop reliable third or fourth players outside of Apple and Samsung. With Apple

charging over US\$600 per model (meaning US\$400 carrier subsidy per unit) and Samsung charging US\$450-500 for Galaxy S and Note (implying US\$250-300 carrier subsidy per unit), carriers need to create competition in order to drive down the price of Apple and Samsung as well as diversifying the supplier base. However, the carriers have been trying with HTC, Motorola, Nokia and even Huawei / ZTE but none of their effort has borne much fruit - Apple and Samsung still continue to gain share and push most of the rest smartphone companies to OP loss. It's easy to see why their efforts have not been working – there are simply not enough selling points and price gap. With much smaller scale and lack of vertical integration, HTC / LGE / Motorola simply cannot afford to price at enough of a discount vs. the high end models of Samsung. Moreover, Samsung has a massive marketing budget that very few companies could match. As such, the duopoly of Apple and Samsung in the high end is getting very difficult to change.

Given the zero hardware margin business model, companies like Amazon and Google can price smartphone model with comparable hardware features similar as Galaxy S3 at about half the price. As such, the after-subsidy price of those models from Amazon can go to zero if carriers provides approximately US\$250 of subsidies. Moreover, the internet / software companies generally have their own media to consumers (Amazon's shopping website, Google's Google play, GMAIL) to have direct access to consumers, which will neutralize the marketing advantage of some of the bigger handset branded companies. Lastly, most of consumers are already using multiple services / software from Amazon, Google and Microsoft so those phones may have much more selling point than models from pure hardware companies. As such, we believe carriers have strong incentive to push the smartphone from internet / software companies.

There's a big difference between Google Nexus tablet and smartphone

The business models for Nexus tablet and Nexus smartphone are dramatically different

Many argue that Google is already doing a smartphone and it's not successful at all given the lackluster sell-through of Nexus-series smartphone. We note this is a big misunderstanding. The business models of Nexus tablet and Nexus smartphone are dramatically different. Nexus 7 tablet is a hot selling product because of its extremely low price and attractive hardware specs. Google can achieve such a low price because both Google and Asus are making zero margin. While Asus' brand appears on Nexus 7, Asus' role is more likely a design house with zero margin. Google is in charge of the pricing strategy and bears all the inventory risk.

Nexus series smartphone has very little to do with Google. When Google has a new version of Android OS, it will find a partner and provide them with the OS earlier than it does with other smartphone makers. Google will also pitch in the design of the Nexus smartphone. However, the pricing strategy is controlled by OEMs and inventory is on the book of branded companies. As such, there's almost no price difference between Nexus series smartphone and other smartphones with the same hardware specs. More importantly, branded companies will take turns to launch Nexus series (Samsung, HTC and LG have all launched Nexus series smartphone) so there's no reason for any branded companies to put too much resources to push the Nexus smartphone model. Basically, OEMs want to work on the Nexus series smartphone so that they can familiarize themselves with the new OS and launch their own product earlier. For example, Samsung wanted to be involved in Nexus smartphone so its other smartphone could move to the latest OS earlier. Samsung will definitely put more resources into its own Galaxy S or Note series because Samsung does not own the Nexus brand. Nexus smartphone is unlikely ever to sell very well, in our view, because no OEM will push the Nexus series aggressively.

Whitebox Players to Dominate Sub-US\$200 Segment in Emerging Markets

Many investors are still under the impression that whitebox market smartphone are of low quality and are barely usable. We note that after the major reshuffle of feature phone food chain from 2010-2011, many system integrators and design houses were out of business. Those which remain in the business have started to change their mentality and focus more on quality. During our multiple trips to China in the past 6 months, we've witnessed a huge improvement in whitebox smartphone quality. With better economy of scale, prices also have come down very rapidly.

We do believe that most consumers are willing to pay a premium for branded products over Chinese brand / whitebox smartphone, especially in the mid to high end segment. However, for the low end segment consumers are generally more price sensitive with lower brand loyalty. If branded companies' products are noticeably nicer than whitebox products, most consumers are still willing to pay substantial premium for the branded products. However, we believe that in the sub-US\$200 segment, whitebox makers can offer similar form factor design but much better hardware specifications at lower prices. As such, it's extremely difficult for branded players to compete with whitebox makers.

Based on what we've seen so far in China, we don't think branded companies stand a chance of competing with the whitebox makers in the sub-US\$200 segment.

Figure 7. Mid-low end Smartphone BOM Cost

Parts	EDGE low end		EDGE mid to low	3G mid to low end		3G mid end	
Chipsets supplier	MTK ¹ 6515M	SPRD 6820	MTK 6515	QCOM 7227A	MTK 6575	QCOM 8225	MTK 6577
Chipset + Connectivity	\$8.0	\$7.0	\$10.0	\$10.0	\$11.0	\$12.0	\$14.0
RAM + ROM	US\$5 - 5.5 (256 MB + 512MB)		US\$5 - 5.5 (256 MB + 512MB)	US\$9.5-10.5 (512 MB + 4GB) US\$7.5-8.5 (512MB+512MB)		US\$9.5-10.5 (512 MB + 4GB) US\$7.5-8.5 (512MB+512MB)	
Total PCBA (including royalty)	US\$18-23		US\$20-25	US\$30-35		US\$40-45	
LCD	US\$6 - 8 (3.2-3.5" HVGA)		US\$9-10 (3.7-4" WVGA)	US\$9-13 (3.7-4.3" WVGA)		US\$14 - 25 (4.0" - 4.7" qHD)	
Touch panel	US\$ 5-7		US\$ 5-7	US\$6 - 9		US\$8 - 10	
Camera module	US\$2.5 - 3 (3M/FF)		US\$2.5 - 3 (3M/FF)	US\$6 - 7 (5M/AF)		US\$8-10 (8M/AF)	
Enclosure & other mechanical parts	US\$6-8		US\$6-8	US\$8-10		US\$9-115	
Others (battery, cable, headset, packaging.....)	US\$4-5		US\$4-5	US\$6-7		US\$7-10	
BOM cost	US\$40-50		US\$50-55	US\$65-80		US\$90-130	
Retail price	US\$55-60		US\$65-75	US\$90-120		US\$140-250	

Source: Citi Research

Segmentation by display size gives huge opportunities to whitebox makers

Currently, most branded players segment their smartphone products based on screen size. The highest models have 5 plus inch screen, high end model with 4.7 inch screen, mid to high end with 4.3 inch screen, mid end of 3.7-4 inch and low end of 3.2-3.5 inch. Branded companies adjust the resolution, application processor and camera resolution along with the screen size. Rule of thumb is the bigger the screen, the better the resolution, processor and camera. Given most branded

¹ Due to Citi's involvement in the potential acquisition of MStar Semiconductor Inc by Mediatek Inc, CIRA is restricted from publication of new research reports, and suspended its rating and target price on 22nd June, 2012 (the Suspension Date). While CIRA may continue to publish research on the Company, it will not express a view about the proposed transaction, nor will its financial model(s) take into account the transaction. Additionally, the Company price chart available on CIRA's disclosure website, is current only through the Suspension Date and, accordingly, does not reflect that CIRA suspended its rating and target price on the Suspension Date.

companies position their smartphone based on screen size (with Apple being the only exception), consumers are already used to the idea that the larger the screen size, the higher the price they are willing to pay.

The pricing strategy of branded companies gives a huge opportunity for whitebox players. Whitebox players are now offering 4.5-5 inch qHD / WVGA display at US\$130-200. Normally, branded companies price this kind of product at around US\$400-500. It's impossible for branded companies to launch sub-US\$200 model with 5 inch screen because it would disrupt their entire pricing segmentation strategy. As such, the large screen whitebox smartphone is now selling extremely well in China, cannibalizing the low end smartphone sales of multiple branded companies.

Sub-US\$100 segment - global brands have no presence

Sub-US\$100 segment is dominated by whitebox players with no presence from global brands. For US\$100 model, whitebox players can feature single core 1 GHz processor with 4 inch WVGA display and 5MP camera. For branded players, their lowest price models are generally around US\$120 with outdated 800 MHz processor, lower resolution 3.2-3.5 inch HVGA screen and 3MP camera.

The US\$55-75 EDGE smartphone from whitebox makers is also selling extremely well in China. Most of these models have 3.5 inch VGA display with 1 GHz processor and 2-3MP camera. Global brands have no presence in this segment.

Figure 8. Existing Retail Price Comparison Among Leading Smartphone Makers and Whitebox

	Samsung	HTC	Whitebox
	Galaxy Y DUOS	Desire C	
Price	\$125	\$165	\$90
Connectivity	3G	3G	3G
Screen resolution	3.14" 320x240 QVGA	3.5" 480x320 HVGA	3.5" 480x320 HVGA
Rear Camera	3.15MP	5MP	3MP
Processor	Broadcom ARM 11 832MHz single core	Qualcomm MSM7225A - 600MHz Cortex A5 single core	MTK 6575 Cortex A9 dual 1Ghz core
Battery	1,300 mAh	1,230 mAh	1,230 mAh
Memory	290MB RAM, 512ROM	512MB RAM	512MB RAM
Internal Storage	2GB	4GB	2GB
OS	Android	Android	Android

Source: Companies and Citi Research

US\$100-150 segment - whitebox players have huge advantage on hardware specs and prices

In this segment, we have a very interesting dynamic with high end EDGE smartphone and mid end 3G smartphone. For US\$120-150, whitebox makers can offer EDGE smartphone with 1GHz processor, 4.7 inch qHD and 5MP camera. We note that qHD (960X540) is normally used in very high end smartphone. For example, Samsung Galaxy S2 and HTC Sensation XL both used only WVGA (800X480).

For US\$140-150, whitebox makers can offer 3G Cortex dual core A9 processor, with 5.3 inch WVGA display and 5MP camera.

The HTC Desire V is priced around US\$300 in China and it merely has 1GHz processor, 4 inch WVGA screen and 5MP camera. Basically, consumers can pay half the price to get a whitebox smartphone with even better hardware specs. This is why we believe that HTC's sales momentum started to slow in China in late 3Q12 when MTK launched dual core 6577 processor, which enabled multiple higher quality smartphones to hit the market.

Figure 9. Existing Retail Price Comparison Among Leading Smartphone Makers and Whitebox

	Samsung	HTC	Whitebox
	Galaxy Ace 2	One V	
Price	\$235	\$235	\$140
Connectivity	3G	3G	3G
Screen resolution	3.8" 800x480 WVGA	3.7" 800x480 WVGA	4.7" 800x480 WVGA
Rear Camera	5MP	5MP	5MP
Processor	800MHz dual core	Qualcomm MSM8255 single core 1GHz	MTK 6577 Cortex A9 dual core 1Ghz
Battery	1,500 mAh	1,500 mAh	1,500 mAh
Memory	768MB RAM	512MB RAM	512MB RAM
Internal Storage	4GB	4GB	2GB
OS	Android	Android	Android

Source: Company and Citi Research

US\$150-200 - quad core low cost smartphone is coming in 1Q13

With MTK, QCOM, Spreadtrum and Marvell all launching low cost quad core solution, we expect US\$150-200 quad core smartphone to hit the market in 1Q13. Based on the current component price trend, we believe a Cortex A7 1-1.2Ghz quad core processor with 4.7-5.3 inch qHD display and 8MP camera will cost less than US\$200 by 1H2013. By then, we believe that the US\$200 whitebox smartphone could start to threaten even US\$200-300 mid end smartphone.

Figure 10. Expected Price Comparison Among Leading Smartphone Makers and Whitebox in 1Q13

	HTC	Whitebox
	Sensation XE	\$200
Price	\$350	US\$200
Connectivity	3G	3G
Screen resolution	4.3" 960x540 qHD	5.3" 960x540 qHD
Rear Camera	8MP	8MP
Processor	Qualcomm MSM8260 - 1.5GHz dual core	MTK 6589 Cortex A7 1Ghz quad core
Battery	1,730 mAh	1,500 mAh
Memory	768 MB RAM	512MB RAM
Internal Storage	4 GB	4GB
OS	Android	Android

Source: Company and Citi Research

Smartphone Will Hit 1.1Bn Units in 2013

With EDGE smartphone retail price hitting US\$50 by early 2013, we expect low end smartphone to cannibalize feature phone in a meaningful way, leading to a much higher than expected smartphone shipment in 2013.

Smartphone pricing approaching those of mid end feature phone

With EDGE smartphone retail price hitting US\$50 and 3G smartphone hitting US\$70 by early 2013, we expect low end smartphone to cannibalize feature phone in a meaningful way, leading to a much higher than expected smartphone shipment in 2013.

Based on our recent channel check in China, retail price of whitebox 3G smartphone using QCOM 7227A / MTK 6575 has reached as low as US\$80 in the open channel without subsidy. EDGE smartphone with MTK 6515M / SPRD 6820 has reached as low as US\$55-60 in the retail channel. With industry volume ramping higher in 2H12, we expect retail price of EDGE smartphone to hit US\$50-55 and 3G smartphone to hit US\$70-75 by late 4Q12. Once EDGE smartphone retail price reaches US\$50 in 1Q13, we expect even feature phone of US\$40-50 will be converted to smartphone (most consumers are willing to pay small premium to upgrade their handset to smartphone)

Conversion in the next 18 months will be substantially above expectation

Gartner broke down handset price by 3 segments: Premium Communication Device (ASP around US\$340), Basic Communication Device (ASP around US\$100), Utility Communication Device (ASP around US\$30). According to Gartner, Basic communication device accounts for 40% of total emerging market handset shipments in 2012. Majority of Basic Communication Device shipments in 2011 was feature phone. With low end smartphone retail price falling below US\$60 in 2H12 and around US\$50 in 1Q13, we believe majority of the Basic Communication Device will be converted to smartphone in 2013.

Figure 11. Mobile Device ASP, 2009 – 2016 (Gartner)

ASP (US\$)	2009 YR	2010 YR	2011 YR	2012 YR	2013 YR	2014 YR	2015 YR	2016 YR
Utility Communication Devices	37	31	30	30	29	28	27	26
Basic Communication Device	138	116	104	102	98	95	93	91
Premium Communication Device	307	310	357	341	317	296	280	268
Grand Total	142	121	130	137	138	140	141	144

Given ASP of US\$90-100, we expect majority of the Basic Communication devices to be converted into smartphone in 2013

Source: Gartner

Figure 12. Gartner's Categorization By Region

Unit: millions	2009		2010		2011		2012E		2013E	
Developed market										
Utility Communication Devices	29	7%	32	8%	32	8%	35	8%	33	7%
Basic Communication Device	215	53%	196	46%	159	39%	126	29%	102	23%
Premium Communication Device	162	40%	196	46%	221	54%	268	62%	312	70%
Subtotal	406	100%	424	100%	411	100%	429	100%	447	100%
Emerging market										
Utility Communication Devices	365	45%	542	46%	601	44%	649	45%	686	43%
Basic Communication Device	334	42%	534	46%	615	45%	586	40%	615	39%
Premium Communication Device	106	13%	98	8%	146	11%	215	15%	283	18%
Subtotal	805	100%	1173	100%	1363	100%	1449	100%	1584	100%

Basic Communication device remains a big portion of emerging market handset and we expect most of the handsets in this segment to be converted into smartphone

Source: Gartner

77% conversion rate of the "Basic Communication Device" in EM giving us 1.1bn units global smartphone shipment in 2013

According to Gartner, smartphone shipment in developed markets will reach 345M units in 2013. For worldwide smartphone to hit 1.1 Bn units in 2013, total emerging market smartphone need to hit around 755M units in 2013. Based on Gartner's estimate, total emerging market Premium Communication device will be 283M units. Assuming all Premium Communication device to be smartphone, to achieve 755M units of smartphone shipment in emerging market, 472M units of the total 615M units of Basic Communication Device in emerging markets need to be converted to smartphone in 2013, implying a 77% conversion rate. Given the US\$90-100 ASP for the Basic Communication Device in emerging markets, we believe the conversion rate is likely to be higher than 77%. We suspect that Gartner is severely underestimating the price erosion of smartphones and volume of whitebox smartphone, resulting in a rather low conversion rate.

Figure 13. 1.1Bn Smartphone in 2013 – Very Achievable With Unaggressive Assumption of Conversion Rate

Gartner's smartphone assumption

Unit: million

	2009	2010	2011	2012E	2013E
Total smartphone	172	299	472	649	818
Developed Market	109	176	229	289	344
Emerging Market	64	123	243	360	474
Premium Communication Device					283
Conversion from Basic Comm. Device					191

Based on Gartner's assumption, 191M units of the total 615M Basic Comm. Device will be converted to smartphone, implying only 31% conversion rate.

Citi's smartphone assumption

Unit: million

	2009	2010	2011	2012E	2013E
Total smartphone	172	302	481	738	1,100
Developed Market	109	176	229	286	342
Emerging Market	64	126	253	452	758
Premium Communication Device					283
Conversion from Basic Comm. Device					475

Based on Citi's assumption, 475M units of the total 615M Basic Comm. Device will be converted to smartphone, implying 77% conversion rate.

We believe 1.1 Bn smartphone shipment (77% conversion rate in emerging market) in 2013 looks very achievable with smartphone retail price hitting US\$55 by late 2012

Source: Gartner and Citi Research

Figure 14. Sensitivity Analysis on Basic Communication Device Conversion

Smartphone shipment (in millions)	2013E	2014E	2015E
Conversion rate of Basic Communication device			
50%	934	1,043	1,149
smartphone as % of EM handset	37%	40%	43%
smartphone as % of total handset	46%	49%	52%
60%	996	1,102	1,208
smartphone as % of EM handset	41%	44%	46%
smartphone as % of total handset	49%	52%	54%
70%	1,057	1,160	1,266
smartphone as % of EM handset	45%	47%	49%
smartphone as % of total handset	52%	55%	57%
80%	1,119	1,219	1,324
smartphone as % of EM handset	49%	51%	53%
smartphone as % of total handset	55%	58%	60%
Gartner conversion rate assumption	36%	43%	50%

We believe 80% conversion rate or above is the most likely scenario

Source: Citi Research

1bn smartphone – regional breakdown

Given whitebox smartphone is the major source of upside for global smartphone shipment, we try to incorporate all the whitebox handset in the global handset shipment numbers to have a more comprehensive picture. To better put things into context, we also adjusted the historical numbers to include whitebox handset shipments back to 2007.

We acknowledge that Gartner started to incorporate more whitebox handset volume in 2010 (hence the 70% Y/Y feature phone growth in China in 2010). We tried to incorporate whitebox units back in 2007 and come out with a global handset estimate incorporating as much whitebox handset as possible. For developed markets, our number is exactly the same as Gartner's as whitebox handset is mainly an emerging market phenomenon.

Figure 15. Citi vs. Gartner Regional Forecast Comparisons

(millions)	2007	2008	2009	2010	2011	2012E	2013E	YY	2008	2009	2010	2011	2012E	2013E
Citi total	1,210	1,341	1,373	1,670	1,907	1,992	2,180		11%	2%	22%	14%	4%	9%
Gartner total	1,153	1,222	1,211	1,597	1,775	1,878	2,031		6%	-1%	32%	11%	6%	8%
diff	5%	10%	13%	5%	7%	6%	7%							
FEATURE PHONE														
Citi feature phone	1,087	1,201	1,201	1,367	1,426	1,254	1,081		11%	0%	14%	4%	-12%	-14%
Gartner feature phone	1,031	1,083	1,039	1,298	1,303	1,229	1,213		5%	-4%	25%	0%	-6%	-1%
diff	6%	11%	16%	5%	9%	2%	-11%							
China														
Citi - China	210	252	280	355	383	308	253		20%	11%	27%	8%	-20%	-18%
Gartner - China	160	167	209	355	366	332	331		4%	25%	70%	3%	-9%	0%
diff	31%	51%	34%	0%	5%	-7%	-24%							
Emerging Market (x China)														
Citi - Emerging Market (x China)	529	640	623	765	860	805	725		21%	-3%	23%	12%	-6%	-10%
Gartner - Emerging Market (x China)	522	607	532	696	754	757	779		16%	-12%	31%	8%	0%	3%
diff	1%	5%	17%	10%	14%	6%	-7%							
North America														
Citi - North America	155	146	137	120	89	67	43		-6%	-6%	-13%	-26%	-25%	-35%
Gartner - North America	155	146	137	120	89	67	43		-6%	-6%	-13%	-26%	-25%	-35%
diff	0%	0%	0%	0%	0%	0%	0%							
Western Europe														
Citi - Western Europe	165	142	144	112	82	68	58		-14%	1%	-23%	-27%	-18%	-15%
Gartner - Western Europe	165	142	144	112	82	68	58		-14%	1%	-23%	-27%	-18%	-15%
diff	0%	0%	0%	0%	0%	0%	0%							
Japan														
Citi - Japan	28	21	16	16	12	6	2		-25%	-22%	-1%	-28%	-49%	-66%
Gartner - Japan	28	21	16	16	12	6	2		-25%	-22%	-1%	-28%	-47%	-68%
diff	0%	0%	0%	0%	0%	0%	0%							
SMARTPHONE														
Citi smartphone	122	139	172	302	481	738	1,100		14%	24%	75%	59%	53%	49%
Gartner smartphone	122	139	172	299	472	649	818		14%	24%	73%	58%	38%	26%
diff	0%	0%	0%	1%	2%	14%	34%							
China														
Citi - China	16	14	20	30	85	186	317		-14%	44%	51%	183%	119%	71%
Gartner - China	16	14	20	28	78	137	181		-14%	44%	40%	179%	76%	33%
diff	0%	0%	0%	8%	10%	36%	75%							
Emerging Market (x China)														
Citi - Emerging Market (x China)	35	38	44	96	168	266	440		8%	17%	119%	74%	59%	66%
Gartner - Emerging Market (x China)	35	38	44	95	165	224	293		8%	17%	116%	74%	35%	31%
diff	0%	0%	0%	1%	1%	19%	50%							
North America														
Citi - North America	21	36	46	72	107	135	165		69%	27%	58%	49%	26%	22%
Gartner - North America	21	36	46	72	107	135	167		69%	27%	58%	49%	26%	24%
diff	0%	0%	0%	0%	0%	0%	-1%							
Western Europe														
Citi - Western Europe	25	32	46	86	97	119	141		26%	41%	89%	12%	23%	19%
Gartner - Western Europe	25	32	46	86	97	120	141		26%	41%	89%	12%	25%	17%
diff	0%	0%	0%	0%	0%	-1%	0%							
Japan														
Citi - Japan	25	20	17	18	25	32	36		-20%	-12%	3%	39%	27%	12%
Gartner - Japan	25	20	17	18	25	33	36		-20%	-12%	3%	39%	33%	7%
diff	0%	0%	0%	0%	0%	-5%	0%							

Gartner started to consolidate the whitebox volume into their estimate starting 2010, resulting in a 70% handset growth in China. It implies that Gartner probably underestimate the China market by 50-60% in the past. We expect the same thing to happen for the China smartphone market soon

Source: Gartner and Citi Research

Early evidence of massive upside to Gartner's estimate

Gartner estimates China smartphone market shipment to be 137M units in 2012. We believe there's massive upside to Gartner's number. Based on MTK's guidance, they will ship more than 110M units of smartphone chipset in 2012 and 80-90% will be sold to smartphone in China (the rest will go to other emerging market). As such, smartphone based on MTK chip in China will be around 95M units in 2012. SPRD will have around 30M almost entirely in China. Hence, between MTK and SPRD, there are already 125M units. Almost none of the global handset OEMs uses SPRD and MTK. For example, Apple uses QCOM baseband and in house processor. Samsung uses QCOM, Broadcom and in house processor. (Samsung uses SPRD's baseband for TD but it's extremely small). Nokia, Sony, LGE and RIM do not use MTK / SPRD. Even local brands like ZTE, Huawei and Coolpad still mainly use QCOM chipset. Assuming MTK and SPRD to account for 60% of China smartphone chipset market, then China smartphone market shipment could easily be 200M units (we have only 186M units in our estimate for 2012 in China).

We note that IDC / Gartner's severe estimate of handset shipment due to the disregard of whitebox market is nothing new. In fact, the underestimate is so severe that both of them need to change their methodology, leading to a stunning 70% Y/Y shipment growth in 2010 based on Gartner's estimate. It's clear China handset market did not grow 70% in 2010. The huge growth number was basically recognizing that its previous China handset market size was underestimated by easily 50-60%.

Emerging markets – major source of upside for smartphone

China is the home of the whitebox smartphone with the most comprehensive design, component, manufacturing and distribution of whitebox smartphone. China also has the most severe smartphone price erosion given its hundreds of whitebox smartphone vendors which can survive with less than 10% gross margin with extremely low overheads and marketing expenses.

Due to overly aggressive pricing strategy, many Chinese whitebox handset vendors have been struggling to stay in business over the past 12 months (gross profit of each feature phone PCBA including baseband, memory, passive components is generally less than US\$0.1). Those who remain in the handset business are aggressively moving to smartphones. With all the feature phone players moving to smartphone, competition among whitebox smartphone makers is now triggering another wave of substantial price erosion, which is why we will have a US\$70 3G smartphone and sub-US\$50 EDGE smartphone within the next 6 months.

As such, our China smartphone shipments in 2012 / 2013 are higher than Gartner forecast by 36% / 75% respectively. Given our assumption of higher smartphone cannibalization at the expense of feature phone, our feature phone shipment China in 2012 / 2013 is 7% / 24% lower than Gartner forecast.

Figure 16. We See Meaningful Upside to Low-End Smartphone Volume From Whitebox Market...

(millions)	2007	2008	2009	2010	2011	2012E	2013E
Citi Est. Feature Phone	1,089	1,201	1,201	1,367	1,426	1,254	1,081
Citi Est. Smartphone	119	139	172	302	481	738	1,100
Citi Est. Total	1,208	1,341	1,373	1,670	1,907	1,992	2,180
<i>Gartner feature phone</i>	<i>1,031</i>	<i>1,083</i>	<i>1,039</i>	<i>1,298</i>	<i>1,303</i>	<i>1,229</i>	<i>1,213</i>
<i>Gartner smartphone</i>	<i>122</i>	<i>139</i>	<i>172</i>	<i>299</i>	<i>472</i>	<i>649</i>	<i>818</i>
Gartner Total	1,153	1,222	1,211	1,597	1,775	1,878	2,031
<i>Diff (feature phone)</i>	<i>6%</i>	<i>11%</i>	<i>16%</i>	<i>5%</i>	<i>9%</i>	<i>2%</i>	<i>-11%</i>
<i>Diff (smartphone)</i>	<i>-2%</i>	<i>0%</i>	<i>0%</i>	<i>1%</i>	<i>2%</i>	<i>14%</i>	<i>34%</i>
<i>Diff (total)</i>	<i>5%</i>	<i>10%</i>	<i>13%</i>	<i>5%</i>	<i>7%</i>	<i>6%</i>	<i>7%</i>

Gartner underestimated whitebox market

Implies more upside to mid-low end smartphone of Gartner's est.

Source: Gartner and Citi Research

For non-China emerging markets, due to the chipset shortage in 3Q12, the availability of whitebox smartphone is still much lower than China. The pricing also is higher due to much higher logistic cost as well as import tax. Hence, we only assume 19% upside to Gartner numbers in 2012. However, with alleviation of chipset shortage, we expect the China whitebox makers to aggressive convert their feature phone business in India and Southeast Asia to smartphone. As such, our 2013 smartphone shipment assumption in the non-China emerging market is 50% higher than that of Gartner' forecast.

3-year View on Smartphone Industry

Based on our assumption of 1) huge smartphone growth rate driven by rapid conversion of feature phone into smartphone, 2) Chinese brand and whitebox players dominating the sub-US\$200 segment, 3) software and internet companies with zero hardware margin business model dominating the US\$200-300 segment, we expect 1) smartphone industry profitability to decline over the next 3 years, 2) multiple incumbent players are likely to exit the market, 3) semiconductor industry likely to flourish driven substantial semi content increase in handset and 4) handset ODM / EMS is likely to see strong growth opportunity due to expansion of addressable market

Industry profitability to decline and incumbents to exit

With whitebox smartphone in sub-US\$200 segment and internet / software companies offering US\$200-300 smartphone to compete with mid end US\$300-500 smartphone, we expect industry profit to come down in the next few years. We expect top 8 global OEMs blended OP margin to be around 25% in 2012 so there seems to be lots of room for margin to come down in 2013 and beyond.

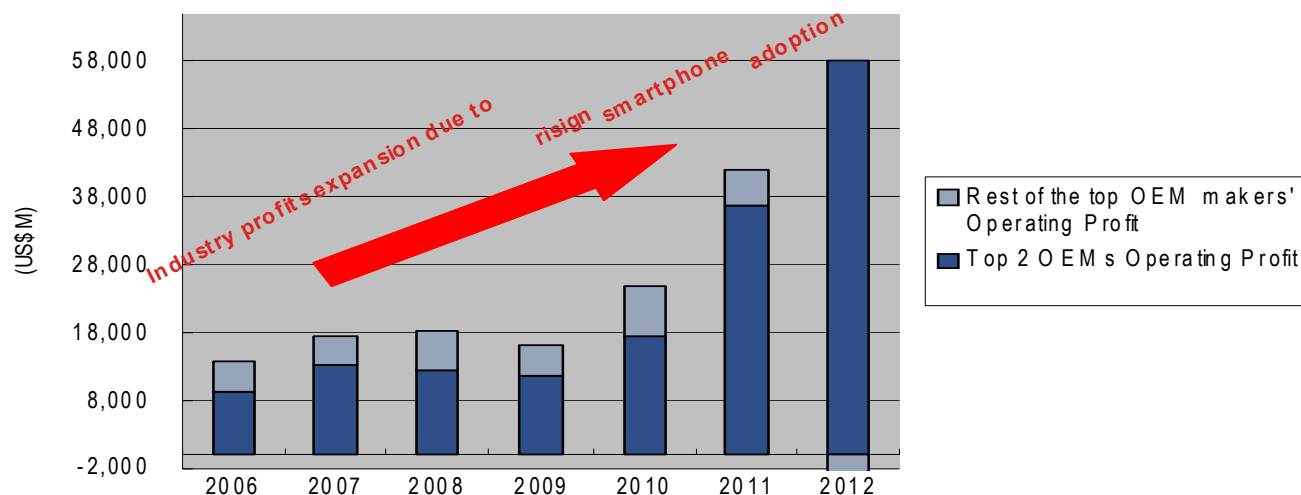
Only 3 of out the top 8 global OEMs currently are profitable

Currently, only 3 of out the top 8 global OEMs are profitable. Apple and Samsung made US\$57Bn operating profit and the rest combined lost US\$3Bn. With internet / software entering the smartphone market with their zero hardware margin business model, we expect the industry profitability to decline and many OEMs to exit the market in the next few years.

Currently handset industry profitability is extremely high

Since the launch of iPhone, handset industry profitability has seen a huge improvement from 2007 to 2012. Back in 2007, aggregate revenue of the global top 8 handset OEMs was US\$133Bn with a blended OP margin of 13.3%. In 2011, aggregate revenue reached US\$196Bn with blended OP margin of 21.4%. In 2012, we expect aggregate top 8 OEM revenue to climb further to US\$223Bn with blended OP margin of 24.7%. Basically, aggregated operating profit of top 8 OEM went up from US\$17.7Bn in 2007 to US\$55.1Bn in 2012.

Figure 17. Industry Profits Trend



Source: Citi Research

Figure 18. Industry Profitability

Device Revenue (mn USD)	2006	2007	2008	2009	2010	2011	2012
Apple	-	1,541	8,042	15,029	28,889	57,814	85,801
Samsung	18,833	24,214	26,476	27,302	32,261	45,978	77,028
HTC	2,855	3,286	4,664	4,161	8,587	15,577	9,511
Nokia	42,353	51,853	51,153	38,375	39,024	33,139	20,046
Motorola	28,380	18,992	12,099	7,146	7,819	9,531	8,165
LG	9,544	11,281	13,349	13,436	11,180	10,331	8,880
Sony	13,839	17,764	16,549	9,453	8,448	8,276	7,175
RIMM	1,928	3,927	7,730	11,742	14,777	15,035	6,422
Top 8 OEMs Revenue (USD M)	117,734	132,858	140,061	126,644	150,984	195,682	223,029
Operating Margin (%)	2006	2007	2008	2009	2010	2011	2012
Apple	-	32.2	38.4	45.1	44.5	51.3	49.8
Samsung	9.3	11.4	10.3	9.6	10.9	15.2	20.0
HTC	25.3	26.2	19.9	17.0	15.8	14.8	6.6
Nokia	15.3	20.2	18.6	12.8	11.3	4.2	(6.2)
Motorola	9.4	(5.5)	(12.5)	(12.9)	(2.5)	(1.3)	(1.9)
LG	0.8	8.5	11.5	7.7	(5.2)	(2.5)	(0.2)
Sony	11.6	12.0	(0.8)	(14.8)	2.5	1.4	(9.8)
RIMM	22.3	25.6	25.9	20.5	21.1	12.1	(23.8)
Top 8 OEM Operating Margin (%)	11.7	13.3	13.0	12.8	16.4	21.4	24.7
Operating Profit (US\$ M)	2006	2007	2008	2009	2010	2011	2012
Apple	-	497	3,088	6,783	12,846	29,684	42,691
Samsung	1,747	2,751	2,724	2,617	3,513	6,970	15,437
HTC	724	860	930	709	1,358	2,302	624
Nokia	6,482	10,488	9,515	4,910	4,411	1,406	-1,251
Motorola	2,661	-1,037	-1,509	-923	-198	-126	-155
LG	81	958	1,534	1,037	-576	-261	-16
Sony	1,606	2,128	-125	-1,395	214	112	-704
RIMM	430	1,007	1,999	2,411	3,119	1,825	-1,527
Top 8 OEM Total Operating Profit	13,730	17,651	18,157	16,149	24,687	41,912	55,100
Top 2 OEMs Operating Profit	9,143	13,239	12,603	11,693	17,257	36,653	58,128
Rest of the top OEM makers' Operating Profit	4,587	4,412	5,554	4,455	7,430	5,259	-3,028
Operating Profit share	2,006	2,007	2,008	2,009	2,010	2,011	2,012
Apple	0%	3%	17%	42%	52%	71%	77%
Samsung	13%	16%	15%	16%	14%	17%	28%
HTC	5%	5%	5%	4%	6%	5%	1%
Nokia	47%	59%	52%	30%	18%	3%	-2%
Motorola	19%	-6%	-8%	-6%	-1%	0%	0%
LG	1%	5%	8%	6%	-2%	-1%	0%
Sony	12%	12%	-1%	-9%	1%	0%	-1%
RIMM	3%	6%	11%	15%	13%	4%	-3%
Top 2 Operating Profit Market Share	67%	75%	69%	72%	70%	87%	105%
Rest of the top OEM makers' Operating Margin	33%	25%	31%	28%	30%	13%	-5%



Top 2 players get most of the profit, while others are struggling to turn profit

Source: Company data, Citi Research

Software / internet players to squeeze industry profitability

With their zero hardware margin business model, software / internet companies are able to launch high end hardware (quad core processor with close to 5 inch HD resolution display) at US\$250-300. In our view, the hardware specs from the likes of Amazon and Google could be very similar to the high end models of Apple and Samsung but the price will be at a 40-50% discount.

We believe there's a very good chance that the mid to high end smartphone at US\$300-500 will be wiped out by the high end models from the internet / software companies.

Most incumbent branded players to potentially exit the market

As we stated earlier, the top 8 global handset OEM have seen a dramatic profit growth in the past 5 years. When industry OPM was 12% in 2007, 7 out of the 8 global OEMs were profitable. However, when industry OPM rises to 25% in 2012, only 3 companies are profitable. For the remaining 3 profitable companies, Apple accounts for 77% of the industry profit, Samsung accounts for 28% and HTC accounts for 1%. Moreover, Apple and Samsung have successfully pushed all the rest handset OEMs to the mid end and low end segment. With internet / software and whitebox companies all launching high performance and low price models in the mid end and low end segment, we believe the OP loss for many global OEMs could deteriorate over the next couple of years and force many to exit the smartphone industry.

Longer term, smartphone market may become more specialized

We expect smartphone market to become a more specialized market where companies with specific business models dominating specific price segment. It will be increasingly difficult to have someone like Nokia, which used to dominate almost every price segment. Below is what we think the market may look like in 3 years.

Apple & Samsung to dominate the US\$500 plus segment

This is the status quo and consensus. Apple has the scale, brand name, proprietary OS to differentiate them from everyone else, a superb ecosystem and a huge number of frenetic fans. There's no reason to expect Apple to lose its grip of the high end market. Samsung has the scale and the most advanced hardware to differentiate its product so they are also likely to continue to be a winner in the high end segment.

Internet / Software companies to lead the US\$200-300 segment

As we stated earlier, most internet / software companies will use their zero hardware margin business model to launch very high end hardware specs with a retail price of US\$249-299. It's almost impossible for the branded companies to compete with their existing mid end products given the substantial hardware spec difference.

Whitebox & Chinese brand to win the sub US\$200 segment

With their low fixed cost and low gross margin requirement, we expect whitebox / Chinese brands also launch a large number of sub-US\$200 models with relatively high end specification. This will also make it very difficult for global brands to compete.

US\$300-500 segment likely to shrink in a meaningful way

Finally, we expect the US\$300-500 segment to shrink in a very big way. This is already a shrinking segment with many consumers willing to pay up to buy iPhone and high end Samsung Galaxy. For those unwilling to pay up due to price sensitivity, we believe they could find great value in the smartphone launched by internet / software companies. They could also move down to the models by whitebox / Chinese brands makers, which offers sub-US\$200 models with decent hardware features.

Semi Content To Soar Further in 2013

Driven by the willingness of whitebox box smartphone company to take razor thin margin and internet / software companies to take no margin, high end processors are finding their way into relatively low end phones. As we stated above, internet / smartphone companies will use almost PC grade Cortex A15 dual / quad core processor with 28nm process on US\$250-300 smartphone. Whitebox companies will use A7 quad core processor with 28nm process on US\$150-200 smartphone and A7 / A9 dual core processor on 28 / 40 nm process on US\$100-150 smartphone. Even US\$50-100 smartphone will use 1GHz processor with 40nm process. We believe smartphone processor based on 65nm process will be almost entirely phased out next year.

Handset EMS / ODM to Come Back to Life

The handset EMS / ODM is on the brink of extinction because of the dramatic decline of their addressable market. In the heyday of the handset EMS / ODM, there was plenty of business from Nokia, Motorola, Sony Ericsson and RIM. With Apple, Samsung and Chinese whitebox makers dominating the handset market, traditional handset EMS / ODM lost most of their business in the past 4-5 years. The problem for the handset EMS / ODM is that Apple gives almost all the iPhone to Hon Hai and Samsung keeps manufacturing in house. Moreover, large EMS / ODM have not been able to serve whitebox makers due to the nature of "high mix; low volume" for the whitebox business.

Take FIH for example, the former heavyweight handset EMS used to be the biggest EMS of Nokia, Motorola and Sony Ericsson and they had a peak market cap of US\$22.9Bn and peak earning of US\$0.1. Since the demise of their key customers, FIH's market cap has dropped to merely US\$2.5Bn, only 11% of its peak market cap.

Internet / software companies to create a sizable addressable market

None of the internet / software companies have any in-house manufacturing capacity. As such, they have to rely on handset EMS / ODM for manufacturing services.

We estimate that smartphone ranging from US\$200-500 accounts approximately 20-25% of total smartphone volume. Currently, most of the US\$200-500 smartphone models are made in house by traditional handset brands. Handset brands still keep the US\$200-500 segment in house and mainly outsource the sub-US\$200 smartphone to EMS / ODM. Problem is that sub-US\$200 from branded companies simply can't compete with those from whitebox companies as we described above. As such, handset EMS is stuck with models which are too expensive to compete with whitebox smartphone face tremendous inventory risk. Moreover, Samsung and LG still keep all their smartphone in house so the revenue opportunity from the two Korean OEMs is zero. If internet / software companies take 50% of the market share in the US\$200-500 segment, it will be about 100-125M units of potential volume and revenue opportunity of US\$25-30Bn. This is a huge number for the handset EMS, which have all become rather small companies due to the sharp decline of their addressable market.

FIH is a primary beneficiary; Xiaomi and Amazon to become critical customers

FIH's 1H12 revenue is merely around US\$2.5Bn, down almost 60% from its peak. We expect FIH to be the sole manufacturer of Amazon's smartphone. Before Amazon releases the model, it's difficult to gauge how many units Amazon can sell. If we use Amazon's tablet as a proxy, Amazon's tablet is roughly at an annual run

rate of 15-20M units. If we assume that Amazon could reach the same unit in smartphone as they do in tablet market at roughly US\$280 per unit, it will generate approximately US\$4.2-5.6Bn of sales for FIH. Note that FIH's current annual revenue run rate is only around US\$5Bn so Amazon could be a huge contributor for FIH starting 2H13. Moreover, FIH is also a primary component supplier / EMS for Xiaomi Technology. With Xiaomi likely to ramp up volume in a big way in 2013, we believe that Xiaomi will also become an important client for FIH in 2013. We expect FIH to ship around 14M units to Xiaomi and Amazon in 2013 and 30M units in 2014.

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Traditional Handset Companies At Risk But Connector Companies Benefit

Representing over 500 million annual units Nokia, Motorola and Research in Motion are traditional handset companies most at risk to both losing more market share and more aggressive pricing pressure. Connector companies Molex, Amphenol, and TE Connectivity to benefit as new form factors and features need micro miniature connectors (multiple cameras, antenna, etc).

Traditional Handset Companies at Risk

Representing over 500 million units in total by the combined traditional handset companies of Nokia, Motorola, and Research in Motion during 2011 we see the greatest risk from at least two different angles 1) losing market share leading to sub-optimal economies of scale and 2) Aggressive pricing pressure.

Figure 19. Traditional Handset Companies: Units Sold, 2011

Nokia	417m
Motorola	42 m
Research in Motion	53 m
Total	512 m

Source: Company reports, Citi Research

- **Share Shifts.** As shown in Figure 19, Nokia, Motorola and Research in Motion combined for over 500 million units sold in 2011 and we see these companies most at risk of losing market share to the whitebox cell phone makers. Importantly, the Android operating system provides OEMs with both patent protection and minimal R&D investments, both of which have been barriers in the past. We are already starting to see non-traditional handset OEMs break into markets including the US, where Huawei phones have recently started to emerge (Metro PCS and Leap/Cricket). Market share losses by these companies will likely result in sub-optimal economies of scale and the need for additional restructuring.

Figure 20. Average Selling Price (USD), 2011

Samsung (blended)	\$140
Apple	\$620
Nokia Smart phones	\$193
Nokia Feature phones	\$77
Motorola Smart phones	\$331
Motorola Feature phones	\$114
RIMM	\$285
HTC	\$346

Source: Company reports, Citi Research

- **Aggressive Pricing Pressure.** We believe the new challenge by white box makers will put additional pressure on pricing, especially on the mid and low end providers (Nokia, Motorola, Research in Motion). See pricing in Figure 20.

Connector Companies

Molex, Amphenol, and TE Connectivity to benefit as new form factors and features need micro miniature connectors (multiple cameras, antennas, etc). A great example of this is when Apple recently reduced the size of its iPhone 5 charging port. This simple one item change resulted in a complete redesign and upgrade to all peripherals such as charging cords, automobile rechargers, docking ports, eternal stereo speakers, etc. Furthermore, adding dual cameras (front and back), multiple antennas (LTE, 3G, etc) requires additional micro miniature connectors. Because connectors are a low part of the bill of materials (less than 5% of the total cost) and often include over a dozen connectors per phone, of which any one connector can cause the phone to stop working, risk of pricing pressure is less severe than for other industries.

Stocks Highlighted: Valuation and Risks

Foxconn International Holdings

(2038.HK; HK\$2.82; 2)

Valuation: Our TP for FIH of HK\$5.8 is set at a 2014E P/E of 10x, which represents a premium to the historical avg P/E of 8-10x for EMS / ODM to reflect FIH's strong positioning in key growth segments of the smartphone supply chain. We believe a TP based on 2014 earnings allows us to better capture the fair value of the company given our expectation of sharp earnings growth in 2014, driven by a substantial addressable market expansion and OP leverage in the next 2-3 years.

Risks: Upside risks that could impede the stock from achieving our target price include: 1) Nokia's strategy change in PCBA assembly business, 2) Major changes for most OEMs' smartphone outsourcing strategies, 3) Samsung or other top handset players significantly increasing EMS outsourcing. Downside risk that could trade below our target price mainly comes from the weaker than expected macro demand affecting Nokia, SonyEricsson or other top FIH clients' handset shipment.

TSMC

(2330.TW; NT\$89.90; 1)

Valuation: Our DCF-based target price for TSMC is NT\$105, which translates to a 2013E P/E of 15.1x and 2013E P/B of 3.3x. Factoring in a 1.39% risk-free rate, 7% risk premium and 0.94 beta, we derive a WACC of 7.23% for our DCF model. We estimate 3% long-term revenue growth from 2015, compared to TSMC's forecast of long-term semiconductor industry growth of 4-5%. We assume long-term EBIT margin forecast of 30%, which appears reasonable compared to 31-38% from 2009-2012. In our view, DCF is a good metric to value TSMC as it has been generating stable free cash flow from its operations.

Risks: The main downside risks to the shares achieving our target price include: 1) Global semiconductor market weakness; 2) Larger-than-expected margin contraction due to depreciation cost hikes; 3) A slowdown in IDM outsourcing; 4) Competition from global foundries and Samsung; and 5) Longer-than-expected inventory correction in the tech supply chain.

Hon Hai Precision

(2317.TW; NT\$88.60; 1)

Valuation: Our target price of NT\$120 is based on a target P/E multiple of ~12x 2013E. This is below Hon Hai's five-year trading average of 14x, given our expectation of lower earnings growth momentum for Hon Hai vs. historically.

Risks: Downside risks include: 1) Pegatron proving a viable competitor for Apple's business, which could threaten Hon Hai's long-term margin sustainability, 2) management focus and resources being shifted to large-screen TV manufacturing, which could negatively impact earnings, and 3) a lack of price discipline that makes earnings highly volatile. Upside risks include: 1) faster-than-expected progress in NB segment; 2) stronger-than-expected new product shipments; and 3) sharp cost reductions. Any of these risk factors could cause the shares to deviate from our target price.

Chipbond Technology

(6147.TWO; NT\$52.00; 1)

Valuation: Our DCF-based target price of NT\$56 reflects Chipbond's ability to generate stable cash flow. With a risk-free rate of 1.24%, a market risk premium of 7% and an equity beta of 1.06, we calculate Chipbond's WACC as 6.91%. Our model assumes 3% long-term revenue growth starting in 2015E and EBIT margin of 16.5% in 2015E with gradual annual decline. Our target price is equivalent to 1.8x 2013E BVPS and 12.1x 2013E EPS.

Risks: Key downside risks to our investment thesis and target price for Chipbond include: 1) Prolonged weak demand in large panel TFT-LCD; 2) Competitors' aggression in ramping 12" capacity and price cuts; 3) Weaker-than-expected small panel LCD demand. These risks could impede the stock from reaching our target price.

Samsung Electronics

(005930.KS; W1,327,000; 1)

Valuation: Our 12-month target price of W1,970,000 is derived using a sum-of-the-parts methodology, based on 2012E -13E Avg. EBITDA. In calculating total operating value, we reference global peers in assigning fair-value EV/EBITDA multiples for the four main divisions (7.2x for Semiconductor, 3.2x for Display panel, 5.8x for Handset, and 4.8x for Media & Appliance). On the non-operating side, we employ Jun-2012 book value to value treasury shares and our 2012E-13E average estimate for equity-method investment assets. The 7.2x EV/EBITDA multiple for Semiconductors represents a 30% premium to Hynix's (000660.KS; W21,150; 1) target price implied multiple, justified in our view given SEC's superior market position through: 1) a rising market share; 2) outstanding profitability; and 3) healthier financial status. The 3.2x multiple for Display panels represents a 30% premium to LGD's (034220.KS; W23,500; 1) target price implied multiple, backed by SEC's AMOLED technology leadership. The 5.8x target multiple for Handset represents a 30% premium to HTC's (2498.TW; NT\$290.00; 3) target price implied multiple, given the sustainable HW leadership from vertical integration (AMOLED, mobile CPU and memory). For Media & Appliance division, we apply the implied target price multiples of the global peer average.

Risks: Downside risks that could prevent the shares from reaching our target price include: 1) PC sales weaken more than our forecast and NAND oversupply proves worse than our forecast; 2) Aggressive investment by competitors in the highly cyclical memory semiconductor/TFT-LCD industries could have a negative impact on prices; 3) Competition in the handset market intensifies, reducing SEC's handset margin; and 4) Any major appreciation of the won would hit SEC's earnings.

Appendix A-1

Analyst Certification

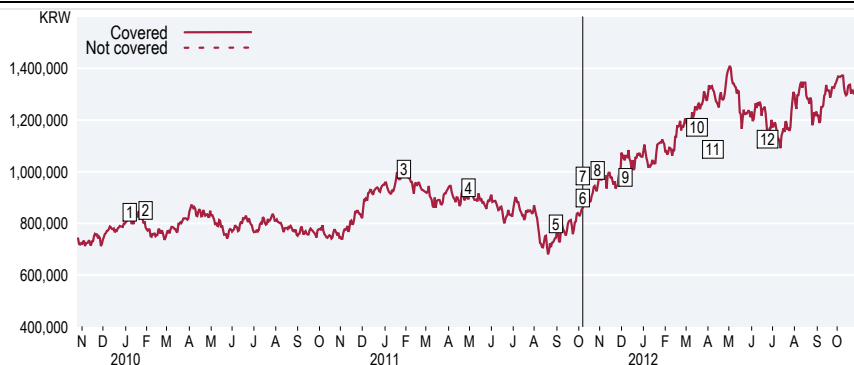
The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

IMPORTANT DISCLOSURES

Samsung Electronics (005930.KS)

Ratings and Target Price History Fundamental Research

Analyst: Henry H Kim, CFA



	Date	Rating	Target Price	Closing Price
1	7-Jan-10	1L	*1,100,000.00	813,000.00
2	29-Jan-10	1L	*1,160,000.00	784,000.00
3	28-Jan-11	1L	*1,200,000.00	1,010,000.00
4	29-Apr-11	1L	*1,250,000.00	893,000.00

* Indicates change

	Date	Rating	Target Price	Closing Price
5	31-Aug-11	1L	*1,200,000.00	744,000.00
6	7-Oct-11	Stock rating system changed		
7	7-Oct-11	*1	1,200,000.00	860,000.00
8	28-Oct-11	1	*1,300,000.00	945,000.00

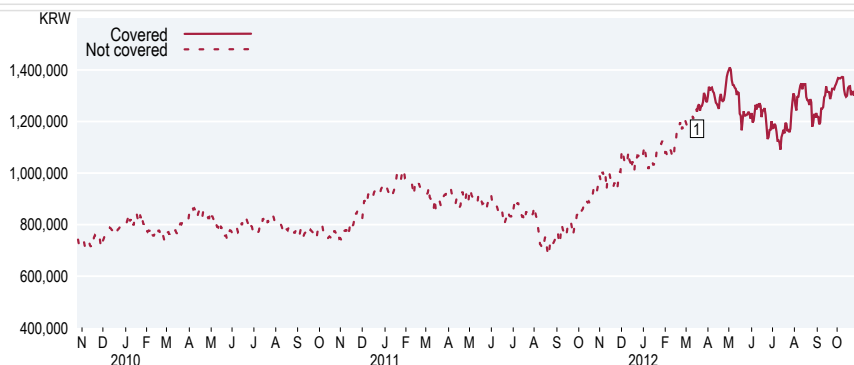
	Date	Rating	Target Price	Closing Price
9	7-Dec-11	1	*1,400,000.00	1,056,000.00
10	16-Mar-12	1	*1,800,000.00	1,238,000.00
11	9-Apr-12	1	*1,900,000.00	1,317,000.00
12	25-Jun-12	1	*1,970,000.00	1,132,000.00

Rating/target price changes above reflect Eastern Standard Time

Samsung Electronics (005930.KS)

Ratings and Target Price History Best Ideas Research Relative Call (3 Month)

Analyst: Henry H Kim, CFA



	Date	Rating	Target Price	Closing Price
1	16-Mar-12	*ADD MP	-	1,238,000.00

* Indicates change

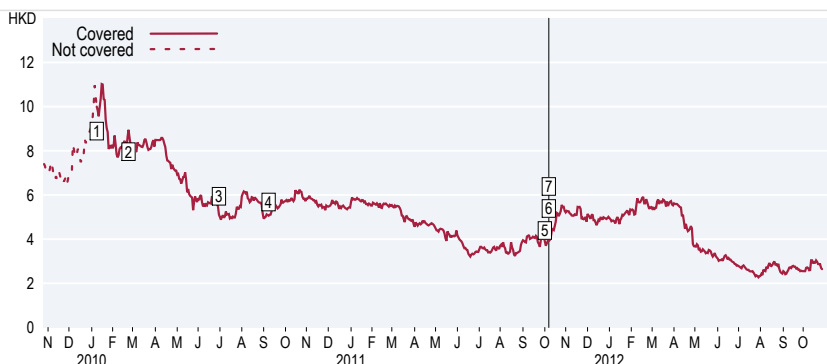
Rating/target price changes above reflect Eastern Standard Time

Foxconn International Holdings (2038.HK)

Ratings and Target Price History Fundamental Research

Analyst: Kevin Chang

Covered since January 8 2010



	Date	Rating	Target Price	Closing Price
1	8-Jan-10	*3S	*5.70	10.00
2	23-Feb-10	3S	*5.40	8.95
3	30-Jun-10	3S	*4.10	5.11

* Indicates change

	Date	Rating	Target Price	Closing Price
4	8-Sep-10	3S	*3.80	5.06
5	2-Oct-11	3S	*4.00	4.08
6	7-Oct-11	Stock rating system changed		

	Date	Rating	Target Price	Closing Price
7	7-Oct-11	*2	4.00	3.92

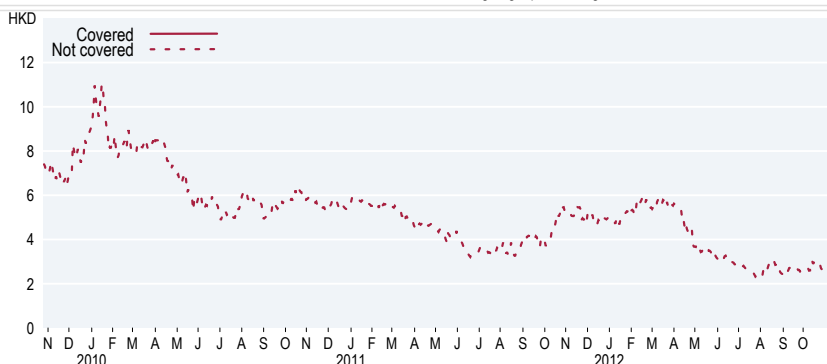
Rating/target price changes above reflect Eastern Standard Time

Foxconn International Holdings (2038.HK)

Ratings and Target Price History Best Ideas Research Relative Call (3 Month)

Analyst: Kevin Chang

Covered since January 8 2010



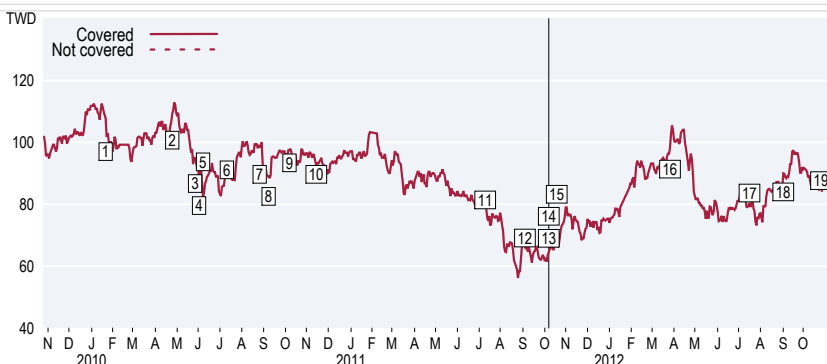
* Indicates change

Rating/target price changes above reflect Eastern Standard Time

Hon Hai Precision (2317.TW)

Ratings and Target Price History Fundamental Research

Analyst: Kevin Chang



	Date	Rating	Target Price	Closing Price
1	21-Jan-10	*2L	110.68	107.73
2	26-Apr-10	2L	*115.11	109.21
3	27-May-10	2L	*97.40	94.82
4	2-Jun-10	2L	*90.02	88.18
5	8-Jun-10	2L	*84.12	82.28
6	11-Jul-10	*1L	*121.75	88.92
7	26-Aug-10	1L	*123.97	98.35

* Indicates change

	Date	Rating	Target Price	Closing Price
8	8-Sep-10	1L	*115.70	89.26
9	7-Oct-10	1L	*127.27	97.52
10	14-Nov-10	1L	*122.31	93.80
11	10-Jul-11	1L	*114.88	80.74
12	5-Sep-11	1L	*114.55	66.36
13	7-Oct-11	Stock rating system changed		
14	7-Oct-11	*1	114.55	64.55

	Date	Rating	Target Price	Closing Price
15	19-Oct-11	1	*106.36	67.73
16	27-Mar-12	1	*127.27	98.18
17	17-Jul-12	1	*104.55	80.45
18	2-Sep-12	1	*105.00	84.80
19	25-Oct-12	1	*120.00	85.20

Rating/target price changes above reflect Eastern Standard Time

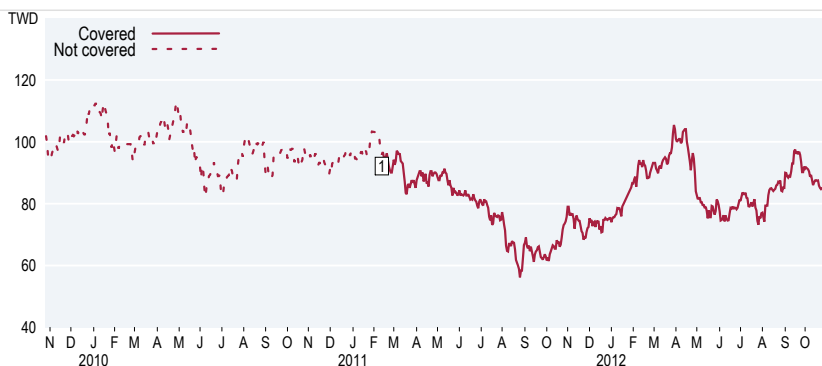
Hon Hai Precision (2317.TW)

Ratings and Target Price History

Best Ideas Research

Relative Call (3 Month)

Analyst: Kevin Chang



	Date	Rating	Target Price	Closing Price
1	11-Feb-11	*ADD MP	-	95.87

* Indicates change

Rating/target price changes above reflect Eastern Standard Time

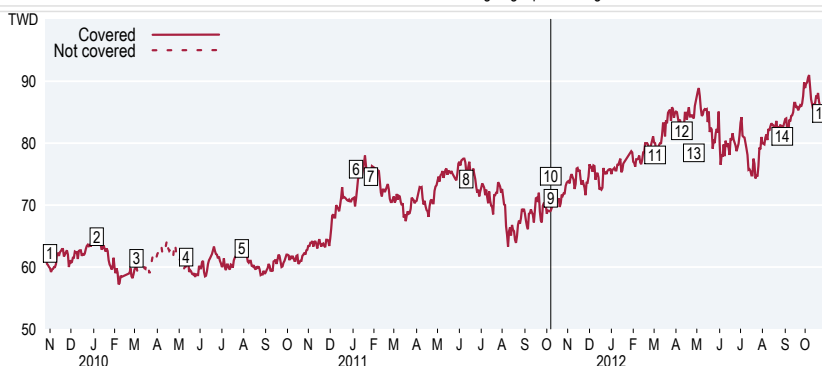
TSMC (2330.TW)

Ratings and Target Price History

Fundamental Research

Analyst: Roland Shu

Covered since May 12 2010



	Date	Rating	Target Price	Closing Price
1	30-Oct-09	1L	*68.00	60.00
2	6-Jan-10	1L	*69.00	64.90
3	3-Mar-10	Coverage terminated		
4	12-May-10	1L	*80.00	60.10
5	29-Jul-10	1L	*78.00	63.00

* Indicates change

	Date	Rating	Target Price	Closing Price
6	6-Jan-11	1L	*84.00	71.00
7	27-Jan-11	1L	*86.00	75.20
8	10-Jun-11	1L	*84.00	75.30
9	7-Oct-11	Stock rating system changed		
10	7-Oct-11	*1	84.00	69.10

	Date	Rating	Target Price	Closing Price
11	2-Mar-12	1	*92.00	80.00
12	10-Apr-12	1	*100.00	82.00
13	26-Apr-12	1	*104.00	84.00
14	29-Aug-12	1	*103.00	82.70
15	25-Oct-12	1	*105.00	84.80

Rating/target price changes above reflect Eastern Standard Time

TSMC (2330.TW)

Ratings and Target Price History

Best Ideas Research

Relative Call (3 Month)

Analyst: Roland Shu

Covered since May 12 2010



	Date	Rating	Target Price	Closing Price
1	11-Feb-11	*ADD MP	-	71.40

* Indicates change

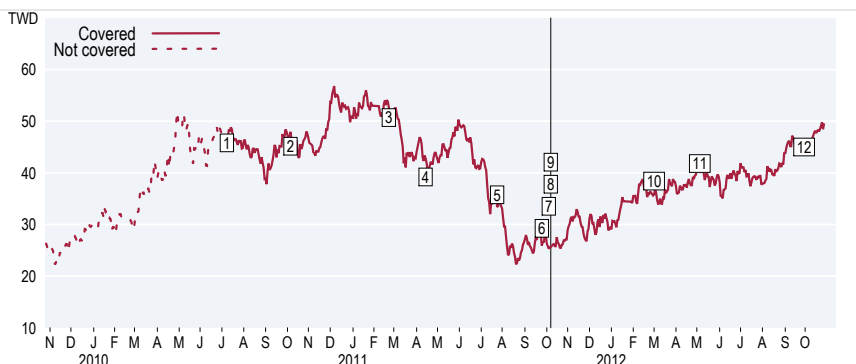
	Date	Rating	Target Price	Closing Price
2	10-Aug-11	*REM MP	-	65.80

Rating/target price changes above reflect Eastern Standard Time

Chipbond Technology (6147.TWO)

Ratings and Target Price History Fundamental Research

Analyst: Roland Shu
Covered since July 8 2010



	Date	Rating	Target Price	Closing Price
1	8-Jul-10	*2L	*50.00	46.00
2	6-Oct-10	*3L	*41.00	47.95
3	22-Feb-11	3L	*45.00	52.70
4	14-Apr-11	3L	*40.00	42.85

* Indicates change

	Date	Rating	Target Price	Closing Price
5	25-Jul-11	*2L	*35.00	33.40
6	25-Sep-11	2L	*30.00	27.80
7	5-Oct-11	2L	*27.50	25.30
8	7-Oct-11	Stock rating system changed		

	Date	Rating	Target Price	Closing Price
9	7-Oct-11	*2	27.50	25.60
10	1-Mar-12	2	*34.00	35.80
11	4-May-12	*1	*52.00	40.35
12	28-Sep-12	1	*56.00	46.50

Rating/target price changes above reflect Eastern Standard Time

Chipbond Technology (6147.TWO)

Ratings and Target Price History Best Ideas Research Relative Call (3 Month)

Analyst: Roland Shu
Covered since July 8 2010



	Date	Rating	Target Price	Closing Price
1	11-Feb-11	*ADD LP	-	51.50

* Indicates change

	Date	Rating	Target Price	Closing Price
2	10-Aug-11	*REM LP	-	24.25

Rating/target price changes above reflect Eastern Standard Time

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Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Baidu Inc

Citigroup Global Markets Inc. owns a position of 1 million USD or more in the debt securities of Broadcom Corp

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Data current as of 5 Oct 2012

	12 Month Rating			Relative Rating		
	Buy	Hold	Sell	Buy	Hold	Sell
Citi Research Global Fundamental Coverage	51%	38%	11%	7%	85%	7%
% of companies in each rating category that are investment banking clients	50%	47%	45%	59%	47%	50%

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