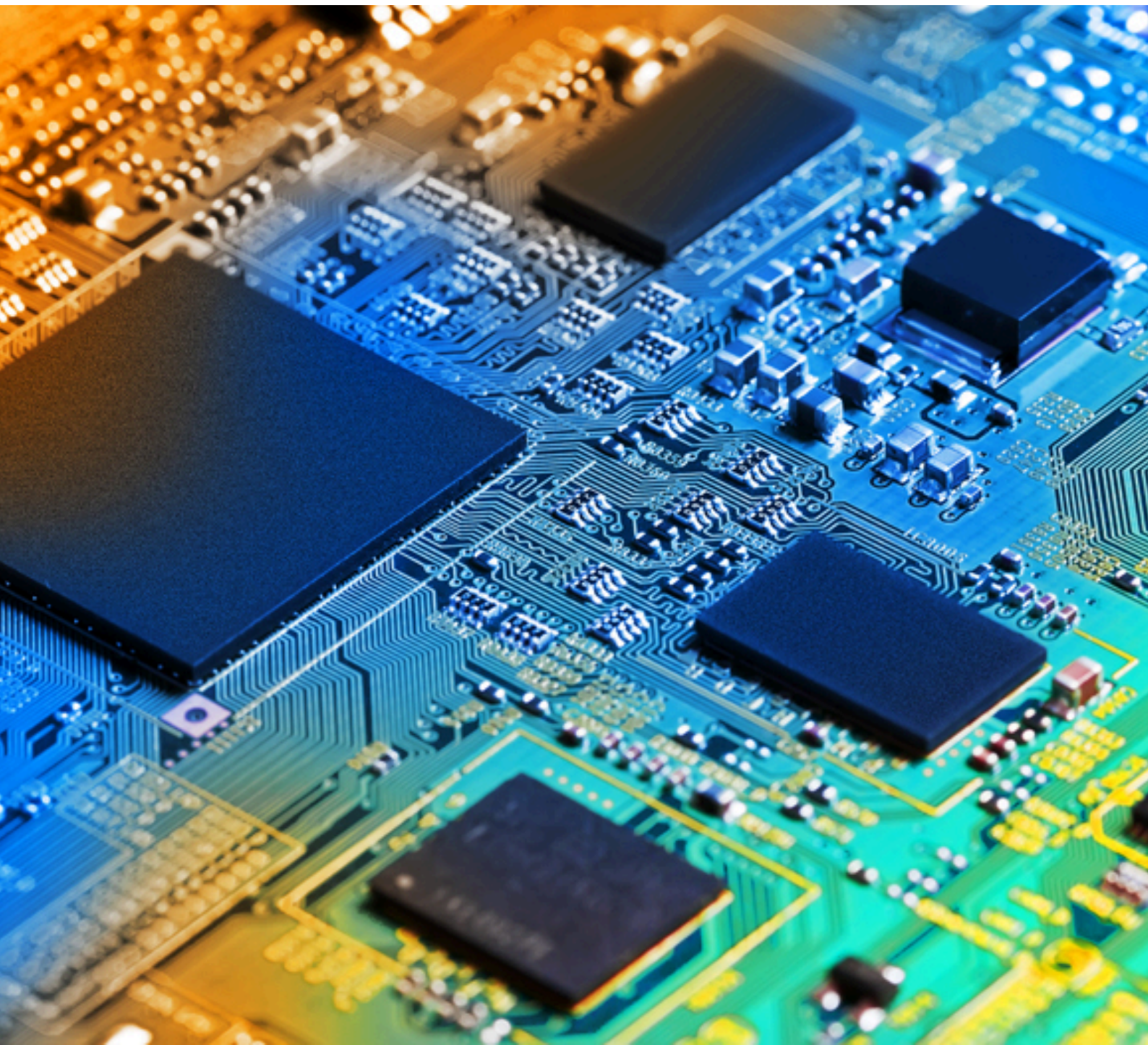


Vietnam

Consumer Electronics Report

Includes 5-Year forecasts to 2022



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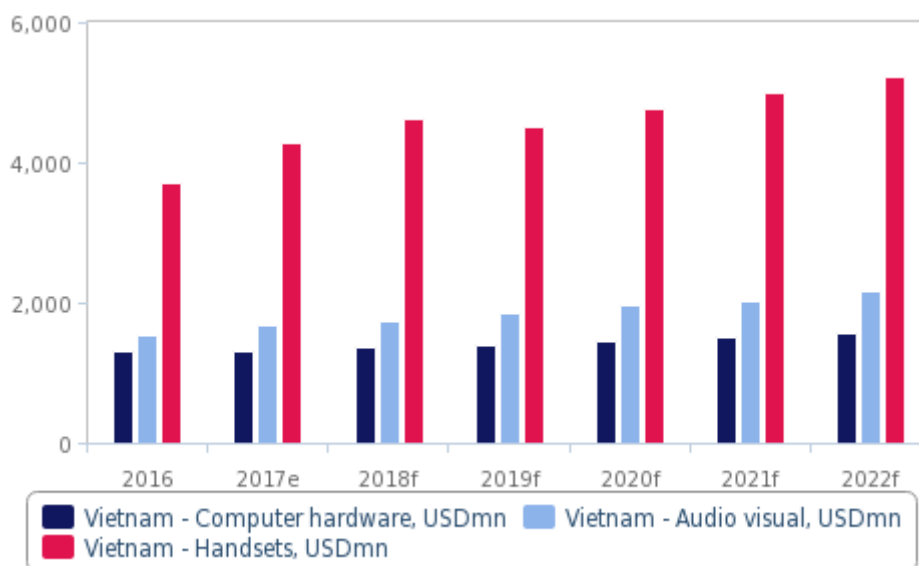
BMI Industry View

BMI View: Consumer electronics spending maintained double-digit annual US dollar growth in Vietnam during 2015-2017, fuelled by a large number of first-time smartphone and flat-panel buyers together with retail and trade liberalisation. Growth will decelerate as the market matures, but there are still significant opportunities in a fast growing economy because of purchasing power gains that will accrue to households. The local industry also has a positive outlook where Vietnam has emerged as an important node in regional and global supply chains. Regional economic and security risks are the key source of potential downside.

Latest Updates And Industry Developments

- **Computer Hardware Sales:** USD1.4bn in 2018 to USD1.6bn in 2022, a compound annual growth rate (CAGR) of +3.4%. The retail market is on a lower volume trajectory because of use case cannibalisation, but there are still PC growth opportunities in sales to firms and the public sector.
- **AV Sales:** USD1.8bn in 2018 to USD2.2bn in 2022, a CAGR of 5.5%. Flat-panel TV set and digital TV set/set-top box upgrades, alongside smartphone complimentary audio spending make AV the outperforming segment.
- **Handset Sales:** USD4.6bn in 2018 to USD5.2bn in 2022, a CAGR of 3.1%. The market will adjust to a slower trajectory when the boom associated with floods of first-time smartphone buyers comes to an end, with another drag in the form of price erosion.

Growth To Cool As Volume Booms Wane, But Expansion Will Continue
Consumer Electronics Spending Forecasts



e/f = BMI estimate/forecast. Source: BMI

SWOT

Consumer Electronics Market

SWOT Analysis

Strengths

- Relatively low penetration in key device categories means the domestic market is still in a rapid growth phase, with trade liberalisation and growing affordability driving projected double-digit growth.
- Broad-based income and GDP growth are increasing device affordability, with a huge and relatively untapped market in the rural and suburban areas.
- Vietnam's integration into the global trade network.
- Rapid development of local production facilities and rising electronics exports, driven by major investments from leading global vendors such as Samsung Electronics, Intel, Apple, Nokia and LG Electronics.
- Supportive demographics, with the population aged 15-64 forecast to increase at a CAGR of 0.6% over 2018-2022.

Weaknesses

- Highly price-sensitive market, putting pressure on vendor margins and leading to a preference for local low-cost devices.
- Low broadband penetration continues to be a drag on demand for consumer electronics devices.

Opportunities

- Robust purchasing power growth envisaged, which should deepen the devices market as households gain the disposable income required to enter the global market.
- Smartphones, particularly low-cost Android devices, are popular with consumers, with penetration rates rising rapidly.
- Low PC penetration could see volumes increase significantly, while rising incomes will boost demand for lifestyle PCs including gaming and hybrid notebooks.
- Operator investments in data networks are boosting demand for connectivity devices, particularly into underpenetrated rural and lower income areas.

Threats

- Cannibalisation of the use case for tablets and low-end notebooks by smartphones is lowering the long-term potential installed base of the PC market.
- External shock, such as a hard landing in China or disruption to regional/global trade networks from a Trump presidency.
- Relentless pressure for lower prices in key product categories like TV sets, tablets and smartphones putting pressure on margins as Chinese OEMs achieve higher standards.

Industry Forecast

BMI View: Total consumer electronics device spending in Vietnam is forecast increase at a CAGR of 3.7% over 2018-2022. We have a bright outlook for device spending growth based on the combination of low device penetration rates, disposable income growth and supportive demographics. This will drive broad based expansion of device spending, but product trends will continue to be important, with smartphone and flat-panel TV set upgrades expected to be areas of outperformance.

Latest Updates

- The forecast period was extended to 2022 in the Q118 update but our core scenario remains in place for device spending growth to be fueled by a strong purchasing power growth trend against a backdrop of low device penetration rates.
- We anticipate handset segment outperformance as the smartphone upgrade trend continues; with upside for higher value sales as incomes rise, but we caution that price erosion and oversupply poses downside risk.
- Meanwhile, for computer hardware the smartphone boom is a threat to mass market PC spending, where demand for tablets and low end notebooks is being cannibalised.

Structural Trends

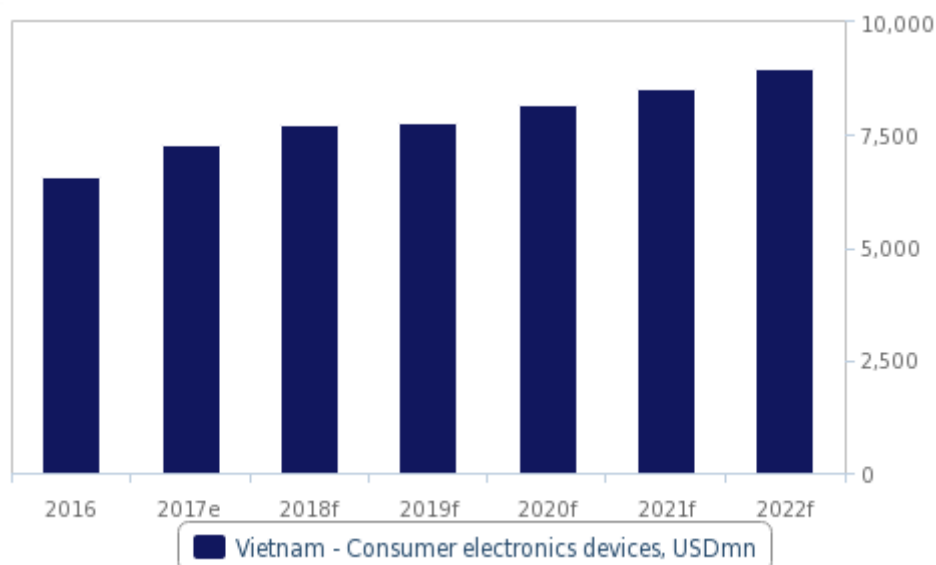
2018 Outlook

We forecast total consumer electronics device spending - including PCs and peripherals, TV sets, digital cameras and camcorders, audio devices and mobile handsets - will increase by 6.4% in 2018 to a total of USD7.8bn. This corresponds to local currency growth of 7.7%, with both local currency and USD growth forecast to decelerate y-o-y. This view reflects the cooling of the device spending boom over 2015-2017 that was triggered by trade and retail liberalisation - but the economic environment will remain supportive and product trends consistent y-o-y in 2018.

Our Country Risk team identifies Vietnam as having one of the most promising consumer markets in the Asia-Pacific region along with Indonesia, India and the Philippines. Real GDP, private final consumption and government spending growth are forecast at 6.7%, 7% and 6.2% respectively. This underpins a positive outlook for device spending where consumer sentiment and credit access will also contribute to growth. There will be a modest drag from dong depreciation, but GDP per capita is still forecast to increase by almost 9% in USD terms in 2018.

In terms of patterns of device spending, we expect another year of computer hardware underperformance as smartphone ownership proliferation continues to cannibalise use cases for tablets and low-end notebooks. This will, however be, partially offset by demand growth from existing owners and first-time buyers for whom the functionality offered by smartphones is insufficient. Meanwhile, the AV and handset segments have brighter outlooks based on flat-panel TV set and smartphone upgrades respectively, but we expect spending growth to slow slightly y-o-y in both segments as the upgrade booms begin to lose momentum due to higher penetration and the reduced impact of liberalisation.

Consumer Electronics Demand
(2016-2022)



e/f = BMI estimate/forecast. Source: BMI

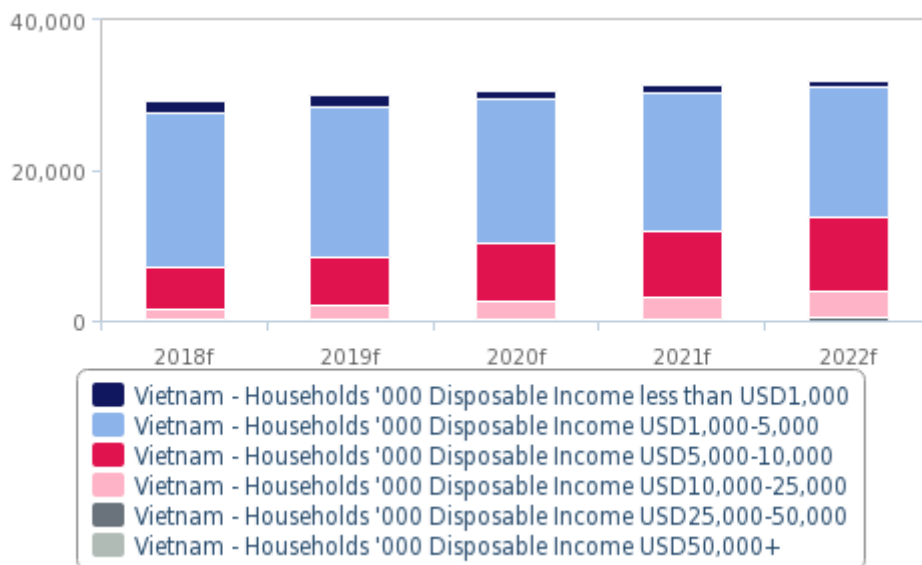
Market Drivers

There will be two engines for consumer electronics spending growth over the medium term with rising purchasing power and positive demographic trends that position vendors to benefit from first-time buyer and higher value replacement sales growth. BMI's Country Risk team for Vietnam forecasts that real GDP growth will average 6.5% annually over 2018-2022, with slightly faster real growth in private final consumption at 6.8%. There will be a mild drag on purchasing power growth due to dong depreciation, but GDP per capita in US dollar terms is still forecast to record robust growth at a CAGR of 9.4% over 2018-2022.

Although incomes will still be low in Vietnam even by 2022, at USD3,585, the combination of rising purchasing power and supportive demographics - with the population aged 15-64 in Vietnam forecast to increase at a CAGR of 0.6% over 2018-2022 - is a solid foundation for device market growth. This is reflected in our household income forecast that shows the expected large-scale migration of households to higher income bands over the medium term. Vietnam has one of the highest percentages of low-income households (with incomes below USD5,000 annually) in the region, but with broad-based economic growth momentum there will be an expanding middle class over the medium term.

There is also an important regional dimension to the income growth outlook because the Vietnamese market is divided between a rural market, with low penetration of devices and limited sales due to lack of purchasing power, and a more developed urban market in Hanoi and Ho Chi Minh City that still accounts for most sales in the country. This divide is especially deep in terms of big-ticket items such as flat-screen TVs and computers that are still out of reach for the majority of rural consumers, even as access to credit has improved.

Rising Incomes Will Expand The Middle Class
 Vietnam Household Income Breakdown (2018-2022)



f = BMI forecast. Source: BMI, national sources

The economic outlook is positive, but the proposed tax reform package, which includes a VAT hike, would likely be disruptive in the short-term for big-ticket consumer products markets such as PCs and TV sets. Meanwhile, there are some regional and global risks that present downside risk. These include a renewed maritime dispute with China, the Trump administration introducing fresh tariffs on Vietnamese imports in the US, or economic policy slippages that could undermine investor confidence and result in a slowdown in FDI inflows and manufacturing growth.

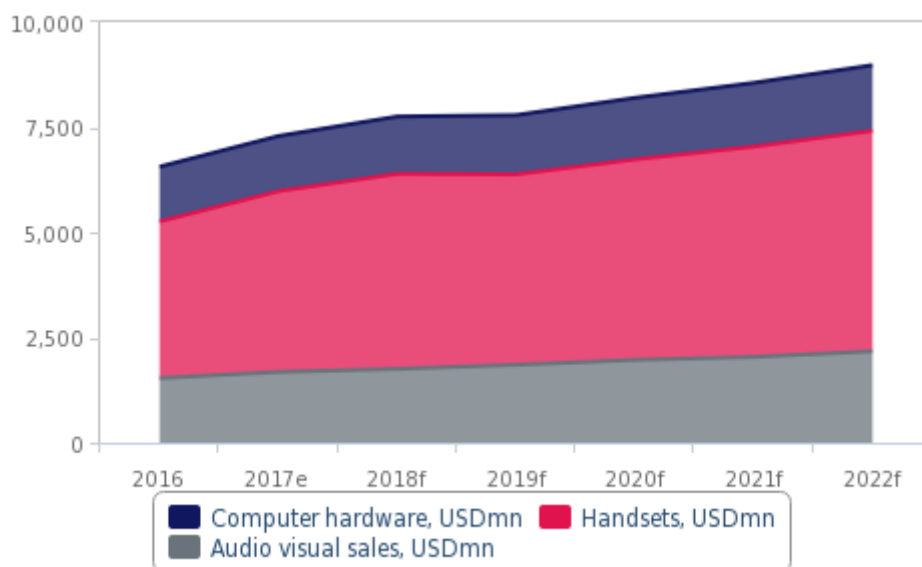
The technological risk outlook is broadly positive but there is some downside, for instance the potential for cybersecurity incidents to undermine confidence in networked devices and solutions such as mobile financial services. Of greater concern is the potential for intense price competition for price sensitive local consumers against a backdrop of oversupply from production in Vietnam and the wider region to limit the returns to vendors.

Segments

Mobile handset sales boomed as smartphone volumes increased and raised the average selling price of the handset market as a whole, a trend that saw it come to dominate overall device spending, as well as negatively impacting other products such as PCs and digital cameras. There is still short-term potential for spending growth to be driven by smartphone first-time buyers, but this will begin to diminish as saturation approaches and result in slower growth rates. By the end of the forecast period increases in total handset spending will rely on vendors upselling higher specification and branded smartphones to an expanding and more affluent middle class - but their ability to do so is uncertain in a price sensitive market and there is downside due to potential for unsustainable price erosion as vendors compete aggressively for market share.

As a frontier market there is still potential for AV segment growth to be supported by first-time upgrades to flat-panel TV sets as purchasing power increases, whereas developed and even most emerging markets are by 2018 saturated. There will also be a positive impact from the digitisation of TV broadcasting and transmission in Vietnam, which will trigger TV set and/or set-top-box upgrades by households. The Vietnamese government plans to digitise television broadcasting and transmission by 2020. Elsewhere, digital camera and camcorder demand will be flat and based on power users, with the casual user market tapped by smartphones. There are some other growth pockets, especially in devices complimentary to smartphones, for instance wireless speakers and headphones.

Consumer Electronics Demand
(2016-2022)



e/f = BMI estimate/forecast. Source: BMI

The computer hardware segment underperformed over 2014-2017 when PC demand was negatively affected by the cannibalisation of tablet and notebook demand as smartphone ownership proliferated. In a market where there is a relatively low legacy of PC ownership among households we expect an increasing number of consumers to become accustomed to smartphones being the only devices through which they access the internet - putting the PC market on a lower volume potential trajectory when compared to earlier maturing markets. There is nonetheless still growth potential due to the very low PC penetration, with demand from affluent consumers and power users set to grow - and PCs that are functionally differentiated from smartphones including gaming and hybrid notebooks, workstations and all-in-ones set to record growth.

CONSUMER ELECTRONICS OVERVIEW (VIETNAM 2016-2022)

Indicator	2016	2017e	2018f	2019f	2020f	2021f	2022f
Consumer electronics devices, USDmn	6,560.80	7,290.27	7,754.14	7,786.47	8,197.65	8,553.53	8,975.11
Computer hardware, USDmn	1,302.47	1,309.66	1,362.06	1,408.11	1,463.98	1,514.55	1,559.23
Audio visual, USDmn	1,536.14	1,683.72	1,755.74	1,853.29	1,968.77	2,039.65	2,174.08
Handsets, USDmn	3,722.19	4,296.89	4,636.35	4,525.07	4,764.90	4,999.34	5,241.80

e/f = BMI estimate/forecast. Source: BMI

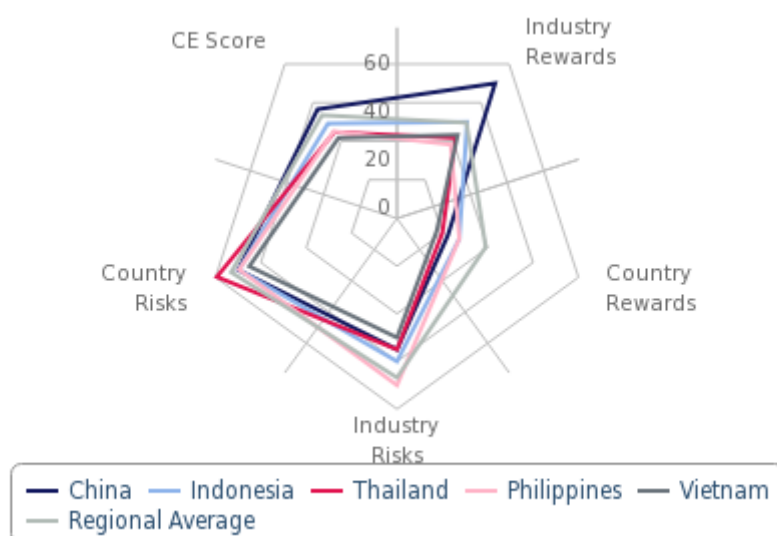
Industry Risk/Reward Index

BMI View: Altered macroeconomic and political risks outlooks were applied to most of the Asian markets we cover in Consumer Electronics and as many of these amendments were positive in nature, so the overall Risk/Reward Index score appreciated this quarter. The two markets negatively affected by new data were Thailand and Pakistan, already two of the most challenging countries from an investment perspective.

There was a 2.9 point increase to the overall Consumer Electronics score on our Asia Risk/Rewards Index in Q218, taking the regional average to 53.5 points out of a potential 100. There are many Asian markets where sales and investment potential is not being fulfilled but, broadly, that potential is being kept in check by flattish sales of key products such as TV sets and audiovisual equipment. The smartphone market also shows that, while sales in terms of volumes are increasing, falling prices offset most of the gains being made.

Just three of the 14 markets we survey recorded altered Industry Rewards scores this quarter as, in general, we had no need to alter market forecasts while we await Q3 or full year 2017 data. The three markets that did receive new scores were Thailand (-1.6 points), the Philippines (+3.3) and Vietnam (+2.4). Conspicuously, all three lie near the bottom of the league table, so these adjustments have a greater impact given base effects.

China Surges Ahead, Leaving Weaker Rivals Behind
Underperforming Markets' RRI Scores, Q218



Note: Scores out of 100, with high scores denoting low risk. Source: BMI

Thailand suffered a 1.6 point reduction in its Industry Rewards score, which is now the third lowest in the region and well below the average of 49.6. We expect a deceleration in smartphone spending growth as saturation approaches, which will affect the market as a whole because it is the largest product category. Meanwhile, we anticipate an improvement in the computer hardware segment, after a multiyear contraction over 2013-2017, based on pent-up demand for PCs, especially premium devices such as ultra-slim, hybrid and gaming notebooks. The return to growth will, however, be modest because of the underlying drag from contracting demand for tablets where cannibalisation of demand by smartphones will be a negative factor, especially at the low-end.

Vietnam gets a higher Industry Rewards score this quarter as we raised overall spending forecasts in most product categories. Purchasing power growth will drive increases in device spending as vendors will be able to tap into relatively low device penetration rates, in addition to increased demand for lifestyle and higher specification devices at the higher end of the income scale. Meanwhile, the Philippines benefits from a raised expectation of 5.4% growth in spending on devices linked to the slower rate of peso depreciation against the US dollar.

As noted above, most of the changes this quarter occur in Country Risks, where 11 out of 14 markets had their scores revised. The most notable change was that recorded by China, which now enjoys a Country Risks score of 70 (previously, it was below 40 points). Our Asia Country Risk team upgraded 2017 and 2018 real GDP growth rates to 6.8% and 6.5%, respectively, acknowledging the country's success in addressing significant overcapacity issues as well as an acceleration in business reforms.

China's services sector will continue to outperform over the coming years and act as a key support to the economy as more resources are directed towards consumer focused industries. Notably, the e-commerce sector performed very well, growing by 34.2% y-o-y. We believe that the e-commerce sector will benefit from wider accessibility of internet retail sales channels due to state support for technology, along with the proliferation of 3G/4G and falling smartphone prices.

Most other countries saw only modest changes to their Country Risks scores, linked to improved short to medium term economic growth outlooks based on H117 data. Indonesia and Pakistan both saw downward movement in their scores, however, keeping them below the regional average. We believe Indonesia's 2018 budget is unrealistic, particularly with regards to revenue targets; underperformance will seep down to consumer spending power and inhibit sales potential from a consumer electronics perspective.

As for Pakistan, our Country Risk team is below consensus with regards to the weak economic growth outlook, partly led by depreciation of the rupee relative to the US dollar. We also expect inflation to rise faster than most observers are currently expecting. Neither view bodes particularly well for the consumer electronics sector.

ASIA-PACIFIC CONSUMER ELECTRONICS RISK/REWARDS INDEX, Q2 2018

Country	Industry Rewards	Country Rewards	Industry Risks	Country Risks	Q218 CE Score	Q-o-Q Change	Q218 Rank
Australia	60.0	72.5	85.0	76.0	68.9	0.1	1
Japan	61.6	67.5	85.0	75.6	68.4	0.0	2
South Korea	55.0	55.0	70.0	85.0	64.6	3.0	3
Hong Kong	50.0	70.0	80.0	72.0	62.5	0.0	4
Singapore	43.3	67.5	85.0	84.5	61.7	0.4	5
China	70.0	22.5	55.0	70	56.6	5.7	6
Taiwan	43.3	42.5	70.0	85.9	54.0	-0.1	7
Malaysia	46.7	37.5	70.0	80.0	53.2	0.0	8
Indonesia	50.0	27.5	60.0	69.7	49.2	-0.2	9
India	53.3	10.0	60.0	65.4	45.9	0.2	10
Philippines	38.3	27.5	70.0	69.6	45.1	1.2	11
Thailand	41.7	20.0	55.0	79.4	44.7	-1.4	12
Vietnam	43.3	17.5	50.0	65.1	41.7	1.0	13
Pakistan	38.3	10.0	40.0	45.0	32.8	-0.5	14
Average	49.6	39.1	66.8	73.1	53.5	2.9	

Note: Scores out of 100, with 100 being the best. The Consumer Electronics (CE) Index is the principal score. It comprises two sub-indices, Rewards and Risks, which have a 70% and 30% weighting, respectively. In turn, the Rewards Index comprises Industry Rewards and Country Rewards, which have a 65% and 35% weighting and are based on growth/size of the CE industry (Industry) and the broader economic/socio-demographic environment (Country). The Risks Index comprises Country Risks, which have a 40% and 60% weighting and are based on a subjective evaluation of barriers to entry and the regulatory environment (Industry), and the industry's broader Country Risk exposure (Country), which is based on BMI's Country Risk Index. The Index structure is aligned across all industries for which BMI provides Risk/Rewards Indices. Source: BMI

Market Overview

Recent Developments

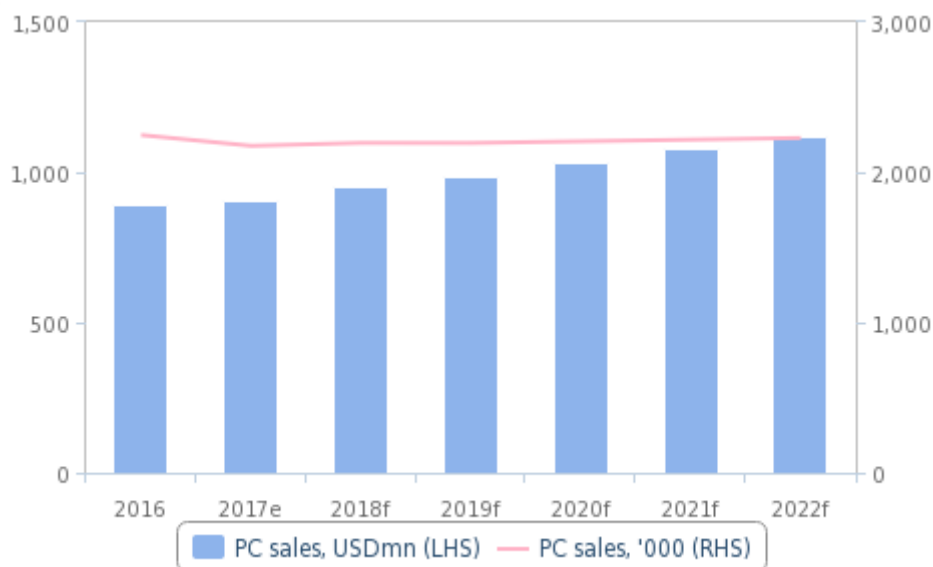
- The computer hardware market stabilised in 2017 after multiyear contraction in 2014-2016 when product trends hit performance as usage shifted towards a mobile-first market.
- There was a boom in AV spending over 2015-2017, especially for flat-panel TV sets, when the market was boosted by liberalisation of tariffs and retail.
- The handset segment sustained double-digit US dollar growth in each year of 2012-2017 as smartphone volumes soared, and handsets increased to almost 60% of total device sales by 2017.

Computer Hardware

PC SALES (VIETNAM 2016-2022)							
Indicator	2016	2017e	2018f	2019f	2020f	2021f	2022f
PC sales, USDmn	890.22	903.48	950.79	989.02	1,034.20	1,078.45	1,121.46
PC sales, '000	2,247.81	2,176.13	2,195.49	2,194.97	2,205.85	2,216.97	2,228.23
Desktop sales, '000	743.41	699.55	707.94	695.20	690.33	680.67	666.37
Notebook sales, '000	778.65	828.48	869.90	909.92	946.32	984.17	1,023.54
Tablet sales, '000	725.76	648.10	617.64	589.85	569.20	552.13	538.32

e/f = BMI estimate/forecast. Source: BMI

The computer hardware market contracted in Vietnam over 2014-2016 before stabilising in 2017 when notebook demand growth was sufficient to offset declining demand for desktops and tablets. The downturn in the tablet market was an important trend because of an increasing competitive threat from smartphones cannibalised some replacement spending, as well as affecting first-time buyer numbers. A larger share of the population in frontier markets were adopting smartphones as their only computing device, thereby putting the computer hardware segment on a permanently lower trajectory.

Computers: Demand
 (2016-2022)


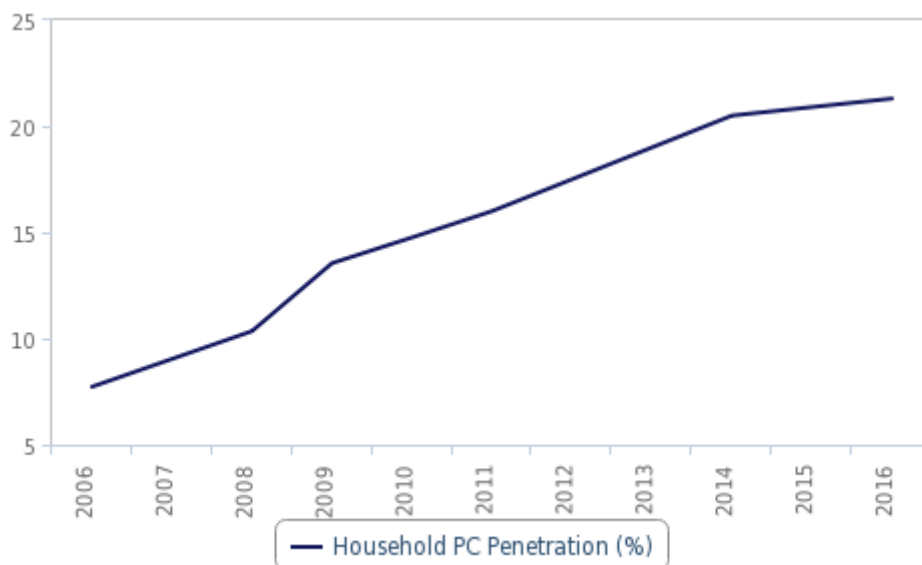
e/f = BMI estimate/forecast. Source: BMI

PCs

Vietnam's retail PC market is characterised by low levels of ownership, though there was widespread use of PCs in enterprises and government agencies, meaning the market is less reliant on consumer demand than more developed economies in the region. Official MIC statistics show household PC penetration reached 21.3% in Vietnam in 2016, putting it ahead of most other frontier markets in APAC such as India, Indonesia and Sri Lanka, and on a par with the Philippines.

Despite such low ownership levels against a backdrop of income growth momentum and declining PC prices, which increased affordability, there was no strong development for PC ownership in Vietnam during the review period. PC penetration was only up by 1.3pps 2014-2016.

Vietnam Household PC Penetration (%)
2006-2016



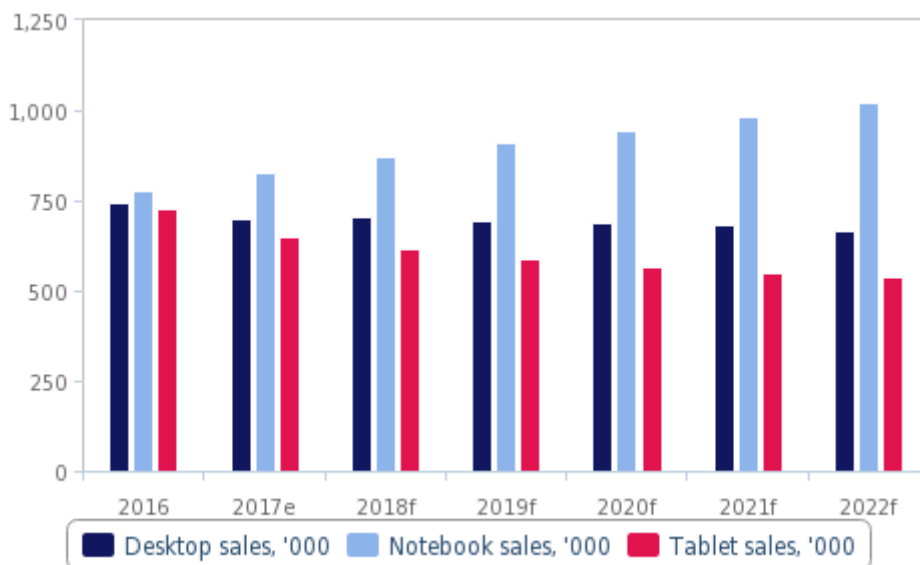
Source: MIC, BMI

This was because the traditional market trajectory of rising PC penetration as incomes increase and device prices decline was weakened in price sensitive frontier markets like Vietnam due to smartphone cannibalisation. The higher price sensitivity of low-income households meant there was an affordability constraint on maintaining distinct devices, and historically low levels of PC ownership and usage meant Vietnam was positioned to become a mobile-first market where large numbers of consumers become accustomed to smartphones being their sole computing device.

Tablets were the most vulnerable PC device type to cannibalisation by smartphones due to the limited differentiation of use cases, for instance between a small screen tablet and phablet, which we believe means the contractionary trend in tablet volumes in Vietnam in 2015 and 2016 will extend out over the medium term.

There was however a stabilisation in notebook spending in 2017, a materialisation of our forecast for outperformance of PCs that maintained a greater degree of functionality differentiation to smartphones. An additional positive for notebook sales was the upturn in demand for gaming and hybrid devices.

PC Volume Forecast
(2016-2022)

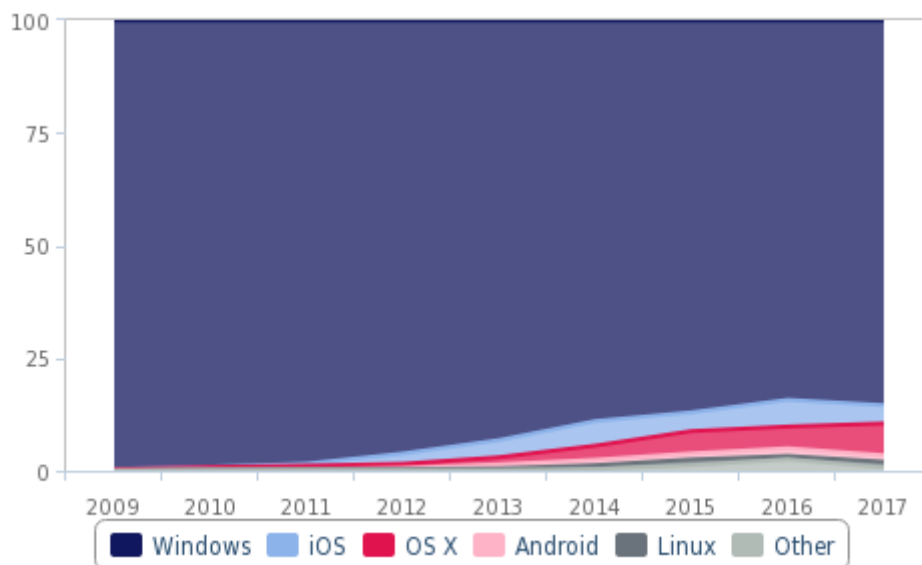


e/f = BMI estimate/forecast. Source: BMI

The retail desktop market underwent a sustained contraction during the review period, with consumers exhibiting a strong preference for mobile form factors and so devices were not replaced at end of life. This negative trend was however cushioned by growing demand from the increasing digitisation of enterprise and public sectors as the economy expanded and modernised. This was also a positive for desktop selling prices as higher value products, such as workstations accounted for a larger share of the desktop sales mix.

The leading vendors in the PC market are all Windows partner vendors with strategies targeted at a price sensitive market, led by US vendor **Dell**, ahead of Taiwanese vendor **ASUS**. Behind the leading two players are other Windows partner vendors including **Lenovo**, **Acer** and **HP**. The most important distributor is local company **FPT Distribution**, which has a nationwide network of 400 dealers. Meanwhile, **Apple** occupies a high-income but small premium niche in desktops and notebooks, but with a stronger position in tablets via the iPad.

Vietnam PC Browsing Traffic By OS (%)
2009-2017

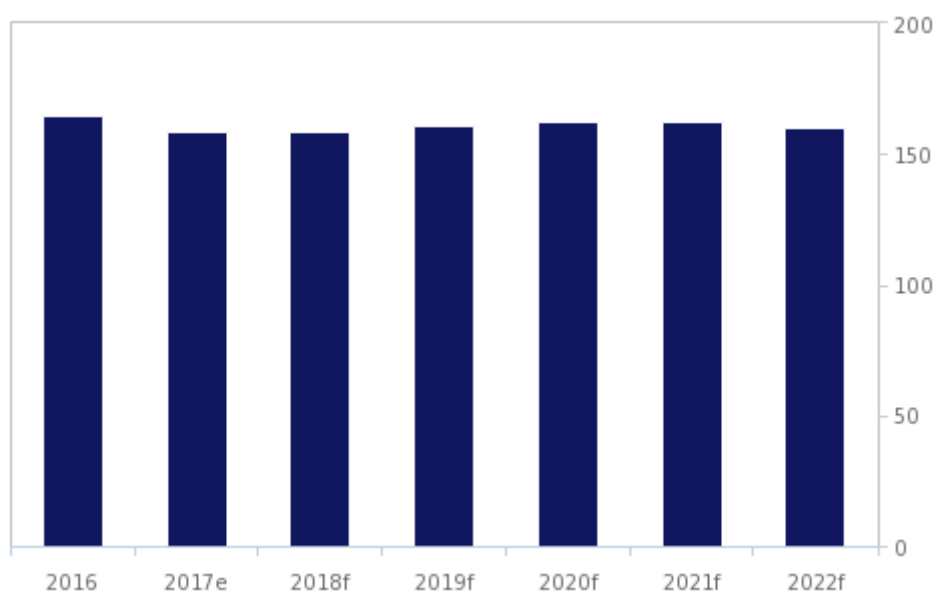


Source: Statcounter

Printer, Copier And Multifunctional Peripherals

Printer spending increased slightly in 2016 as the market stabilised after sharp declines in both 2014 and 2015, but then there was again a decline in 2017. There is some scope for higher levels of printer and copier spending in Vietnam due to its frontier market status, which means vendors could benefit from the increased informatisation of the public and private sectors that accompanies economic development. This will, however, be offset by pressure on retail and enterprise printer spending from the wider ownership of mobile PCs and smartphones, as well as the trend towards paperless offices and meetings, and environmental initiatives. There was underperformance for standalone inkjet and laser printers compared to multifunctional devices over 2015-2017.

Printer And Copier Spending Forecast
(2016-2022)



e/f = BMI estimate/forecast. Source: BMI

Audio-Visual

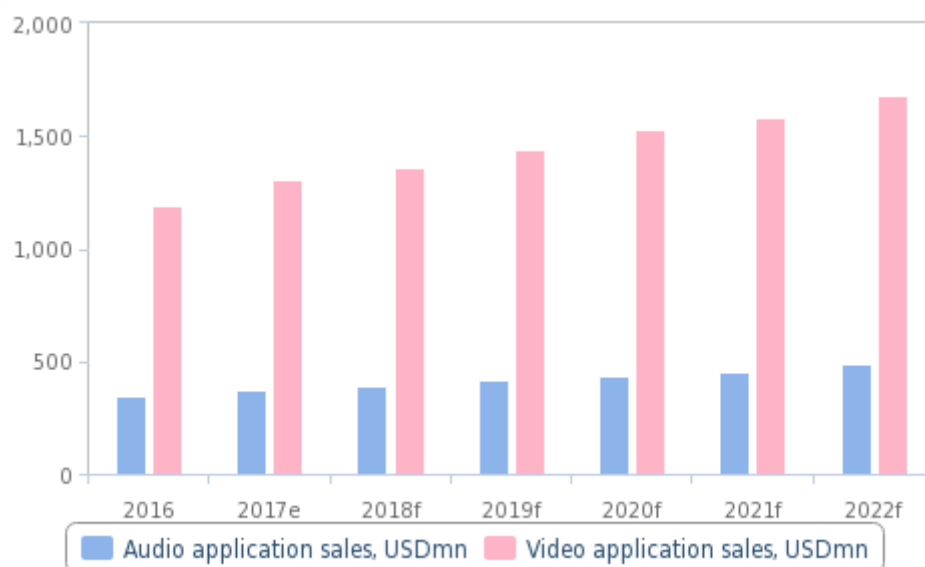
AV SALES (VIETNAM 2016-2022)

Indicator	2016	2017e	2018f	2019f	2020f	2021f	2022f
Audio visual sales, USDmn	1,536.14	1,683.72	1,755.74	1,853.29	1,968.77	2,039.65	2,174.08
Audio application sales, USDmn	346.26	376.04	391.83	415.73	437.77	456.59	491.29
Video application sales, USDmn	1,189.88	1,307.68	1,363.91	1,437.56	1,531.00	1,583.05	1,682.79
Flat-panel TV set sales, '000	1,022.01	1,130.44	1,190.36	1,271.30	1,366.65	1,424.05	1,436.86
Digital camera sales, '000	140.95	136.44	131.40	128.37	126.45	125.56	125.69

e/f = BMI estimate/forecast. Source: BMI

Strong growth in audio-visual spending during 2015-2017 in Vietnam was fuelled by upgrades to flat-panel TV sets - the largest product category at around 50% of total spending. Additional momentum for upgrades came from purchasing power growth, tariff cuts as part of Vietnam's WTO Free Trade Agreement, and a liberalisation of retail that allowed foreign companies to have full ownership of businesses under the new commercial law. The competitive landscape was diverse, including the global leaders, Chinese OEMs and then Vietnamese brands that mounted a strong challenge during the review period.

AV: Demand
(2016-2022)



e/f = BMI estimate/forecast. Source: BMI

TV Sets And Accessories

There was strong growth over 2015-2017 in Vietnam's TV set market when performance was driven by flat-panel upgrades that were unlocked by retail and trade liberalisation, migration to digital services and price erosion that resulted from competition between disruptive local brands, Chinese OEMs and global market leaders. This represented a turnaround from performance in 2014 when the market dipped as the domestic credit environment tightened, which had an impact because of Vietnam's highly price sensitive market, where TV sets are big-ticket items for the vast majority of Vietnamese households and as such are subject to deferral.

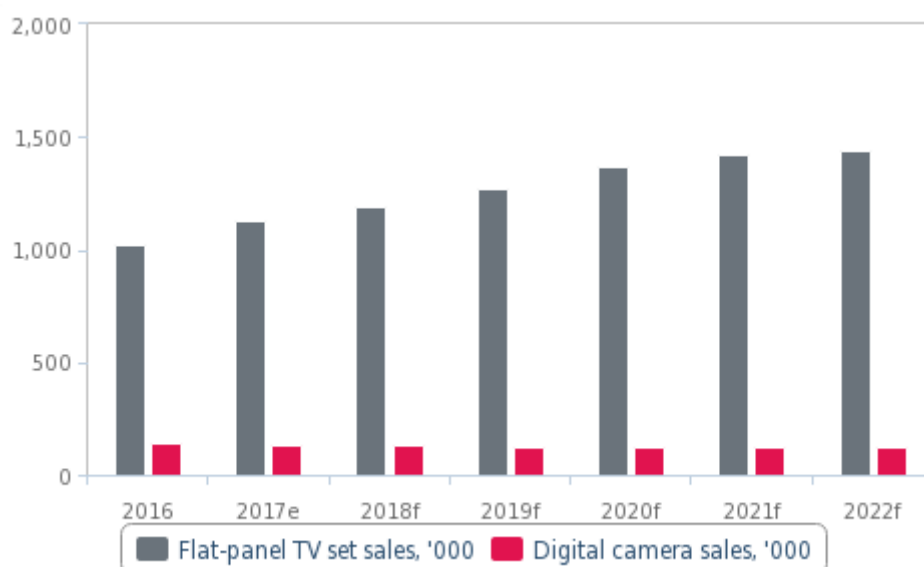
The strong economic environment was boosted by TV set performance, but an important starting characteristic was the much lower level of flat-panel TV set ownership compared to developed and emerging markets, which were either at or approaching saturation in the early years of the review period. Meanwhile, in Vietnam, colour TV set ownership has long been widespread, but there was still a pool of potential first-time flat-panel LED/LCD upgrades even at the end of the review period in 2017.

Vietnam's frontier market status also impacted technology trends. As noted, LED/LCD flat-panel upgrades were the dominant trend, with a large number of first-time upgrades, but there was also strong growth in smart (connected) TV technologies in 2014-2017 because of the low-cost of adding networked features. There was however little impact from Ultra-HD 4K, OLED or HDR TV sets because even with price declines in 2015-2017 globally, they were still out of reach for the majority of households at four to six times the price of a non-UHD sets in 2017.

Samsung Electronics is the leader in Vietnam's TV set market, with a market share of around one-third. Samsung has a deep range of TV sets available that hit price points attractive to premium and middle class consumers in Vietnam, as well as a large marketing budget to support brand awareness, that has enabled it stay ahead of its global rivals such as **LG** and **Sony**. Meanwhile, Vietnamese brand **Asanzo** is the leader in the rural market, with around 80% of Asanzo sales in rural areas in 2016, but its low-cost strategy also extended to competing in more affluent segments, for instance with 4K sets where it sold 12,000 units in the last two months of 2017. It sold 500,000 TV set units in 2016, a figure that increased to 710,000 in 2017, and benefited from extensive reach outside the major urban areas, with 6,000 points of sales and 1,000 service stations in Vietnam.

There were important developments in the TV set accessory market over 2012-2017. Most important was the government's digitisation of television broadcasting and transmission plan that will run until 2020. Beginning in 2014, manufacturers were required to integrate digital terrestrial signal receiving functions in TV sets sold in the Vietnamese market. This also acted as an upgrade push factor both for TV sets and receivers. Meanwhile, there was steady growth in set-top box (STB) demand, in part driven by digital migration, but also the increased adoption for pay-TV services. The MIC's White Book for 2017 showed a total of almost 10.9mn cable-TV subscribers (but 7.2mn were analog), as well as more than 0.5mn digital terrestrial and almost 1.4mn digital satellite subscriptions. This was up from 9.9mn total pay-TV subscriptions in 2015, and 6.7mn at the end of 2013, illustrating a stream of STB demand as first-time subscribers entered the market.

AV: Demand Key Products
(2016-2022)



e/f = BMI estimate/forecast. Source: BMI

Digital Cameras

The digital camera market never reached the levels of ownership in developed markets because of low incomes and high price sensitivity during the peak years of the global digital camera boom. There was nonetheless still a decline in the number of digital cameras sold in Vietnam over 2013-2017 because of the proliferation of smartphone ownership that cannibalised demand for dedicated devices among casual users. The worst affected part of the market was point and shoot compact digital cameras where smartphone camera capabilities improved to be strong substitute products during the review period.

The rate of decline was not as steep as in high and middle income markets where digital camera ownership was more widespread before smartphone competition arrived. Therefore the concentration of the market on premium customers and power users was less pronounced, but it was still products with optical zoom features not ready substitutable for smartphones - including DSLR cameras, lenses, and action cameras - that outperformed.

Games Consoles

The games console market is small in Vietnam, with low levels of ownership for both consoles connected to a TV set and for handheld devices. The reason for a small legacy of console gaming is that they are unaffordable for the vast majority of households, but even with rising incomes in Vietnam during 2012-2017 there was little convergence towards leading global markets such as the US, Western Europe and Japan. This was because of a greater role for PC and online gaming in the local culture, and meant the impact of next-generation of consoles from Microsoft (Xbox One) and Sony (PlayStation4) in 2014 was less pronounced than even most other frontier markets.

Audio

Audio spending accelerated in 2017, with several positive product trends behind this performance. There was strong demand for soundbars, a trend derived from the flat-panel TV set boom. Smartphone complimentary audio devices also registered strong performance, including for headphones and wireless speakers even though a large number of Vietnamese consumers will use the headphones/speakers that come bundled with the primary device purchase.

The strong performance in flat-panel TV and/or smartphone accompanying audio was enough to counter weaker dynamics for stalwarts of Vietnam's audio market such as radio receivers and loudspeakers. There was pressure on radio demand as an increasing number of households transitioned to TV sets as the primary media device, and then smartphones began to erode their role as an information service. Nonetheless, radio receivers, along with loudspeakers, were still the largest product categories in the audio market over 2011-2016, ahead of other products such as headphones and amplifiers.

Mobile Devices

MOBILE COMMUNICATIONS (VIETNAM 2016-2022)							
Indicator	2016	2017e	2018f	2019f	2020f	2021f	2022f
Mobile handset sales, USDmn	3,722.19	4,296.89	4,636.35	4,525.07	4,764.90	4,999.34	5,241.80
Smartphone sales, USDmn	3,429.89	4,098.72	4,484.00	4,376.38	4,636.77	4,891.80	5,151.06
Mobile handset sales, '000	39,556.02	40,513.28	41,769.19	41,226.19	41,885.81	42,137.13	42,389.95
Smartphone sales, '000	21,729.69	28,222.52	32,201.89	31,622.26	33,614.46	35,194.34	36,531.72

e/f = BMI estimate/forecast. Source: BMI

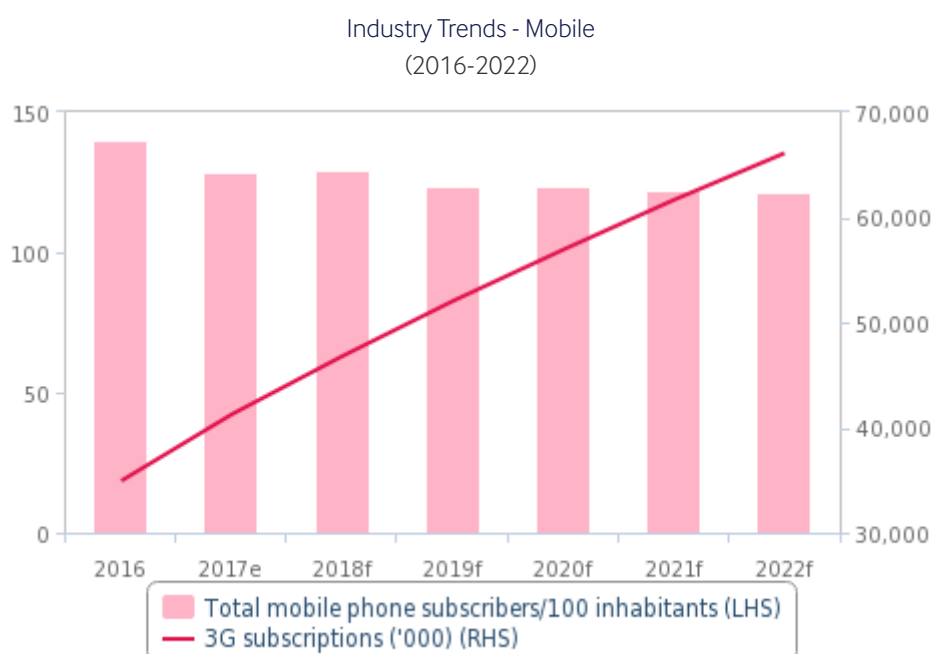
There was a sustained boom in handset spending in Vietnam as smartphone ownership proliferated rapidly during the review period. The key enabler of the boom was the availability of low-cost Android devices where competition between global leader

Samsung, Chinese brands and local vendors resulted in smartphone prices declining rapidly and deepening the market to income levels lower than those reached by PC or flat-panel TV set vendors. The fall in average selling prices did however mean narrow margins for Android vendors where differentiation and brand loyalty was a constant challenge.

Mobile Subscription Trends

Despite being a frontier market Vietnam has a mobile penetration rate higher than its regional peers, a characteristic developed due to aggressive price competition among operators. The adoption of wireless data services was however still a developing trend and far below developed markets in APAC, at around one-third of total subscriptions in 2017.

The major development in the mobile services market was the award of 4G licences to four operators in October/November 2016; **VNPT-Vinaphone** launched its service in late November while **Viettel** launched its network in April 2017. **MobiFone** rolled out 4G services in 345 cities and provinces in July 2017, while **G Mobile**, the fourth licensee, bypassed 3G to move directly to 4G.

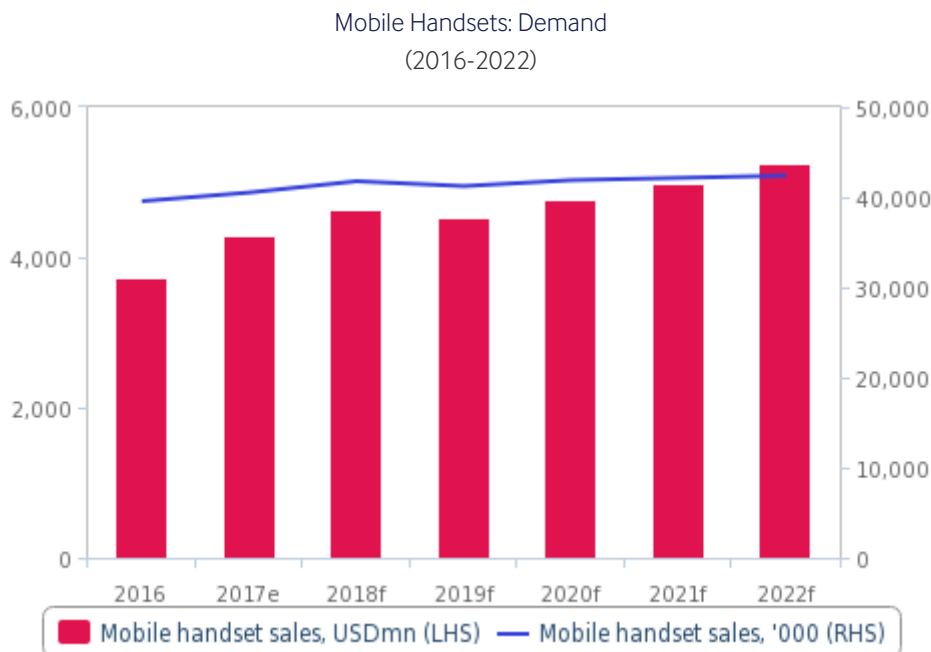


e/f = BMI estimate/forecast. Source: BMI, operators, VNTA

Handset Market

Handset ownership was already widespread in Vietnam at the start of the review period, and the only significant areas of low penetration were remote rural areas. There was not therefore a strong volume growth dynamic during 2012-2017 because of a depleted pool of first-time buyers, and so vendors came to rely on replacement purchases. In addition there was a negative trend for replacement volumes because of lower levels of multiple device ownership and longer replacement cycles associated with smartphone ownership.

While volumes did not have sustained growth, there was a boom in handset spending driven by a deepening of the smartphone market that pushed up the average selling price. There was however still a large market for 2G/featurephones, reflecting Vietnam's frontier market status. This means there was still demand for low-cost phones, particularly in rural areas, in 2017. Even so there was sustained pressure on featurephone market leader **Nokia** as smartphone prices carried on declining during the review period.

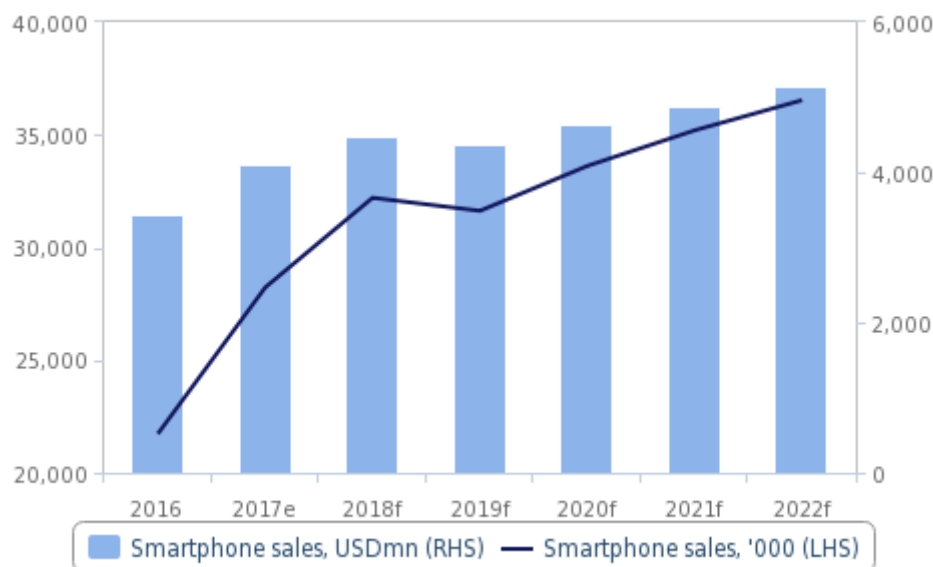


e/f = BMI estimate/forecast. Source: BMI

Smartphones

The growth in smartphone sales in Vietnam was the main product trend in the consumer electronics market, enabled by steep declines in prices as a result of intense competition in the Android ecosystem. This meant smartphone ownership quickly passed PCs, and then for an increasing number of local consumers they were the first and only computing device used for accessing the internet. This mobile-first developmental path was common to several other frontier markets in APAC.

The smartphone boom transformed the sales mix in Vietnam, with the share of smartphones increasing dramatically, from just 6% of units in 2012 to more than two-thirds by 2017. In order to fuel such strong volume growth in a frontier market there was a steep fall in average selling prices, first in the USD100-150 segment, and then by 2016 there was also strong demand for smartphones priced under USD100. Despite falling average selling prices the boom in volumes was sufficient to offset and ensure the market continued to growth in value terms.

Mobile Handsets: Smartphones
 (2016-2022)


e/f = BMI estimate/forecast. Source: BMI

Samsung Electronics is the market leader in Vietnam, and as is the case globally, the South Korean vendor was the most successful Android partner in capitalising on, and driving, the smartphone boom. It has a strong presence in the small premium market, competing against **Apple**, in the major urban centres where brand loyalty and after sales service is critical. This was behind Apple's decision in 2015 to appoint **FPT Shop** and **The gioi di dong** (Mobile World) as official retailers in Vietnam, enabling them to import iPhones direct from Apple Singapore.

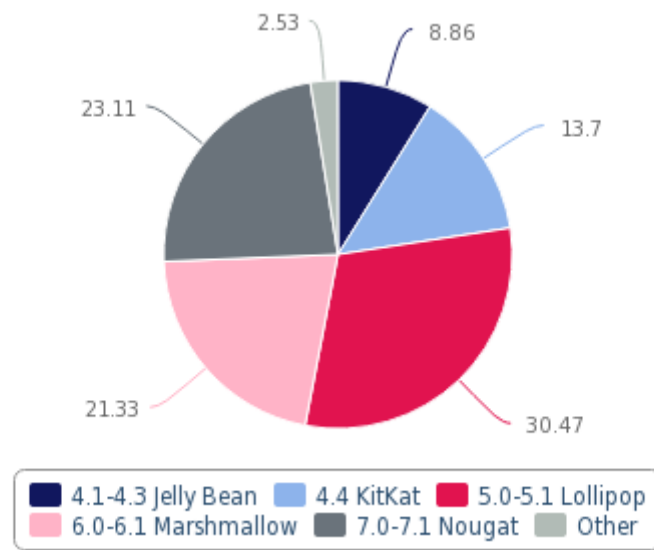
The core of Samsung's mobile business in Vietnam was built on its more affordable smartphone ranges such as the Galaxy J, which was often the most popular handset in the market during the review period. In the early years of the review period Samsung's success came by out competing first-generation Android vendors such as **LG**, **HTC** and featurephone market leader Nokia - but by 2016-2017 the landscape had changed and the main rivals were Chinese brands.

Oppo was the second largest vendor in Vietnam in 2017, where it is positioned in the mid-range of the local market after it increased marketing spending, especially outside of the main urban markets, since 2015. Another Chinese brand - **Vivo** - was in the top-five, according to Counterpoint Research.

Two other success stories in 2017 were **Nokia HMD** and **iTEL**. HMD produces Android smartphones under the Nokia brand, which still had cache in Vietnam and so it was able to make inroads against other Android partners and local brands. Meanwhile, iTel launched in Vietnam in 2017 is part of Hong Kong based **Transsion Holding** that is a frontier market focused smartphone group that has had significant success in Sub-Saharan Africa.

The losers in the smartphone market during 2016-2017 were local brands such as **Q-Mobile**, owned by **ABTel**. It had positioned at the low end of the Android ecosystem and benefited from local branding and retail relationships. However, Q-Mobile and other Vietnamese brands such as **Mobiistar**, **Bavapen** and **Masscom** that pursued ultra-low cost strategies got squeezed in the face of the scale of Chinese vendors.

Vietnam Android Mobile Browsing Traffic By Version (%)
December 2017



Source: Statcounter

Industry Trends And Developments

BMI View: Vietnam has quickly emerged as an important node in global consumer electronics supply chains, most prominently through the boom in smartphone production and exports. The boom in the electronics industry is being driven by investment from foreign companies - most notably Samsung and LG Electronics from South Korea, and US chipset vendor Intel - that have looked to take advantage of the attractive cost profile in Vietnam as wages rise in China.

Consumer Electronics Trade

Vietnam is a major production centre for electronics devices and components with a high level of integration into regional and global supply chains, especially for mobile handsets where it is one of the largest exports globally. As well as assembling end-user ready devices for export, Vietnam also has a domestic component industry which means it is less reliant on imported inputs for assembly than some other markets of comparable wage levels in Emerging APAC that are more concentrated in the assembly of finished devices. It is nonetheless still primarily characterised as an electronics market at the low-value end of the spectrum, and this is reflected in trade flows where it has a surplus for computer hardware, AV and telecommunications devices, and a deficit for components that grew as the electronics industry expanded.

Trade data for 2016 show a large increase in the consumer electronics surplus for Vietnam, but we caution that this is based on mirror data from Intracen and is unlikely to reflect the final figures when reported directly by official Vietnamese sources. There was a similar relationship for 2015 data that was initially reported as surplus for components based on mirror sources, before being revised down when final data became available. The data to 2015 is still able to show some clear trends because there is a boom taking place in Vietnam's electronics industry - as trade flows increased to 28.5% of national goods exports in 2015, and 20.1% of imports.

VIETNAM CONSUMER ELECTRONICS (CE) TRADE, 2011-2016

Trade Balance (USDmn):

	2011	2012	2013	2014	2015	2016
Computer hardware	1,189	2,559	4,481	4,488	5,486	4,734
Electronic components	-3,401	-6,699	-9,699	-9,795	-10,875	712
AV	-257	-252	-170	143	1,010	4,767
Telecommunications devices	5,158	9,653	18,491	20,195	23,810	29,283
Consumer electronics parts	-1,611	-2,433	-6,625	-6,918	-6,597	297
CE total	1,079	2,828	6,478	8,113	12,834	39,793

Exports (USDmn):

	2011	2012	2013	2014	2015	2016
Computer hardware	2,345	3,718	5,808	6,125	7,053	6,242
Electronic components	1,022	2,399	2,708	2,836	5,253	17,241
AV	634	1,081	1,435	1,834	2,834	6,068
Telecommunications devices	6,065	10,405	19,491	21,499	25,223	31,280
Consumer electronics parts	788	2,714	2,192	2,665	5,817	11,900
CE total	10,854	20,317	31,635	34,959	46,180	72,731

Trade Balance (USDmn):

CE as % of national exports	11.2	17.7	24.0	23.3	28.5	34.4
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Imports (USDmn):

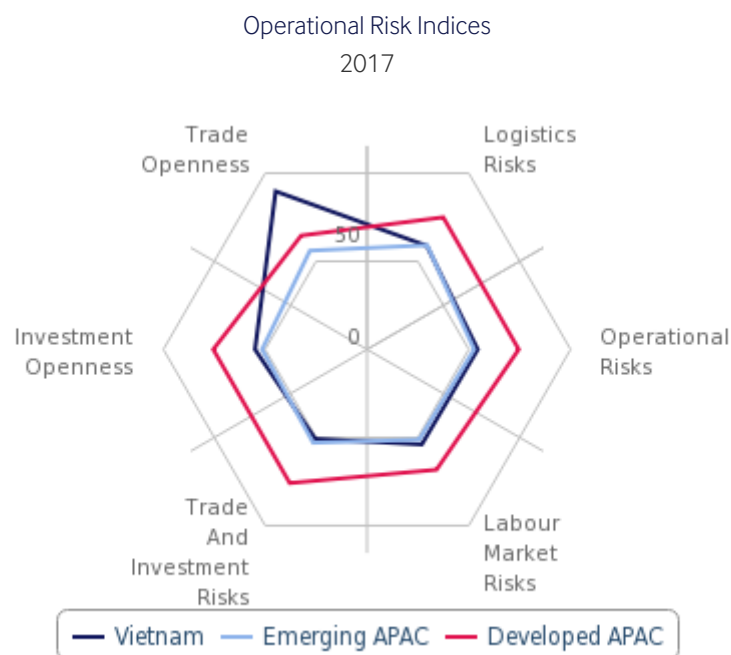
	2011	2012	2013	2014	2015	2016
Computer hardware	1,157	1,159	1,327	1,637	1,566	1,508
Electronic components	4,423	9,098	12,408	12,631	16,128	16,530
AV	890	1,333	1,605	1,691	1,824	1,301
telecommunications devices	906	753	999	1,304	1,412	1,997
Consumer electronics parts	2,399	5,147	8,818	9,583	12,414	11,603
CE total	9,775	17,489	25,157	26,846	33,346	32,938
CE as % of national imports	9.2	15.4	19.1	18.2	20.1	16.6

Source: Intracen, BMI

Industry Analysis

Vietnam's electronics industry has expanded rapidly in recent years and has been an important contributor to the country's strong overall economic performance. Vietnam scores in line with the Emerging APAC regional average in most of the categories of **BMI's** Operational Risk Indices, but behind Developed APAC in all but Trade Openness where it is among the highest scores in the region. The liberal trade regime has been a major positive for the development of the domestic electronics and software development industries, and helped attract major inward investment from global electronics leaders such as **Samsung, LG** and **Intel**.

A key factor is that Vietnam has low wage levels for both manufacturing and technically skilled roles that has attracted foreign investment, and therefore in 2016 the ILO reported that 99 out of the 100 largest electronics companies in the country were foreign owned. Manufacturing wages were around 20% cheaper than the Emerging APAC average in 2016 and at just 40% of the level in China, enabling Vietnam to attract investment as manufacturers look to diversify in labour intensive assembly but retain proximity to existing East APAC supply chains.



Source: BMI

Computer Hardware

Printers have historically been the main product category for Vietnam's computer hardware industry, with government statistics estimating production of 14.5mn devices in 2015, and this made Vietnam one of the leading production centres for printers globally, and a major exporter. The industry was however undergoing a period of substantial contraction over 2014-2015, with output down from a high of 17.3mn units in 2013 as printer demand was adversely affected by the wider adoption of mobile PC devices. There was however a bright spot in H216 when **Fuji Xerox** announced plans to develop another factory in Haiphong, and it stated that it regarded Vietnam as a key production base in the region. **Canon** is another of the global printer market leaders with major production facilities in Vietnam.

Since 2012 there has been a surge in PC exports from Vietnam, which overtook printer & copier exports in 2013, with mobile PCs (notebooks and tablets) the largest product category. Intel's CPU production facility in Vietnam (see below) is a major draw for vendors and contract manufacturers, particularly in the context of the low labour costs in Vietnam and increasing pressure on contract manufacturers in China where wages are rising. This has attracted export oriented investments, for instance Kingtec Group from Taiwan is building an electronics manufacturing plant in Binh Duong Province that will export to Europe and North America.

A major landmark for the computer hardware industry was reached in 2017 when Taiwan's **Compal Electronics**, the second-largest notebook manufacturer globally, began manufacturing operations in Vietnam, after announcing an investment of USD500mn in 2015. There was however a change of its plans because local sources reported that the facility would be geared towards a greater share for smartphone and tablet production, and away from the notebook focus that was previously envisaged due to weak PC demand from customers globally.

Compal had initially planned large production facilities in Vietnam in 2007, and secured the highest investment incentives available - 10% corporate tax for a 50-yr project duration - but plans were suspended in 2013 due to incomplete supply chains that reduced efficiency. However, by 2015 the ecosystem was stronger and the Compal refreshed its plans to invest in a facility in the northern province of Vinh Phuc that will have capacity for 24mn notebooks a year, as well as monitors, peripherals, LCD TV sets and other electronics. It is estimated that around a dozen companies will invest in operations in Vietnam to supply the facility, which could take total employment generated to over 200,000, while annual revenue for only Compal is expected to be in the region of several billion US dollars annually, the majority of which will be for export.

Components And Parts

Vietnam's component and parts industry has been a major success story and means that the country is not just an electronics assembly centre capitalising on its low labour cost competitive advantage. The growing importance of the semiconductor industry reflects strong demand from the domestic electronics industry that previously relied on imports, as well as investments by major international vendors looking to capitalise on the low cost of skilled labour in Vietnam. This is reflected in the fact that Vietnam was ranked 20th globally for imports of semiconductor manufacturing equipment in the 2016 ITA Semiconductors report.

One major driver of demand for semiconductor manufacturing equipment was the government owned **Saigon Industry Corporation (CNS)** semiconductor fab that began operations in 2016, and there is scope for further investments as the fab expands and moves towards the production of newer semiconductor technologies. The CNS plant is expected to produce 1.8bn integrated circuits annually, with sales of around USD90mn.

The centrepiece of Vietnam's components industry continues to be the operations of US global chipset leader **Intel** that has invested over USD1bn and has been producing notebook and mobile chipsets in Vietnam since 2010 and had produced more than 600mn units by 2016. Around 80% of Intel computer chips sold worldwide were produced in Vietnam in 2015 after it began producing fourth generation Haswell CPUs at the facility that employed a total of around 1,000 workers in the Saigon Hi-Tech Park. The size of the Intel operations - and its stated intention to invest in upgrades to expand Internet of Things chip production in Vietnam - is also creating valuable linkages, and it is aiming for an 80% localisation rate in Vietnam, but as of 2015 it had only 16 Vietnamese firms supplying its operations. .

Other major semiconductor firms operating in Vietnam include **Renesas**, **Acrosemi**, **E-Silicon** and **Splendid Technology**. Meanwhile in 2014 **Saigon Semiconductor Technology Inc (SSTI)** became the first Vietnamese company to setup an integrated circuit manufacturing facility with a USD257.5mn investment in a plant at the Saigon Hi-Tech Park.

Samsung's display manufacturing unit announced in 2014 that it received approval for a USD1bn factory in northern Vietnam to supply small displays for smartphones and tablets, and in 2015 Samsung Display announced an investment of an additional USD3bn to augment its display module production capabilities. Then in 2017 another USD2.5bn investment from Samsung Display in the Bac Ninh province facility was approved, to take total investment to USD6.5bn - and reinforcing Samsung group as Vietnam's largest foreign investor and exporter. The investments will take place through to 2020, with local reports linking the investment to Apple's plan to shift to active matrix OLED displays. The OLED display modules produced by Samsung Display also serve as inputs to Samsung Electronics' smartphone, flat screen TV sets and tablet manufacturing facilities in Bac Ninh and Thai Nguyen.

Another display vendor is Chinese firm **Winter** which has a USD870mn touch display production plant in the north of the country. Meanwhile, Japanese vendor Panasonic invested USD3.95bn in an electronics and component production facility in Southern Vietnam. More investment in components and parts is expected to take place as vendors target the major investments from global finished device leaders such as Samsung, LG and Microsoft, as well as inputs for components after Intel announced in 2014 that it would double the value of materials sourced from local suppliers.

Audio-Visual

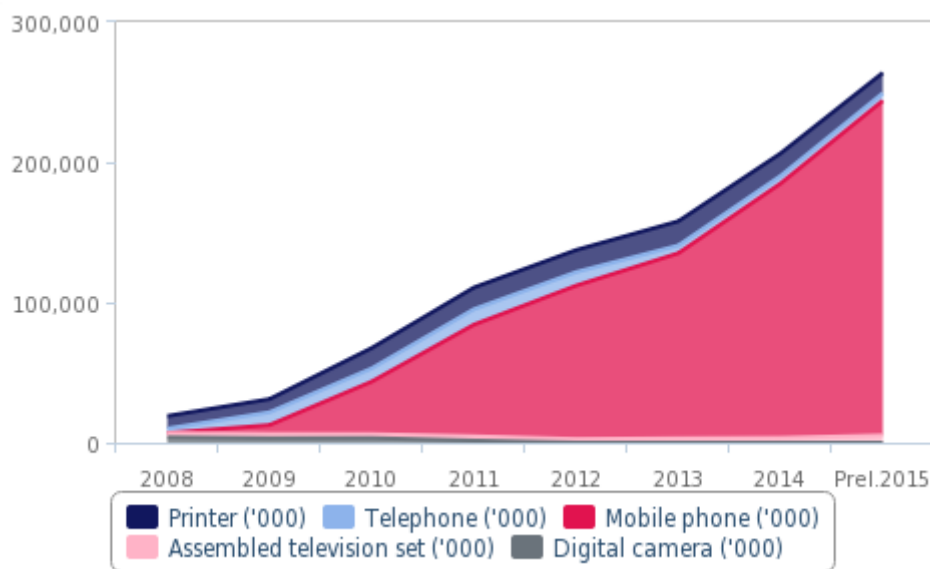
Official statistics show that the output of Vietnam's audio visual industry increased significantly in 2015 when it produced a total of almost 5.4mn TV sets, up from 3.7mn TV in 2014, and almost double the volume of output from 2012. The key driver of this increase was the investments made by Samsung Electronics and LG Electronics in production facilities in Vietnam as they looked to take advantage of lower production costs outside of China and South Korea.

LG Electronics, the second largest global TV set vendor, reiterated its commitment to producing in Vietnam in H216 when it announced plans to relocate TV production from Thailand to Vietnam in H117, which could total an additional 600,000 sets annually in Vietnam. LG wanted to consolidate TV production in the region outside of South Korea into a single facility, and it cited costs and time for component shipments from China as reasons for selecting Vietnam.

LG has invested heavily in Vietnam and is aiming for annual output of 2.3mn TV sets by 2020 from its USD1.5bn Hai Phong City factory. The plant in Hai Phong opened in 2014 and alongside TV sets produces mobile phones, washing machines, air conditioners and car infotainment systems. In H116 LG committed USD1.5bn for the establishment of an OLED factory, also in Hai Phong that could add 6,000 jobs, and then a further USD550mn investment commitment was made by LG Innotek in September 2016.

Samsung is another AV vendor that is heavily invested in Vietnam, with total investment pledges of more than USD17bn by 2017 including the Samsung Display facility and three Samsung Electronics manufacturing centres in Thai Nguyen and Bac Ninh, and an R&D centre in Ho Chi Minh City. This has seen the global consumer electronics market leader locate manufacturing in the country for several device categories. In terms of TV set production, a market in which it is the global market leader, Samsung announced a USD560mn investment in a 'consumer appliances production centre', mainly for the production of digital TV sets for export.

Vietnam Consumer Electronics Device Production
2008-2015



Source: GSO Vietnam

Communications

The mobile handset industry is the leading segment of Vietnam's consumer electronics industry. Official statistics show total output reached 238.7mn handsets in 2015 - up from just 6.4mn units in 2009. This phenomenal growth was driven by large investments from several vendors, for instance LG expects to produce 41mn mobile phones in Vietnam by 2020.

The leading force is undoubtedly Samsung, with several facilities and total staff of over 25,000 - and accounting for 10% of Vietnam's total exports (with contribution from handsets, TV sets and other electronics devices). It did, however, report a decline in financial performance in 2016 because of the Note 7 recall, because the devices had been assembled in Bac Ninh. The Thai Nguyen facility produces electronics and telecoms parts, while the Bac Ninh plant specialises in phone manufacturing and assembly. In terms of handset investments, during 2013, Samsung invested USD2bn in establishing a handset production plant in Vietnam capable of producing at least 40% of its global smartphone stock, and in 2014 it invested a further USD2bn to build a second factory in Thai Nguyen. It is estimated that as much as 80% of Samsung's global smartphone output could be located to Vietnam once its facilities reach full capacity.

Samsung has also invested in handset R&D in Vietnam, for instance, in December 2015 it was announced that the Samsung Vietnam Mobile Research and Development Centre in Hanoi contributed around 10% of software used on its smartphones and

tablets globally in 2015. The centre has more than 1,500 employees, with just five foreign nationals, and Samsung plans to increase the total to 2,600 by 2018 after a further USD300mn investment in Samsung's R&D operations in Hanoi was approved in March 2016.

A precursor to the boom in South Korean handset vendor investments in Vietnamese facilities was the presence of Nokia. The plant was founded in 2011 producing featurephones, and in 2014 began producing Lumia smartphones, exporting more than 5mn. The Bach Ninh plant initially benefited from the acquisition of Nokia by Microsoft when the latter relocated 39 production lines from Hungary, China and Mexico to Vietnam. However Microsoft subsequently divested the Nokia hardware business and sold the factory in Vietnam to the global leading handset contract manufacturer **Foxconn**. This could accelerate moves by Chinese brands such as **Xiaomi** that were in 2017 reported to be considering Vietnam as a lower cost production centre for smartphones.

Regulatory Development

The Ministry of Information and Communications of the Socialist Republic of Vietnam is the state administration in charge of policymaking and regulatory matters in posts, telecommunications, information technology, electronics, internet, radio transmission and emission techniques, radio frequency management and national information infrastructure, and management of public services. It also has control over, on behalf of government and as stipulated by laws and regulations, the state capital in posts, telecommunications and information technology enterprises. Its main functions include the following:

- Submitting to the government drafts of laws, ordinances, regulations, strategies and development plans on posts, telecommunications and information technology.
- Giving guidance in implementation of laws, ordinances and regulations, as well as development strategies and plans related to posts, telecommunications and information technology.
- Regulating the electronics and information technology industry development plan.
- Regulating the quality of posts, telecommunications and information technology networks, plants, products and services.
- Conducting international cooperation activities in posts, telecommunications and information technology, and as stipulated by law.
- Assigning and organising the implementation of regulations in fields of copyright and intellectual property rights regarding press, publications, information technology services, related inventions.
- Taking actions to protect organisations and individuals in the fields of copyright and intellectual property rights.
- Inspecting all activities and settling all regulatory breaches in the fields of its legal functions.

Cybersecurity

In response to the rising cyber threats from criminal and political actors, the government has initiated a number of programmes to improve cybersecurity. The Department of Network Security was officially opened in Hanoi in 2014, with the remit of securing Vietnam's internet traffic. It is also working with international partners to improve cybersecurity, signing a deal with Microsoft in March 2014 and cooperating with fellow Association of South East Asian Nations (ASEAN) members to combat transnational cybercrime.

The Law on Information Security passed in November 2015 and came into effect on July 1, 2016, introducing some cybersecurity protections. In more concerning provisions, the law allows the sharing of users' personal information without consent at the request of competent state agencies, mandates that authorities be given decryption keys on request, and introduces licensing requirements for tools that offer encryption as a primary function, threatening anonymity. This may jeopardize the protection of private or sensitive business information.

Tariffs

Vietnam has a liberal regime for electronics trade, and regional tariffs were lowered again as the ASEAN Economic Community (AEC) was formed, while the AEC is also committed to reducing non-tariff barriers. Intracen data show average applied tariff in 2017 for computer hardware, components and parts such as integrated circuits, and mobile handsets was 0%. The only electronics segment with tariff protection in 2017 was AV, where for example TV set imports to Vietnam had average applied tariffs of between 0.9% and 13.9% depending on the origin. Of the top sources for TV receiver imports to Vietnam in 2016, AEC markets Malaysia, Singapore and Philippines had a low applied rate of 1.6%, while China was slightly higher at 4.3%, but still faring better than Taiwan and the US (13.9%) and South Korea (10.5%).

Digital TV Signal Migration

The Vietnamese government plans to digitise television broadcasting and transmission by 2020, after the first five cities to migrate to digital services were Hanoi, Ho Chi Minh City, Haiphong, Danang and Can Tho. The deadline for conversion to digital for these cities was December 31 2015, and they account for a considerable share of Vietnam's 22mn TV households.

Competitive Landscape

Vietnam Consumer Electronics Companies

Intel

Intel opened its first office in Vietnam in 1997 and continues to be responsible for developing and deploying strategies to support OEMs and developers in the local market. In 2006, Intel announced it was going to invest USD1bn in an assembly test facility in Vietnam near Ho Chi Minh City, which began operation in 2010. The plant in Vietnam is one of seven Intel production facilities globally, as it chose Vietnam due to technical proficiency, low cost of labour and proximity to large and important markets. Intel was the first major foreign investor in Vietnam's technology sector, and the first investor in the semiconductor industry. In H216 it was initially reported that Intel was considering leaving Vietnam, but this was denied, although there would be downsizing of sales and management operations as part of a global company restructuring that leaves the production operations of Intel Products Vietnam unaffected.

Intel's assembly test facility in Vietnam is the source of around 80% of its total computer chips output, and the operations employ more than 1,000 workers at its 500,000 square foot facility. In July 2014, Intel announced the launch of its first central processing unit (CPU) manufactured at its factory at the Saigon Hi-tech Park. The CPU was from the fourth 'Haswell' generation of CPUs. In 2015, Intel moved some production for mature products (desktops and servers) from Kulim in Malaysia to Ho Chi Minh City and Chengdu (China) facilities. Intel also announced a partnership with FPT for product display and experience areas in FPT stores.

Samsung Electronics

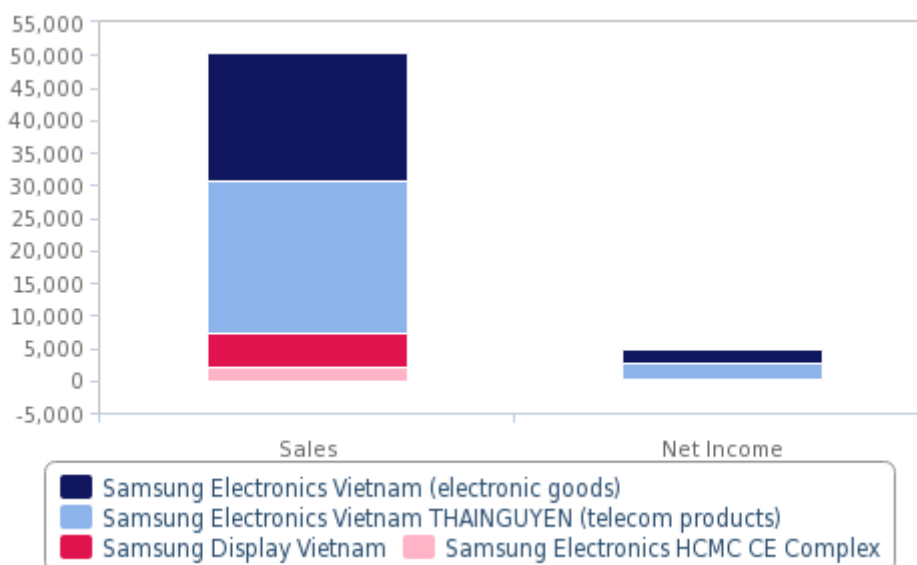
Samsung Electronics is the most important investor in Vietnam's ICT industry, and the largest exporter in the country. Meanwhile, Vietnam has become an important production centre for the electronics giant in terms of assembling finished devices where low labour costs are an advantage, but also in the production of displays, as well as research activities. The scale of Samsung's device assembly operations are so large that South Korea overtook China as Vietnam's largest source of imports in H117 as through component and parts supply for device production.

Samsung began expanding production in Vietnam in 2009 when it opened a USD700mn facility near Hanoi, with capacity of 100mn units per year, mostly for export, and staff of 10,000. The major expansion of production in Vietnam began in 2012 when it announced a USD2bn facility that in 2015 reached a full production capacity of 120mn handsets annually, about 40% of the group total. Subsequently, in December 2014 Samsung offered to raise its investment in Vietnam to USD20bn by 2017 and increase upon the 30,000 workers already employed at the Thai Nguyen Plant.

More recent investments have extended beyond device assembly, including in display production and research facilities. For instance, the Vietnam Mobile Research and Development Centre in Hanoi contributed around 10% of software used on its smartphones and tablets globally in 2015. The centre has more than 1,500 employees, with just five foreign nationals, and Samsung plans to increase the total to 2,600 by 2018. Meanwhile, in March 2016, a further USD300mn investment in Samsung's R&D operations in Hanoi was approved. Samsung Asia secured approval from the Vietnamese government to increase its investment in the Saigon Hi-Tech Park in Ho Chi Minh City by USD600mn to USD2bn, with the additional investment focused on production of Samsung's smart TVs and other electronic goods, as well as research and development.

The display production facility, enabled by USD3bn of investment over 2015-2020, began to make a meaningful contribution to Samsung's Vietnam output in 2016 and ramped up output considerably in 2017 as it is a key rear-end process line for the OLED panels used in Apple's latest iPhones. The facility can also produce panels for Samsung's flat screen TV sets, tablet computers and smartphones.

Samsung Vietnam Financials (KRWbn)
2016

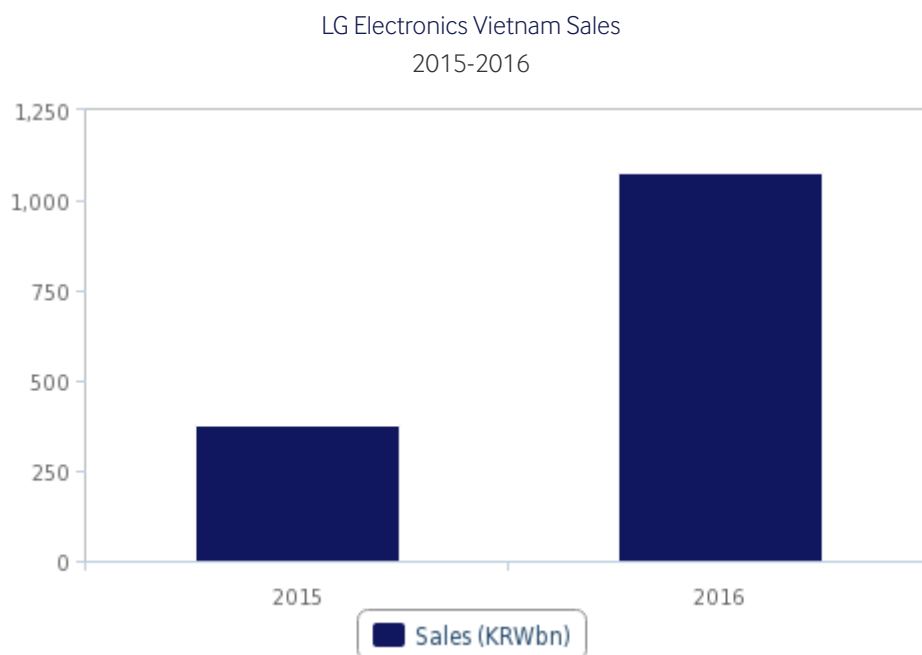


Source: Samsung Electronics

LG Electronics

LG Electronics Vietnam was founded in 2007 and the market is a key sales and production centre for the South Korean group. LG reportedly achieved revenue of USD350mn in Vietnam in 2014, a 30-fold increase from 1995. The importance of Vietnam to LG has, however, increasingly become as a production centre for a range of devices including mobile handsets, and home appliances such as air conditioners, washing machines and vacuum cleaners in Vietnam. LG also has a network of 80 service centres and almost 2,000 employees in Vietnam. This was evident in the 2016 group financial results that showed a large increase in output in Vietnam as new production at its Hai Phong display facility continues to come online.

In 2013 LG announced a new production facility in Vietnam as part of a USD1.5bn investment in the country that will run to 2028. Investment will take place in two phases, with the first reaching USD500mn from 2013-2017, and the second from 2018-2024 comprising USD1bn. The Vietnamese government has provided tax incentives for the investment. The investment will see its two existing facilities in Vietnam absorbed into new facilities. In March 2015 LG opened its new production centre in Hai Phong, a northern port city in Vietnam, relocating production from the factory in Hung Yen. LG is earmarking much of its Vietnamese production for export (around 80%), hence the shift to a port location. Meanwhile in May 2016 LG pledged USD1.5bn investment to establish a display facility in Hai Phong, which began producing OLED display in 2017.



Source: LG

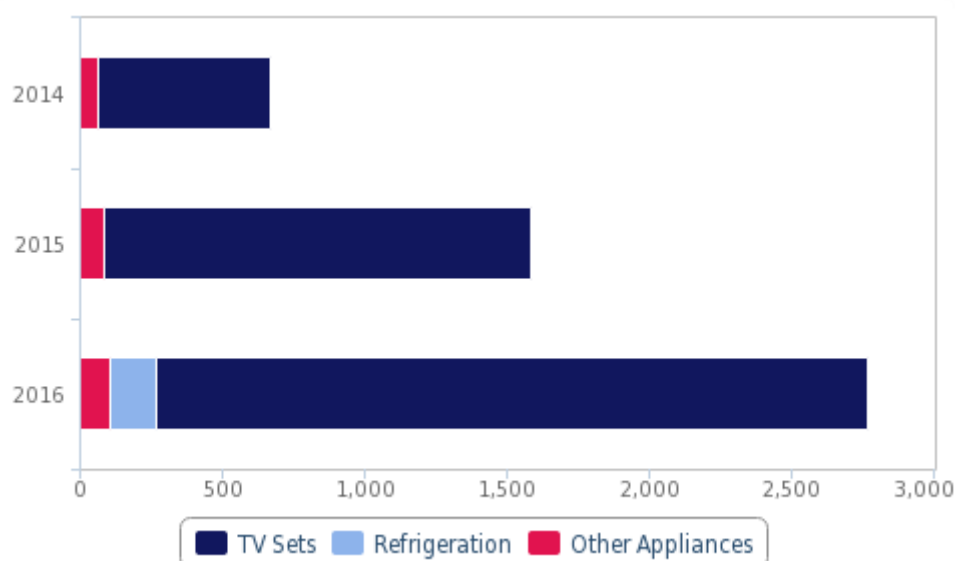
Meiko Vietnam Electronics

Meiko is a specialist producer of printed circuit boards that is a key source of inputs for a range of consumer electronics devices produced in Vietnam by vendors such as Samsung and local smartphone brand **Bkav**. The group was founded in Japan in 1975, and is still its largest production location with four factories, but it also has one each in China and Vietnam. The first facility in Vietnam was located in Thach That Industrial Zone (Hanoi) and was announced with a total investment of USD300mn in 2006, concluded as part of government level meetings. At the time, it was the single largest electronics production project from foreign investors in the country. The factory came online in 2009 with EMS services before the PCB plant began operations in 2011. Subsequently, in 2014, Meiko opened its Thang Long Plant on the premises of **Panasonic Vietnam's** operations, taking total employees in the country to around 7,000 and estimated sales of USD1.7bn per year.

Asanzo

Asanzo is a Vietnamese TV manufacturer, which launched its first smartphones in the country via its 6,000 stores and partner vendors in August 2017, aimed at middle income customers with prices of between VND4.99mn (USD220) and VND2.99mn (USD130). Senior management stated Asanzo is capable of producing 600 units a day at its smartphone assembly plant in Tan Binh district, Ho Chi Minh City, and expected to sell around 20,000 units a month.

Asanzo is however primarily a TV set vendor, a market in which it sold more than 500,000 units in 2016, and accounted for over 90% of group revenue of VND2.5trn in 2016. Asanzo also produces and sells household appliances in Vietnam, but it is TV and mobile sales that are expected to drive revenue higher, with management targeting VND4trn of sales in 2017. Asanzo is also expanding production capacity, investing in a new 17,000 square meter facility in Cu Chi District to add to its existing USD20mn factory in Tan Binh.

Asanzo Sales (VNDbn)
 2014-2016


Source: Asanzo

Consumer Electronics Vendors - APAC, 2016

COMPUTER HARDWARE							
Company	HQ	Products	Financial Performance 2016*				
			Group Revenue	Group Operating Profit (loss)	Computer Hardware as % of Group Revenue	APAC Revenue (group)	Group Employees (year-end)
Dell	US	PCs, Monitors, Servers, Storage	61,600	- 3,300	91%	na	101,800
Apple	US	PCs	218,118	59,212	19%	78,321	116,000
HP	US	PCs, Printers, Servers	48,530	3,501	76%	9,706	49,000
Lenovo	China	PCs, Monitors, Servers, Storage	42,589	991	79%	18,807	60,000
Canon	Japan	Printers & Office Equipment	31,336	2,108	66%	14,033	197,673
Ricoh	Japan	Printers & Office Equipment	18,711	412	62%	8,000	109,361
ASUS	Taiwan	PCs	14,485	582	65%	6,229	6,870
Fujitsu	Japan	Servers, Storage, PCs	41,641	1,634	19%	30,801	156,515
Acer	Taiwan	PCs, Monitors	7,222	37	99%	2,383	7,033
Seiko Epson	Japan	Printers & Office Equipment	9,405	643	67%	4,790	67,605
IBM	US	Servers, storage	79,918	11,474	7%	17,313	380,300

Company	HQ	Products	Financial Performance 2016*				
TPV Technology (AOC)	Hong Kong	Monitors	9,808	148	54%	4,424	30,129
Oracle	US	Printers & Office Equipment	37,444	12,666	11%	5,410	136,262
Brother Industries	Japan	Printers & Office Equipment	5,860	513	60%	2,562	36,929
Cisco Systems	US	Servers	48,686	12,191	7%	7,862	73,700
Kyocera	Japan	Printers & Office Equipment	12,885	860	23%	8,311	69,229
Lexmark (2015 data)	US	Printers & Office Equipment	3,551	408	81%	na	12,000
Logitech	Switzerland	Peripherals	2,142	186	86%	440	5,900

*calendarised financials. na = not available. Source: BMI, Bloomberg, Company reports.

AUDIO VISUAL

Company	HQ	Products	Financial Performance 2016* (USDmn)				
			Group Revenue	Group Operating Profit (loss)	AV as % of Group Revenue	APAC Revenue (group)	Group Employees (year-end)
Samsung Electronics	South Korea	TV Sets, Audio	174,076	25,215	23%	73,976	308,745
Sony	Japan	TV Sets, Games Consoles, Audio, Digital Cameras	69,229	998	26%	34,763	125,300
TCL Multimedia	Hong Kong	TV Sets	15,957	- 211	99%	na	79,561
LG Electronics	South Korea	TV Sets, Audio	47,745	1,154	31%	20,477	75,000
Canon	Japan	Digital Cameras	31,336	2,108	20%	14,033	197,673
ARRIS International	United States	Set-top boxes	6,829	111	70%	292	7,020
Skyworth	China	TV Sets, Set-top boxes	5,559	289	85%	2,446	39,000
TPV Technology (AOC)	Hong Kong	TV Sets	9,808	148	46%	4,424	30,129
HiSense Electric	China	TV Sets	4,752	265	90%	na	19,789
Nikon	Japan	Digital Cameras	7,091	460	51%	na	25,729
Technicolour	France	Set-top boxes	5,412	289	54%	211	17,017
Vizio (2015 data)	United States	TV Sets, Audio	2,900	na	100%	na	400
Changhong	China	TV Sets, Set-top boxes	10,035	164	25%	na	60,439

Company	HQ	Products	Financial Performance 2016* (USDmn)				
Panasonic	Japan	TV Sets, Digital Cameras, Audio	66,589	3,086	4%	49,540	256,133
JVC Kenwood	Japan	Audio, Cameras	2,685	49	74%	1,488	21,040
Haier Electronics	China	TV Sets	9,601	498	na	na	15,476
Ricoh	Japan	Digital Cameras	18,711	412	5%	8,000	109,361
Olympus	Japan	Digital Cameras	6,855	784	9%	3,899	33,336

*calendarised financials. na = not available. Source: BMI, Bloomberg, Company reports.

MOBILE HANDSETS

Company	HQ	Products	Financial Performance 2016* (USDmn)					
			Group Revenue	Group Operating Profit (loss)	Mobile as % of Revenue	Smartphone Unit Sales (mn)	APAC Revenue (group)	Group Employees (year-end)
Apple	US	Smartphones	218,118	59,212	66%	215	78,321	116,000
Samsung	South Korea	Mobile Phones, Smartphones	174,076	25,215	48%	306 (Gartner est)	73,976	308,745
Huawei	China	Mobile Phones, Smartphones	75,103	6,842	34%	139	43,772	180,000
Oppo	China	Mobile Phones, Smartphones	na	na	na	85.3 (Gartner est)	na	12,000
Transsion (TECNO/itel/infinix)	Hong Kong	Mobile Phones, Smartphones	na	na	na	79	na	15,000
Vivo (BBK)	China	Mobile Phones, Smartphones	na	na	na	72.4 (Gartner est)	na	9,000
Xiaomi (2015 data)	China	Smartphones	12,500	na	90%	71	na	8,100
LG Electronics	South Korea	Mobile Phones, Smartphones	47,745	1,154	21%	55	20,477	75,000
Lenovo	China	Mobile Phones, Smartphones	42,589	991	18%	61	18,807	60,000
Sony	Japan	Smartphones	69,229	998	10%	15	34,763	125,300
ASUS	Taiwan	Smartphones	14,485	582	18%	na	6,229	6,870
TCL Communications	Hong Kong	Mobile Phones, Smartphones	3,026	- 61	85%	39	249	12,000

*calendarised financials. na = not available. Source: BMI, Bloomberg, Company reports.

Retailers

Electronics

Mobile World JSC is a clear leader in the electronics retail sector, operating more than 750 outlets across the country, under the brand names The Gioi Di Dong, Electric Green and Bach Hoa Xanh. It has been expanding rapidly in the last few years and planned to raise its store count to 1,000 in 2016. In line with the ambitious expansion plans, Mobile World had been aiming for a USD1.6bn in turnover in 2016, which would have represented 35% y-o-y growth. 2016 results had not been reported at the time of writing. Other key participants in the electronics retail include FPT Group, Vien Thong A and Viettel, each with 200-300 outlets as of late 2015 (latest data). Rapid expansion of large electronics retail chains has triggered numerous closures of small independent retailers in the segment.

In 2015, Thailand's retail conglomerate **Central Group** acquired a 49% stake in Vietnam-based electronics retailer **Nguyen Kim**, which is currently running 23 electronics shopping centres in the country. Following the acquisition, the retailer announced plans to expand its store network to 50 branches by 2019, also expecting strong online sales growth during the period. **FPT Group** currently runs an electronics store network of more than 260 outlets, but the company has, recently, revealed its plans to withdraw from the distribution and retail business, focusing instead on mergers and acquisitions in the technology sector. FPT Group expected to sell its retail business in Vietnam by the end of 2016, but no further details had been reported at the time of writing.

SELECT ELECTRONICS RETAILERS

Company	Parent/ Ownership	Sub-Sector	Revenues	Employees	Stores	Notes
The Gioi Di Dong	Mobile World JSC	Mobile phones, laptops etc	na	na	688	
Electric Green	Mobile World JSC	Consumer electronics and home appliances	na	na	91	Formerly known as Dien May.
Home Center	VHC Trading Company	Electronics and home appliances	na	na	14	
Media Mart	JSC Vietnam MediaMart	Electronics and home appliances	na	na	27	
Pico	na	Electronics	na	na	6	Plans to have 30 outlets in Vietnam by the end of 2016.

na = not available. Source: Companies, BMI

E-Commerce

Although Vietnam has one of the highest online shopping penetration rates in Asia, it is one of the smallest e-commerce markets in the region. At 0.1% of total retail sales, the e-commerce market was valued at less than USD0.1bn in 2014. Lack of a reliable integrated payment platform, poor logistics and delivery services conspire to keep confidence in business-to-consumer (B2C) platforms in check. As in Thailand, consumers prefer to pay very small sums for goods purchased online, most often through deals and flash sellers hosted on social media platforms, such as **Facebook** and **ZingMe**.

SELECT E-COMMERCE RETAILERS

Company	Parent/ Ownership	Sub-Sector	Revenues	Employees	Stores	Notes
Zalora	Central Group	Branded fashion	na	na	na	Sold to Thailand's Central Group in April 2016.
Lazada	Rocket Internet	Fashion, electronics, health and beauty, baby care, sport etc	na	na	na	Active across South East Asia.
Sendo	FPT	Fashion, accessories, baby care, beauty, electronics etc	na	na	na	
Tiki.vn	Ti Ki Corporation	Electronics, fashion, accessories, books, etc	na	c.90	na	

na = not available. Source: Companies, BMI

Demographic Forecast

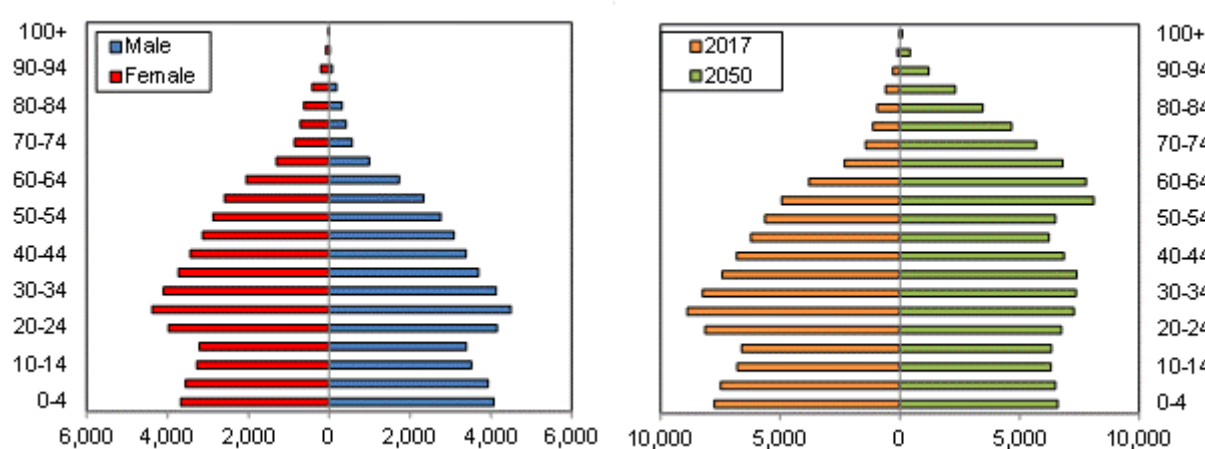
Demographic Outlook 2017

Demographic analysis is a key pillar of **BMI**'s macroeconomic and industry forecasting model. Not only is the total population of a country a key variable in consumer demand, but an understanding of the demographic profile is essential to understanding issues ranging from future population trends to productivity growth and government spending requirements.

The accompanying charts detail the population pyramid for 2017, the change in the structure of the population between 2017 and 2050 and the total population between 1990 and 2050. The tables show indicators from all of these charts, in addition to key metrics such as population ratios, the urban/rural split and life expectancy.



f = BMI forecast. Source: World Bank, UN, BMI

Vietnam Population Pyramid
 2017 (LHS) & 2017 Versus 2050 (RHS)


Source: World Bank, UN, BMI

POPULATION HEADLINE INDICATORS (VIETNAM 1990-2025)

Indicator	1990	2000	2005	2010	2015	2020f	2025f
Population, total, '000	68,209	80,285	84,308	88,472	93,571	98,360	102,763
Population, % y-o-y		1.1	0.9	1.0	1.1	1.0	0.8
Population, total, male, '000	33,583	39,551	41,521	43,683	46,284	48,687	50,847
Population, total, female, '000	34,625	40,734	42,787	44,789	47,287	49,672	51,915
Population ratio, male/female	0.97	0.97	0.97	0.98	0.98	0.98	0.98

na = not available; f = BMI forecast. Source: World Bank, UN, BMI

KEY POPULATION RATIOS (VIETNAM 1990-2025)

Indicator	1990	2000	2005	2010	2015	2020f	2025f
Active population, total, '000	38,808	49,712	55,862	61,728	65,651	67,881	69,607
Active population, % of total population	56.9	61.9	66.3	69.8	70.2	69.0	67.7
Dependent population, total, '000	29,401	30,573	28,446	26,744	27,920	30,479	33,155
Dependent ratio, % of total working age	75.8	61.5	50.9	43.3	42.5	44.9	47.6
Youth population, total, '000	25,494	25,416	22,896	20,948	21,609	22,556	22,780
Youth population, % of total working age	65.7	51.1	41.0	33.9	32.9	33.2	32.7
Pensionable population, '000	3,907	5,157	5,549	5,795	6,310	7,922	10,375
Pensionable population, % of total working age	10.1	10.4	9.9	9.4	9.6	11.7	14.9

f = BMI forecast. Source: World Bank, UN, BMI

URBAN/RURAL POPULATION AND LIFE EXPECTANCY (VIETNAM 1990-2025)

Indicator	1990	2000	2005	2010	2015e	2020f	2025f
Urban population, '000	13,815.9	19,568.8	23,000.3	26,888.6	31,433.5	36,195.5	41,048.9
Urban population, % of total	20.3	24.4	27.3	30.4	33.6	36.8	39.9
Rural population, '000	54,393.7	60,716.8	61,308.5	61,583.9	62,138.1	62,164.6	61,714.6
Rural population, % of total	79.7	75.6	72.7	69.6	66.4	63.2	60.1
Life expectancy at birth, male, years	66.0	68.4	69.3	70.2	71.3	72.5	73.6
Life expectancy at birth, female, years	75.1	78.1	79.2	80.0	80.7	81.5	82.3
Life expectancy at birth, average, years	70.5	73.3	74.3	75.1	76.1	77.1	78.0

e/f = BMI estimate/forecast. Source: World Bank, UN, BMI

POPULATION BY AGE GROUP (VIETNAM 1990-2025)

Indicator	1990	2000	2005	2010	2015	2020f	2025f
Population, 0-4 yrs, total, '000	9,211	7,244	6,760	7,277	7,752	7,645	7,493
Population, 5-9 yrs, total, '000	8,512	9,119	7,139	6,656	7,233	7,710	7,607
Population, 10-14 yrs, total, '000	7,769	9,052	8,997	7,014	6,622	7,200	7,678
Population, 15-19 yrs, total, '000	7,277	8,401	8,951	8,891	6,981	6,592	7,169
Population, 20-24 yrs, total, '000	6,570	7,610	8,257	8,774	8,816	6,918	6,532
Population, 25-29 yrs, total, '000	5,938	7,019	7,427	8,036	8,674	8,719	6,834
Population, 30-34 yrs, total, '000	5,079	6,300	6,876	7,243	7,947	8,583	8,632
Population, 35-39 yrs, total, '000	3,842	5,746	6,197	6,731	7,165	7,866	8,501
Population, 40-44 yrs, total, '000	2,447	4,938	5,665	6,103	6,652	7,086	7,784
Population, 45-49 yrs, total, '000	2,003	3,710	4,877	5,594	6,011	6,557	6,991
Population, 50-54 yrs, total, '000	1,956	2,331	3,652	4,798	5,469	5,884	6,429
Population, 55-59 yrs, total, '000	2,033	1,873	2,226	3,496	4,622	5,280	5,696
Population, 60-64 yrs, total, '000	1,658	1,779	1,729	2,057	3,309	4,392	5,036
Population, 65-69 yrs, total, '000	1,402	1,759	1,603	1,557	1,896	3,066	4,093
Population, 70-74 yrs, total, '000	1,021	1,313	1,522	1,393	1,375	1,688	2,750
Population, 75-79 yrs, total, '000	747	977	1,073	1,256	1,161	1,158	1,438
Population, 80-84 yrs, total, '000	426	593	726	809	958	899	910
Population, 85-89 yrs, total, '000	221	334	382	479	541	654	625
Population, 90-94 yrs, total, '000	70	131	176	208	265	307	379
Population, 95-99 yrs, total, '000	15	40	52	73	88	116	137
Population, 100+ yrs, total, '000	1	6	11	16	23	30	40

f = BMI forecast. Source: World Bank, UN, BMI

POPULATION BY AGE GROUP % (VIETNAM 1990-2025)							
Indicator	1990	2000	2005	2010	2015	2020f	2025f
Population, 0-4 yrs, % total	13.50	9.02	8.02	8.23	8.29	7.77	7.29
Population, 5-9 yrs, % total	12.48	11.36	8.47	7.52	7.73	7.84	7.40
Population, 10-14 yrs, % total	11.39	11.28	10.67	7.93	7.08	7.32	7.47
Population, 15-19 yrs, % total	10.67	10.46	10.62	10.05	7.46	6.70	6.98
Population, 20-24 yrs, % total	9.63	9.48	9.79	9.92	9.42	7.03	6.36
Population, 25-29 yrs, % total	8.71	8.74	8.81	9.08	9.27	8.87	6.65
Population, 30-34 yrs, % total	7.45	7.85	8.16	8.19	8.49	8.73	8.40
Population, 35-39 yrs, % total	5.63	7.16	7.35	7.61	7.66	8.00	8.27
Population, 40-44 yrs, % total	3.59	6.15	6.72	6.90	7.11	7.20	7.58
Population, 45-49 yrs, % total	2.94	4.62	5.78	6.32	6.42	6.67	6.80
Population, 50-54 yrs, % total	2.87	2.90	4.33	5.42	5.84	5.98	6.26
Population, 55-59 yrs, % total	2.98	2.33	2.64	3.95	4.94	5.37	5.54
Population, 60-64 yrs, % total	2.43	2.22	2.05	2.33	3.54	4.47	4.90
Population, 65-69 yrs, % total	2.06	2.19	1.90	1.76	2.03	3.12	3.98
Population, 70-74 yrs, % total	1.50	1.64	1.81	1.58	1.47	1.72	2.68
Population, 75-79 yrs, % total	1.10	1.22	1.27	1.42	1.24	1.18	1.40
Population, 80-84 yrs, % total	0.63	0.74	0.86	0.91	1.02	0.91	0.89
Population, 85-89 yrs, % total	0.33	0.42	0.45	0.54	0.58	0.67	0.61
Population, 90-94 yrs, % total	0.10	0.16	0.21	0.24	0.28	0.31	0.37
Population, 95-99 yrs, % total	0.02	0.05	0.06	0.08	0.09	0.12	0.13
Population, 100+ yrs, % total	0.00	0.01	0.01	0.02	0.03	0.03	0.04

f = BMI forecast. Source: World Bank, UN, BMI

Consumer Electronics

Industry Forecast Methodology

BMI's industry forecasts are generated using the best practice techniques of time-series and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case being determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions, which allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

We mainly use OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, we use a 'general-to-specific' method. **BMI** mainly uses a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **BMI** selects the best model according to various different criteria and tests, including but not exclusive to:

- R2 tests explanatory power; adjusted R2 takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

BMI uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all our industry forecasting. Experience, expertise and knowledge of industry data and trends ensure that analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

Consumer Electronics forecasting is complicated due to the fragmented nature of the market, with little transparency of vendor data and low apparent agreement between many sets of figures in terms of market definition, base and methodology. Individual variables taken into account in creating each forecast include:

- Economic context, and GDP and demographic trends;
- Technological developments, and diffusion rates;
- Underlying demand trends;
- Telecommunications market developments

- Projected GDP share of industry;
- Maturity of market structure;
- Regulatory developments and government policies;
- Exogenous events.

Estimates for each industry segment are calculated using government statistics, where available, and our own macroeconomic and demographic forecasts.

Sources

Sources used in electronics reports include national ministries, statistics agencies, ICT regulatory bodies, national industry associations, officially released company results and figures and international and national industry news.

Risk/Reward Index Methodology

BMI's Risk/Reward Index (RRI) provide a comparative regional ranking system evaluating the ease of doing business and the industry-specific opportunities and limitations for potential investors in a given market. The RRI system divides into two distinct areas:

Rewards: Evaluation of sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is further broken down into two sub categories:

- Industry Rewards (this is an industry-specific category taking into account current industry size and growth forecasts, the openness of market to new entrants and foreign investors, to provide an overall score for potential returns for investors)
- Country Rewards (this is a country-specific category, and the score factors in favourable political and economic conditions for the industry)

Risks: Evaluation of industry-specific dangers and those emanating from the state's political/economic profile that call into question the likelihood of anticipated returns being realised over the assessed time period. This is further broken down into two sub categories:

- Industry Risks (this is an industry-specific category whose score covers potential operational risks to investors, regulatory issues inhibiting the industry and the relative maturity of a market)
- Country Risks (this is a country-specific category in which political and economic instability, unfavourable legislation and a poor overall business environment are evaluated to provide an overall score).

We take a weighted average, combining industry and country risks, or industry and country rewards. These two results in turn provide an overall Risk/Reward Index, which is used to create our regional ranking system for the risks and rewards of involvement in a specific industry in a particular country.

For each category and sub-category, each state is scored out of 100 (100 being the best), with the overall Risk/Reward Index a weighted average of the total score. Importantly, as most of the countries and territories evaluated are considered by **BMI** to be 'emerging markets', our score is revised on a quarterly basis. This ensures that the score draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

BMI's approach in assessing the risk/reward balance for infrastructure industry investors globally is fourfold:

- First, we identify factors (in terms of current industry/country trends and forecast industry/country growth) that represent opportunities to would-be investors;

- Second, we identify country and industry-specific traits that pose or could pose operational risks to would-be investors;
- Third, we attempt, where possible, to identify objective indicators that may serve as proxies for issues/trends to avoid subjectivity;

Finally, we use BMI's proprietary Country Risk Index (CRI) in a nuanced manner to ensure that only the aspects most relevant to the infrastructure industry are incorporated. Overall, the system offers an industry-leading, comparative insight into the opportunities/risks for companies across the globe.

Sector-Specific Methodology

In constructing these indices, the following indicators have been used. Almost all indicators are objectively based.

CONSUMER ELECTRONICS RISK/REWARD INDEX INDICATORS

Rewards

Industry Rewards

Consumer electronics sales, USDmn

Sales per capita, USD

ICT development

Growth, %

Country Rewards

Urban/rural split

Young population

Richest 10%, % of total

GDP per capita, USD

Risks

Industry Risks

Barriers to entry

Government consumer electronics policies

Country Risks

Short-term economic risk

Real PC growth, volatility

Short-term financial risk

Trade bureaucracy

Institutions

Source: BMI

Weighting

Given the number of indicators/datasets used, it would be inappropriate to give all sub-components equal weight. The following weighting has been adopted:

WEIGHTING OF INDICATORS

	Weighting (%)
Rewards	70, of which
Industry Rewards	65, of which
Consumer electronics sales, USDmn	50
Sales per capita, USD	16
ICT development	16
Growth, %	16
Country Rewards	35, of which
Urban/rural split	25
Young population	25
Richest 10%, % of total	25
GDP per capita, USD	25
Risks	30, of which
Industry Risks	40, of which
Barriers to entry	10
Government consumer electronics policies	10
Country Risks	60, of which
Short-term economic risk	10
Real PC growth, volatility	10
Short-term financial risk	10
Trade bureaucracy	10
Institutions	10

Source: BMI



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