Public version

Economic Analysis of Competition Impact Arising from the Acquisition of WTT Holding Corp. by HKBN Ltd.

A report for the Communications Authority (CA)

LE London Economics

plum

March 2019

About London Economics

London Economics is one of Europe's leading specialist economics and policy consultancies. Based in London and with offices and associate offices in five other European capitals, we advise an international client base throughout Europe and beyond on economic and financial analysis, litigation support, policy development and evaluation, business strategy, and regulatory and competition policy.

Our consultants are highly-qualified economists who apply a wide range of analytical tools to tackle complex problems across the business and policy spheres. Our approach combines the use of economic theory and sophisticated quantitative methods, including the latest insights from behavioural economics, with practical know-how ranging from commonly used market research tools to advanced experimental methods at the frontier of applied social science.

We are committed to providing customer service to world-class standards and take pride in our clients' success. For more information, please visit www.londoneconomics.co.uk.

Head Office: Somerset House, New Wing, Strand, London, WC2R 1LA, United Kingdom.

w: londoneconomics.co.uk e: info@londoneconomics.co.uk : @LondonEconomics
t: +44 (0)20 3701 7700 f: +44 (0)20 3701 7701

About plum

Plum are a leading independent consulting firm, focused on the telecommunications, media, technology, and adjacent sectors. We apply extensive industry knowledge, consulting experience, and rigorous analysis to address challenges and opportunities across regulatory, radio spectrum, economic, commercial, and technology domains.

Head Office: 10 Fitzroy Square; London W1T 5HP; UK

Table of Contents

Telecommunications Operators in Hong Kong

CMHK	**China Mobile Hong Kong Company Limited (CMHK)** is a mobile network operator (MNO) and fixed network operator (FNO) in Hong Kong. CMHK is a wholly owned subsidiary of China Mobile Limited. CMHK leases HKBN's network for the provision of downstream retail fixed residential broadband services, while CMHK leases capacity to HKBN for the provision of mobile services.
COLT	**COLT Technology Services Limited (COLT)** is a multinational telecommunications company, which recently announced the expansion of their fibre-optic and Ethernet network to Hong Kong. COLT aims to provide connectivity to 80% of Hong Kong's business buildings.
Easy Tone	**Easy Tone Network Limited (Easy Tone)** is a new entrant into the Hong Kong telecommunications market, holding a unified carrier licence since September 2017. Easy Tone provides information and communications technologies (ICT) solutions and data communication services, including broadband access, to business customers.
HGC	**HGC Global Communications Limited (HGC)** is a pure fixed telecommunications operator and is the [redacted] largest fixed voice and fixed broadband operator in Hong Kong, by number of subscribers. HGC was previously wholly owned by Hutchison Telecommunications Hong Kong Holdings Limited before it was acquired by a private investment firm in October 2017.
HKBN	**Hong Kong Broadband Network Limited and HKBN Enterprise Solutions Limited (HKBN).** They are both wholly-owned subsidiary of HKBN Ltd. and are now the [redacted] largest fixed telecommunications operators in the residential segment in Hong Kong. Over the last decade, the group has also been taking up market shares in the business segment. HKBN Enterprise Solutions Limited is previously NWT, acquired in March 2016. HKBN is one of the parties seeking to merge.
PCCW-HKT	**PCCW-HKT Telephone Limited and Hong Kong Telecommunications (HKT) Limited**, jointly referred to as PCCW-HKT in this report, is the universal service provider, obliged to provide fixed telephony services anywhere in Hong Kong. In addition to fixed telephony services, PCCW-HKT also provides broadband services, external fixed services, and mobile services. The company is also affiliated with PCCW Media Limited which is one of the two pay-TV services

providers in Hong Kong. Hong Kong Telecommunications (HKT) Limited is an MNO which provides mobile services in Hong Kong.

Hutchison

Hutchison Telecommunications Company Limited (Hutchison) is Hong Kong's [redacted] largest mobile telecommunications operator and is majority owned by Hutchison Telecommunications Hong Kong Holdings Limited.

i-Cable

Hong Kong Cable Television Limited (i-Cable) is one of two pay-TV services providers in Hong Kong. i-Cable also holds a unified carrier licence for provision of fixed telecommunications services and has recently also started to provide broadband services using fibre technology. i-Cable was formerly an associated company with WTT, [redacted]

NWT

New World Telecommunications Limited (NWT) was a fixed telecommunications operator in Hong Kong. NWT was acquired by HKBN group in March 2016. NWT was renamed as HKBN Enterprise Solutions Limited in September 2016.

SmarTone

SmarTone Mobile Communications Limited (SmarTone) is a MNO, providing mobile voice and data services in Hong Kong. SmarTone's associated fixed arm leases HKBN's network for the provision of downstream retail fixed residential broadband services, while SmarTone leases capacity to HKBN for the latter's provision of mobile services. SmarTone is a subsidiary of Sun Hung Kai Properties Limited.

Superloop

Superloop Limited (Superloop) is a new provider of connectivity services in the Asia-pacific area. Superloop acquired its unified carrier licence in 2015 and launched its Hong Kong dark fibre network in 2016.

Traxcomm

TraxComm Limited (Traxcomm) is a wholly owned subsidiary of the MTR Corporation, focusing on wholesale customers. It provides a range of services including dedicated bandwidth fibre, optical wavelength and protected transport bandwidth services. Traxcomm entered into agreements with FNOs whereby these operators will lease fibre blockwiring from Traxcomm to serve business customers with retail outlets in the MTR stations. Currently, Traxcomm has installed fibre in [redacted] MTR stations.

Towngas	**Towngas Telecommunications Company Limited (Towngas)** is a wholly owned subsidiary of The Hong Kong and China Gas Company Limited, focusing on network connectivity, data centre and cloud computing.
WTT	**WTT HK Limited (WTT)** is a fixed telecommunications operator in Hong Kong focusing on the business segment. WTT has a strong network position in the business segment, with extensive fibre coverage. WTT is one of the parties seeking to merge.

Glossary

BMO	**Building Management Office**.
Dark fibre	**Dark fibre** refers to fibre infrastructure (cables, switches, etc.) that has been deployed but is currently unused. Dark fibre provides extra capacity that is not currently used but may be used in the future or leased to clients.
DSL	**Digital Subscriber Line (DSL)** is an Internet access connection over an existing telephone line; the family of all such services is generally referred to as **xDSL**.
ETF	**External Telecommunications Facilities (ETF)** refer to the external telecommunications facility-based services based on submarine cables, overland cables and/or satellites connecting Hong Kong with location outside Hong Kong.
ETS	**External Telecommunications Services (ETS)** comprise international voice services, call back services, telephone calling card services, virtual private network services, and telephone services carried out over data communication networks such as the Internet.
Facility-based operator	**Facility-based operators** are telecommunications operators, licensed to establish and maintain their own network, which may cross unleased Government land or public streets. Facility-based operators are licensed under a unified carrier licence.
Fixed Internet	**Fixed Internet** refers to Internet access services provided over a fixed telecommunications network.
Fixed voice	**Fixed voice** refers to voice telephony services provided over a fixed telecommunications network.
FNO	A **Fixed Network Operator (FNO)** is a telecommunications operator which is authorised to establish and maintain its own network for providing telecommunications services, such as fixed voice services and fixed broadband access services.

FTTB	**Fibre to the Building**.
FTTH	**Fibre to the Home**.
FTTO	**Fibre to the Office**.
IDD	**International Direct Dialling (IDD)** refers to international voice services accessible by dialling the code "001" or "002". IDD is part of the wider External Telecommunications Services (ETS) segment.
Merger Guideline	The **Guideline on the Merged Rule (Merger Guideline)** refers to the guideline jointly issued by the Competition Commission of Hong Kong and the Communications Authority in July 2015.
MNO	A **Mobile Network Operator (MNO)** is a telecommunications operator who has established and maintained its own mobile network for providing mobile telecommunications services such as mobile voice telephony and mobile data services.
Mobile backhaul	**Mobile backhaul** refers to the connection from base stations such as cell towers to the core network. The links from the base stations to the core network are referred to as the backhaul network.
Multiple play services	**Multiple play services** refer to different telecommunications services that are offered together as a bundle. For example, quadruple play bundles typically bundle together fixed voice service, fixed Internet access service, mobile service and television service.
MVNO	A **Mobile Virtual Network Operator (MVNO)** has no right to radio spectrum, and has to access and interconnect with a MNO to make use of the latter's radiocommunications infrastructure for service provision.
PSTN	**Public Switched Telephone Network**.
SBO	A **Services-Based Operator (SBO)** is an operator which has been granted an SBO licence. In contrast to facility-based operators, SBOs do not have authorisation to establish or maintain their own telecommunications network crossing unleased Government land or public streets but have to make use of facility-based operators' networks to provide their services.

SI services	**Systems integration (SI) services** refer to services such as project management in buildings, Wi-Fi availability for customers such as hotels and venue operators, structure cabling and annual equipment maintenance.
VoIP	**Voice-over-IP telephony (VoIP)** allows users to make and receive calls over a broadband Internet connection instead of a traditional phone line.
VPN	**Virtual Private Network (VPN)** is a private network that directly connects network participants. A VPN can be established between a number of computers, offices, or even across multiple sites.

Executive Summary

On 7 August 2018, HKBN Ltd. announced its proposed acquisition of the entire issued share capital of WTT Holding Corp. (Proposed Transaction). As both undertakings, through their wholly-owned subsidiaries namely HKBN and WTT respectively, indirectly hold carrier licences issued under the Telecommunications Ordinance (Cap. 106) (TO), the Proposed Transaction falls within the scope of the Merger Rule under the Competition Ordinance (Cap. 619) (CO). This document provides an economic analysis in relation to the competition effects which might arise from the Proposed Transaction.

According to the Merger Guideline, an assessment of competition effects of a merger entails the identification of the relevant market(s), followed by an assessment of whether the merger has, or is likely to have, the effect of substantially lessening competition (SLC Effect) in the identified relevant market(s).

Potentially affected markets

Both merging parties, through HKBN and WTT, are authorised to provide internal and external fixed telecommunications services in Hong Kong. In addition, the merging parties, through HKBN, WTT and other wholly-owned subsidiaries, also hold SBO licences for the provision of various telecommunications services, such as local voice telephony services, Internet access services, ETS and MVNO services.

The following are markets potentially affected by the Proposed Transaction:

- Retail local fixed voice services
- Retail local fixed Internet access services
- Retail mobile telecommunications services
- Retail multiple play services
- Local fixed network access services
- Wholesale market for interconnection with fixed networks
- External telecommunications services
- Fixed external telecommunications facilities
- IT services

In relation to each of these markets, the report defines the relevant market, considers the position of the merging parties within it, including their closeness as competitors, and assesses, in view of market trends as well as other relevant considerations, the potential competition effects which might arise as a result of the Proposed Transaction.

Broadly speaking, the merging parties have a small combined market share and/or do not appear to be close competitors in most of the markets listed above. Most of the analysis in this report therefore focuses on the retail local fixed voice services market, retail local fixed Internet access services market and local fixed network access services market, where the potential competition effects of the Proposed Transaction merit more in-depth consideration.

Analysis of competition effects

Retail local fixed voice services

For the present case, the focus of the analysis of competition effects is on the business segment of the market, the only one where the merging parties overlap.

In the overall market, the merging parties' combined market share is around [redacted]% in terms of number of subscribers and [redacted]% in terms of revenues. PCCW-HKT remains the largest player with over [redacted]% market share in terms of number of subscribers.

Our assessment is that the Proposed Transaction is unlikely to cause anti-competitive impact in the retail local fixed voice services market if the local fixed network access services market remains competitive post-merger. The reason is that the possibility of entry into the retail local fixed voice services market, via the market for local fixed network access services, will enable existing market players and new entrants to compete in this market, acting as competitive constraint over the merged entity post-merger.

Retail local fixed Internet access services

For the present case, the focus of the analysis of competition effects is on the business segment, the only one where the merging parties overlap.

Supply substitution appears to support the definition of a wider market, as suppliers to large corporates are also able to supply services to smaller corporates or vice versa so long as the incentives are there.

While both the merging parties are key players in this wider market, they are not considered as close competitors within the segment of large corporates as large corporates generally do not appear to consider HKBN as a close substitute to WTT. WTT's strong position in the segment of large corporates is thus not significantly affected by the Proposed Transaction.

In relation to the SME segment, while the merging parties have overlap in that segment, this segment is predicted to remain competitive because of threat of entry as well as reactions from existing competitors.

As in the retail local fixed voice services market, the impact of the Proposed Transaction in this market is dependent on post-merger competitive conditions in the local fixed network access services market. Our assessment is that so long as effective competition is maintained in the local fixed network access services market, existing market players and new entrants will be able, via that market, to compete in the retail local fixed Internet access services market, acting as competitive constraint over the merged entity post-merger.[1]

[1] The Modified Greenfield Approach is an analytical approach which takes as a starting point the products or services that are consumed at the retail level and works up the value chain to identify the wholesale products or services that are required to produce them. The analysis of competition should then start by assessing competition at the wholesale level and introduce appropriate remedies where there are problems. Finally, the analysis should return to the retail level and consider whether any intervention is required in addition to what is done at the wholesale level. The modified Greenfield approach is included in the European Commission's 2014 Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation.

Local fixed network access services

This market encompasses retail connectivity services and wholesale access services. This approach takes into account the significant similarity between retail connectivity services (such as leased lines provided to large corporates) and wholesale access services provided to other service providers, for example Internet access service providers. The merging parties' business overlap is also similar across these two segments. There is no further distinction between any other aspects such as technology adopted and speed of services in the definition of this market.

The combined position of HKBN and WTT in this market would be strengthened via coverage in two ways as a result of the Proposed Transaction if completed. Extended coverage is the first channel through which potentially market power might be conferred to the merged entity post-merger. However, given the small magnitude of such coverage expansion on the part of the merged entity, there is little likelihood that such competition risk shall arise post-merger. The second channel through which coverage is affected as a result of the Proposed Transaction entails buildings not exclusively for residential use where both merging parties are present. For these overlapping buildings, if competitors and potential entrants have difficulties in accessing these buildings to provide services and compete with the merging parties there, the fact that rivals of the merging parties, both extant and potential ones, could not extend their networks at such group of buildings may limit the scope of their coverage. Such limitation on the scope of network coverage on rivals may potentially confer market power to the merging parties following the Proposed Transaction thereby raising the competition risk in this market in the form of unilateral effects.

Furthermore, some rivals to the merging parties in the downstream services market are using merging parties' wholesale inputs for service provision. There is a risk that these downstream rivals may become captive customers to the merged entity during the transitional period. This could increase their costs of providing retail services downstream, which in turn would weaken their ability to compete with the merged entity post-merger during the transitional period.

Economic efficiency claim made by the merging parties in relation to the Proposed Transaction

The merging parties submit that the Proposed Transaction will lead to cost efficiencies and synergies. Savings can, according to the merging parties, be achieved through optimisations in network usage, staff reduction costs and relocation of offices.

The merging parties, however, fall short of a detailed quantification of these predicted efficiencies and of making a clear argument that they would be passed on to consumers, the latter being a necessary condition for efficiencies to be weighed against possible negative impacts on competition.

Commitments offered by the merging parties

We note that the merging parties offered a set of commitments to the CA to address the two competition risks identified above, and in light of the representations in response to the notice of the CA's proposed acceptance of commitments, offered a set of revised commitments. We consider that the revised commitments would be able to address the competition risks that might arise from the Proposed Transaction.

1 Introduction

This report presents findings based on an economic assessment in relation to the competition effects which might arise from the Proposed Transaction.

1.1 The Proposed Transaction

On 7 August 2018, HKBN Ltd. announced the Proposed Transaction.

HKBN Ltd. is publicly listed on the Stock Exchange of Hong Kong Limited and indirectly wholly owns HKBN. WTT Holding Corp. indirectly wholly owns WTT. Both HKBN and WTT are carrier licensees under the TO authorised to provide fixed telecommunications services.

1.2 Brief overview of Hong Kong's telecommunications markets landscape

This section provides background and context to the Proposed Transaction. Hong Kong's telecommunications markets have features that are important to highlight before proceeding with the analysis of the competition effects of the Proposed Transaction.

This overview focuses on the fixed telecommunications services markets as they are the most relevant in relation to the Proposed Transaction.

Hong Kong has consistently been a top performer in the global rankings for broadband download speeds. Such rankings are consistent with the wide deployment of optical fibre infrastructure in Hong Kong's fixed telecommunications networks. The deployment of optical fibre networks has enabled peak download speeds of up to 10 Gbps for residential users.

Hong Kong is unique compared to other advanced economies in that significant investments associated with the deployment of optical fibre networks have not resulted from active government policy but rather the market-driven and light-handed regulatory approach of the telecommunications sector. This is in contrast with many other markets that have had strong government interventions in the form of policies and investments on the rollout of higher speed broadband services.

1.2.1 Fixed network technologies

Historically, fixed telecommunications networks were built using copper technology. In recent years, DSL technologies have become commercially established as demand for broadband services has grown. There has been an evolution of DSL technologies and in many advanced markets very-high-bit-rate DSL (VDSL) and VDSL2 have now been deployed. Such advanced fixed telecommunications networks typically deliver downlink speeds of 20-70 Mbps. In Hong Kong, where such technology is deployed at locations with low population density such as rural areas, these speeds may be indicative of the performance delivered. Where this technology is used as the final link at buildings (where the building is supplied with a fibre connection and copper loop lengths are short), considerably higher downlink speeds can be obtained (e.g. greater than 70 Mbps). There is an evolution path for copper technology being pursued in some economies using G.Fast technology. However, as there is already extensive deployment of fibre infrastructure in Hong Kong, there does not appear to be much interest in moving to this technology.

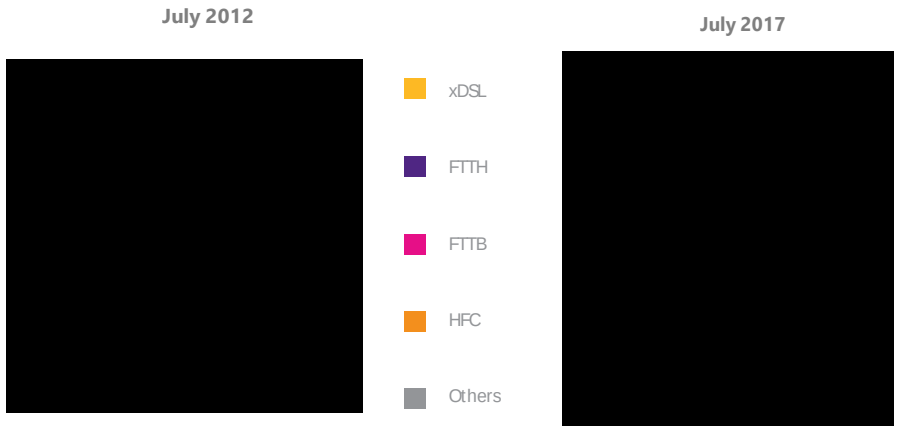
Hong Kong has experienced a rapid deployment of fibre access infrastructure and this trend is expected to continue where fibre is considered to be commercially viable. Fibre access is generally based on Passive Optical Network (PON) technology with 1 Gigabit-Capable PON being the most widely deployed today. PCCW-HKT offers Internet services for residential customers with a connection speed of 10 Gbps and it is expected that other network operators will move to similar speeds in the future.

Cable-based broadband is also deployed in Hong Kong and is reliant on Data-Over-Cable-Service-Interface Specification (DOCSIS) version 3.0. However, it appears that there are no plans to advance to DOCSIS3.1 and that the preferred path for expansion is the use of fibre.

1.2.2 Fixed broadband services

In recent years high speed broadband subscriptions in Hong Kong has increased significantly, driven by consumer demand for higher speed broadband services as well as the wider availability of fibre to the building/home (FTTB/H). Figure 1 below provides a comparison of the proportion of broadband subscriptions by technology in July 2012 and July 2017. Over the 5-year period, the number of FTTH subscribers grew at a compound annual growth rate (CAGR) of [redacted]% from [redacted] to [redacted] while the number of subscribers with [redacted]

Figure 1 Fixed broadband subscribers in Hong Kong



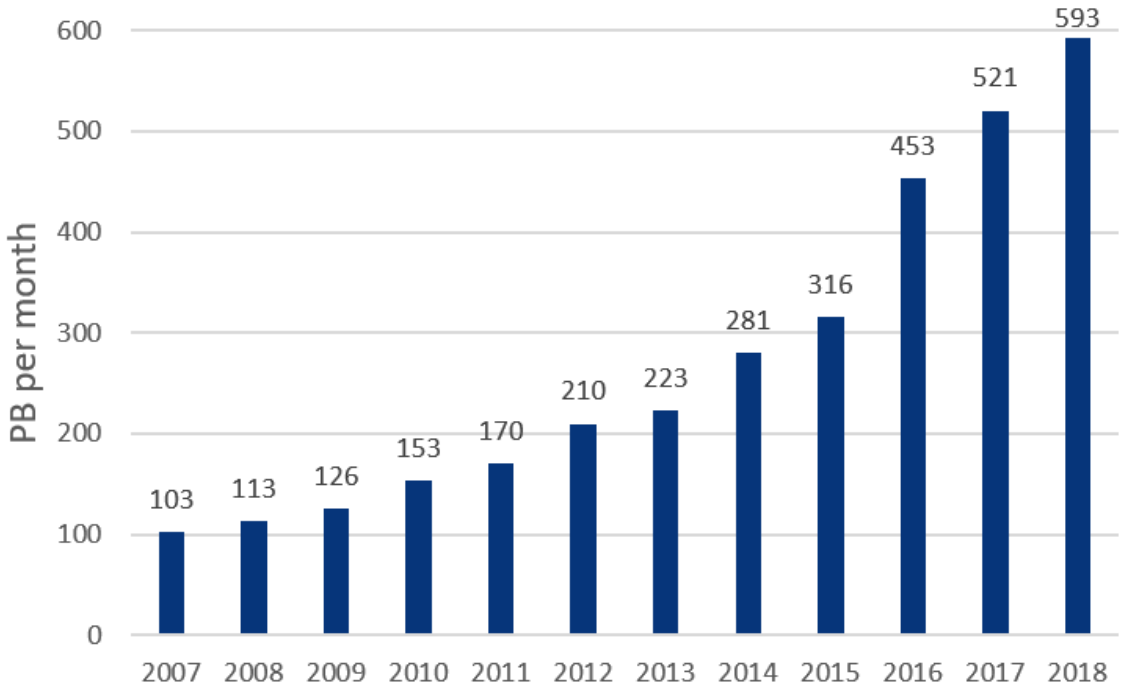
Note: Others include fixed wireless access and FTTO subscribers
Source: OFCA

As shown in Figure 2 below, fixed broadband traffic in Hong Kong has risen significantly between 2007 and 2018 and, in recent years, the growth has been driven increasingly by the consumption of online video streaming services. Video now comprises some 70% of total data traffic[3] and is expected to grow further. The shift towards higher resolutions (e.g. HD, UHD/4K) will increase

[2] Others include Local Multipoint Distribution System (LMDS), High Speed Packet Access (HSPA) and Fibre-to-the-Office (FTTO) subscribers.
[3] Based on Cisco reported proportions for Japan (72%) and Korea (63%) and Kenny and Broughton (2014) (74%).

bandwidth demand on fixed networks. Compared to other fixed access technologies, FTTH – which offers typical speeds of 100 Mbps or higher – is in a better position to handle future growth in demand.

Figure 2 Fixed broadband traffic volume in Hong Kong, 2007 - 2018



Note: Data based on December of each year, except for 2018 (October).
Source: OFCA

1.2.3 Voice services

Modern telecommunications networks are based on digital packet switched technologies and, in many cases, voice services are carried over Internet-Protocol (IP) bearer channels as VoIP streams with appropriate protocols enabling effective call routing (e.g. session initiation protocol – SIP). Media gateways (MGWs) are typically used to interface between traditional Time-Division Multiplexing (TDM) systems and modern alternatives. VoIP is becoming prevalent across both fixed and mobile networks.

Within fixed telecommunications networks, PSTN-based circuit switched voice services are gradually being phased out in many cases. With the advent of 2G and 3G mobile networks, voice signals have been conveyed digitally, with use of various voice digital codec technologies – to enable data compression for improvements in capacity efficiency across the network. However, voice services in these mobile technologies are still essentially circuit switched.

The pace of migration of both fixed and mobile voice services from circuit switched voice to next generation networks varies greatly among service providers and across different economies and is dependent on a wide variety of different factors.

Voice over Long-Term Evolution (Voice over LTE or VoLTE) technology allows operators to offer an enhanced and more efficient voice service in comparison to circuit-switched networks and employs VoIP. The higher bandwidth offered by LTE permits transmission of higher definition audio, giving end users clearer calls with higher quality. VoLTE requires the deployment of IP

Multimedia Subsystems (IMS) as core elements – which control how calls are initiated and directed in the network, together with compatible handsets.

Over the last several years, carriers have begun to interconnect their networks at the IP level using session border controllers (SBCs), but voice call routing has continued to rely on the PSTN telephone number – which is adequate if the call ultimately terminates on a PSTN phone.

VoIP peering enables direct network interconnection without utilising the PSTN. To fully enable VoIP peering, interconnection needs to occur on a transport level, on a signalling level, as well as on an ENUM[4] (from tElephone NUmber Mapping) database level. Standards groups and industry fora are working to resolve industry-wide issues to facilitate the industry's complete migration to VoIP peering.

1.2.4 Infrastructure-level competition – competing fibre networks

Hong Kong's telecommunications market demonstrates a very competitive market landscape with multiple operators having their own infrastructure networks and competing at low service charges.

Hong Kong has a number of key advantages that have enabled this competitive industry structure to emerge:

- Hong Kong has a population of 7.5 million (2.6 million households) living in an area of 1,106 square km. High population density drives down unit costs of fibre network construction.
- High GDP per capita enables consumers to afford higher value services.
- Open information economy has ensured high value attributed to fast broadband services.
- Competitive and entrepreneurial spirit has driven risk taking and investment.

Favourable regulatory framework with pro-competitive, independent regulator.

In light of the fact that competition across all fixed telecommunications services in Hong Kong is underpinned by rivalry at the fixed infrastructure level, one important analytical lens through which the competition effects would be assessed in this report is that of facilities-based competition.

1.3 The merging parties

1.3.1 HKBN

HKBN is the [redacted] largest player in the residential segment of the fixed voice and broadband services markets. HKBN also provides services in the business segment of the fixed telecommunications markets.

HKBN has entered Hong Kong's telecommunications market as an aggressive, disruptive competitor, authorised to provide wireline-based fixed services starting from January 2003 and

[4] See ITU recommendation T-Rec-E.164 for details of the E.164 numbering scheme.

launching Hong Kong's first 100 Mbps residential broadband services in 2004. By focussing exclusively on Ethernet and VoIP services (rather than legacy xDSL and PSTN) HKBN was able to minimise costs and price aggressively to grow market share.

HKBN's market position in retail market

HKBN offers fixed broadband and voice services to both residential and business retail customers. For residential customers, it also offers ETS, OTT services through a partnership with Television Broadcasts Limited (TVB) and mobile services through its partnership with SmarTone and CMHK. For business customers, it also offers associated data, IDD and IT solutions (e.g. cloud computing, data centre, SI services).

Alongside PCCW-HKT, HKBN has one of the most extensive fibre networks in Hong Kong with coverage over [redacted]% of residential homes and some 2,300 business buildings. In terms of homes passed, HKBN is [redacted] PCCW-HKT whose FTTH coverage is around 88.3%.[5] HKBN operates a full IP-based core network and its access network is predominantly based on this. This is unlike PCCW-HKT which is still using legacy copper access networks, particularly for provision of broadband services to more rural parts of Hong Kong.

All network operators in Hong Kong have been deploying IP networks for some years. HKBN has been offering fixed services over a full multi-service IP network since before 2011. Hong Kong was an early adopter of IP networks and next generation access technologies.

HKBN's market position in relation to WTT

In the business segment of Hong Kong's fixed telecommunications markets, HKBN has a weaker network reach and brand recognition. Despite that, HKBN can be considered a direct competitor to WTT in this market segment and WTT is unlikely to be completely immune from pricing pressures, notwithstanding [redacted] Hence, the extent to which HKBN exerts a competitive pressure on WTT needs to be considered, in addition to the competitive pressure independently exerted by PCCW-HKT and HGC.

In 2017, it is reported that HKBN ran a successful campaign offering customers switching from WTT 50% off their original service bills when signing a 24-month contract and a similar business campaign targeted at the WTT customers within the 19 "strategically located business buildings".[6] Following on the success of such campaign, HKBN launched another campaign poaching HGC's customers through granting any business customer who switched from HGC and agreed to sign on a 24-month contract, 50% off their HGC monthly fees.[7]

HKBN is also a mobile virtual network operator (MVNO) leasing network capacity from SmarTone and CMHK for the provision of mobile services. On the other hand, it has leased out its fixed network to both of these companies for their provision of downstream retail residential broadband services.

[5] PCCW-HKT's Annual Results Presentation 2018
[6] PR Newswire Asia, http://www.asiaone.com/business/hkbn-enterprise-solutions-extends-fibre-coverage-to-19-wharf-commercial-buildings, accessed on 19/10/2018
[7] HKBN Enterprise Solutions Limited, https://www.hkbnes.net/form/enquiry_en.jsp?formid=promotional&promoid=50offswitchingoffer, accessed on 19/10/2018

1.3.2 WTT

WTT enjoys a strong position in the business segment of the fixed telecommunications markets and offers a portfolio of services in those markets such as business voice, broadband and IT services among other related offerings. PCCW-HKT is still the market leader in this segment, who has around a [redacted]% market share of voice and Internet access services. WTT is the [redacted] largest player in the business segment of the voice services market, and [redacted] behind PCCW-HKT in the market for business broadband services.

WTT has an extensive fibre-based fixed network with coverage connecting [redacted] business buildings - estimated to cover [redacted]% of business customer demand in Hong Kong[8]. WTT's network position is further enhanced by its operation of submarine cables connecting Hong Kong islands and Kowloon via Lantau, which HGC and HKBN lack. With its sole business focus on business customers, WTT has steadily grown its market share over the last five years. WTT differentiates itself from rivals by offering customised packaged solutions including connectivity, fixed-voice and IT services to its customers thereby enhancing customer loyalty.

WTT's in-house information and communications technology (ICT) capabilities give it a further competitive edge over rivals that lack such capabilities. In addition, it has built a [redacted] customer base of [redacted] business clients [redacted]

1.3.3 The merging parties' views on the Proposed Transaction's impact

The merging parties set out in their submissions[9] that the Proposed Transaction will not result in adverse effects or SLC Effect in Hong Kong. Instead, the merging parties argue that the Proposed Transaction will be pro-competitive as the merged entity will be able to expand product offerings as well as enhance competitive pressure in the telecommunications markets, with consumers ultimately benefitting as a result.

The merging parties' arguments are briefly summarised below:

- [redacted]
- [redacted]
- [redacted]

[8] HKBN and WTT
[9] HKBN and WTT

- [redacted]

1.4 Other market participants' views on the Proposed Transaction's impact

While we will detail other market participants' responses to the Proposed Transaction in the following sections on the relevant market segments, we note here the more general responses to the Proposed Transaction provided by [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

1.5 Approach to defining the relevant markets affected by the Proposed Transaction

In this sub-section we outline our proposed approach to defining the markets which would be affected by the Proposed Transaction. The approach towards market definition adopted in this report takes into account the Communications Authority (CA)'s previous practice, the Merger Guideline as well as practices in Europe and elsewhere, their applicability to the structure of fixed telecommunications markets in Hong Kong and the context of the Proposed Transaction.

1.5.1 Wholesale versus retail

In telecommunications it is typical to distinguish between retail/downstream markets where firms sell services/products to end users, and wholesale/upstream markets where certain firms sell inputs to other firms, which then use the acquired inputs to provide services to end users.

In some jurisdictions, telecommunications regulators focus on ensuring access to these upstream or wholesale markets in order to facilitate the development of competition in the downstream markets.[12] In this regard, the European Commission (EC) makes the following recommendation: when a retail market has been identified as not being effectively competitive absent regulation, the market to be analysed first is the one that is most upstream of the retail market in question in the vertical supply chain. (…) A retail market should only be subject to direct regulation if it is not effectively competitive despite the presence of appropriate wholesale regulation on each of the related upstream market(s).

[redacted]

[12] See, for example, Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, 2014 and the OECD's 2014 working paper "Defining the Relevant Market in Telecommunications", https://www.oecd.org/daf/competition/Defining_Relevant_Market_in_Telecommunications_web.pdf

Wholesale leased lines and backhaul products more generally are provided to both fixed and mobile services providers. Backhaul access services can be offered via wholesale leased line products. Some wholesalers offer managed backhaul services which may include the provision of value-added services such as managed Ethernet access services for backhaul to mobile cell sites.

It is noted that such a distinction is not entirely straightforward as certain products or services can be sold both at the wholesale and/or at the retail level. An important example of this in the present context is leased lines.

Leased lines

At the retail level, leased lines are purchased almost exclusively by business customers. Leased lines, also known as private circuits, provide dedicated transmission capacity to carry voice and data traffic between a business customer's various premises. They are characterised by special quality features, such as symmetric bandwidth. To determine whether the retail leased line service market is a relevant market for competition purposes, both demand substitution and supply substitution need to be considered.

When examining demand substitution, it is necessary to consider whether other data transmission services, such as VPNs, Symmetric Digital Subscriber Loop (SDSL) or Ethernet in the First Mile, should be included in the same retail market. A leased line offers dedicated, symmetric transmission between two points, with guaranteed bandwidth. In contrast, other data services (such as VPN), are shared at some point, and thus do not provide guaranteed bandwidth. Moreover, there are different degrees of flexibility enjoyed by the users and different levels of customer care. As a result, there may not exist sufficiently close substitutes to which customers could readily switch in order to counter a price rise by a hypothetical monopolist.[13]

On the supply side, suppliers of symmetric data products other than leased lines may not be in a position to exert constraint on the hypothetical monopolist providing leased lines because existing suppliers of these other symmetric data products, not currently providing retail leased line services would actually need to acquire and deploy leased lines in order to supply their services.

At the wholesale level, telecommunications operators purchase leased lines for provision of downstream telecommunications services. They are essential to support the provision of mobile services and fixed broadband services by service providers that have not deployed, or not fully deployed, their own physical network.

1.5.2 Business versus residential customers

At the retail level, relevant markets can be defined with respect to the needs of different categories of users. In particular, residential and business users may or may not belong to the same relevant market.

While it is clear that some large businesses can have very different needs from those of residential users, business users are too diverse, for example in terms of size differences and nature of their businesses to form a uniform category. For example, the needs of SMEs may resemble the needs

[13] OECD Defining the Relevant Market in Telecommunications, 2014, https://www.oecd.org/daf/competition/Defining_Relevant_Market_in_Telecommunications_web.pdf

of residential users more than the needs of large corporations and multi-national firms, who often require tailor-made services.

In the Telefónica case, for example, the EC defined the relevant market as the market for all of the non-differentiated broadband products, regardless of technology, and marketed in the "mass market" for both residential and non-residential users. The relevant market, however, did not include tailor-made broadband solutions, which are mainly offered to large corporations.[14]

In the merger between Vodafone and TelstraClear, cleared by the New Zealand Commerce Commission (Commerce Commission), the Commerce Commission found that certain categories of businesses (i.e. businesses operating from home and small business having their own premises) form part of the residential market as the telecommunications services/products they purchase are typically equivalent to the products purchased by residential customers.[15]

1.5.3 Geographical markets

In telecommunications, regulatory and competition authorities in most jurisdictions have traditionally defined relevant markets as national in scope. This is often on the simple basis that the corresponding licensing regimes are also national.

However, the number, coverage and market share of alternative networks and alternative operators may differ across different regions with the result that competitive conditions are often no longer homogenous across all regions within the same country. When that is the case, there may be a need to reflect such diverse sub-national market conditions in the competition analysis.

Indeed, several countries now apply regulation in the telecommunications sector on a sub-national basis. In Australia, for example, the Australian Competition and Consumer Commission acknowledged that ex ante regulations should reflect the fact that infrastructure-based competition is likely to develop in a heterogeneous manner across the country. Sub-national regulation of telecommunications markets arises where either relevant markets are defined on a sub-national basis, or remedies are differentiated geographically even if markets are defined nationally.

An early example of sub-national geographic segmentation in telecommunications regulation within the European Union (EU) comes from the United Kingdom (UK). In 2007, the Office of Communications (Ofcom), the UK's regulatory authority for communications services, submitted to the EC a notification concerning the wholesale broadband market, in which it proposed to significantly modify the existing ex ante regulation. In particular, Ofcom proposed to define the relevant wholesale broadband market in the UK on a regional basis. Several developments led Ofcom to consider that there may no longer be a national geographic market for wholesale broadband. In particular, Ofcom pointed to BT's differential wholesale broadband charges across regions and the varying conditions in terms of competitive pressure exerted by alternative providers across those same regions.

[14] EC, Case COMP/38.784, Wanadoo España vs. Telefónica (2007).
[15] Commerce Commission (2012), Vodafone New Zealand Limited and TelstraClear Limited (2012) NZCC 33. Available at: https://comcom.govt.nz/__data/assets/pdf_file/0027/76176/NZCC-33-2012-Vodafone-TelstraClear-clearance-public-decision-29-October-2012.pdf

1.5.4 One-way substitution – competitive pressure from mobile to fixed voice services

It has been considered, by several regulatory authorities, that while mobile services can exert a competitive constraint on fixed voice services, the converse is not true.

As far back as 2006, the United States (US) Federal Communications Commission (FCC) reviewed and approved a merger between AT&T and BellSouth – two large US fixed-line operators.[16] As for the reasons for granting approval, in addition to the fact that these operators had very small geographical overlap, the FCC also noted that the rapid growth of intermodal competitors – from cable telephony, mobile wireless service providers as well as providers of certain VoIP services was likely to continue to provide end-users with viable alternatives.

More recently, the Finnish regulator, FICORA, considered that retail fixed access for voice services was fully substitutable with mobile access services, but not the other way around. That is, if there were a SSNIP[17] for retail fixed access services, it would be defeated by significant switching of fixed voice subscribers to mobile service subscriptions.

In the presence of asymmetric substitution, it is important to define the focal product of the market analysis, i.e. the main product under investigation, and consider the effects of asymmetric substitution on the focal product when delineating the relevant market. If there is substitution from the focal product to another product, both products belong to the same market.

Similarly, services such as VoIP can effectively constrain the behaviour of other players in the fixed voice services market. Where services such as VoIP are considered by end-users as potential substitutes for traditional fixed voice services, they may have a considerable impact on the delineation of the precise boundaries of relevant markets.

1.5.5 Bundled services

The purchase of television services and telecommunications services in bundles of several components has become quite common around the world. In terms of fixed-line based services, it is common to see cable TV companies offering telephony and broadband services, as well as traditional telephony companies entering the market for broadband Internet access and television. This has been made possible to a large extent thanks to the transition from legacy PSTN to IP broadband networks.

If a large portion of customers purchase telecommunications services in the form of bundles, it is important that this fact gets reflected in the definition of the respective relevant markets.

The EC in its Explanatory Note to the Recommendation on Relevant Markets does not suggest that particular bundles of services be considered as separate markets. Rather, the EC considers important that national regulators are able to ensure that all elements of the bundle can be effectively replicated (in terms of both technical and economic replicability) at the retail level,

[16] FCC (2007), Memorandum Opinion and Order, WC Docket No. 06-74, In the matter of AT&T Inc. and BellSouth Corporation application for transfer of control, FCC 06-189. Available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-189A1.pdf

[17] Small but Significant Non-transitory Increase in Price, usually considered to be 5 to 10 per cent, which is part of the hypothetical monopolist test used in market definition analysis.

without necessarily applying or extending regulation to bundled elements that are available under competitive conditions.

Moreover, the EC suggests, in cases of the provision of the fixed voice service with broadband access and/or IPTV, bundling at the retail level is rather a phenomenon of continued provision of a declining fixed voice service alongside broadband access and/or IPTV, rather than an economically significant offer that would alter the competitive dynamics over a longer period.

1.6 Structure of this document

In what follows, we first identify the relevant markets and then assess how the Proposed Transaction might or might not affect each one of them in Sections 2 to 10.

Retail local fixed voice services

Retail local fixed Internet access services

Retail mobile telecommunications services

Retail multiple play services

Local fixed network access services

Wholesale market for interconnection with fixed networks

External telecommunications services

Fixed external telecommunications facilities

IT services

We then consider in Section 11 the economic efficiency claims made by the merging parties in relation to the Proposed Transaction. In the last section, we will discuss the commitments offered by the merging parties to the CA in order to address the competition issues that might arise from the Proposed Transaction.

2 Retail local fixed voice services

2.1 Overview of the market

The market for fixed voice services comprises a range of services capable of delivering voice communication at a fixed location, such as wireline-based telephony services and VoIP.

PCCW-HKT, the incumbent was historically the sole player in the fixed voice market in Hong Kong before the market liberalisation. It continues to have by far the largest market share by number of subscribers. The fixed telecommunications services market was first liberalised in 1995 with three new entrants introduced. Since 2003, the market has been fully liberalised that there is no maximum number of licences that would be issued.

For the residential sector, fixed voice services can be a standalone service, a value-added service or an add-on item that is combined with broadband services. For the business segment, fixed voice services appear to remain an essential service.

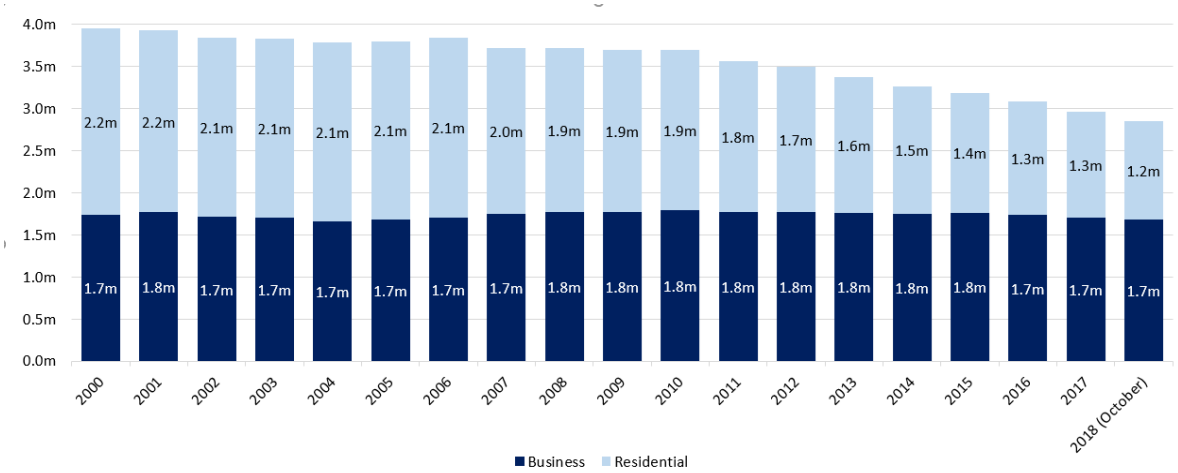
In Hong Kong, fixed voice services are provided on a monthly flat rate basis, although there are no licence restrictions that prevent operators from providing these on a per minute charging scheme instead.

2.2 Main trends

The last decade has seen a slow but steady decline in the number subscribers of traditional wireline-based telephony services, due to substitution away from fixed voice services towards mobile services and VoIP. Business customer subscriptions have remained fairly constant.[18]

[18] BuddeCom (2015), Hong Kong Telecoms, Mobile and Broadband, 21st Edition

Figure 3 Fixed-line telephony, number of lines, 2000-2018



Note: 'Exchange lines' statistics prior to December 2007 included IP telephony / VoIP subscribers by some operators. Since December 2007 IP telephony/VoIP are recorded under a separate item, resulting in a decrease in the number of exchange lines in December 2007. Also the statistics above do not include number of subscribers of VoIP services provided by SBO licensees.

Source: London Economics based on data from BuddeCom (2015), Hong Kong Telecoms, Mobile and Broadband, 21st Edition for 2000-2014; and OFCA data for 2015-2018

2.3 Main players in Hong Kong

PCCW-HKT is the universal service provider, who is obliged to provide basic switched telephone services under the TO[19]. Currently, PCCW-HKT remains the main player in the fixed voice services market, [redacted] in both the residential and business segments.

HKBN has a strong presence in the residential segment, capturing approximately [redacted]% of this market, while only approximately [redacted]% of the business segment. WTT has a relatively strong presence in the business segment, capturing nearly [redacted]% of this market segment. Having withdrawn from the residential market in 2010, WTT [redacted]

As of October 2018, HGC is the [redacted] largest player in the overall fixed voice services market, capturing approximately [redacted]% of this market segment – approximately [redacted]% of the residential market, and approximately [redacted]% of the business segment. Other operators account for less than [redacted]% of the business segment, and around [redacted]% of the residential segment.

[19] This includes: "the service connection, continued provision of connectivity provision of a dedicated telephone number, an appropriate directory listing, a standard telephone handset without switching capacity, standard billing and collection services and relevant ancillary services and facilities necessarily utilized by the licensee." (TO, Section 2)

[redacted]

Table 1 Fixed voice services market shares, October 2018

Operator	Residential segment		Business segment		Overall market	
	No. of telephone lines/ subscribers	Share (%)	No. of telephone lines/ subscribers	Share (%)	No. of telephone lines/ subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
Others						
Merged Entity				***[20% - 25%]***		

Note: Fixed voice services include both wirelines and VoIP services. Please note that the figures for wireline services are based on the number of telephone lines whilst the figures for VoIP services are based on number of subscribers. Market shares are rounded to 1 decimal place and as a result may not sum to 100%. [redacted]

Source: OFCA

Depending on how the relevant market is ultimately defined, the Proposed Transaction can be considered a 4-to-3 merger in the business segment. In the residential segment, since WTT is not providing retail services, there is no concentration as a result of the Proposed Transaction.

Looking deeper at the different segments within overall fixed voice services markets (Table 2 and Figure 4), reveals that HKBN is particularly strong in the residential wireline segment (capturing around [redacted]% of this market), while WTT is particularly strong in the business VoIP segment (capturing more than [redacted]% of this segment)[21]. However, the overlap between the two merging parties in these segments is very small as WTT is not present in the residential wireline segment and HKBN's share in the business VoIP segment is at [redacted]% only.

There is greater overlap between the merging parties in the business wireline segment, where HKBN and WTT account for approximately [redacted]% and [redacted]% of that segment respectively.

Table 2 Fixed voice services market shares, by segment, October 2018

Operator	Share of telephone lines (%)			Share of subscribers (%)		
	Wireline - overall	Wireline - residential	Wireline - business	VoIP - overall	VoIP - residential	VoIP - business
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
Others						
Merged Entity						

Note: Market shares are rounded to 1 decimal place and as a result may not sum to 100%.

Source: OFCA

[21] In Hong Kong, whether VoIP service is licensable depends mainly on two factors: whether it is required to carry a local telephone number and whether there is equipment located in Hong Kong for its operation. If either one of the above is positive, a licence is required. The statistics in relation to VoIP services in this report only reflect the licensable VoIP services.

Figure 4 Fixed voice service subscribers / telephone lines, by segment, October 2018

Note: Wireline is given by number of telephone lines (thousands) whilst VoIP is given by number of subscribers (thousands).
Source: OFCA

2.4 Possible impacts of the Proposed Transaction on concentration measures

This sub-section looks at the impact of the Proposed Transaction on concentration in the retail fixed voice services market. We use several segmentations of the retail fixed voice services market to gauge the extent to which our quantification of the Proposed Transaction on concentration in this relevant market is sensitive to the way in which the market boundary is drawn.

Market shares in terms of revenues also provide important information about the market position of the merging parties. However, OFCA does not collect revenue data from all operators but some of the major FNOs. We are able to report only partial revenue share information based on that collected by OFCA and that provided by the merging parties. This follows after the subscriber share data below.

2.4.1 Business + Residential

Table 3 Fixed voice services market shares, overall, October 2018

Operator	Fixed Voice Services (Wireline + VoIP) - overall		Wireline - overall		VoIP - overall	
	No. of telephone lines/ subscribers	Share (%)	No. of telephone lines	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
Others						
Merged Entity						

Note: Market shares are rounded to 1 decimal place and as a result may not sum to 100%.
Source: OFCA

Table 4 Impact of the Proposed Transaction on the combined market share of the four largest firms (CR4), October 2018

Segment	CR4 before the Proposed Transaction (%)	CR4 after the Proposed Transaction (%)	Market share post-Proposed Transaction (%)
Fixed voice services (Wireline + VoIP) – overall	[redacted]		
Wireline – overall			
VoIP – overall			

Note: Wireline market shares based on number of telephone lines, VoIP market shares based on number of subscribers.

Source: London Economics based on OFCA data

Table 5 Impact of the Proposed Transaction on the Herfindahl-Hirschman Index (HHI), October 2018

Segment	HHI - min			HHI - max		
	Before the Proposed Transaction	After the Proposed Transaction	Difference	Before the Proposed Transaction	After the Proposed Transaction	Difference
Fixed voice services (Wireline + VoIP) - overall	[redacted]					
Wireline – overall						
VoIP - overall						

Note: Wireline market shares are based on number of telephone lines whereas VoIP market shares are based on number of subscribers. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

If we include both the business and residential segments in our market definition, Table 3 to Table 5 show the impact of the Proposed Transaction on market shares, and the two concentration measures viz. CR4 and HHI respectively. We note that these values are above the safe-harbour thresholds as set out in the Merger Guideline. In terms of CR4, for market structure with CR4 which exceeds 75%, the merged entity would need to have a combined market share no higher than 15% for it to fall within the safe-harbour.[22] In terms of HHI, for a market with a post-merger HHI of more than 1,800, the increase in HHI associated with the Proposed Transaction would have to be less than or up to 50 points for it to fall within the safe-harbour.[23] The Proposed Transaction does not meet the safe-harbour threshold for either of the concentration measures.

However, we note that the fact that the Proposed Transaction does not meet the requirement for it to fall within the safe-harbour conditions as set out in the Merger Guideline is not by itself an indication that it would give rise to competition concerns. It only indicates that a more detailed analysis of the likely competition effects of the Proposed Transaction is warranted.

2.4.2 Business segment

Table 6 Fixed voice services market shares in the business segment, October 2018

Operator	Fixed voice services (Wireline + VoIP) - Business		Wireline - Business		VoIP - Business	
	No. of telephone lines/ subscribers	Share (%)	No. of telephone lines	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
Others						
Merged Entity		***[20% - 25%]***				

Note: Market shares are rounded to 1 decimal place and as a result may not sum to 100%.
Source: OFCA

[22] According to the Merger Guideline, for market with CR4 which does not exceed 75% and the merged entity has a market share of less than 40%, the CA takes the view that it is unlikely that there will be a need to carry out a detailed investigation or to intervene. Where the CR4 is 75% or more, the CA is unlikely to investigate the transaction if the combined market share of the merged entity is less than 15% of the relevant market. (Paragraph 3.15 of the Merger Guideline)

[23] According to the Merger Guideline, any market with a post-merger HHI of less than 1,000 will be regarded as un-concentrated. Markets with a post-merger HHI of between 1,000 and 1,800 will be regarded as moderately concentrated. Mergers producing an increase in the HHI of less than 100 in these markets are unlikely to result in an SLC Effect and normally require no further investigation. Markets with a post-merger HHI of more than 1,800 will be regarded as highly concentrated. Merger producing an increase in HHI of less than 50 are unlikely to substantially lessen competition. (Paragraphs 3.17-3.19 of the Merger Guideline)

Table 7 Impact of the Proposed Transaction on the CR4, October 2018

Segment	CR4 before the Proposed Transaction (%)	CR4 after the Proposed Transaction (%)	Market share post-Proposed Transaction (%)
Fixed voice services (Wireline + VoIP) – Business	[redacted]	[redacted]	[20% - 25%]
Wireline – Business	[redacted]	[redacted]	[redacted]
VoIP – Business	[redacted]	[redacted]	[redacted]

Note: Wireline market shares based on number of telephone lines, VoIP market shares based on number of subscribers.

Source: London Economics based on OFCA data

Table 8 Impact of the Proposed Transaction on the HHI, October 2018

Segment	HHI - min			HHI - max		
	Before the Proposed Transaction	After the Proposed Transaction	Difference	Before the Proposed Transaction	After the Proposed Transaction	Difference
Fixed voice services (Wireline + VoIP) - Business	[redacted]	[redacted]	[250 – 300]	[redacted]	[redacted]	[250 – 300]
Wireline - Business	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
VoIP - Business	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: Wireline market shares based on number of telephone lines, VoIP market shares based on number of subscribers. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

The merging parties overlap in the business segment of the fixed voice services market with a combined market share of [20% - 25%]. WTT is the [redacted] largest supplier [redacted] and HKBN is the [redacted] largest [redacted] Apart from these four players, the rest of the market constitutes less than [redacted]%. The Proposed Transaction is a 4-to-3 merger in this segment.

2.4.3 Residential segment

Table 9 Fixed voice services market shares in the residential segment, October 2018

Operator	Fixed voice services (Wireline + VoIP) - Residential		Wireline - Residential		VoIP - Residential	
	No. of telephone lines/ subscribers	Share (%)	No. of telephone lines	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
Others						
Merged Entity						

Note: Market shares are rounded to 1 decimal place and as a result may not sum to 100%.

Source: London Economics based on OFCA data

Table 10 Impact of the Proposed Transaction on the CR4, October 2018

Segment	CR4 before the Proposed Transaction (%)	CR4 after the Proposed Transaction (%)	Market share post-Proposed Transaction (%)
Fixed voice services (Wireline + VoIP) – Residential	[redacted]		
Wireline - Residential			
VoIP - Residential			

Note: Wireline market shares based on number of telephone lines, VoIP market shares based on number of subscribers.

Source: London Economics based on OFCA data

Table 11 Impact of the Proposed Transaction on the HHI, October 2018

Segment	HHI - min			HHI - max		
	Before the Proposed Transaction	After the Proposed Transaction	Difference	Before the Proposed Transaction	After the Proposed Transaction	Difference
Fixed voice services (Wireline + VoIP) - Residential	[redacted]					
Wireline - Residential						
VoIP - Residential						

Note: Wireline market shares based on number of telephone lines, VoIP market shares based on number of subscribers. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

Table 9 to Table 11, indicate that the merging parties do not overlap in the residential segment within the relevant market.

2.4.4 Partial revenue data

On the basis of revenue data available, we assess the market shares of the various players offering fixed voice services in revenue terms. Since the revenue data provided is available only for the 4 FNOs listed in Table 12 below, the revenue shares calculated solely on that basis are upper bounds.

Table 12 Fixed voice services – revenue share estimates (in thousands HKD)

Operators	Residential lines	Business lines	Share (%)
HKBN	[redacted]		
WTT			
HGC			
PCCW-HKT			
Merged entity (upper bound)			

Note: 2017 Revenues; all companies except HKBN are for year end 31 December 2017. HKBN year end is 31 August 2017. Only data for the four companies listed was reported in this source. As a result, the full size of the market is not known, and the estimated shares are therefore upper bounds.

Source: OFCA

On the basis of revenue data available, we note that the market share of the merging parties is estimated to be at most [redacted]% in the fixed voice services market, after the Proposed Transaction. We note that such market shares by revenue [redacted] the safe-harbour threshold market share level of 15%, below which it is unnecessary to conduct a more detailed assessment for the Proposed Transaction.

2.4.5 Data from HKBN and WTT's submissions

The merging parties have submitted further data on both subscriber numbers and turnover. Table 13 below reports on the merging parties' subscriber share data.

Table 13 Fixed voice services (inc. IDD) – segment shares (subscriptions) – all customers

Operator	2015		2016		2017	
	Subscription (thousands)	Market share (%)	Subscription (thousands)	Market share (%)	Subscription (thousands)	Market share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
Others						
Segment size						
Merged entity						

Source: HKBN and WTT

We note that market shares of various players offering fixed voice services based on the subscriber data provided by the merging parties do not differ significantly from the ones calculated on the basis of OFCA's data. WTT's market share in terms of subscriptions provided by the merging parties is in line with that based on telephone lines as seen by comparing Table 1 and Table 13.

The merging parties were also able to provide their own estimates of market shares in terms of turnover. [redacted]

Table 14 Fixed voice services (inc. IDD)– segment shares (subscriptions) – business customers only

Operator	2015		2016		2017	
	Subscription (thousands)	Market share (%)	Subscription (thousands)	Market share (%)	Subscription (thousands)	Market share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
Others						
Segment size						
Merged entity						

Note: Market shares are rounded to 1 decimal place and as a result may not sum to 100%.
Source: HKBN and WTT

Table 15 Fixed voice services (inc. IDD)- segment shares (turnover) - business customers only

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged entity						

Note: The fixed voice services market size estimate [redacted]
Source: HKBN and WTT

Table 16 Fixed voice services (excl. IDD)- segment shares (turnover) - business customers only

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged entity						

Note: The market size estimate [redacted]
Source: HKBN and WTT

The merging parties' own data thus suggest that their respective and combined market shares based on turnover are significantly lower than those same measures based on of the number of subscribers. Indeed, as shown in Table 15, if we were to include IDD in the relevant market, the merging parties' turnover data implies a combined market share which is below the safe-harbour threshold of 15% as set out in the Merger Guideline.

We thus have corroborating sources indicating combined market shares by revenue for the merging parties which are, [redacted]

2.5 Closeness of competition between HKBN and WTT

Market shares alone do not provide all the information needed to gauge the extent to which the merging parties in the Proposed Transaction exert a competitive constraint on each other – or the extent to which they would be likely to continue doing so in the absence of the Proposed Transaction.

In order to exert a competitive constraint on each other, the merging parties would have to be perceived as close substitutes by a significant proportion of their customers. One way to investigate this issue is to examine porting and switching data. In particular, we consider the following:

- Of all the customers who leave WTT, is the percentage that end up with HKBN high? That percentage would be considered high if it is greater than the share of HKBN in the relevant market without WTT. If this were the case, it would be an indication that WTT customers consider HKBN a closer substitute than the other competitors, and vice versa for customers leaving HKBN.
- Of all the customers that switch into HKBN, is the percentage that come from WTT high? That percentage would be considered high if it is greater than the share of WTT in the market without HKBN. If this were the case, it would be an indication that HKBN has greater success at attracting WTT customers than customers from other competitors, and vice versa for customers switching into WTT.

This section examines the two issues identified above based on porting and [redacted] data provided by the merging parties in their submissions. We note that the porting data is only available for retail fixed voice services and so only closeness of competition between the merging parties in this market can be examined.

2.5.1 Porting out of HKBN and porting into WTT

Table 17 shows the proportion of phone numbers transferred from HKBN to other operators (Port-OUT), while Table 18 shows the proportion of phone numbers transferred from other operators to WTT (Port-IN), over the last four years on a quarterly basis. For each operator, the tables compare the proportion of phone numbers transferred to/from other operators to the residual market shares of those operators (i.e. excluding HKBN in Table 17 and excluding WTT in Table 18) for the overall fixed voice market (wireline + VoIP).

Considering first HKBN's port-out data, we note that WTT does not appear to be particularly attractive to customers exiting HKBN. There are, however, notable exceptions. [redacted]

From the perspective of WTT's port-in data in Table 18, [redacted]

[redacted] This suggests that new WTT customers are not coming from HKBN, providing further evidence that WTT does not appear to be 'stealing' HKBN customers.

Table 17 HKBN port-out data, 2015 - 2018

New operator	2015Q1		2015Q2		2015Q3		2015Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT	[redacted]							
HGC								
WTT								
Others								

New operator	2016Q1		2016Q2		2016Q3		2016Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT	[redacted]							
HGC								
WTT								
Others								

New operator	2017Q1		2017Q2		2017Q3		2017Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT	[redacted]							
HGC								
WTT								
Others								

New operator	2018Q1		2018Q2		2018Q3	
	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT	[redacted]					
HGC						
WTT						
Others						

Note: The table shows, for each quarter, the proportion of telephone numbers transferred from HKBN to other operators (Port-OUT), compared to the proportion of telephone lines owned by that operator relative to all telephone lines owned by operators other than HKBN. Fixed voice includes wireline and VoIP. Please note that multiple numbers can be associated with a line and that for wireline services, it is likely that one subscriber could subscribe to multiple lines for a single premises. Also note that each column may not sum to 100% due to rounding approximations. [redacted]

Source: OFCA, WTT

Table 18 WTT port-in data, 2015 - 2018

Previous operator	2015Q1		2015Q2		2015Q3		2015Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

Previous operator	2016Q1		2016Q2		2016Q3		2016Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

Previous operator	2017Q1		2017Q2		2017Q3		2017Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

Previous operator	2018Q1		2018Q2		2018Q3	
	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-IN	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]					
HGC						
HKBN						
Others						

Note: The table shows, for each quarter, the proportion of telephone numbers transferred from other operators to WTT (Port-IN), compared to the proportion of telephone lines owned by that operator relative to all telephone lines owned by operators other than WTT. Fixed voice includes wireline and VoIP. Please note that multiple numbers can be associated with a line and that for wireline services, it is likely that one subscriber could subscribe to multiple lines for a single premises. Also note that columns may not sum to 100% due to rounding approximations. [redacted]

Source: OFCA, WTT

From the data analysis above, except for certain quarters during the period where data are available, we note that WTT receives a [redacted] percentage of its switching-in customers from HKBN. This indicates that prior to the Proposed Transaction WTT does not exert a significant competitive pressure on HKBN.

2.5.2 Porting out of WTT and porting into HKBN

Port-in data from HKBN (Table 19) show [redacted]

WTT's port-out data (Table 20) registered [redacted] These numbers therefore indicate that HKBN is a close competitor for WTT in this market segment.

Table 19 HKBN port-in data, 2015 - 2018

Previous operator	2015Q1		2015Q2		2015Q3		2015Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT								
HGC								
WTT								
Others								

Previous operator	2016Q1		2016Q2		2016Q3		2016Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT								
HGC								
WTT								
Others								

Previous operator	2017Q1		2017Q2		2017Q3		2017Q4	
	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT								
HGC								
WTT								
Others								

Previous operator	2018Q1		2018Q2		2018Q3	
	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)	Port-IN	Operator's fixed voice share in 'market-minus-HKBN' (%)
PCCW-HKT	[redacted]					
HGC						
WTT						
Others						

Note: The table shows, for each quarter, the proportion of telephone numbers transferred from other operators to HKBN (Port-IN), compared to the proportion of telephone lines owned by that operator relative to all telephone lines owned by operators other than HKBN. Fixed voice includes wireline and VoIP. Please note that multiple numbers can be associated with a line. Also note that columns may not sum to 100% due to rounding approximations. [redacted]

Source: OFCA, WTT

Table 20 WTT port-out data, 2015 - 2018

New operator	2015Q1		2015Q2		2015Q3		2015Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

New operator	2016Q1		2016Q2		2016Q3		2016Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

New operator	2017Q1		2017Q2		2017Q3		2017Q4	
	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]							
HGC								
HKBN								
Others								

New operator	2018Q1		2018Q2		2018Q3	
	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)	Port-OUT	Operator's fixed voice share in 'market-minus-WTT' (%)
PCCW-HKT	[redacted]					
HGC						
HKBN						
Others						

Note: Table shows, for each quarter, the proportion of telephone numbers transferred from WTT to other operators (Port-OUT), compared to the proportion of telephone lines owned by that operator relative to all telephone lines owned by operators other than WTT. Fixed voice includes wireline and VoIP. Please note that multiple numbers can be associated with a line. Also note that columns may not sum to 100% due to rounding approximations. [redacted]

Source: OFCA, WTT

We note that available data examined above seem to indicate that while WTT does not appear to be a close competitor to HKBN, HKBN appears to be a close competitor to WTT prior to the Proposed Transaction.

2.5.3 Business segment [redacted] data to [redacted]

[redacted]

Table 21 [redacted] business customer [redacted] data, 2015 – 2016

Operators	2015Q1	Operator's fixed voice business share in 'market-minus-[redacted]' (%)	2015Q2	Operator's fixed voice business share in 'market-minus-[redacted]' (%)	2015Q3	Operator's fixed voice business share in 'market-minus-[redacted]' (%)
PCCW-HKT	[redacted]					
HGC						
[redacted]						
Others						

Operators	2015Q4	Operator's fixed voice business share in 'market-minus-[redacted]' (%)	2016Q1	Operator's fixed voice business share in 'market-minus-[redacted]' (%)	2016Q2	Operator's fixed voice business share in 'market-minus-[redacted]' (%)
PCCW-HKT	[redacted]					
HGC						
[redacted]						
Others						

Note: [redacted] is compared to market shares of operators other than [redacted] in the business fixed voice segment and the business broadband segment. These shares were calculated as the number of subscribers by an operator relative to the total number of subscribers of all operators other than [redacted].

Source: [redacted]

The [redacted] data in Table 21 appears to suggest that HKBN was not a particularly attractive competitor to WTT [redacted]

2.5.4 Assessment of porting and [redacted] data

If all competitors are equally close competitors to each other, we would predict that customers leaving one firm would be likely to move to a competitor in direct proportion to the market share of that competitor in the remainder of the market (i.e. excluding the originating company). When a competitor attracts a significantly larger share of the customers of the originating company than is implied by its market share, then this could be construed as an indication that the originating company and that competitor are close competitors.

[redacted]

[redacted] the porting and [redacted] data used for the analysis above may not be comprehensive enough to draw any conclusive view on closeness of competition between HKBN and WTT, and therefore any pattern identified based on the analysis of the porting and [redacted] data should be taken as an indicative one only rather than a conclusive one. In conclusion, we consider that no definite conclusion about the closeness of competition could be drawn from either or both of the porting and [redacted] data examined above.

2.6 Market definition

In this section, we turn to define the relevant market(s) in relation to retail local fixed voice services.

2.6.1 The merging parties' views

[redacted]

[redacted]

[redacted]

2.6.2 Views of other parties

In September 2018, OFCA asked all FNOs and MNOs in Hong Kong, as well as top [redacted] customers of HKBN and WTT to provide information and comments on the Proposed Transaction. No parties other than the merging parties expressed any view on the definition of the relevant market for retail fixed voice services.

2.6.3 Assessment

Due to demand substitutability, we consider that the relevant market for retail fixed voice services should encompass VoIP services as well as traditional wireline telephony. Mobile voice services are likely to exert significant competitive constraint on pricing of fixed voice as they are close substitutes for a range of voice communication demands. Despite that, we consider that they fall short of being in the same market because there are demand segments for which mobile voice is not a close enough substitute. This is especially likely to be the case for certain business customers.

There is significant supply substitutability between the residential and business segments, although products of different characterises are offered to each type of customer separately.

In considering the definition of the relevant market for retail fixed voice services, we have also taken account of relevant EC decisions on competition cases in the telecommunications sector. For example, in Vodafone/Kabel Deutschland the EC considered that VoIP services and traditional telephony are part of the same overall market because the services are interchangeable.[27] No distinction was made between residential and business customers in Tele2 Sverige/TDC Sverige.[28] Likewise, in Liberty Global/BASE it was decided that the relevant product market was the overall retail market for the provision of fixed telephony services.[29]

With regard to the question of whether the relevant market for retail fixed voice services should encompass both the residential and the business segments, or have them treated separately, and despite the fact that there are precedents in the EC where both segments are included in the same relevant market, we note that in the present case it is unnecessary for us to form a definitive view on this issue. This is the case because, as discussed above, WTT has withdrawn from providing retail fixed voice services to residential customers. On the other hand, the merging parties are

[redacted]

[27] Link to Decision: http://ec.europa.eu/competition/mergers/cases/decisions/m6990_571_2.pdf; see para 113: "The Commission concludes that traditional telephony and VoIP are interchangeable within the market for the retail local fixed voice services."
[28] http://ec.europa.eu/competition/mergers/cases/decisions/m8131_399_3.pdf para 25.
[29] See M.5532 Vodafone/Kabel Deutschland (2013); M.7637 Liberty Global/BASE (2016); M.8131 Tele2 Sverige/TDC Sverige (2016); M.7231 Vodafone/ONO (2014)

both active players as providers of retail fixed voice services to business customers. As such, while focusing the assessment of the competition effects of the merger on the segment for business customers, it is safe to assume that competition effects would be no worse in the broader market.

Given that there is no evidence to suggest that the interchangeability between traditional wireline and VoIP services as perceived by customers differs from other jurisdictions, it would be reasonable for us to follow the EC precedent in that regard and consider that retail fixed voice services encompass both services supplied via traditional wireline and those via VoIP. We note, however, that we do not have complete data which reflect the entirety of VoIP use in Hong Kong[30].

As such, we acknowledge that our market share calculations involving VoIP are only proxies and while this is not ideal, we are able to take into account the likely effect of these widely available substitutes (i.e. VoIP) when assessing the competition effects of the Proposed Transaction.

We consider next whether the relevant market should include or exclude ETS. An analysis of the wider market, inclusive of ETS, would be complicated by [redacted]

The ETS segment is considered very competitive and has numerous players in addition to the 4 FNOs. As such, if we were to exclude ETS from our analysis of the retail local fixed voice market we could only err on the side of caution since the market shares of the parties would necessarily be smaller in the wider market.

In spite of the considerations above, we note that a case can be made for leaving ETS out of the relevant market definition. ETS generally entail higher prices and calls are normally charged on a per minute basis while internal fixed voice services are often charged at a flat fee with unlimited minutes. Furthermore, it appears to be the case that there are far more competing suppliers providing ETS than those providing internal fixed voice services.

We thus consider that ETS have features which differ significantly enough compared to local fixed voice services to be taken out from the retail local fixed voice services market and have a separate section of its own in this report.

Summary

For the purpose of assessing the potential competition effects of the Proposed Transaction, we focus on the business segment of the retail local fixed voice services market where no distinction is made between alternative technologies for the delivery of voice services at a fixed location. For reasons discussed above, we leave it open whether the residential segment should be included in this market and focus on the business segment only as there is no overlap between the merging parties in the residential segment. We also exclude ETS and mobile services as a part of this relevant market.

[30] See footnote 21.

[redacted]

2.7 Competition effects of the Proposed Transaction

This section analyses the main factors that determine whether or not the transaction in question is likely to give rise to SLC Effect.

Absolute and relative size of the merged entity, unilateral and coordinated effects

We note that the incumbent, PCCW-HKT has the largest market share in this relevant market. It can be argued that the Proposed Transaction strengthens a substantial competitor to PCCW-HKT [redacted]

In considering whether the Proposed Transaction results in a loss of competition between the merging parties, we take into account information from porting and [redacted] data. The observed porting behaviour of customers switching away from WTT appears to indicate that HKBN may exert a significant competitive constraint on WTT, which would be lost as a result of the Proposed Transaction. However, according to the data available to us, we note that such closeness of competition is not observed in the [redacted] data. The inconsistent results of the porting data and [redacted] data do not permit a conclusion that the merging parties are close competitors in the retail business fixed voice market.

In terms of unilateral effects, we note that a combined market share of [20% - 25%], with PCCW-HKT still being the largest player in the relevant market with market share over [redacted]%, is unlikely to enable the merged entity to have the requisite market power to raise prices after the Proposed Transaction. Furthermore, from a facilities-based competition perspective, where rivals of the merged entity in this market compete on the basis of their respective fixed network infrastructure level, so long as those rivals can extend their networks throughout the territory of Hong Kong in general without significant difficulties, whether at the core network level or at the building access level, the Proposed Transaction would be unlikely to confer market power to the merged entity. More discussion on the issues related to the rollout and/or extension of fixed network infrastructure will be discussed in Section 6 below. Hence, the prevailing evidence appears to suggest that there will be no risk from unilateral effects following the Proposed Transaction in this market. We consider also the extent to which the Proposed Transaction might facilitate coordinated behaviour among the top players. More symmetric market structures are generally deemed to favour collusion. However, in this case, even after the Proposed Transaction, the structure is very far from symmetric [redacted]

More importantly, competitive pressure exerted by close substitutes to the traditional supply of retail fixed voice also acts to reduce the risk of loss of competition from both unilateral and coordinated effects. Competitors who own fibre access infrastructure can deliver their own VoIP services over their broadband access circuits. Alternatively, voice can be provided over broadband access circuits by OTT providers. The move to use of OTT voice services is a global trend. The growing ability for customers in this market to access innovative forms of delivering voice services and comparable forms of communication are strong forces that would act to defeat unilateral price increases and destabilise collusive agreements.

Barriers to entry and barriers to expansion

One necessary condition for a Proposed Transaction to negatively impact competition is that barriers to entry are high. Entry into the retail local fixed voice services market can take place by

operators who lay their own infrastructure or service providers that buy wholesale access products from the operators of relevant infrastructures.

In principle, operators with authorisation from the CA may lay telecommunications lines on land that is not for exclusive occupation or use and may access common parts of buildings for the purpose of rolling out their networks. In practice, the former Telecommunications Authority (TA) noted that operators sometimes had encountered difficulties in accessing buildings[32]. More recent evidence to support this observation comes from [redacted], who have pointed to access difficulties at some commercial buildings due to site constraints and lack of engagement from the BMO or the FNOs with existing access in the building. This view was echoed by [redacted]. These issues will be further discussed in the section which analyses the local fixed network access services market.

Entry at the infrastructure level is possible but is not without some cost and/or delay and it is unlikely that an entrant would invest in infrastructure for the sole purpose of providing retail fixed voice services. Having said that, we do observe that in recent years, there is evidence to suggest that entry at the infrastructure level albeit at a smaller scale than a ubiquitous network covering all territories in Hong Kong and targeting business segment only has emerged, with [redacted] being one example. This type of boutique-style de novo entry focusing to serve business customers only is important for the present analysis as the merging parties do overlap only in the business segment of this market pre-merger. This piece of information is important as it demonstrates that targeted entry at the fixed infrastructure level is a viable business strategy. Hence, on top of the constraint imposed by the merged entity's extant rivals one of which is the incumbent, such de novo boutique-style entry could serve an additional constraint on the merged entity's market power post-merger.

There is another constraint exerting competitive pressure on the merged entity after the Proposed Transaction. Some service providers in this retail market may not have their own networks, and thus would have to rely on wholesale fixed network access services in order to provide services. Hence, a competitive wholesale market for local fixed network access services would enable such pure service providers to enter this retail level market with relatively ease and serve as another source of competitive constraint to the merged entity.

As long as competitive conditions in the local fixed network access services market are maintained, the competitive constraint imposed by entrants, extant ones or new entrants and with or without their own fixed network infrastructure, on retail operators would continue to defeat any plans to raise prices. The extent to which the local fixed network access services market may be affected by the Proposed Transaction is discussed in Section 6.

Assessment

Based on the information available so far, our view is that the risk is low for this market to raise competition risks whether unilateral or coordinated ones following the Proposed Transaction.

We note that if there are no competition concerns in the local fixed network access services market, or if any such concerns are adequately addressed, this would further add to the conclusion that the retail local fixed voice services market would not be negatively impacted by the Proposed Transaction. The local fixed network access services market is analysed in Section 6 of this report.

[32] Statement of the TA, 6 January 2006

3 Retail local fixed Internet access services

This section covers retail local fixed Internet access services and considers also the market for retail business connectivity given that certain data sources do not allow us to separate between these two segments.

3.1 Market trends

In Hong Kong, retail local fixed Internet access services comprises mainly broadband services with a connection speed of 1 Mbps or above. The household penetration of broadband services stood at 92.8%, as of October 2018, with around [redacted]% of residential subscribers and [redacted]% of non-residential subscribers using high-speed broadband services with a connection speed of 100 Mbps or above.[33] In addition to broadband services, around 2% of subscribers are currently still using dial-up Internet access. See Table 22.

We note that whilst there is a distinction made between residential and business segments of broadband services, no such distinction is made in the business segment between SME customers and large corporate customers.

Table 22 Number of fixed Internet access subscribers, by segment, October 2018

Segment	Total number of subscribers
Internet Access Services (IAS) - Overall[1]	2,741,612
Broadband - Overall	2,688,949
Broadband – Residential	2,389,301
Broadband - Residential (1 to less than 10 Mbps)	361,624
Broadband - Residential (10 to less than 100 Mbps)	[redacted]
Broadband - Residential (100 Mbps or above)	
Broadband - Business	299,648
Broadband - Business (1 to less than 10 Mbps)	72,310
Broadband - Business (10 to less than 100 Mbps)	[redacted]
Broadband - Business (100 Mbps or above)	
Dial-up	52,663

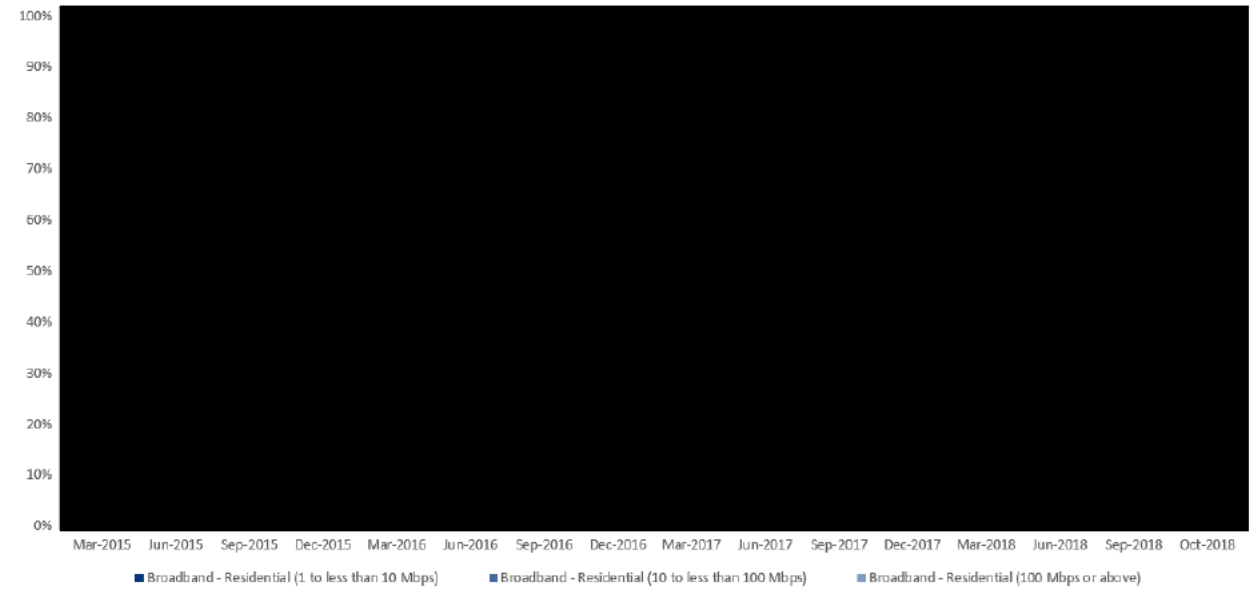
Note: (1) Dial-up + Broadband
Source: OFCA

While the number of Internet users in Hong Kong has steadily increased between 2000 and 2016, the number of fixed Internet service subscribers has remained flat over the same time period[34].

Over that period, liberalisation and increased competition in the Hong Kong's telecommunications market has driven investments in fibre network infrastructure[35], resulting in rapid increases in the number of fixed Internet subscribers connected via broadband, and a corresponding decline in the number of subscribers connected via narrowband[36].

[33] OFCA
[34] BuddeCom (2015), Hong Kong Telecoms, Mobile and Broadband, 21st Edition, Chart 2
[35] HKBN (2017), *Hong Kong's Fibre Broadband Market*, https://telsoc.org/ajtde/2017-09-v5-n3/a117, accessed on 26/09/2018.
[36] BuddeCom (2015), Hong Kong Telecoms, Mobile and Broadband, 21st Edition, Chart 3.

Figure 5 Proportion of residential broadband subscribers, by connection speed – March 2015 to October 2018

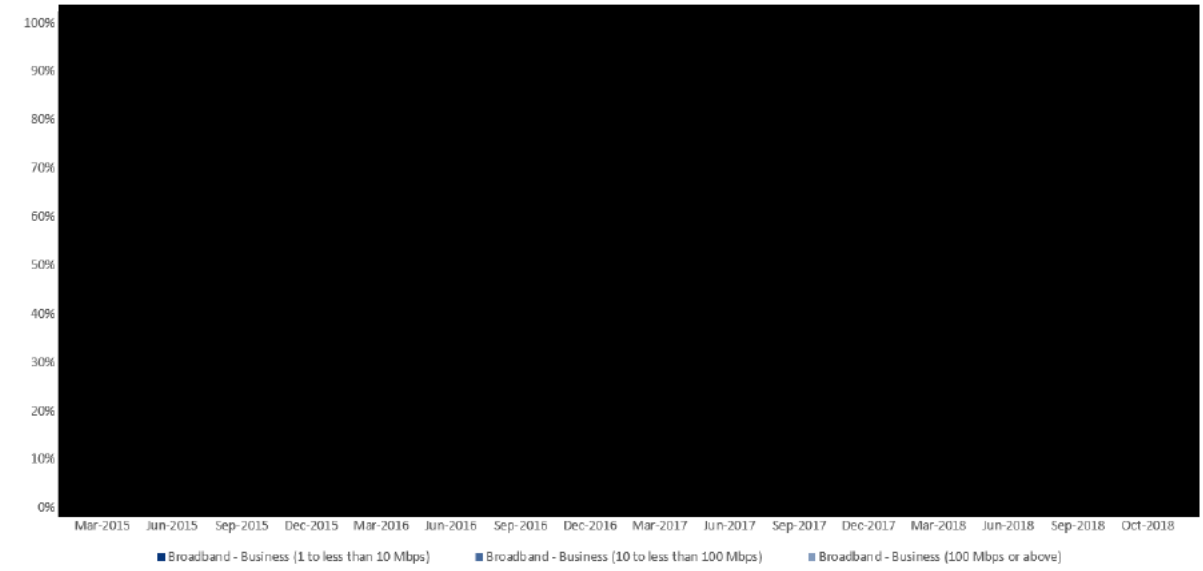


Note: [redacted]

Source: London Economics based on OFCA data

As a result, the vast majority of retail Internet access subscribers are now connected via broadband, with the share of subscribers connected via high-speed Internet (100 Mbps or above) continuing to increase. As Figure 6 indicates, the proportion of business users subscribing to high-speed broadband, in particular, has increased rapidly, from [redacted]% in March 2015 to [redacted]% in October 2018.

Figure 6 Proportion of business broadband subscribers, by connection speed – March 2015 to October 2018



Source: London Economics based on OFCA data

3.2 Main players

As with retail fixed voice services, PCCW-HKT is the incumbent in the fixed Internet access services sector and remains as the major player capturing approximately [redacted]% of the overall market (dial-up + broadband). PCCW-HKT also has a particularly extensive fibre network which, according to PCCW-HKT, covers 88.3% of all households with FTTH, as of December 2018, and offering residential broadband speeds of up to 10 Gbps (at selected locations).[37] In some locations, such as rural villages and tenement buildings, PCCW-HKT remains the sole service provider of fixed broadband services[38].

HKBN is the [redacted] largest fixed Internet access services provider in Hong Kong, capturing [redacted]% of the overall market. HKBN is particularly strong in the high-speed residential market segment (100 Mbps or above), offering broadband speeds up to 2 Gbps for residential users[39]. Indeed, by number of subscribers, HKBN is the major player in this segment, capturing approximately [redacted]% of this market, compared to approximately [redacted]% captured by PCCW-HKT. However, HKBN has also been gaining market presence in the business broadband segment, increasing its business broadband services market share from [redacted]% in 2006 to [redacted]% by October 2018[40]. As with the residential sector, HKBN is particularly strong in the high-speed business broadband segment, capturing almost [redacted]% of the market shares in this segment as of October 2018. Moreover, HKBN has a very strong presence in the dial up segment, capturing [redacted]% of the market share by subscribers, [redacted]

Table 23 Fixed Internet access services market shares, October 2018

Operator	IAS Overall[1]		Dial-up		Broadband	
	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
i-Cable						
Others						
Merged Entity						

Note: Market shares based on number of subscribers. (1) Dial-up + Broadband

Source: OFCA

HGC is the [redacted] largest fixed Internet access provider, in terms of subscribers, capturing approximately [redacted]% of the overall market. In the broadband segment, HGC is the [redacted] largest player, as of October 2018, capturing [redacted]% of the overall broadband market and [redacted]% and [redacted]% of the residential and business broadband segments, respectively. HGC offers residential broadband ranging from 10 Mbps to 2.2 Gbps[41], and up to 1 Gbps to its business customers[42].

[37] PCCW-HKT's Annual Results Presentation 2018
[38] OFCA
[39] OFCA
[40] OFCA
[41] OFCA
[42] HGC website - http://www.hgcbiz.com/Product/business-broadband-en.html - accessed on 21/10/2018.

In the overall market of retail local fixed Internet access services, WTT is a relatively small supplier and therefore the impact of the Proposed Transaction on market structure is small. We next turn to an analysis of particular market segments where the Proposed Transaction may be more of a concern.

Available data allow us to calculate market shares separately for the residential and business segments.

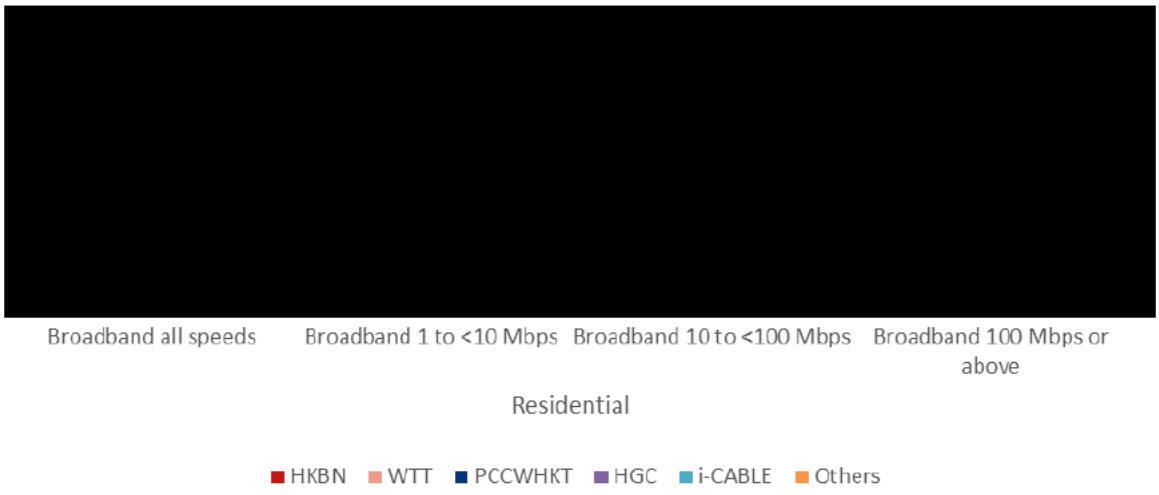
Table 24 Fixed Internet access services market shares, by segment, October 2018

Operator	Residential (%)				Business (%)			
	Broadband all speeds	Broadband 1 to <10 Mbps	Broadband 10 to <100 Mbps	Broadband 100 Mbps or above	Broadband all speeds	Broadband 1 to <10 Mbps	Broadband 10 to <100 Mbps	Broadband 100 Mbps or above
HKBN	[redacted]							
WTT								
PCCW-HKT								
HGC								
i-Cable								
Others								
Merged Entity					***[35% - 40%]***			

Note: Market shares based on number of subscribers.

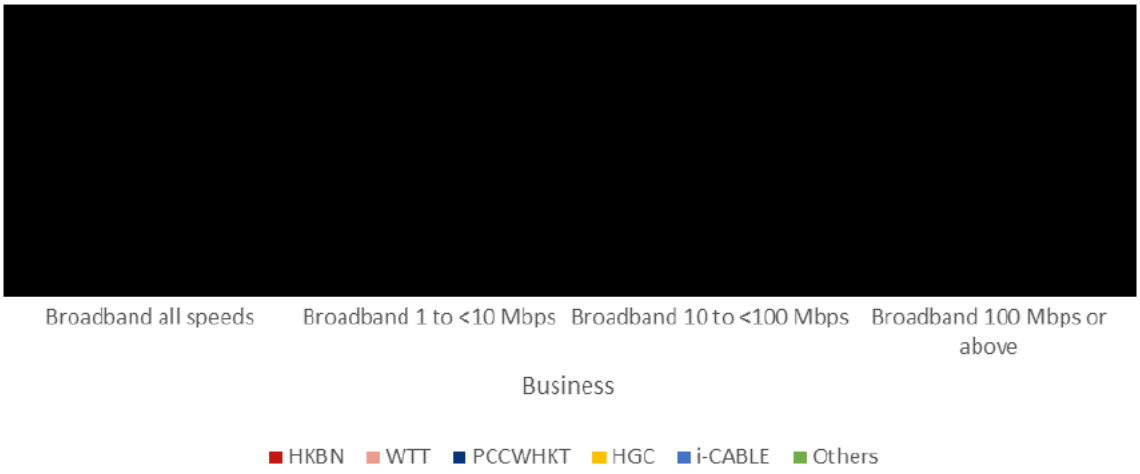
Source: OFCA

Figure 7 Residential fixed Internet access subscribers (thousands), by speed segment, October 2018



Source: OFCA

Figure 8 Business fixed Internet access subscribers (thousands), by speed segment, October 2018



Source: OFCA

WTT stopped being a supplier of retail residential Internet access services in 2010[43]. As a result, its share at just over [redacted]% in the overall fixed Internet access services market is comparatively low (see Table 25). However, WTT has a strong presence in the business broadband segment capturing approximately [redacted]% of businesses in this segment. WTT offers broadband speeds up to 1 Gbps to its business customers[44], capturing a particularly large share of the 10-100 Mbps broadband segment (around [redacted]%) and the high speed (100 Mbps or above) broadband sub-segment (around [redacted]%).

3.3 Impact of Proposed Transaction on concentration measures

3.3.1 Business + Residential

Based on the data available, we are able to assess the impact of the Proposed Transaction on concentration measures only in relation to either the market as a whole (both dial-up and broadband service subscribers) or separately for the residential and business segments of broadband services.

[43] OFCA
[44] http://www.wttictmall.com/download/WTT-2018-FibreBusinessBroadband-leaflet-web.pdf

Table 25 Fixed Internet access services market shares, overall, October 2018

Operator	IAS Overall[1]		Dial-up		Broadband	
	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]					
WTT						
PCCW-HKT						
HGC						
i-Cable						
Others						
Merged Entity						

Note: Market shares based on number of subscribers. Also note that each column may not sum up to 100% due to rounding approximations.

Source: OFCA

Table 26 Impact of Proposed Transaction on CR4, October 2018

Segment	CR4 before Proposed Transaction (%)	CR4 after Proposed Transaction (%)	Market share post-Proposed Transaction (%)
IAS Overall[1]	[redacted]		
Dial-up			
Broadband			

Note: Market shares based on number of subscribers in October 2018. (1) Dial-up + Broadband.

Source: London Economics based on OFCA data

Table 27 Impact of Proposed Transaction on HHI, October 2018

Segment	HHI - min			HHI - max		
	Before Proposed Transaction	After Proposed Transaction	Difference	Before Proposed Transaction	After Proposed Transaction	Difference
IAS Overall[1]	[redacted]					
Dial-up						
Broadband						

Note: Market shares based on number of subscribers in October 2018. (1) Dial-up + Broadband. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

3.3.2 Business segment

Table 28 Fixed Internet access services market shares in the business segment, October 2018

Operator	Broadband - Business		Broadband - Business (1 to less than 10 Mbps)		Broadband - Business (10 to less than 100 Mbps)		Broadband - Business (100 Mbps or above)	
	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]							
WTT								
PCCW-HKT								
HGC								
i-Cable								
Others								
Merged Entity		***[35% - 40%]***						

Note: Market shares based on number of subscribers. Also note that each column may not sum to 100% due to rounding approximations.

Source: OFCA

Table 29 Impact of Proposed Transaction on CR4, October 2018

Segment	CR4 before Proposed Transaction (%)	CR4 after Proposed Transaction (%)	Market share after Proposed Transaction (%)
Broadband – Business	[redacted]		[35% - 40%]
Broadband - Business (1 to less than 10 Mbps)			
Broadband - Business (10 to less than 100 Mbps)			
Broadband - Business (100 Mbps or above)			

Note: Market shares based on number of subscribers in October 2018.

Source: London Economics based on OFCA data

Table 30 Impact of Proposed Transaction on HHI, October 2018

Segment	HHI - min			HHI - max		
	Before Proposed Transaction	After Proposed Transaction	Difference	Before Proposed Transaction	After Proposed Transaction	Difference
Broadband – Business	[redacted]		[700 – 750]			[700 – 750]
Broadband - Business (1 to less than 10 Mbps)						
Broadband - Business (10 to less than 100 Mbps)						
Broadband - Business (100 Mbps or above)						

Note: Market shares based on number of subscribers in October 2018. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.

- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

3.3.3 Revenue data from HKBN/WTT submission

In the business segment of fixed Internet access services market, revenue data is not available for all operators. We report revenue-based market share relying on data submitted by the merging parties in Table 31.

Table 31 Fixed Internet access to business customers – turnover shares

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged Entity						

Note: The market size estimate [redacted]

Source: HKBN and WTT

According to data submitted by the merging parties, their market shares in terms of revenue are lower than those measured in terms of number of subscribers. This divergence in market share based on different basis is likely to reflect the business reality that the merging parties charge lower than their rivals.

3.3.4 Residential segment

Table 32 Fixed Internet access services market shares in the residential segment, October 2018

Operator	Broadband - Residential		Broadband - Residential (1 to less than 10 Mbps)		Broadband - Residential (10 to less than 100 Mbps)		Broadband - Residential (100 Mbps or above)	
	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)	No. of subscribers	Share (%)
HKBN	[redacted]							
WTT								
PCCW-HKT								
HGC								
i-Cable								
Others								
Merged Entity								

Note: Market shares based on number of subscribers.

Source: OFCA

Table 33 Impact of Proposed Transaction on CR4, October 2018

Segment	CR4 before Proposed Transaction (%)	CR4 after Proposed Transaction (%)	Market share after Proposed Transaction (%)
Broadband - Residential	[redacted]		
Broadband - Residential (1 to less than 10 Mbps)			
Broadband - Residential (10 to less than 100 Mbps)			
Broadband - Residential (100 Mbps or above)			

Note: Market shares based on number of subscribers in October 2018.

Source: London Economics based on OFCA data

Table 34 Impact of Proposed Transaction on HHI

Segment	HHI - min			HHI - max		
	Before Proposed Transaction	After Proposed Transaction	Difference	Before Proposed Transaction	After Proposed Transaction	Difference
Broadband - Residential	[redacted]					
Broadband - Residential (1 to less than 10 Mbps)						
Broadband - Residential (10 to less than 100 Mbps)						
Broadband - Residential (100 Mbps or above)						

Note: Market shares based on number of subscribers in October 2018. The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-off for a merger to be under "safe-harbour" conditions is a difference in the HHI of 50 for markets with a post-merger HHI of more than 1,800.

Source: London Economics based on OFCA data

3.3.5 Assessment

The Proposed Transaction has no impact on the residential segment of the market for fixed Internet access services. As mentioned above, this is due to the fact WTT has withdrawn from this segment since 2010. As a result, there is no overlap of business between the merging parties in the residential segment of fixed Internet access services. The Proposed Transaction appears to have a smaller impact on concentration measures for the market taken as a whole and a larger impact on the business customers segment.

3.4 Retail business connectivity

[redacted]

However, data is not readily available for us to conduct a separate analysis of the market segments [redacted]

Table 35 Retail business connectivity (inc. Internet) – turnover shares

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged Entity						

Note: The market size estimate [redacted]

Source: HKBN and WTT

3.4.1 Assessment

The turnover data in Table 35 indicate that the merging parties overlap in this segment, with combined market shares that are relatively small but nonetheless above the safe harbour threshold of 15% for CR4 exceeding 75%. The turnover data also indicate that the value of this segment is more than twice the value of the business segment of the Internet access market.

[redacted]

The merging parties' overlap in this segment advises a further assessment of the effects of the merger on competition in the market segment of retail business connectivity. As the nature of the connectivity services other than fixed Internet access services is closely related to the local fixed network access services to be discussed in Section 6, these are thus discussed there.

3.5 Market definition

3.5.1 The merging parties' views

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.5.2 Views of other parties

In September 2018, OFCA asked all FNOs and MNOs in Hong Kong, as well as top [redacted] customers of HKBN and WTT to provide information and comments on the Proposed Transaction. We received some views in relation to business connectivity services.

[redacted]

3.5.3 Assessment

In identifying the relevant market(s) for the retail local fixed Internet access services and retail business connectivity services, LE notes the distinction made by the EC and other competition authorities between residential and SME customers on the one hand and large corporate businesses on the other. From a demand-side perspective, these two customer segments differ in terms of their requirements (in terms of, for example, speed and contention ratios).

The fixed Internet access services requirements of a large part of SME businesses are very similar to those of residential customers. Telecommunication requirements for large businesses or corporates, however, are likely to differ from residential customers and SMEs, as for these customers, the security and reliability of fixed Internet connections is a crucial aspect of their business.

[redacted]

While size may be one factor that determines whether a SME has needs similar to those of residential customers, we note that some SMEs may require sophisticated fixed Internet access services with higher speeds or quality of service that differ significantly from what is typically offered to residential customers.

The approach towards market definition where residential customers/SMEs and large corporates are grouped under separate markets has not always been shared by other competition authorities and regulators in other jurisdictions. Ofcom, for instance, did not distinguish between residential and business customers at all in drawing market boundary for the fixed business Internet access services.[59] Ofcom considers that fixed Internet access services demanded by residential/SME and those supplied to larger corporate broadband services differ mainly in terms of the levels of support and repair times needed between the sets of customers. Ofcom also considers that fixed broadband service providers not currently offering services to large corporates can relatively easily configure their networks to do so as well as develop the necessary supporting services required for such customers at reasonable expense. Therefore, Ofcom believes that supply-side substitutability considerations would imply that the market for fixed Internet access services should include both residential/SME customers and corporate customers with no subdivision between the two.

For the purpose of this report, since the available data from OFCA does not have breakdown of business customers into SMEs and large corporates, we would not be able to make a separate economic analysis of the two segments.

[redacted]

Furthermore, we note that WTT does not offer services to residential customers and, as such, the merging parties have no overlap in that segment while they overlap in the business segment, both for SME and corporate customers. This also implies that no detriment to competition can be expected in relation to residential customers and that if we restrict the assessment of the impact of the Proposed Transaction to business customers, we can at worst err on the side of caution since the competitive constraints faced by the merging parties in the wider market can only be greater.

We therefore opt to leave open in this report whether the relevant market under consideration encompasses both business (both SMEs and large corporates) and residential customers or the two segments should be treated separately.

With regard to segmenting the market by technology or speed, we note that the EC has often left this question open,[60] although in Carphone Warehouse/Tiscali UK, the EC did decide to include fixed Internet access services offered via both DSL technology and via cable without further segmentation of markets by types of technology.[61] Furthermore, the EC had considered splitting the market by speeds above/below 30 Mbps with the consideration being that different users (e.g.

[59] Ofcom (2014), Review of the wholesale broadband access markets, page 29.
[60] See M.7637 Liberty Global/BASE (2016); M.5532 Vodafone/Kabel Deutschland (2013); M.8131 Tele2 Sverige/TDC Sverige (2016)
[61] M.5532 Carphone Warehouse/Tiscali UK (2009)

gamers versus more casual users) had different needs and there were considerable price differences for these different services, but ultimately left the question open.[62]

Ofcom decided that fixed broadband services via "copper, cable and fibre access networks at all speeds are within the same market" so that no distinction is made either in terms of speed or technology.[63] We concur with Ofcom's view on speed and technology and follow this approach in this report.

[redacted] We note this point but following existing precedents on this matter in other jurisdictions we consider that the two types of services are at this point in time not yet substitutable as mobile broadband services tend to be more expensive and slower than their fixed alternatives.

Given the foregoing considerations, we define the relevant market to encompass all fixed Internet access services and all technologies and speeds. For the purpose of this report, given that WTT is not present in the residential segment, our analysis focuses on the business segment of the retail local fixed Internet access services market.

3.6 Closeness of competition

As mentioned earlier, the merging parties do not compete in the residential segment of the relevant market under consideration, given that WTT has currently no residential customers. Of course, it is always possible that WTT could enter the residential segment as an independent competitor in the near future without the Proposed Transaction. [redacted] As such, the Proposed Transaction appears unlikely to impact competition in the residential segment.

Given the significant growth that HKBN has obtained in the business segment in the last few years, and given WTT's traditionally strong position in that segment, it seems likely that HKBN has sought to 'steal' customers from WTT. Yet, the merging parties do not seem to be considered as particularly close competitors by some business customers, especially large corporates (see Section 3.5.2).

[redacted]

In addition, we note that the [redacted] data [redacted], which can be found in Table 21, and discussion therein, are also relevant for the assessment of closeness of competition in the retail fixed Internet access market. That particular snippet of [redacted] data did not indicate that WTT's business customers viewed HKBN as a particularly close substitute.

[redacted]

[62] M.7421 Orange/Jazztel (2015)
[63] Ofcom (2014), Review of the wholesale broadband access markets, page 29

[redacted]

[redacted], thus an overlap between the merging parties in the large corporates segment.

Since WTT also has its own SME customers in addition to larger corporates, there does seem to be considerable businesses overlap between HKBN and WTT in the business segment as a whole encompassing both SMEs and large corporates.

3.7 Competition effects of the Proposed Transaction

Focusing on the business segment of the retail local fixed Internet access services market, with no distinction drawn in terms of large corporates or SMEs, technology or speed, we will now consider the competition effects of the Proposed Transaction.

Unilateral Effects

In terms of unilateral effects, we note that the merged entity would have a share of [35% - 40%] in this market as reported in Table 28 above. Estimates of revenue shares provided by the merging parties indicate a joint share of revenues of around [redacted]% (Table 31)[65].

These market share figures may overstate the actual market power the merged entity would gain in the relevant market as a result of the Proposed Transaction. This is the case, as discussed in Section 2 above, because in Hong Kong's telecommunications markets, the nature of market rivalry is one driven by facilities-based competition. With relatively similar fixed network coverage, any of the FNOs can make available their services to business customers in this market so long as no significant hurdles exist to prevent them from doing so. Discussion on whether facilities-based rivals of the merged entity could in fact do so will be discussed in Section 6 below. Under such circumstances, customers can switch suppliers at relatively modest cost with the effect of deterring the merged entity from attempting to raise price in the first place.

Indeed, according to industry participants, if a fixed network is already in place, the hurdle for capacity expansion is generally modest, with some exceptions.[66] In other words, if the merged entity were to raise prices after the Proposed Transaction, it is not difficult for PCCW-HKT, HGC and/or other FNOs, if they happen to be present at the location(s) concerned, to expand capacity to compete with the merged entity, even in the worst case scenario where their networks' capacities have been fully utilised. Hence, we expect output expansion on the part of other FNOs, in particular HGC and PCCW-HKT would be able to serve as an effective constraint on the merged entity's pricing power after the Proposed Transaction.

Furthermore, as discussed in Section 2 above, the possibility of boutique-style de novo entry targeting business segment in this market is yet another effective constraint on the ability of the

[redacted]

[65] Note that this is based on data from 2017 and market shares may have changed slightly since then.

[66] [redacted]

merged entity to raise prices post-merger. However, for such mode of entry to be effective in constraining the merged entity post-merger, it requires that such new entrant to be able to extend their network coverage to serve business customers across the territory of Hong Kong. Again more about whether such condition exists will be discussed in Section 6. There is another constraint exerting competitive pressure on the merged entity after the Proposed Transaction. Some service providers in this retail market may not have their own networks, and thus would have to rely on wholesale fixed network access services in order to provide services. Hence, a competitive wholesale market for local fixed network access services would enable such pure service providers to enter this retail level market with relatively ease and serve as another source of competitive constraint to the merged entity.

Given the considerations above, our view is that so long as the local fixed network access services market, to be considered in detail in Section 6, stays competitive, the Proposed Transaction will not cause any competition concern in terms of unilateral effects in this market.

Coordinated Effects

Coordinated effects arise if, after a merger, firms can increase their market power by coordinating their actions. Competition authorities must therefore assess the extent to which a merger is likely to favourably impact on the factors that allow firms to reach and enforce collusive outcomes. Such coordination must involve at least one firm other than the parties. To be a significant concern, this additional competitor, or competitors, must have a large market share in the same market. Furthermore, the "increased probability" of collusion must be attributable to the merger.

Two high-level indicators provide a first glimpse at the likelihood of the merger raising coordinated effects: 1) market structure: tacit collusion is unlikely to arise unless post-merger there are only few firms in the market, with considerable symmetries among them; 2) past evidence of any coordinated outcome: relevant factors to be considered may include whether firms have close relationships (such as joint ventures, purchasing and/or distribution agreements, cross-directorates etc.), or whether there is systematic exchange of information or effective mechanism to co-monitor prices, or whether suspiciously parallel price movements have been observed in the past.

On the first of these, while it can be argued that the merger increases symmetry, [redacted] the reality is that the market structure after the Proposed Transaction is still far from symmetric. Furthermore, PCCW-HKT is the original incumbent in these markets and has followed a very different path from HKBN's and WTT's to reach the market position it now has. It would be difficult to argue that the merged entity will have many similarities to PCCW-HKT, whether referring to network investment, commercial strategy, range of markets where it is present, or services offered.

For example, the main FNOs would most likely have different cost structures given that they entered into this market in different time periods, starting with PCCW-HKT being the earliest, and HKBN being the most recent entrant. Network equipment and configurations, for example, are likely to be different among the different market participants resulting in cost differences between them. Such cost differences in turn would imply divergent interests among the potential participants of a colluding outcome in this market. In particular, cost differences may cause the potential participants of the colluding group to have different expectations on the level of coordinated prices rendering it more difficult for them to agree on them.

In terms of historic evidence suggesting market participants coordinating in fixed telecommunications services markets inclusive of this market, we understand from OFCA that the CA has not observed any signs of collusive behaviours in the market. Hong Kong is instead characterised by strong competition and particularly so given the number of market participants that have invested in their own physical networks.

In sum, these two high-level indicators are consistent with a market structure not likely to give rise to coordinated outcomes. We continue, nonetheless, towards a more in-depth analysis of additional criteria.

An analytical framework commonly used in this context, which has been adopted by several jurisdictions, including the EU, indicates that, in order for coordinated effects to arise, the so-called "Airtours criteria" have to be fulfilled. According to the "Airtours criteria", coordination is more likely to emerge in markets where it is relatively simple to reach a common understanding on the terms of coordination. In addition, three conditions are necessary for coordination to be sustainable. First, the coordinating firms must be able to monitor to a sufficient degree whether the terms of coordination are being adhered to. Second, discipline requires that there is some form of credible deterrent mechanism that can be activated if deviation is detected. Third, the reactions of outsiders, such as current and future competitors not participating in the coordination, as well as customers, should not be able to jeopardise the results expected from the coordination.

The conditions above are cumulative, in the sense that they must all be met simultaneously in order for a collusive arrangement to be successfully sustained. Within a merger context, the Proposed Transaction will be considered to raise potential concerns in terms of coordinated effects if the market in question meets these cumulative conditions and one or more among them is enhanced by the event of the merger.

As discussed in Section 2, the Proposed Transaction does not appear to have brought about much in terms of symmetry between the merged entity and the remaining rivals in this market. This in turn suggests that the merged entity and its rivals would encounter significant difficulties in agreeing on the terms of coordination in the first place even assuming they have the incentive to do so. For example, as mentioned above, the cost differences among the different participants in this market would not be rendered much smaller as a result of the Proposed Transaction. And to the extent that capacity is not a constraint, rapid capacity expansion would confer incentive on the part of any member of the potential coordinating group to deviate from the coordinated in order to gain a much larger share albeit at a lower price. This argument is even more forceful if not all extant rivals of the merged entity attempt to attain a coordinated outcome. For when that happens, the ability to expand capacity and the corresponding output would mean that just such threat on the part of the non-coordinating market participant should serve as a deterrent on any attempted coordinated outcome in the first place.

With regard to the third criterion, in light of what we have discussed about the extant threat of de novo boutique-style entrant targeting only business customers in this market, it is more likely than not that such threat of entry again would act as a deterrent for any attempted coordinated outcome in the first place. More on entry will be examined in the next section on barriers to entry. To conclude then, given the potential threat of new entrant, together with the fact that the Proposed Transaction does not bring any significant changes in the market to make the coordinated outcome any easier to attain, we do not see the “Airtours Criteria” are being met in this case.

Barriers to entry

Retail fixed Internet access services face the same access regulations and problems as retail fixed voice services (Section 2) with telecommunications operators in principle able to lay telecommunications lines on land that is not for exclusive occupation or use and access common parts of buildings to roll out their networks.

There have been a number of new entrants in the relevant market, suggesting that barriers to entry, at least for new entrant targeting only the business segments, are not prohibitively high:

- **Easy Tone** was newly established in 2016 and received a unified carrier license from the CA in September 2017. Easy Tone provides ICT solutions and data communication services, including broadband access, to business customers. Easy Tone already has a fibre-optics network in the metropolitan area, covering over 300 business buildings with plans to extend its network to the Pan-Asia region.[67]
- **Superloop** launched its dark fibre network in Hong Kong in 2016[68], currently providing high speed data connectivity to 20 business buildings, with 4 additional business buildings being connected soon, and 20 data centres in Hong Kong as well as a number of cable landing stations and on-demand data centres.[69]
- **COLT**, in March 2017, announced the expansion of its services to Hong Kong as part of their expansion in Asia. The Hong Kong services will be based on both Fibre-Optic and Ethernet architecture and aims to provide connectivity to 80% of Hong Kong's business buildings – with full business coverage in the Hong Kong Island, East Kowloon and West Kowloon central business districts.[70] However, COLT does not have a carrier license and so they are not authorised to roll out their own network crossing unleased Government land or public streets. As a result, COLT may not be a candidate for a facility-based new entrant, at least in the short-run.

The fact that entry seems to be targeting the business segment is significant for the assessment of the likely impact of the Proposed Transaction. Indeed, the merging parties only have significant overlap in this segment. The presence of new entrants as discussed in section 2 suggests that a business-segment-only strategy appears to be sustainable in this market. Sufficiently low barriers to entry would deter a merged entity from raising prices or otherwise distorting competition. For such boutique-style new entrant to be viable, however, it needs to be the case that they could extend their fixed network infrastructure across Hong Kong where business customers are located. Whether such conditions are met will be discussed further in Section 6. There we argue that so long as the local fixed network access services market remains competitive, entry from extant and new entrants would serve as potent constraint on forestalling competition risk, whether unilateral or coordinated ones.

[67] http://www.easytone.net/

[68] Superloop (2016). *Hong Kong Network Launch Party,* https://www.superloop.com/hong-kong-network-launch-party/, accessed on 27/09/2018.

[69] Superloop, *Our Hong Kong Network,* https://www.superloop.com/solutions/global-networks/ accessed on 27/09/2018.

[70] Colt (2017), *Launching high-bandwidth services in Hong Kong,* https://www.colt.net/resources/press-release-colt-to-launch-high-bandwidth-services-in-hong-kong-by-july-2017/, accessed on 27/09/2018. While we know from various press reports on COLT about its network expansion plan, we note that COLT is not a carrier licensee, and hence is not authorised to roll out their own network via laying their own fibre underground. Furthermore, [redacted] COLT is therefore not an example of a facilities-based new entrant. Nonetheless, it is a services-based entrant, and part of company with a large international presence.

Conclusion

So far as unilateral conduct is concerned, we note that as long as the market for local fixed network access services market remains competitive, there is sufficient competitive constraint imposed by rivals to prevent the merged entity from exercising market power. As for coordination incentives, the threat of entry, would be sufficient to prevent a coordinated outcome.

4 Retail mobile telecommunications services

Only one of the two merging parties, namely HKBN, is present in the retail mobile communications services. As such, the Proposed Transaction has no direct impact on this market.

Nonetheless, it is important to consider three separate questions in relation to this market.

First, whether WTT, absent the Proposed Transaction, would be likely to enter the market in the near term. If so, the Proposed Transaction would signify a loss of future competition between WTT and HKBN in the retail market for mobile telecommunications services.

Second, whether retail mobile voice services are a close enough substitute to fixed voice services so that they should be considered part of the same market. In such an enlarged market, encompassing all voice services, both fixed and mobile, the parties would be in direct competition.

Third, and similar to the paragraph above, whether retail mobile data services are a close enough substitute to fixed broadband services so that they should be considered part of the same market. In such an enlarged market, encompassing all data services, both fixed and mobile, the parties would be in direct competition.

[redacted]

This section turns next to an overview of Hong Kong's retail mobile telecommunications services market and then considers the market definition questions and ultimately an assessment of the impact of the Proposed Transaction on competition in the relevant market.

4.1 Overview of the market

Penetration of mobile services is very high in Hong Kong, reaching nearly 257% as of September 2018. Mobile services in Hong Kong are very affordable with many packages coming with over 1,000 or even unlimited voice minutes per month. The vast majority (96.2 %) of mobile customers also use mobile data services (2.5G, 3G, or 4G).[71]

In addition to handheld devices such as phones and tablets, mobile data services are also available via standalone Wi-Fi routers and may thus provide a substitute to fixed Internet services.

At present, there are four majors MNOs in Hong Kong, HKT, Hutchison, CMHK, and SmarTone, which together capture approximately [redacted]% of the mobile market shares (Table 36).

[71] OFCA

Table 36 Mobile telecommunications services market shares, as of August 2018

Operator	Market share (%)
CMHK	[redacted]
HKT	
Hutchison	
SmarTone	
HKBN	
Others / MVNOs other than HKBN	

Source: OFCA

Both HKBN and WTT hold SBO licenses for the provision of MVNO services, however, they are not assigned any spectrum for mobile services operation. As such, they need to lease network access from MNOs in order to provide mobile services (i.e. operate as MVNOs).

HKBN launched their mobile services with network support from SmarTone, matching the best offers in the market[72]. In addition to leasing network capacity from SmarTone, HKBN has also been leasing network capacity from CMHK[73]. HKBN's share of the mobile services market is small at present capturing around [redacted]% of the 2.5G/3G/4G market, as of August 2018[74].

WTT has not reported any mobile subscribers at the present time [redacted]

4.2 Impact of the Proposed Transaction on concentration measures

The Proposed Transaction will have no impact on any measures of concentration in the market for retail mobile telecommunications services since WTT is not present in this market.

4.3 Market views

4.3.1 The merging parties' views

[redacted]

[72] *DBS Group Research (2017). China / Hong Kong Industry Focus - Hong Kong Telecom Sector*
[73] OFCA
[74] OFCA
[redacted]

4.3.2 Views of other parties

No other parties expressed any views with regard to this market.

4.4 Market definition

In previous decisions, the market for retail mobile telecommunications services has been defined as a relevant market for competition analysis without any further segmentation. In other words, services to residential and business customers are considered to be within the same relevant market and different speeds or technologies are similarly considered to be within the same relevant market.

The main argument for this approach, in recent EC decisions, has been that supply-side substitutability whereby a mobile provider offering one service, e.g. mobile services to individuals, could easily provide another mobile service, e.g. mobile services to business customers.[78] Similarly, the EC has considered there to be one market for retail mobile telecommunications services not subdivided based on the type of service or the type of network technology.[79]

For the purpose of the analysis of the Proposed Transaction, it is not necessary to consider further whether the mobile services market should be more finely segmented since the merging parties do not currently compete in this market and a prospective entry by WTT, while most likely to be focused on the business segment, is not envisaged to be substantial, as detailed in the next subsection.

Next, we consider whether the relevant market could be broader and encompass retail local fixed voice services and retail local fixed Internet access services.

In terms of voice services, the argument of perfect substitutability appears weaker. While voice services via mobile networks are gaining ground, the number of fixed voice service subscribers for both residential and business segments has remained stable. This is likely to indicate that both residential users and businesses are less willing to switch from a fixed to a mobile voice service.

While it is clear that a great deal of substitutability exists, for example between a smartphone connected to a home fixed-line based router or accessing data via the mobile network, it is still most commonly the case that customers have both fixed-line and mobile data service contracts. This would indicate that the two types of services are substitutes occasionally but not substitutes when considered as overall services. It is possible that the level of substitutability will increase further when 5G services become widespread.

However, it should be noted that, at least at the present time, there are important differences between the two forms of data service. Mobile data contracts generally come with a usage cap, “unlimited” usage plans also usually come with a fair-use policy, under which traffic is slowed down when the usage cap is exceeded. Service quality may also be subject to external factors, such as congestion in particular locations and/or in particular points in time.[80] The level of reliability and quality of services provided by these two alternatives are therefore not always comparable. On the other hand, fixed broadband services do not come with a usage cap in Hong

[78] M.7231 Vodafone/Ono (2014); and M.5532 Vodafone/Kabel Deutschland (2013)
[79] M.7612 Hutchison 3G UK/Telefonica UK, 2016; and M.6497 Hutchison 3G Austria/Orange Austria, 2012
[80] OFCA

Kong, meaning that subscribers have unlimited access to the Internet through a fixed broadband connection.

To summarise this discussion on market definition, it does not at present appear justified to include fixed-line based services in the same market as mobile-based services. The relevant market therefore is the retail mobile telecommunications services.

4.5 Conclusion

Given the competitive nature of the market, and non-overlapping market shares of the merging parties, the Proposed Transaction will not result in market concentration in the retail mobile telecommunications market. The Proposed Transaction falls within the safe harbour and therefore its impact on the retail mobile telecommunications market is expected to be negligible. As a result, we have no competitive concerns in relation to this market.

5 Retail multiple play services

5.1 Overview of the market

Multiple play services bundle together different services in one single service package. Typically, a quadruple play bundle encompasses fixed voice service, fixed Internet access service, mobile service and TV service. Multiple play services can also refer to bundles that include only fixed voice and fixed Internet access; or fixed voice, fixed Internet access and mobile; or fixed voice, fixed Internet access and TV.

The customers most likely to be attracted to such bundled services are residential rather than business customers. It does not need to be the case that a single operator provides all elements of the bundle itself but may work with other services providers. For example, HKBN offers a quad-play product of broadband, fixed voice, mobile and content by working with TVB for local drama. It is reported that multi-play packages have increased in popularity in recent years leading to greater competition between providers. This competition is made possible because multi-play packages allow a combination of product elements by both FNOs and MNOs.

Bundles that target business customers are, however, also advertised by the main players in Hong Kong. For instance, PCCW-HKT offer fixed voice and broadband service bundle, HKBN and HGC both offer fixed voice, fixed broadband and mobile services. All three offer other IT services in addition to telephony and Internet access.[81]

5.2 Main players

HKBN is the only FNO in Hong Kong which currently offers quad-play services bundling fixed voice, fixed broadband, mobile services and TV content together. While PCCW-HKT is the only FNO who operates all elements of quad-play bundles by itself or by its associated companies, it does not currently offer quad-play bundles.

While HKBN did not provide the number of subscribers of its tri-play or quad-play services, we may make an estimation based on its public information. At the end of financial year 2018, HKBN reported that they have a total of 835,000 myTV SUPER's TV box orders, and 212,000 myTV SUPER's mobile apps subscribed together with its mobile service plans.[82] As they have 860,000 residential broadband, 500,000 residential voice and 265,000 registered mobile subscribers[83], the number of their quad-play customers could be 265,000 at most. However, this assumption is rather strong, as not all of their mobile subscribers also subscribed to HKBN's residential fixed services.

[81] See for example http://www.hgcbiz.com/products-and-services/unified-communications; http://www.hkt-sme.com/en/promo-starterpack-cny/; and https://www.hkbnes.net/acqform/select.sc?planType=BB&lang=en
[82] HKBN's Annual Results Presentation 2018
[83] HKBN's Annual Report 2018

CMHK recently announced a strategic partnership with i-Cable allowing CMHK's customers to watch programmes produced by i-Cable via CMHK's mobile network[84], and facilitating CMHK's plans to offer 'four-in-one' services covering mobile communications, home fibre broadband, home telephone, and smart home businesses[85]. CMHK has offered service packages to new customers for free access to certain channels of i-Cable.[86]

5.3 Impact of the Proposed Transaction on competition measures

WTT withdrew from the residential market in 2010, meaning that HKBN and WTT compete in the business segment only. However, WTT is not currently offering the typical quad-play service packages. In fact, service packages that bundle mobile services and fixed services are relatively less popular in the business segment, as businesses do not generally buy mobile services in a bundle with the fixed services. This means that currently the merging parties are not in fact competing in the multi-play service market, whatever the definition of such market. The Proposed Transaction will therefore have limited impact on any measures of concentration in this market.

5.4 Market views

[redacted]

No other party expressed a view on the market for retail multiple play services.

The concern expressed by [redacted] is perhaps better understood in terms of the wider range of services and wider market reach that the merged entity would offer. This is not likely to manifest in terms of the traditional concept of multi-play services such as triple or quad play.

5.5 Market definition

In previous decisions, the EC decided to leave open whether there is a separate market for retail multiple play services which is separate from markets for each of the individual components of the bundle.[87] No decision was made in these cases, despite the importance of bundling in the market,

[84] South China Morning Post (SCMP) (2018). *i-Cable's content deal with China Mobile Hong Kong pushes up cable TV provider's stock by 102 per cent*. Available at: https://www.scmp.com/business/companies/article/2162562/i-cables-content-deal-china-mobile-hong-kong-pushes-cable-tv accessed on 27/09/2018

[85] CMHK (2018). *i-*Cable *and China Mobile Hong Kong Announce Strategic Partnership.* Available at: https://www.hk.chinamobile.com/en/about_us/media_centre/NewsPDF/20180903pr.html, accessed on 27/09/2018

[86] https://www.hk.chinamobile.com/en/UTV_iCable_new.html, accessed on 26/02/2019

[87] M.7231 Vodafone/Ono (2014); and M.5532 Vodafone/Kabel Deutschland (2013)

as the transaction did not raise concerns under any alternative product market definition. The merging parties in the present case do not mention a view on retail multiple play services and it is our view that this market presents no competition concerns and we do not believe it necessary to define a separate market for the bundling of individual components of telecommunications services.

5.6 Conclusion

Given that WTT does not currently provide multi-play services and does not compete in the residential segment for fixed-line based services, we do not expect any impact of the Proposed Transaction on this market.

6 Local fixed network access services

Local fixed network access services can take a range of forms and there are different views on how to define the relevant markets for competition analysis.

In this section, we first look at the market background, regulatory framework and likely impacts of new technologies in the Hong Kong markets for fixed access. Next, we focus on the main components of these markets.

As a starting point, we look separately at building-level access and leased line access. For each, we consider the strength of existing and potential competition and expected impacts of the Proposed Transaction.

6.1 Market and regulatory background

In Hong Kong, whether an internal FNO[88] is willing to lease its own networks to another internal FNO and the charge level for such services are, in general, decided by commercial negotiation. The incumbent internal FNO, i.e. PCCW-HKT, is no longer subject to a mandatory requirement to provide local loop unbundling service (known as Type II interconnection in Hong Kong) for its copper-based network at the telephone exchange level.[89] However, mandatory Type II interconnection at street level and building level for copper-based network is still maintained such that all internal FNOs are obliged to provide such services to other internal FNOs, whilst the level of the charges would be subject to commercial negotiation.[90] There are no interconnection obligations for optical fibre networks.[91]

Some statutory provisions help the promotion of the government's facilities-based competition policy in the local fixed telecommunications services market. Under section 14(1) of the TO, the CA is empowered to authorise licensees to lay telecommunications lines in, over or upon any land, except that for the exclusive occupation or use of any person whilst the land is being so occupied or used. This provision empowers the CA to authorise a licensee to enter the common parts of buildings for rolling out its network. It helps promote facilities-based competition in Hong Kong as many buildings in Hong Kong have common parts like lift lobbies, corridors and TBE rooms. Internal FNOs may lay their own networks on these common parts within buildings for directly accessing the customers' premises without the need to rely on any of the rivals' network facilities for provision of competing services.

[88] Internal FNO may provide fixed telecommunications services between two fixed points within Hong Kong.
[89] In Hong Kong, an internal FNO may interconnect with another internal FNO for customer access at three levels: the telephone exchange level, at street level (i.e. in a manhole on the street between the exchange and the resident) and the building level (usually at the telecommunications and broadcasting equipment (TBE) Room).
[90] Despite this, the CA is empowered under section 36A of the TO to determine the charge level of interconnection charges, including those for Type II interconnection.
[91] For details, please refer to the Statement of the TA on Review of Type II Interconnection Policy (6 July 2004) at http://tel_archives.ofca.gov.hk/en/tas/interconnect/ta20040706.pdf

6.2 Technology outlook

Hong Kong has seen a rapid deployment of fibre access infrastructure and this trend is expected to continue where fibre is considered to be commercially viable. Cable broadband is also deployed in Hong Kong based on DOCSIS[92] version 3.0. However, it appears that there are no plans to advance to DOCSIS3.1 and that the preferred path for expansion is fibre.

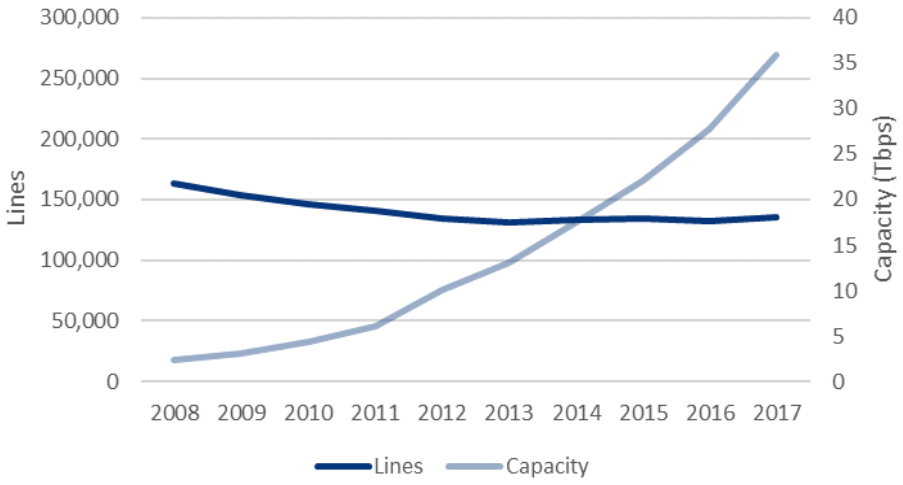
Wholesale providers of fixed access provide services based on these two forms of technologies[93], typically in the form of leased lines which are used by other telecommunications operators or IT users to meet their requirements. These could range from low bandwidth services such as voice to high capacity data links.

Another common wholesale product in the sector is dark (unlit) fibre which can be used for connectivity purposes.

Looking forward, demand for high capacity links is expected to grow, particularly with the anticipated rollout of 5G over the next few years. This will increase the need for higher capacity IP lines while TDM-based services are expected to decline.

This is in line with the trend over the past 10 years as illustrated in Figure 9 below. While the total number of leased lines has actually declined slightly, the total bandwidth has increased dramatically at a CAGR of 42% from a per line average of 8 Mbps in 2008 to 270 Mbps in 2017.

Figure 9 Leased line volume and capacity over last 10 years



Note: Leased line data includes both wholesale and retail data and disaggregated data is not available.
Source: OFCA

The responses from HKBN and WTT on demand forecasts for wholesale services, [redacted]

[92] Data Over Cable Service Interface Specification
[93] Wholesale inputs in the telecommunications sector can be classified generally according to two main networking technologies – TDM and IP. TDM is a legacy technology which has been around since the early 1980s and is more expensive to maintain and to scale up to accommodate higher capacity compared to IP technology. However, TDM is still common today given its reliability.

[redacted]

Table 37 HKBN estimated lines (number) at end of upcoming 5 fiscal years

Segment	2018	2019	2020	2021	2022	2023
[redacted]						

Note: [redacted]
Source: HKBN

Table 38 Wholesale market trends and forecasts by technology

Segment	2016	2017	2018F	2019F	2020F	2021F	2022F
[redacted]							

Note: [redacted] Dates with "F" are forecasts by WTT at the time of this response.
Source: WTT

[redacted] At present, the TDM versus IP debate is largely a technical one, and relative strength depends on the specific use and the service level required by customers.

[redacted]

One segment of wholesale access which is likely to grow in importance is the provision of terminating segments or tail circuits for mobile backhaul. This is expected to be a key market in the coming years with the deployment of 5G.

6.3 Leased lines

The merging parties provided information about their market shares in the segment of wholesale leased lines, in terms of turnover.

Table 39 Wholesale leased lines – segment shares in revenue terms

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged Entity						

Note: The market size estimate [redacted] This information, provided by the merging parties, is specifically for wholesale leased lines, whereas OFCA data tends not to be disaggregated by wholesale/retail leased lines.

Source: HKBN and WTT

Table 39 indicates that the merging parties [redacted] their combined market share is still above the 15% safe harbour level for a CR4 of more than 75%.

We also have data on leased lines market shares, provided by OFCA, summarised in Table 40. It should be noted that data reported in Table 40 do not separate between retail and wholesale leased lines. Furthermore, the data differ from those presented in Table 39, as the market shares reported in Table 40 are based on the number of leased lines / bandwidth of these lines and not based on turnover.

Examination of Table 40 shows that [redacted] However, a possibly more important indicator is the share of leased lines bandwidth. In these terms, [redacted] The merged entity would have a market share by bandwidth of [redacted]%[redacted]

[redacted]

Table 40 Local leased lines market shares, October 2018

Operator	Number of leased lines		Bandwidth of leased lines	
	Number	Share (%)	Mbps	Share (%)
HKBN	[redacted]			
WTT				
Total	*135,626*	*100.0%*	*40,330,231*	*100.0%*

Note: Bandwidth is given in Mbps. This information is not separable into retail and wholesale leased lines.

Source: OFCA

The impact of the Proposed Transaction on concentration measures for both number of lines and bandwidth is assessed in the tables below.

Table 41 Impact of Proposed Transaction on CR4, October 2018

Segment	CR4 before the Proposed Transaction (%)	CR4 after the Proposed Transaction (%)	Market share post-Proposed Transaction (%)
Number of local leased lines	[redacted]		
Bandwidth of local leased lines			

Source: London Economics based on OFCA data

Table 42 Impact of Proposed Transaction on HHI, October 2018

Segment	HHI		
	Before the Proposed Transaction	After the Proposed Transaction	Difference
Number of local leased lines	[redacted]		
Bandwidth of local leased lines			

Note: The cut-offs for a merger to be under "safe-harbour" conditions are differences in the HHI of 50 and 100 for markets with a post-merger HHI of more than 1,800 and markets with a post-merger HHI of between 1,000 and 1,800 respectively.

Source: London Economics based on OFCA data

The shares of the merging parties in terms of bandwidth are probably the more relevant to consider. As shown in Table 40, the merging parties would have a combined market share of [redacted]% after the Proposed Transaction. Whilst data in Table 40 does not distinguish between retail and wholesale leased lines, we can use the market shares for retail business connectivity excluding Internet services, in Table 43, as an indicative proxy for the retail leased lines market. Whilst this measure effectively allows us to distinguish between retail and wholesale leased lines, it is only available for HKBN and WTT [redacted]

Table 43 Retail leased lines (excl. internet) – turnover shares

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged Entity						

Note: The market size estimate [redacted]

Source: HKBN and WTT

6.4 Market Definition

6.4.1 The merging parties' views on market definition

[redacted]

6.4.2 Assessment

On the question of whether retail and wholesale customers are part of the same relevant market, we considered supply substitutability. An example of retail customers includes those businesses who rely on leased lines for connecting their offices at different locations across the territory. Wholesale customers include MNOs who acquire backhaul services as inputs to enable them to provide downstream mobile voice and data services. Another example would be those customers who rely on the services in this market as inputs to enable them to provide downstream retail fixed voice and broadband services and may thus act as retail rivals of the merged entity. Across these examples, suppliers are generally able to serve both retail and wholesale customers as the underlying fixed network infrastructure which underpins this market is generally speaking the same. As such, we do not believe that our assessment of the competition effects of the merger will be compromised by considering wholesale and retail customers as part of the same relevant market for local fixed network access services.

On the question of whether there is a need to subdivide the market in terms of technology, there is no available evidence or representations by interested parties which suggest that the underlying technologies which underpinned the fixed network infrastructure deployed by the various FNOs are different in their capability to supply the various services in this market as to warrant a market delineation based on technology. It therefore appears unnecessary for the market to be subdivided into separate markets by speed or technology.

On the question of whether to define separate markets for different elements of the fixed network infrastructure underpinning this market, i.e. for the core level network element and for the building level access element, we do not feel that the competition assessment would benefit from such delineation and we note ample precedent for taking these two elements together. Furthermore, the main participants in this market own and operate their respective fixed network infrastructures consisting of both elements.

With reference to previous cases, it is worth noting that in both Vodafone/Cable & Wireless and Vodafone/Kabel Deutschland the EC did not conclude whether the wholesale leased lines market should be divided into trunk and terminating segments.[101] In Deutsche Telekom/GTS it was considered that leased lines could be further segmented into the trunk and terminating segment, but ultimately the product market definition was left open by the EC. Similarly, in that same case it was also considered but left open the question of whether to segment leased lines into passive and active infrastructure and whether the terminating segment should be further segmented by speed with bandwidth below or above 2 Mbps.

In conclusion, in the context of the present analysis, this market is defined as the market for local fixed network access services without further segmentation by technology, speed, network element types, or by retail versus wholesale customers.

[101] M.6584 Vodafone / Cable & Wireless (2012); M.5532 Vodafone / Kabel Deutschland (2013)

6.5 Competition effects of the Proposed Transaction

6.5.1 Closeness of competition

Views on closeness of competition and effects of the Proposed Transaction

OFCA invited interested parties to provide their views on the impact of the Proposed Transaction and, in particular, on the extent to which they considered HKBN and WTT as offering substitutable services and thus being close competitors in the relevant markets. In relation to local fixed network access services markets, we received responses from [redacted] The main comments are summarised and discussed below.

[redacted]

[redacted]

[redacted]

Discussion

From the responses discussed above, [redacted] These responses thus indicate that HKBN exerts a limited competitive constraint on WTT [redacted]

The analysis of overlapping coverage at the building level is relevant for wholesale access customers who are unable to substitute between nearby buildings and for some large business customers. For these, the reduction in the number of independent network access suppliers in around [redacted] non-residential buildings can be cause for concern. This will be further discussed in the following sections.

6.5.2 Analysis of unilateral and coordinated effects

Unilateral effects

We first note that the market for local fixed network access services, being a crucial part of the fixed telecommunications market, serves the main function of providing inputs for other operators to provide services downstream, whether fixed or mobile and residential or business segments. For downstream mobile telecommunications services, as discussed above, the relevant market provides crucial mobile backhaul services to MNOs. As for the downstream fixed

[redacted]

telecommunications services, whether retail fixed voice or retail fixed Internet access services, having access to this market and maintaining its competitiveness would in turn ensure that the downstream markets remain competitive.

If we are to treat the local leased line market data reported in Table 39 and Table 40 as a proxy for the competitive conditions in this relevant market, taking into account that leased lines are one of the most common products for both retail and wholesale customers of local fixed network access services, the merged entity's market share never exceeds [redacted]%, whether measured in terms of the number of leased lines, bandwidth, or turnover. The market share figure of the merged entity in 2017 is [redacted]% measured by revenue, and in October 2018 it was [redacted]% based on number of leased lines and [redacted]% by bandwidth.

As explained in Sections 2 and 3, the more appropriate approach to assess the competitive landscape is to look at it from a supply side perspective, as facilities-based rivalry is what fundamentally drives competition in this market in particular and in all fixed telecommunications services markets in general. And competition at this level in turn hinges upon coverage, which serves as a gauge of the ability of the market participants to have the ability to provide fixed telecommunications services to business customers at the locations where they are found.

As will be discussed below, as long as such FNOs could expand their networks and capacities without significant difficulties, our view is that sufficient rivalry would remain in this market so that the potential enhancement of the merged entity's market power after the Proposed Transaction might be curtailed.

As discussed above, we note that in order to supply fixed network access services, suppliers must operate the relevant network infrastructure or elements of it. At the core level of the fixed telecommunications network, Hong Kong has a significant degree of facilities-based competition, with existing participants such as HKBN, HGC, PCCW-HKT and WTT all having their respective self-built networks. At the access level, in particular the building access level, while there is also a degree of overlapping infrastructure, the competitive condition at this level might be less intense as that at the core level of the fixed telecommunications network dependent on whether there exist building access difficulties. Hence, while the argument immediately above applies in general to the core level of the fixed telecommunications network, it may not completely apply at the building access level. Building access difficulties, to the extent that they exist, would affect competition in this market via coverage as they limit the ability of rivals to provide fixed telecommunications services to business customers at the locations where they are to be found.

At buildings where only one of the merged entity's network is available prior to the Proposed Transaction, there is no risk of enhancement of market power at all following the Proposed Transaction, as the competitive condition remains the same: the merging parties have only one set of in-building telecommunications system at the building, whether owned by HKBN or WTT. And at buildings where even though both of the merging parties have their respective in-building telecommunications systems at the building prior to the Proposed Transaction, so no long as rivals have no difficulties in gaining access to the buildings should they decide to do so, that the threat of entry would prevent the merged entity from exercising market power.

The situation is different at those buildings where both of the merging parties have installed their in-building telecommunications systems and where there are difficulties for rivals in accessing the buildings for establishing in-building telecommunications systems. For such buildings, not only will there be one less competitor with its in-building telecommunications system available at the building level after the Proposed Transaction, rival(s) currently without its(their) own in-building

telecommunications systems may not be able to enter such buildings because of access difficulties. So long as entry barriers exist at the building level, the Proposed Transaction might have the effect of raising a competition issue in the form of creating the risk of unilateral effects in this relevant market.

As for the scope of such buildings, the focus should be on those buildings which are not exclusively for residential use as the merging parties' businesses overlap only for serving such customers and where both HKBN and WTT have installed their own in-building telecommunications systems for provision of services within the buildings. If the number of this group of buildings is not insignificant, and the building access difficulties exist in these buildings to prevent further FNOs' access to install their own in-building telecommunications systems for service provision, meaning that there is little likelihood of new entry, or threat of new entry, to provide services in those buildings, the overall competitive landscape at the fixed network infrastructure level would likely be adversely altered, giving rise to a potential competition risk in the form of unilateral effects. This outcome may occur because if the number of concerned buildings is not small, that would imply the merged entity may have an edge in terms of wider coverage vis-à-vis its rivals, possibly resulting in market power being conferred to the merged entity at the fixed infrastructure level.

If the number of buildings in this group is of little significance, no competition issue is expected to arise even when there are difficulties in accessing these buildings. This is the case because from a facilities-based competition perspective, a small number of buildings where both HKBN and WTT have installed their own in-building telecommunications systems for provision of services there is highly unlikely to have the effect of conferring sufficient magnitude of network coverage to the merged entity post-merger for it to gain market power at the facilities-based level even if there is little likelihood of new entry or threat of new entry because of building access difficulties.

Building-level fixed network coverage

This section presents a detailed analysis of building-level fixed network coverage by different FNOs in Hong Kong, and how this coverage will be affected by the Proposed Transaction. The analysis is based on a database of buildings, which have coverage by FNOs other than PCCW-HKT. The analysis provided in this section is based on data for March 2018. A more detailed analysis using data for both March 2017 and March 2018 is provided in Annex 1.

We note that the database, for the non-residential buildings segment, does not contain information about the number of offices or flats that a building may have. We therefore take buildings as units but note that one building may contain several, possibly many, offices or flats.[115]

Moreover, as the database only contains buildings with coverage by at least one operator other than the incumbent, PCCW-HKT, it does not cover all buildings in Hong Kong. Further analysis (see Annex A1.3) suggest that, in 2018, between [redacted]% and [redacted]% of all non-residential buildings were covered by at least one operator other than the incumbent.

We note further that the database also includes buildings where FNOs have coverage by leasing other FNOs' network for provision of services.[116] To ascertain the number of buildings that may

[115] For residential buildings, the database does contain the number of households for each residential building, so that an analysis at the household level would be possible for the residential segment. However, given that WTT has withdrawn from the residential segment, the number of residential buildings that WTT has access to is very small (Table 45). Therefore, no further analysis was undertaken at the household level for residential buildings.
[116] This only includes coverage where FNOs lease network from other FNOs excluding the incumbent FNO.

have competition risk identified earlier, we provide further analysis on the number of buildings where both HKBN and WTT have their own in-building wiring. This is based on data provided by the merging parties.

HKBN and WTT overlapping fixed network coverage at the building-level

This section provides an analysis of the extent to which there is an overlap in fixed network coverage at the building level between HKBN and WTT. The database that we relied on to make this analysis was provided to us by OFCA. This database contains information only on buildings that are covered by at least one operator other than PCCW-HKT.[117]

The total number of buildings in Hong Kong which have fixed network coverage by operators other than PCCW-HKT stood, in March 2018, at [redacted]. Building-level coverage by operator is summarised in Table 44 below.

Table 44 Building coverage, by operator (2018)

Operator	Building coverage	
	No.	%
Total no. of buildings in database	[redacted]	
HKBN		
WTT		

Source: London Economics based on OFCA data

In terms of building coverage by type of buildings (Table 45), we observe that WTT has a very small share in the residential buildings segment.

Table 45 Building coverage, by building type and operator (2018)

Operator	Purely Residential		Purely business		All non-residential	
	No.	%	No.	%	No.	%
Total no. of buildings in database	[redacted]					
HKBN						
WTT						

[117] In other words, it excludes buildings where only HKT has fixed-line access.

[redacted]

Note: "All non-residential" buildings represent all buildings that are not purely residential. That is, all "purely business", "other", and "mixed" buildings. "Other" are buildings such as shopping malls, government buildings, hospitals, and schools. "Mixed" represent a small number of buildings that were classified differently by different operators.

Source: London Economics based on OFCA data

The small presence of WTT in the residential segment indicates that this segment will not be directly affected by the Proposed Transaction. Therefore, for the remainder of this section, we will concentrate only on those buildings that are listed as purely business buildings and a slightly broader segment which includes all buildings that are not listed as purely residential.[119]

The overlap between HKBN and WTT in these two categories is significant, as indicated by Table 46 below.

Table 46 Buildings covered by both HKBN and WTT, by building type (2018)

Building type	Total number of buildings in database	Buildings covered by both HKBN and WTT	Percentage of buildings covered by both HKBN and WTT (%)
Purely business	[redacted]		
All non-residential			

Source: London Economics based on OFCA data

In order to assess the impact of the Proposed Transaction it is important to investigate how many independent competitors will remain at each of these buildings after the Proposed Transaction. Therefore, we list the overlap between HKBN and WTT in terms of the total number of competitors. Table 47 shows this.

Table 47 Buildings covered by both HKBN and WTT, by building type and number of operators (2018)

Building Type	Total number of buildings in database	Buildings covered by HKBN and WTT	Buildings covered by HKBN and WTT, by number of competitors				Percentage of buildings covered by HKBN and WTT, by number of competitors			
			2	3	4	5	2	3	4	5
Purely business	[redacted]									
All non-residential										

Note: Number of competitors includes the merging parties (HKBN and WTT) and other operators covered in the database. These are [redacted] In addition, it is assumed that the incumbent (PCCW-HKT) has universal coverage. The "number of competitors" is defined as, prior to the Proposed Transaction, the number of FNOs other than the incumbent having coverage to the building. For example, [redacted] buildings with 2 competitors indicates that [redacted] buildings are covered by HKBN and WTT, in addition to PCCW-HKT. As such, for these buildings, the Proposed Transaction would be a 3-to-2 merger (from HKBN, WTT, and PCCW-HKT to HKBN-WTT and PCCW-HKT).

Source: London Economics based on OFCA data

The table above indicates that the Proposed Transaction would be a 3-to-2 merger in [redacted]% of all non-residential buildings, i.e. [redacted] buildings, and a 4-to-3 merger in [redacted]% of all non-residential buildings, i.e. [redacted] buildings.

[119] "All non-residential" buildings represent all buildings that are not purely residential. That is, all "purely commercial", "other", and "mixed" buildings. "Other" are buildings such as shopping malls, government buildings, hospitals, and schools. "Mixed" represent a small number of buildings that were classified differently by different operators.

If we restrict the analysis only to those buildings with fibre access, we observe that the Proposed Transaction reduces the number of competitors from 3 to 2 in [redacted] buildings and from 4 to 3 in [redacted] buildings.

Table 48 Buildings covered by both HKBN and WTT with fibre access, by building type and number of operators (2018)

Building Type	Total number of fibre-covered buildings in database	Fibre-covered buildings covered by HKBN and WTT	Fibre-covered buildings covered by HKBN and WTT, by number of competitors				Percentage of fibre-covered buildings covered by HKBN and WTT, by number of competitors			
			2	3	4	5	2	3	4	5
Purely business	[redacted]									
All non-residential										

Note: For the purpose of this analysis, buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre. Number of competitors includes the merging parties (HKBN and WTT) and other operators covered in the database. These are [redacted] In addition, it is assumed that the incumbent (PCCW-HKT) has universal coverage. The "number of competitors" is defined as, prior to the Proposed Transaction, the number of FNOs other than the incumbent having coverage to the building. For example, [redacted] indicates that [redacted] buildings are covered by fibre-access by HKBN and WTT, in addition to PCCW-HKT. As such, for these buildings, the Proposed Transaction would be a 3-to-2 merger (from HKBN, WTT, and PCCW-HKT to HKBN-WTT and PCCW-HKT).

Source: London Economics based on OFCA data

HKBN and WTT fixed network coverage at building-level compared to other operators

Following the Proposed Transaction, the merged entity will cover [redacted] ([redacted]%) non-residential buildings with fibre access (Table 49).

Table 49 All non-residential fibre coverage buildings, before and after the Proposed Transaction (2018); providers other than PCCW-HKT

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of non-residential buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: (1) Includes FTTB and FTTH and wireless + fibre.

Source: London Economics based on OFCA data

In addition to the increase in building coverage of the merged entity, it is important to note that, following the Proposed Transaction, the merged entity will only have, at most, two significant competitors (including the incumbent) in the non-residential buildings segment.

For the "Purely business" segment, the importance of the merged entity is even greater, as Table 50 indicates.

Table 50 Purely business building fibre coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of business buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: (1) Includes FTTB and FTTH and wireless + fibre.

Source: London Economics based on OFCA data

HKBN and WTT overlapping fixed network coverage at building level, with their own in-building wiring

The analysis above includes buildings where FNOs have coverage by leasing other FNOs' network for provision of services. To ascertain the number of buildings that may have competition risk, this section analyses the number of buildings where both HKBN and WTT have their own in-building wiring.

Data on buildings with self-owned in-building wiring was provided by HKBN and WTT. It should be noted that [redacted] These buildings are included in the analysis.

Among the [redacted] non-residential and mixed buildings where both HKBN and WTT have coverage (Table 46), both operators have their own in-building wiring in [redacted] buildings (Table 51). Of these [redacted] buildings, all but one building have fibre coverage (Table 52).

Table 51 Buildings with own in-building wiring by both HKBN and WTT, by building type (2018)

Building type	HKBN	WTT	Overlapping
Total no. of buildings with own in-building wiring	[redacted]		
Non-residential or mixed			
Non-residential			

Note: "Total no. of buildings with own in-building wiring" represents buildings of any type with self-owned in-building wiring by HKBN or WTT. "Non-residential" represents buildings were either HKBN or WTT or both indicated that they categorise these buildings as non-residential. "Mixed coverage" represents buildings where one of HKBN and WTT categorises them as residential while the other treats it as non-residential. This could happen as there are buildings in Hong Kong for both residential and business purposes. This is also possible in buildings where the lower floors of the buildings are for business purposes while the upper floors are for residential purposes. In this case, when WTT provides business services to the shops at the lower floors and when HKBN provides residential

[redacted]

services to the upper floors, they would categorise the buildings differently. "Non-residential or mixed" includes all buildings not exclusively for residential use.

Source: London Economics based on data provided to OFCA by HKBN and WTT

Table 52 Buildings with fibre coverage and own in-building wiring by both HKBN and WTT, by building type (2018)

Building type	HKBN	WTT	Overlapping
Total no. of buildings with own in-building wiring	[redacted]		
Non-residential or mixed			
Non-residential			

Note: Fibre coverage includes FTTB, FTTH, and copper + fibre. "Total no. of buildings with own in-building wiring" represents buildings of any type with self-owned in-building wiring by HKBN or WTT. "Non-residential" represents buildings where either HKBN or WTT or both indicated that they have their own in-building wiring to the non-residential part of the building (but neither indicated that they have access to the residential part). "Mixed coverage" represents buildings where one of HKBN and WTT categorises them as residential while the other treats it as non-residential. This could happen as there are buildings in Hong Kong for both residential and business purposes. This is also possible in buildings where the lower floors of the buildings are for business purposes while the upper floors are for residential purposes. In this case, when WTT provides business services to the shops at the lower floors and when HKBN provides residential services to the upper floors, they would categorise the buildings differently. "Non-residential or mixed" includes all buildings not exclusively for residential use.

Source: London Economics based on data provided to OFCA by HKBN and WTT

Table 53 shows the total number of competitors which have access to buildings where both HKBN and WTT have their own in-building wiring. This was established by matching the data provided by HKBN and WTT with the building database. It should be noted that, of the [redacted] buildings where HKBN and WTT have their own in-building wiring, [redacted] buildings could not be matched. As such, these buildings are excluded from the analysis.

The table indicates that the Proposed Transaction would be a 3-to-2 merger in [redacted] non-residential or mixed buildings, and a 4-to-3 merger in [redacted] non-residential or mixed buildings, where both WTT and HKBN have their own in-building wiring.

Table 53 Buildings with own in-building wiring by both HKBN and WTT, by building type and number of operators (2018)

Building Type	Buildings covered by HKBN and WTT	Buildings matched	Buildings covered by HKBN and WTT, by number of competitors			Buildings covered by HKBN and WTT, by number of non-residential competitors		
			2	3	4	2	3	4
Non-residential or mixed	[redacted]							
Non-residential								

Note: Access by HKBN and WTT is through their own in-building wiring. Access by competitors of HKBN and WTT may be either through their own in-building wiring or by leasing other operator's networks. Number of competitors includes the merging parties (HKBN and WTT) and other operators covered in the database. These are [redacted] In addition, it is assumed that the incumbent (PCCW-HKT) has universal coverage.

The "number of competitors" is defined as, prior to the Proposed Transaction, the number of FNOs other than the incumbent having coverage to the building. For example, [redacted] indicates that [redacted] buildings are covered by HKBN and WTT, in addition to PCCW-HKT. As such, for these buildings, the Proposed Transaction would reduce the number of competitors from 3 to 2 (from HKBN, WTT, and PCCW-HKT to HKBN-WTT and PCCW-HKT).

We conduct the building analysis by both the total number of competitors (i.e. all competitors indicate that they have coverage to the building regardless of whether they treat the building as residential or not) and number of non-residential competitors (i.e. only those competitors that indicate that they treat the building as a non-residential one).

Source: London Economics based on OFCA data

To conclude, we have identified that there are around [redacted] non-residential or mixed buildings where both HKBN and WTT have established their own in-building wiring.

The number of buildings that may have competition risk as a result of the Proposed Transaction is likely to be smaller than [redacted]. As explained in Section 6.5, the fact that both of the merging parties have their own in-building wiring available in the same building by itself is insufficient to establish the competition risk in terms of unilateral effects if rivals to the merging parties could build their own in-building wiring at such buildings. This is the case because the merged entity would be subject to the threat of entry and its pricing power should be sufficiently constrained after the Proposed Transaction. In this regard, these [redacted] buildings represent the maximum number of buildings where competition risk in terms of unilateral effects might arise. Bearing that caveat in mind with regard to the [redacted] buildings being the upper limit, we note that such a number nevertheless could not be construed as not significant as they do account for about [15% - 20%] of all buildings not exclusively for residential use[121]. And we thus consider there is a likelihood, albeit not high, where from a facilities-based competition perspective, that the Proposed Transaction, if completed, might confer market power to the merged entity at the facilities-based level via coverage advantage as rivals might not be able to access such buildings. This in turn might raise a competition issue in the form of unilateral effects post-merger.

We also note that there is another channel through which the Proposed Transaction might affect coverage. This happens as the coverage of the merged entity's network will be extended as a result of the Proposed Transaction. However, so long as the number of such newly added buildings not exclusively for residential use is small, the expanded coverage should unlikely to have the ability to confer sufficient coverage advantage to the merged entity vis-à-vis its rivals to the extent where market power would be conferred to the merged entity at the fixed network infrastructure level in this market. According to Table 49, the scale of extension of coverage expected to be brought about the Proposed Transaction is only about [redacted] buildings, which is a small number compared to the total number of this group of buildings. In light of this limited marginal increase in coverage, we do not see the Proposed Transaction would result in any competition risk in terms of unilateral effects via this channel.

Coordinated effects

The reduction in the number of independent competitors in some of the segments analysed in this section requires us to consider whether the Proposed Transaction is likely to have an impact in terms of facilitating and/or incentivising coordinated behaviour between the merged entity and one or more of the remaining competitors. Here, we would again rely on the "Airtours criteria" for an assessment of the risk of coordinated conduct in this market as discussed in Section 3.7 above. The Proposed Transaction would cause an increase in symmetry in the market. After the Proposed Transaction, [redacted] would make a coordinated outcome easier to attain as coordinating the conduct among firms of similar characteristics is less difficult.

Coordinated conduct is easier when firms interact more frequently and observe each other's prices and quantities. In this market, contract duration is usually long, implying interaction among rivals is infrequent, and prices are non-transparent as they are quoted corresponding to the exact requirements of the buyers. The lack of homogeneous products/services in this market is another important factor which makes a coordinated outcome harder to sustain.

[121] The total number of buildings not exclusively for residential use adopted here is estimated based on various sources of data. Please refer to Annex 1.3 for more details.

Moreover, a coordinated outcome is easier to sustain in markets where the pace of innovation is subdued. In this regard, the market at issue is notoriously driven by leading technology innovation and as such does not fit the mould of a likely collusive market.

Entry barriers make a coordinated outcome easier to sustain. For the present case, entry barriers are high for a potential entrant that seeks to offer widespread network infrastructure coverage and they are high also in relation to access to at least some buildings. On the other hand, some new entrants have started operations by rolling out their own infrastructure at selected areas and targeting business customers. Despite their limited coverage, such new entrants' presence will likely have the potential of deterring existing market participants from coordinating their conduct in order to raise prices. This is the case as the businesses of the merging parties overlap only in the business segment in this market, and businesses tend to cluster in certain areas in Hong Kong with the result that the requisite scale required for a de novo entrant targeting business customers only is much smaller than one which requires territory wide-network coverage. And there is evidence to suggest such small scale entry strategy targeting business customers in certain areas in Hong Kong appears to be viable. And, [redacted] have pointed out, the bottleneck in terms of hindering entry appears to be at the building access level. This in turn implies that so long as that particular bottleneck problem could be resolved, entry would be facilitated. And with the threat of potential entry, coordinated outcome is discouraged. More on entry conditions will be discussed below.

6.5.3 Barriers to entry/expansion

In order to supply local fixed network access services, suppliers must operate the relevant network infrastructure elements. At the core level of the fixed network, Hong Kong has a significant degree of facilities-based competition. At the access level, viz. building access level, while there is also a degree of overlapping infrastructure, difficulties in accessing buildings sometimes do exist.

Both entry and capacity expansion will be examined here, for as stated by the International Competition Network's document Analytical Framework for Merger Control (2002), "[e]ven if a merger seems likely to increase market concentration, it might not lead to competition concerns if it is relatively easy for other firms to enter the market or for existing competitors to expand production" (paragraph 5.4, p. 12).

Entry conditions in this market could thus be examined again in its two constituent elements separately, namely building access level, and at the core level of the fixed telecommunications networks. At the core level of the fixed telecommunications networks, other than the relatively large financial resources required for investing in such projects, industry participants in this market, [redacted] generally consider that they have not encountered many difficulties in rolling out their core network in Hong Kong.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

According to the views of participants in this market it appears that access difficulties at the building level pose the most significant barrier to entry in this market. This in turn implies that at those buildings with access difficulties and where both of the merging parties have their networks available, the Proposed Transaction might likely create competition risk in the form of unilateral effects in this market. Again this is the case because, according to the data analysis of the previous section, there are about [redacted] buildings which are not exclusively for residential use and where both of the merging parties have their own in-building wiring, and this number is not insignificant, accounting for around [15% - 20%] of all buildings which are not exclusively for residential use[123]. If access difficulties exist at all of these [redacted] buildings, the Proposed Transaction might likely raise the prospect of competition risk in the form of unilateral effects as entry is prevented from constraining the merged entity at such locations.

With regard to capacity expansion, it is important also to note that to be able to add capacity with relative ease, and for this to serve as an effective constraint on the merged entity in this market, requires that the rivals operate their own networks at both the core as well as the building level. While there is not much information available to show that rivals to the merged entity encounter significant difficulties in expanding their capacity at the core level of their fixed telecommunications networks, it is far from certain at the building level, especially those with access difficulties for reasons discussed above. As a consequence, ease of capacity expansion at the core level of the fixed telecommunications networks operated by rivals to the merged entity alone would be insufficient to serve as an effective constraint to the potential market power which might be conferred to the merged entity in this market as a result of the Proposed Transaction.

[redacted]

[123] See footnote 121.

Further Potential Competition Issue

As we mention at the beginning, some operators rely on the local fixed network access services to offer downstream services. Even if the competitive conditions in this market are preserved, we note that there is a possibility that a customer of the merged entity becoming a captive customer, with the consequence that the merged entity may exercise temporary market power over it. This issue is likely to arise during the interim period when a customer plans to find an alternative supplier in the market but before it successfully does so. During that transition period, there may be a window of opportunity for the merged entity to exploit its transitory market power and raise prices in this market. As a consequence, given that the customer in question is a rival of the merged entity in the downstream services market, the cost of the rival would rise, forcing it to pass on some of that cost to customers in the form of a price increase. As the rival's downstream services price increases, this would enable the merged entity to increase its own price for the same downstream services thereby weakening competition in the relevant downstream services markets as a result.

6.6 Conclusions on likely impact of the Proposed Transaction on local fixed network access services markets

Because of the entry barriers at the building access level, there is the possibility that the Proposed Transaction might result in competition risks in the form of unilateral effects in this market. The potential competition risk identified here would also have repercussions in the downstream services markets such as fixed voice and fixed Internet access services as discussed above.

As for coordinated conduct, we note that so long as the access difficulties at the building level, which hinders entry, is resolved, as market participants have pointed out, ease of entry would be the most potent threat to any attempt in achieving a coordinated outcome.

Furthermore, we note that there is an opportunity for the merged entity to exploit its transitory market power towards its captive customers in this market. Such conduct on the part of the merged entity might weaken competition in some downstream services markets in the short-term.

7 Wholesale market for interconnection with fixed networks

7.1 Market overview

Network operators need to interconnect directly or indirectly such that calls originate from one network could terminate on another network, permitting users of different networks to communicate with each other. In practice, the operator on which the call terminates routes the call and connects it to the called party.

The EC deems that each fixed termination access network constitutes a relevant market, as there is no substitute for call termination on each individual network, and by definition the network operator therefore has 100% market share.[124]

While it is common for network operators in other jurisdictions to charge calls terminated at their own network (i.e. levying "termination charge"), the market in Hong Kong works differently. Hong Kong operates a deregulated call origination and termination system with terms and conditions for interconnection freely set by operators via commercial negotiations. In this regard, for interconnection between network operators, whether an interconnection charge is required, the direction of payment, and the level of such charges is entirely subject to the respective commercial agreements.[125] Given that there is no regulation for the fees set for interconnection, there may be a concern that the Proposed Transaction would give rise to higher prices in the wholesale market for interconnection charges. However, it should be noted that each network operator originates calls to its counterpart and terminate calls at its own network, if the merged entity were to raise its interconnection charge to a rival operator, that operator could reciprocate and demand a correspondingly higher interconnection charge. This could deter the merged entity from raising its prices so long as the Proposed Transaction does not give rise to a disproportionate increase in market power.

Although the interconnection charge in Hong Kong is not subject to regulatory guidance, regulatory safeguard is in place. Under section 36A of the TO, licensees may seek the CA's determination on the terms and conditions of interconnection including the level of charges. The CA is obliged to determine the charge pursuant to reasonable cost. This serves as ultimate protection should operators be unable to commercially agree on the terms and conditions of interconnection.

In addition, fixed voice is largely a declining market, subject to effective competition from services that are increasingly substitutable. For residential customers, any market power in fixed voice is constrained by mobile voice services as well as VoIP services on the consumer broadband services. For business customers, mobile services may be considered less of a close substitute for fixed voice, but the VoIP services are an effective alternative, which are increasingly used by businesses.

[124] M.6584 Vodafone / Cable & Wireless, (2012) paragraphs 25, 26 and 27

[125] For SBOs to provide voice services, they need to have commercial arrangement with a network operator who deliver the calls on their behalf. The CA has issued regulatory guidance for interconnection between SBOs and network operators that SBOs are required to pay interconnection charge to network operators, the level of which is decided commercially.

7.2 Market players

There are 7 FNOs and 4 MNOs currently providing fixed and mobile voice services respectively. Each of them is obliged to ensure any-to-any connectivity such that calls originate from its own network will terminate at the respective network operators and vice versa. However, they may interconnect with other operators through direct or indirect interconnection.

7.3 Market views

7.3.1 Merging parties

The merging parties expressed no views in relation to the market for wholesale market for interconnection on fixed networks.

7.3.2 Other respondents

No market respondent expressed any views or concerns about this market.

7.4 Market definition

The usual practice in relation to these markets is to define each individual FNO as a separate product market. This is also the decision practice by the EC. [126] However, we note that the interconnection market in Hong Kong is not the same as in other jurisdictions, and as we do not consider that the Proposed Transaction is likely to raise any competition issues in relation to wholesale market of interconnection with fixed network, the exact definition of the relevant market could be left open.

7.5 Competition impacts of the Proposed Transaction

We do not consider it likely that the Proposed Transaction would give rise to an increase in bargaining power for the merged entity as there are a number of competitors which can place a competitive constraint on the merged entity. In terms of market share the merged entity will have a market share of [redacted]%, by subscription, in fixed voice services and a [20% - 25%] share if we consider only business customers.[127] The market share by turnover for business customers may be smaller than this although we do not have data on market share by turnover for all customers. Turning to interconnection revenue, which includes interconnection between network operators, we find that the combined market share in terms of revenue is [redacted]% according to the merging parties.[128] This information suggests that the bargaining power of the merged entity will not dramatically increase such that they would be able to leverage their market power to significantly raise prices in the market for interconnection services.

Even though the merged entity will have an increase in market share post-merger, it is unlikely for the merged entity to unilaterally increase its interconnection charge. For instance, if the merged entity were to increase the interconnection charges, rivals may reciprocally increase prices.

[126] M.7637 Liberty Global/BASE (2016); M.8131 Tele2 Sverige/TDC Sverige (2016)
[127] Tables 3 and 6
[128] HKBN and WTT

As a result, we do not believe that any negative impacts of the Proposed Transaction on the wholesale market for interconnection with fixed networks should be expected.

8 External telecommunications services

8.1 Overview of the market

The ETS market comprises international voice services such as the use of calling prefix, call back services, telephone calling card services, VPN services, and telephone services carried out over data communication networks such as the Internet.[129]

IDD is a component of ETS, accessible by dialling access codes "00X", "15XX", "16XX" or "305-9XXXX" with different rates applicable depending on the service operators.

These services utilise ETF (overland and submarine cables along with satellites) for the purpose of making or receiving international calls by telephone subscribers from Hong Kong. When placing an international call, the subscriber's operator will utilise these ETF to connect the call. If they do not operate the ETF themselves, they will have to lease the capacity from another operator. Besides FNOs, SBO licensees may also provide ETS. Consumers may access services provided by these SBO licensees by dialling the respective access codes assigned to individual licensees.

IDD is an important component of ETS, for the purpose of this report, as it forms the bulk of ETS in terms of revenue for the merging parties.

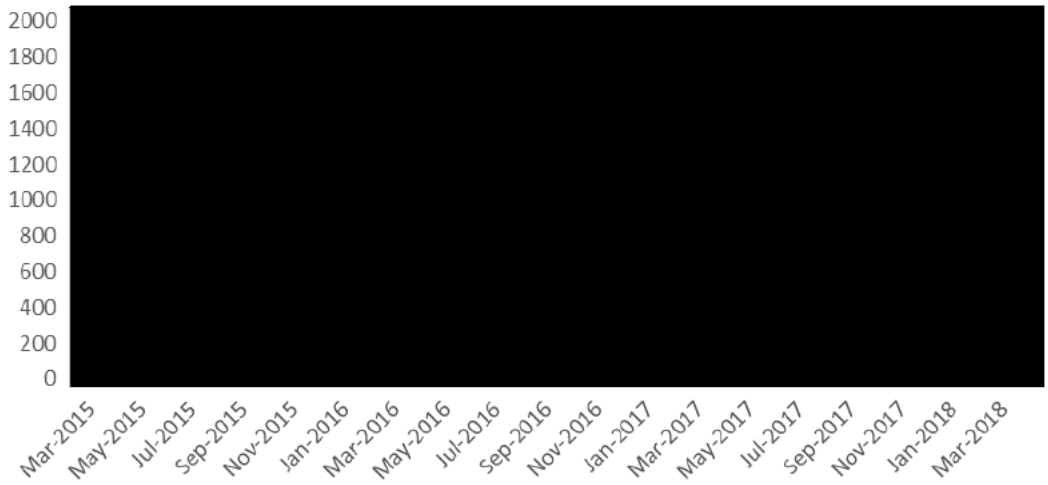
8.2 Main trends

Over the last three years we have seen a decline in total ETS traffic volume in minutes as highlighted in Figure 10. This is as a result of IDD traffic has been declining as consumers shift towards the use of cheaper and higher quality instant messaging (IM) services and VoIP services.

[redacted]

[129] The former Office of the Telecommunications Authority, Regulatory Guide for the Technical Configurations of External Telecommunication Service Platforms Operated by External Telecommunication Service Operators, December 1999, https://www.ofca.gov.hk/filemanager/ofca/en/content_405/hkta3102.pdf.
[redacted]

Figure 10 ETS total traffic volume (million minutes), March 2015 - March 2018



Source: London Economics calculation based on OFCA data

Along with the increase in VoIP usage there has also been a shift towards IM services, such as Skype, FaceTime, Tango, WeChat, WhatsApp, etc. which act as a substitute for voice telecommunications and specifically for expensive IDD services. The usage of Internet-based communications has resulted in savings of around 80% on conventional international call costs.[131] This has led to lower revenues from the IDD market, and to some firms pursuing strategies to rebalance their portfolio to mitigate this decline in IDD revenue.[132]

The increase in IM services is driven both by changing consumer behaviour and increased provision of Internet access and is likely to further reduce demand for IDD services in the future. Consumer demand is shifting towards services which include video and interactive activities not provided by traditional telephone services whilst Wi-Fi hotspots and the rollout of the 5G network are making it easier for consumers to connect to the Internet "on the go".

8.2.1 Main players in Hong Kong

We have information on ETS traffic data provided by OFCA. Firstly, we present the ETS data which incorporates IDD services before examining the IDD market more closely.

[131] BuddeCom (2015), Hong Kong Telecoms, Mobile, and Broadband, 21st Edition
[132] BuddeCom (2015), Hong Kong Telecoms, Mobile, and Broadband, 21st Edition

Table 54 ETS (total) market share - traffic volume (minutes)

Operator	2015 – 2016		2016 – 2017		2017 – 2018	
	Volume (million minutes)	Market share (%)	Volume (million minutes)	Market share (%)	Volume (million minutes)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size	**6,517**	**100%**	**5,078**	**100%**	**4,175**	**100%**
Merged entity	[redacted]					[5% - 10%]

Note: The table shows the total ETS traffic minutes of each major ETS provider during the fiscal year from April to March in the following year. HGC was acquired by an investment fund in October 2017. Before that, HGC and Hutchison, an MNO, belonged to the same business group and the ETS traffic were grouped together for reference. Market shares are rounded to 1 decimal place and as a result may not sum to 100%.
Source: OFCA

In 2016-17 the retail and wholesale IDD market was worth HK$[redacted] million to HKBN and HK$[redacted] million to WTT[133]. In terms of market share of IDD services by voice minutes, we can see from Table 54 that in 2017-18, HKBN had a [redacted]% share whilst WTT had a [redacted]% share making a combined total of [5% - 10%], this is lower than the [redacted]% share of the incumbent, PCCW-HKT. The remaining [redacted]% share is taken by other operators. These operators include other external FNOs, and SBO licensees who do not have their own networks. As of February 2019, there were 40 FNOs authorised to provide ETF, and 196 SBO licensees authorised to provide ETS.

8.3 Synergies

[redacted]

8.4 Barriers to entry and product substitution

The ease of obtaining an SBO licence to provide ETS and the lack of foreign ownership restrictions suggest that barriers to entry in ETS are low. This is emphasised by the severe price discounting reported by the incumbent (PCCW-HKT) which has resulted in their IDD and roaming revenue

[133] HKBN and WTT
[redacted]

falling in recent years.[136] This finding suggests that firms are competing on price within the IDD market, although it is not clear whether this is coming at the expense of (voice) quality. International and domestic operators can enter the market without needing to develop their own network by leasing from local infrastructure owners reducing fixed costs from entering the market.

The merging parties estimate that [redacted][137]

The increasing provision of online communications tools, which bypass traditional fixed telecommunications lines, predominantly IM services offer a substitute for IDD services. In fact, IM services may be considered as a superior good as they provide the benefit of video communications and interactive tools, an improvement on the voice-only communications provided by IDD. Substitution away from IDD services suggests a diminishing importance of such a market, we foresee this substitution increasing in the future as Internet access increases and social media tools proliferate and technological advancement improves quality further.

8.5 Views regarding market definition

8.5.1 The merging parties' views

[redacted]

8.5.2 Views of other parties

[redacted]

[136] PCCW-HKT's Annual Results Announcement 2018, http://www3.hkexnews.hk/listedco/listconews/SEHK/2019/0222/LTN20190222310.pdf
[137] HKBN and WTT

[redacted]

[redacted]

8.5.3 Assessment

In terms of precedent for market definition in these segments, the EC has historically viewed the provision of international voice telephony services as a separate market[143], but in a more recent decision[144], the EC viewed the IDD market as part of the fixed telephony/voice market.

We did not find it necessary to consider whether ETS and IDD should be included within the larger market for fixed voice services, given that, even if we were to take ETS and/or IDD as separate markets, the competitive situation of these segments and the relatively low shares of the merging parties are not to raise any competition concerns in relation to the Proposed Transaction.

8.6 Conclusion on the ETS and IDD markets

Given the rise of VoIP and IM services we believe the IDD market will continue to decline and thus contribute even less to the merged entity's revenue. IM services act as a substitute for IDD services and in some cases as a superior product, for instance in providing the ability for audio-visual communications and interactive services. Given the existence of this substitute, any attempts by the merged entity to raise prices in this market would likely lead consumers to further switch towards this superior product thereby acting as a disincentive for the merged entity to raise prices. Instead, the competition that IM services provides is likely to lead to a continued reduction in IDD prices to the benefit of consumers.

We also note that there are a number of alternative providers of ETS and IDD services and the ease of obtaining an ETS license makes entry likely if prices were to increase. Furthermore, the merged entity will have a relatively low combined market share (around [5% - 10%]) in the ETS market meaning that the Proposed Transaction falls within the safe harbour.

We therefore do not expect the Proposed Transaction to have any negative effects in either the ETS or the IDD market segments.

[redacted]

[143] E.g. V/JV.15 – BT/AT&T (1999)
[144] M.8131 – Tele2 Sverige/TDC Sverige (2016)

9 Fixed external telecommunications facilities

9.1 Overview of the market

ETF are the facilities-based services through submarine, overland cables, or satellites connecting Hong Kong with the international telecommunications network. Hong Kong's ETF market was liberalised in 2000. There are no limits on the number of licenses issued for provision of ETF, no deadline for license application and no foreign ownership restrictions on licensees. A licensee is entitled to operate and maintain capacity on submarine cables to provide cable based ETF. These submarine cables can either be landed at an existing cable landing station (CLS) by leasing from the CLS owner, or through the building of a new CLS. There is currently space available at the existing landing sites, use of which can be negotiated by operators. Vacant land at Chung Hom Kok Teleport site has also been set aside for the development of further CLSs.

9.2 Main trends

In addition to the existing 11 international submarine cable systems, there are five new submarine cables in development. This includes the construction of the 3,900 km Hong Kong-Guam Cable system (with designed capacity of 48 Tbps) by NEC Corporation (NEC)[145] and RTI Connectivity[146]. This cable is expected to be delivered by the fourth quarter of 2019 and will land in Tseung Kwan O.[147] Separately, a consortium (Bay to Bay Express Cable System) composed of China Mobile International, Amazon Web Services (AWS) and Facebook are working with NEC to develop a 16,000 km cable connecting Hong Kong, Singapore and the US to be completed by the fourth quarter of 2020.[148] Further cable systems under development include a connection between Hong Kong and the Americas (with designed capacity of 80 Tbps), SJC2 (with designed capacity of 144 Tbps) and the PLCN (with designed capacity of 144 Tbps) which has already landed in Hong Kong but has not yet entered into service[149].

In terms of overland cables, HGC and China Telecommunications Corporation are planning on constructing a new network of fibre cables via the Hong Kong-Zhuhai-Macau (HZM) Bridge which will be the first such cable on the HZM Bridge and HGC's fifth cross-border route between Mainland China and Hong Kong.[150]

9.3 Main players

As of February 2019, there were 40 carrier licensees authorised to provide ETF using either submarine and/or overland cables with a small number providing satellite services. In Hong Kong,

[145] NEC is a global information technology company, headquartered in Japan, providing IT products and services as well as network solutions.
[146] RTI Connectivity is a Singapore based subsea cable development company.
[147] Telegeography, Cable Compendium, https://www.telegeography.com/products/commsupdate/articles/2017/04/21/cable-compendium-a-guide-to-the-weeks-submarine-and-terrestrial-developments/, accessed on 15th October 2018
[148] Telegeography, Cable Compendium, https://www.telegeography.com/products/commsupdate/articles/2018/07/13/cable-compendium-a-guide-to-the-weeks-submarine-and-terrestrial-developments/ accessed on 15th October 2018
[149] Submarine Cable Networks, https://www.submarinenetworks.com/en/systems/trans-pacific/plcn/plcn-landed-in-hong-kong
[150] Telegeography, Cable Compendium, https://www.telegeography.com/products/commsupdate/articles/2018/05/11/cable-compendium-a-guide-to-the-weeks-submarine-and-terrestrial-developments/index.html, accessed on 15th October 2018

there are 11 submarine cable systems and 8 submarine CLSs, located at Tong Fuk, Tseung Kwan O, Deep Water Bay, Chung Hom Kok and Cape D'Aguilar.[151] Furthermore, there were 20 overland cable systems[152] and 12 communications satellites[153].

In terms of market share by external capacity, [redacted]

Whilst HKBN and WTT are licensed to provide ETF, and both maintain some external submarine cable capacities with HKBN also maintaining some overland cable capacities, their combined market shares are [less than 5%] and neither own CLSs.

9.4 Views on market definition

9.4.1 The merging parties' views

[redacted]

9.4.2 Views of other parties

No other parties raised concern on this market.

9.4.3 Market definition

For the purpose of this report the infrastructure aspect of global telecommunications services are termed ETF and this includes the physical access which connects Hong Kong with the rest of the world, including submarine and overhead cables as well as satellites. Given the narrow activities the merging parties play in this market we leave open the precise definition of the market as we have no substantial competitive concerns.

[151] OFCA (2018), Landing of Submarine Cables in Hong Kong, https://www.ofca.gov.hk/en/industry_focus/telecommunications/facility_based/infrastructures/submarine_cables/index.html
[152] OFCA (2018) Fact Sheet in relation to Telecommunications Matters, https://ofca.gov.hk/filemanager/ofca/en/content_113/telecommunications.pdf
[153] OFCA Trading Fund Report 2017/18, page 24 (https://ofca.gov.hk/trade_fund_report/1718/pdf/en/ofca_tfr_17_18_en.pdf)
[redacted]

9.5 Conclusions on ETF

The Proposed Transaction causes no competition concerns in the market for ETF given the small share of the market that HKBN and WTT control, which means that the Proposed Transaction falls within the safe harbour in this relevant market. Neither HKBN nor WTT owns CLSs and whilst they operate a small amount of capacity through submarine and overland cables, they are only minor players in this market. As a result, we do not believe this market poses any further concern for the Proposed Transaction.

10 IT services

10.1 Market overview

IT services include the day to day management and operations of computing infrastructure and business applications to business customers, systems integration services, data centre services and cloud services.

Services related to data centres, cloud services and systems integration, can be considered as elements of IT service needs, particularly for larger business customers.

10.1.1 Data centres

Data centres are secure, temperature-controlled facilities that house large-capacity servers and data storage systems. They are equipped with multiple power sources to ensure uninterrupted power supply, environmental controls such as air-conditioning and fire suppression and high-bandwidth Internet connections.

Data centres operate on two main customer models: captive or outsourced. A captive data source allows an organisation to build, operate and manage the data centre for internal purposes. The outsourced model is where an organisation leases space and hosting services from data centre providers. We believe the relevant market for consideration is the outsourced model, whereby an operator builds and owns data centres which it then leases out to customers.

Within this outsourced model, firms can either use colocation services or a managed hosting service (the “cloud”). Under the colocation service, a business would physically rent floor space within the data centre, with the operator providing basic infrastructure such as security, power, and cooling and basic network connectivity. It is typical that several customers would use the same data centre under the colocation service. Customers pay a monthly or annual rental fee for these services but must provide their own servers and IT support to manage the resources. Under the managed hosting service, a business would lease cloud services from the data centre such that the customer need not purchase their own server or system support. Instead, they lease software and data space from the provider.

Hong Kong is a key regional data centre hub in Asia due to its reliable and advanced telecommunication, safe environment sheltered from natural disasters and power supply infrastructure. The local government encourages the development of data centres by making land available for the development of large-scale data centres.

10.1.2 Cloud services

Cloud services is the provision of computing resources (hardware and software) to customers over the Internet. The customer benefits from the flexible and easy use of these IT resources with high performance and reliability without needing to develop an in-house IT/networking team or permanently purchase such resources, thereby reducing costs.

10.1.3 Systems Integration

SI services include project management in buildings, Wi-Fi availability for customers such as hotels and venue operators, structure cabling and annual equipment maintenance. SI is the process in which multiple systems are connected to one common platform, providing benefits in infrastructure management, maintaining data integrity, and reducing data errors. For example, in 2016 HKBN began an SI project on a brand-new hotel including laying down structural cabling, setting up the telephone system and installing the emergency electricity backup system.[158]

10.2 Main trends

10.2.1 Cloud services

In 2017 around 72% of businesses used cloud computing services, and this figure was particularly high in large firms where e-mail and communications were the predominant application of cloud services.[159] 97.9% of these cloud using firms used the public cloud, 7.7% used the private cloud, 2.2% used a hybrid cloud and 2.0% used a community cloud.[160] The main reasons for cloud usage are to increase business agility, for example increasing user satisfaction with customer demand, adoption by industry competitors and reducing IT management costs and capital outlays.

Such high usage is also due in part to Hong Kong government policies to encourage cloud computing adoption. The Government Cloud Platform was launched in 2013 to facilitate cost effective delivery of government services electronically and the Expert Group on Cloud Computing Services and Standards was established in 2012 to explore ways to increase cloud adoption.

In the future, demand from international firms moving into the area is likely to increase, fuelling demand for cloud services particularly to take advantage of the Chinese market.[161] Globally, the SI market is expected to more than double in size by 2025, suggesting much room for growth.[162] On the other hand, demand from domestic firms may well be saturated, with 4.5% of firms planning to allocate more than 25% of their IT budget to cloud services, with 75% of firms allocating 0% of their IT budget. Amongst firms not using the cloud, 81.1% report that their reason for not doing so is due to a lack of practical use of such services, suggesting their use will not grow in the future unless there are material changes to their business plans.[163]

10.2.2 Data centres

In recent years there has been a surge in data consumption driven by the increasing availability of Internet services, alongside changing consumer behaviour with the growing level of media and social media consumed online rather than through more traditional means. This rapid growth of data services results in the need to store the data that is digitally generated and exchanged thereby increasing demand for data centres. We expect to see further increases in data volumes as the Internet of Things continues to expand, governments develop smart cities utilising sensors and

[158] HKBN 2017 Annual Report, https://reg.hkbn.net/WwwCMS/upload/pdf/en/e_AnnualReport2017_HKEX.pdf
[159] Census and Statistics Department (2017), https://www.ogcio.gov.hk/en/about_us/facts/doc/itsurveyreport2017.pdf
[160] Note that some firms use more than one type of cloud computing service. Data from Census and Statistics Department (2017).
[161] The Canadian Trade Commissioner Service (2016), https://www.enterprisecanadanetwork.ca/_uploads/resources/Information-and-Communications-Technology-Sector-Hong-Kong.pdf
[162] PR Newswire, System Integration Market Size to Reach Close to USD 528 Billion by 2025, https://www.prnewswire.com/news-releases/system-integration-market-size-to-reach-close-to-usd-528-billion-by-2025--million-insights-682524211.html
[163] Census and Statistics Department (2017), https://www.ogcio.gov.hk/en/about_us/facts/doc/itsurveyreport2017.pdf

big data, consumers continue making their homes more interactive, the shift from media away from traditional television to online video streaming, and the expansion in usage of cloud services to store data.

Traditionally, data centres have been held in-house but data centres offer increased flexibility in data storage and lower upfront costs which is leading to a shift in corporate strategy away from in-house data centres towards the outsourcing of these services. Hong Kong is likely to benefit from increased growth of Chinese Internet firms such as Tencent, which already has a data centre in Hong Kong, which are increasing their international scope, and which will require further data centre capacity. For example, Alibaba Cloud, the cloud computing arm of e-commerce powerhouse Alibaba, already opened a data centre in Hong Kong in 2014 as part of an aggressive international roll-out[164]. Furthermore, Hong Kong is the main financial centre for mainland China and rapid growth of China on international financial markets will further stimulate demand for data centre services.

This surge in business client demand for data services is exacerbated by global content providers embracing a more regional hosting strategy. Such large content providers are increasingly choosing to decentralise their content hosting to ensure that content is available in the location it is required in order to reduce buffering times (latency) which is an important issue, particularly for media content providers. By adopting a strategy of hosting content closer to the market in which it is consumed these firms can reduce latency issues, enhancing the consumer experience. Whilst such a strategy is likely to result in higher data centre costs for these global content providers, the cost is outweighed by higher consumer demand from higher quality services.

Hong Kong is a major gateway for international players to the mainland China market. As foreign firms look to increase their presence in mainland China, we may expect to see greater demand for data centres in Hong Kong to meet this demand. Similarly, Chinese firms looking to increase their Internet presence internationally have an incentive to locate their data centres in Hong Kong, potentially furthering the demand for Hong Kong data centres.

According to DBS Bank[165], data centre supply is exceeding demand in the mature market of Hong Kong, particularly due to the large-scale development of the Tseung Kwan O site, encouraged by the government.[166] Given that the Proposed Transaction will not have an impact on this market we see no issues.

10.3 Main players

10.3.1 Cloud services, professional services and systems Integration

Both WTT and HKBN provide a range of IT services including the provision of SI and cloud services, [redacted]

[164] Alibaba Group, Alibaba Cloud Expands Hong Kong Data Centre by More Than Doubling the Capacity, https://www.alibabagroup.com/en/news/article?news=p170213, accessed on 22/11/2018

[165] DBS Bank is a financial services group headquartered in Singapore, with a presence in China, Southeast Asia and South Asia.

[166] DBS Group Research, Data Centres: What to Do in the Face of Public Cloud, April 2016 https://www.dbs.com.sg/treasures/aics/pdfController.page?pdfpath=/content/article/pdf/AIO/160421_insights_data_centres_what_to_do_in_the_face_of_public_cloud.pdf

HKBN reported that in the 2017 financial year it only generated HK$[redacted] million (less than [redacted]% of HKBN's total turnover).[167]

WTT reportedly generated HK$[redacted] million (approximately [redacted]% of WTT's total turnover) from these services.[168] Its IT service portfolio includes fibre-based high-speed business broadband, local and international data networking, VoIP, cloud services and SI solutions. Through its subsidiary COL Limited (COL), WTT provides SI and professional services including application services, business continuity and disaster recovery services. According to the Hong Kong General Chamber of Commerce, COL has 80% market share in the financial industry and multinational corporation sector with the data centre and business continuity services market.[169] The actual products offered within this market include network planning and design, network installation and integration, network maintenance, support and management, provision of hardware products, and business printing solutions. WTT also provides online marketing applications (e-mail, social media and SMS marketing along with e-Coupon and e-Shop services), telemarketing services and back-end process outsourcing.

[redacted]

We calculate that the combined market share of the merged entity will be less than [redacted]% ([redacted]%) based on an estimated market size for IT services of HK$28.4 billion[171] and figures provided to us by the merging parties where we estimate their activities in the IT service sector to be around HK$[redacted] million for 2017 (see Table 55 and Table 56). We are aware that there are varying definitions for "IT services" which include different components which may alter the exact value for the market share, but we believe the combined entities market share will certainly be below [redacted]%.

10.3.2 Data centres

The main players within the Asia-Pacific data centre services field are non-HK-based firms such as NTT Communications (NTT) (Japan), China Telecom (China), SingTel (Singapore) and Telstra (Australia). As demand for data services in the region grows, firms such as Equinix (US), Global Switch (UK) and Fujitsu (Japan) have expanded existing data centres or built additional capacity to take advantage of higher demand.

Within Hong Kong, there are 107 data centres.[172] The largest data centre provider in terms of raised floor space[173] is iAdvantage (SUNeVision[174]), with 25% of the market, followed by NTT[175] on

[167] HKBN
[168] WTT
[169] Hong Kong General Chamber of Commerce, Hong Kong Business Directory, http://www.chamber.org.hk/en/membership/directory_detail.aspx?id=HKW0409, accessed on 26/10/2018
[redacted]
[171] ComputerWorldHK, https://www.cw.com.hk/it-hk/hk-ict-market-forecast-to-grow-3-8-year, accessed on 26/02/2019
[172] CloudScene, https://cloudscene.com/market/data-centers-in-hong-kong/all, accessed on 04/10/2018
[173] Note that raised floor space is the metric used in the PwC report, however other measures such as gross floor area exist which lead to different values of market share although the broad picture remains unchanged.
[174] SUNeVision is a Hong Kong and China based IT company, focused on data centre, facilities management and value-added services, as well as installation and maintenance services and the renting of investment properties.

13% and PCCW-HKT and Equinix[176] both with a 12% market share.[177] The remaining 39% of the market is occupied by other providers. According to the merging parties [redacted][178]

Cloud giants such as Microsoft, Google and AWS have purchased capacity in Hong Kong to take advantage of increasing demand. Such technology behemoths have sufficient funds to expand in the market and provide increased competition to the benefit of consumers in the form of lower prices and higher quality product offerings (i.e. more server space and quicker traffic times).

[redacted]

Based on information provided to us by the merging parties (and presented in Table 55) the value of Hong Kong's data centre market is HK$[redacted] billion in 2017.[180] The merged entity's turnover from data service revenue in 2017 would be equal to HK$[redacted] million which gives a market share of approximately [redacted]%, this corroborates the merging parties' submissions that their combined market share in the data centre market will be less than [redacted]%.[181]

Table 55 Data centres - segment shares (turnover)

Operator	2015		2016		2017	
	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)	Turnover (HKD, million)	Market share (%)
HKBN	[redacted]					
WTT						
Segment size						
Merged entity						

Source: HKBN and WTT

[175] NTT is a provider of information and communications technology solutions. NTT's services include data centre, cloud, network, enterprise hosting, voice and video communications, and security services.
[176] Equinix is a data centre and interconnection services provider with data centres in more than 180 locations worldwide.
[177] PwC (2017), Surfing the Data Wave: the surge in Asia Pacific's data centre market, https://www.pwc.com/sg/en/publications/assets/surfing-the-data-wave.pdf
[178] HKBN and WTT
[179] [redacted]
[180] [redacted]
[181] HKBN and WTT

Table 56 Data centre services – revenue (FY 2017)

Operator	Revenue	Percent of operator's total revenue
HKBN	[redacted]	
WTT		
Market size	HKD 6 billion	
Forecasted market size by 2020	HKD 9.3 billion	
Combined market share	[redacted]	

Source: HKBN and WTT, SCMP (http://www.scmp.com/tech/enterprises/article/2099871/hong-kong-data-centres-booming-back-mainland-internet-giants), DBS Group Research report, "Hong Kong Data Centres – The Right Supply for Rising Demand"

[redacted]

10.4 Barriers to entry and competitive outlook

Entry into the datacentre/IT services sector does not require a telecommunications license in Hong Kong so long as this does not involve establishment or maintenance of any means of telecommunications in Hong Kong, and so from a regulation sense, barriers to entry are low. However, there are other large costs associated with entering this sector, discussed below.

The location of a data centre is particularly important, with the reach of existing network capacity having to be strong and the distance from the end consumer being increasingly important due to latency issues. The location chosen should be unaffected by natural disasters and have a temperate climate to reduce cooling costs. Customers are increasingly aware of the effects of climate change and so demand facilities with green credentials. This means locations which provide renewable energy sources are expected to increase in popularity in the future. There is a substantial lead-in time to develop a new data centre. It takes 1-2 years to build a data centre from the conversion of an existing building which tends to already have access to utilities, although the number of suitable buildings is limited, and around 3-5 years to construct the data centre on a greenfield site.[182] However, converting existing buildings may be less efficient as the flooring design is often sub-optimal and the building may not be designed to be energy efficient resulting in greater temperature-control costs.

There are substantial costs to building a data centre, with construction costs ranging from US$100 million for a multi-tenanted facility to US$1.5 billion for a cloud campus with several buildings.[183] These large entry costs are likely to deter entry by new start-ups meaning competition would need to come from firms with deep pockets.

Whilst firms may opt to lease data centre services from providers located locally to reduce latency issues, firms which do not require such large-scale data connectivity (those which are not streaming high-quality videos or large-data products) may choose to purchase the services of international competitors, thus leading to stronger competition.

[182] DBS Group Research, Hong Kong Data Centres: The Right Supply for Rising Demand, October 2016 https://www.dbs.com.sg/treasures/aics/pdfController.page?pdfpath=/content/article/pdf/AIO/160421_insights_data_centres_what_to_do_in_the_face_of_public_cloud.pdf

[183] Marketing-Interactive.com, Singapore the 'most robust' market in APAC for data centres, October 2017, (https://www.marketing-interactive.com/singapore-the-most-robust-market-in-apac-for-data-centres/)

[redacted] We believe that any barriers to entry would come from a lack of established client network and brand name/image. These barriers could potentially be overcome by an established firm, from outside this market, entering the IT services sector.

[redacted] However, in previous EC cases it was found that some customers explained they did not have the necessary expertise to use in-house data centres and could not realise economies of scale with such a product.[186] We see no reason why this finding would differ in Hong Kong which suggests that in-house IT service providers may not act as a sufficient competitive barrier.

10.5 Views on the competition impacts of the Proposed Transaction

10.5.1 The merging parties' views

[redacted]

10.5.2 Views of other parties

There are no concerns raised by other parties. [redacted]

[redacted]

[186] M.7678 Equinix/Telecity (2015)

[redacted]

10.6 Market definition

In a previous case[189] the EC left open the market definition because market shares were below the 20% threshold with respect to IT services under any alternative product market definition. The EC considered whether to subdivide the IT services market by functionality (e.g. outsourcing and software maintenance), but left this question open as there were serious concerns with the transactions which were resolved on final commitments.[190]

With regard to data centres, the EC considered that the relevant product market was "colocation services provided by third party data centres without segmenting the relevant product market into services provided by carrier-neutral and carrier-owned data centres, wholesale and retail operators or by type of customers".[191] In the same case, it was decided that third party data centres did not belong to the same product market as in-house data centres due to differences in price related to economies of scale arising from third party providers and due to the required expertise.

[redacted]

10.7 Conclusion on IT services

Given the large number of players in this market, both locally and internationally, and the small market share of the merged entity we raise no concerns as to the competitive nature of this market following the Proposed Transaction. No complaints are raised by other parties suggesting they see few issues in the outcome of this market following the Proposed Transaction. Whilst there are time delays and sunk costs involved in entering this market there are a number of large multinational players which could potentially enter the market if it is financially viable to do so. Furthermore, we see little risk to customers of IT services given the ability for them to switch suppliers, with little cost in most cases.

[189] M.8131 Tele2 Sverige/TDC Sverige (2016)
[190] M.7499 Altice/PT Portugal (2015)
[191] M.7678 Equinix/Telecity (2015)

11 Efficiency effects of the Proposed Transaction

Section 8(1) of Schedule 7 to the CO provides that the Merger Rule does not apply to a merger if the economic efficiencies that arise or may arise from the merger outweigh the adverse effects caused by any lessening of competition in Hong Kong.

The Merger Guideline provides that:

- the efficiency gains must occur as a direct result of the merger ("merger-specific efficiencies"); and
- the efficiencies must be clearly identified and verified ("recognisable efficiencies").
- the efficiency gains must translate into a more effective level of competition from the merged entity than the level that was offered by the merging parties separately ("translated efficiencies").

In particular, the parties should demonstrate that the argued efficiencies will be achieved by the merger and would be unlikely to be achieved without the merger or by another means having less significant anti-competitive effects.

The Merger Guideline recognises that efficiencies are often difficult to verify and quantify, in part because much of the information relating to efficiencies is uniquely in the possession of the merging firms. Nonetheless, efficiency claims must be substantiated by the merging parties so that the CA can verify by reasonable means:

- the likelihood and magnitude of each claimed efficiency;
- how and when each efficiency would be achieved;
- how each efficiency would enhance the merged firm's ability and incentive to compete;
- why each efficiency would be merger-specific; and
- how the efficiencies would outweigh the adverse effects caused by any lessening of competition.

11.1 View of the merging parties

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

11.2 View of other parties

[redacted]

[redacted]

[redacted]

11.3 Assessment

Whilst the merging parties submit that the Proposed Transaction will lead to cost efficiencies and synergies, they provide no quantitative estimates in their submission that we might evaluate.

With regard to the qualitative claims produced in HKBN's acquisition announcement, we agree that savings can, in principle, be achieved through optimisations in network usage, staff reduction costs and relocation of offices. A larger entity may also have greater bargaining power amongst suppliers, which would permit further efficiencies. However, based on present information, we are unable to evaluate the magnitude of such savings.

[redacted]

The merging parties provided [redacted]

With regard to the first point, there is no guarantee that [redacted] it is merely a claim with no commitment on the part of the merging party. It could be changed without any consequences after the Proposed Transaction. As for the second point, there is simply no evidence provided by the merged entity as to [redacted]

In light of the discussion above, we would not give further consideration to the efficiency claims at this stage.

12 Commitments offered by the merging parties

We note that the merging parties offered a set of commitments to the CA to address the competition issues identified. The proposed commitments mainly include the following two components –

(a) **In-building Interconnection Commitment**: For those buildings which are not exclusively for residential use and where both HKBN and WTT have installed their own blockwiring circuits therein, in the circumstances where a competing FNO is not providing fixed telecommunications services to any end-customer (residential or non-residential) at the building concerned and encounters difficulties in accessing that building for installation of blockwiring circuits for the provision of fixed telecommunications services to non-residential end-customers within that building, the merged entity will facilitate access by such FNO to its blockwiring circuits of that building for the purpose of enabling such FNO to provide fixed telecommunications services to non-residential end-customers; and

(b) **Wholesale Access Commitment**: HKBN and/or WTT will continue to provide wholesale services to their downstream rivals who have existing agreements with them on wholesale services based on existing or no less favourable terms and conditions for two years from the effective date of the commitments.

We note that the CA issued a notice on 13 February 2019 to seek representations from the industry and interested parties on the CA's proposed acceptance of the commitments. HKBN and WTT, in light of the representations in response to the notice, offered a set of revised commitments to the CA. We note the following major revisions to the commitments –

(a) apart from interconnection with in-situ blockwiring circuits of the merged entity, the merged entity will also make available other elements of its in-building telecommunications systems of the buildings concerned (including but not limited to lead-in ducts/cables for accessing a building, cabinet space in the telecommunications and broadcasting equipment room, vertical cable risers and horizontal conduits) to the requesting operator;

(b) an operator which is currently leasing blockwiring circuit from a third party FNO for provision of services to residential end-customers will be eligible to seek access from the merged entity for provision of services to non-residential end-customers, on the condition that such operator encounters difficulties of access to the building concerned for serving non-residential end-customers; and

(c) the timeframe which the merged entity should continue to provide wholesale services to its downstream rivals based on existing or no less favourable terms and conditions is revised from two years to three years from the effective date of the commitment.

As compared to the proposed commitments, we consider that the revised commitments would be able to address the competition issues identified in a more effective way, in particular the scope of the In-building Interconnection Commitment has been expanded and the duration of the Wholesale Access Commitment has been extended in response to the representations received. We do not consider that the scope of the revised commitments would need to be further expanded to accommodate some other suggestions made in the representations (e.g. that the In-building Interconnection Commitment should be extended to cover buildings where either HKBN

or WTT is the only blockwiring circuit provider, or that the Wholesale Access Commitment should be made perpetual), as any further expansion of scope as suggested in the representations would appear to be either disproportionate or not relevant to address the potential competition harm identified in this case.

We note that the representations have also raised some comments on the implementation details of the commitments. As these comments do not particularly relate to economic arguments, we will not consider such comments in this report.

[redacted]

12.1 Coordinated effects

12.1.1 Conditions for coordinated effects

As discussed in Section 6 above, two high-level indicators provide a first glimpse at the likelihood of the merger raising coordinated effects: 1) market structure: tacit collusion is unlikely to arise unless post-merger there are only few firms in the market, with considerable symmetries among them. 2) past evidence of any coordinated outcome: relevant factors to be considered may include whether firms have close relationships (such as joint ventures, cross-directorates etc.), or whether there is systematic exchange of information or effective mechanism to co-monitor prices, or whether suspiciously parallel price movements have been observed in the past. We conclude in Section 6 that both of these indicators do not raise any red flag of concern.

12.1.2 The Airtours criteria

In particular, as an analytical framework adopted by many jurisdictions around the world, we have discussed the so-called "Airtours criteria" in Section 6. Those criteria specify both the internal and external conditions that need to be met in order for a coordinated outcome to be viable and sustainable. The important point to emphasize here is that all the conditions have to be fulfilled together before it could be concluded that a competition risk in the form of coordinated outcome might result from a merger. We have explained why the cumulative conditions specified under the “Airtours criteria” are not met in the local fixed network access services market in Section 6. In particular, so long as new entrants have no difficulties in gaining access at the building level, entry, inclusive of de novo entrants, could effectively deter any coordinated outcome from formation in the first place. Given that such possibility of entry results in potentially destabilizing external condition for any coordinated outcome, we conclude there, in addition to other considerations, that it is highly unlikely that the Proposed Transaction would result in competition risk in the form of coordinated effect in the local fixed network access services market. In addition, we note that as the competitiveness of two other relevant markets, namely the retail local fixed Internet access

services market and the retail local fixed voice services market, depends on the competitiveness in the local fixed network access services market. The minimal coordinated outcome risk in the local fixed network access services market would ensure that there is also minimal coordinated outcome risk in those two other relevant markets. This is the case as the possibility of entry into those two downstream markets, via the market for local fixed network access services, results in potentially destabilizing external condition for any coordinated outcome in those two downstream markets.

12.2 Concluding remarks on the commitments offered by the merging parties

In conclusion, we consider that the revised commitments would be able to address the competition issues that might arise from the Proposed Transaction.

Index of Tables, Figures and Boxes

Tables

Figures

Boxes

ANNEXES

Annex 1 Building-level analysis of fixed network coverage

In this annex we provide additional detail of our analysis of fixed network coverage by different FNOs in Hong Kong, at building level. The dataset on which the analysis is based provides current building coverage by operators other than PCCW-HKT. Our working assumption is that PCCW-HKT, as the former incumbent, has fixed network coverage to all buildings in Hong Kong, also in view of its universal service provider obligation.

Section A1.1 provides the analysis based on data for March 2017. Section A1.2 mirrors the analysis of Section A.1.1, using data for March 2018, and provides a comparison between the two years. Section A1.3 combines these numbers with estimates of the total number of non-residential buildings in Hong Kong to obtain a better understanding of the overall building penetration by operators other than the incumbent.

Please note, that the analysis is based on the number of operators, other than PCCW-HKT, have coverage to the respective buildings. However, one building may contain a number of offices or flats. Unfortunately, the database does not contain information about the number of offices or companies based in business buildings. As such, the analysis is restricted to use number of buildings only for the non-residential segment.

Moreover, as the database only contains buildings with coverage by at least one operator other than the incumbent, it does not cover all buildings in Hong Kong. Further analysis (see Annex A1.3) suggests that, in 2018, between [redacted]% and [redacted]% of all non-residential buildings were covered by at least one operator other than the incumbent.

For residential buildings, the database does contain the number of households for each residential building, so that an analysis at the household level would be possible for the residential segment. However, given that WTT has withdrawn from the residential segment, the number of residential buildings that WTT has access to is very small (Table 58 and Table 73). Therefore, no further analysis was undertaken at the household level for residential buildings.

Box 1 provides a number of definitions which should be kept in mind throughout this analysis.

Box 1 Definitions

Total no. of buildings in database: The database does not include all buildings in Hong Kong, but only those buildings covered by operators other than PCCW-HKT (the incumbent).

Building shares: Shares of buildings in this section do not represent shares of all buildings in Hong Kong, but the share of all buildings included in the database; i.e. those covered by operators other than PCCW-HKT (the incumbent).

Building coverage by HKBN: The database included both HKBN and HKBN Enterprise Solutions Limited. For the purpose of this analysis the two were treated as one and the same operator. That is, building coverage of HKBN in this section represents both buildings covered by HKBN and buildings covered by HKBN Enterprise Solutions Limited.

Residential buildings: A building was counted as residential if all operators that provide access to this building classified it as residential. That is, residential buildings correspond to purely residential buildings.

Business buildings: As with residential buildings, a building was counted as business if all operators that provide access to this building classified it as business. That is, business buildings correspond to purely business buildings.

Other buildings: Buildings that are neither residential nor business are classified as "Others" in the database. This includes buildings such as shopping malls, public car parks, club houses, churches, clinics, government buildings, hospitals, law courts, schools, institutions, universities, temples, etc. As with residential and business buildings, other buildings represent only those buildings that were classified as others by all operators providing access to it.

Mixed buildings: A small number of buildings were classified differently by different operators (e.g. residential by HKBN, but business by HGC). These could be buildings with, for example, a shop on the ground floor and a residential block above. For the purpose of this analysis, these buildings were classified as mixed buildings.

Non-residential buildings: Non-residential buildings represents all buildings that are not purely residential. That is, all business, other, and mixed buildings.

A1.1 Building-level analysis of fixed network coverage - 2017

The total number of buildings in Hong Kong, which have fixed network coverage by operators other than PCCW-HKT stood, in March 2017, at [redacted]. Of this total, [redacted]% ([redacted]) are covered by HKBN and [redacted]% ([redacted]) by WTT. This compares to [redacted]% ([redacted]) covered by [redacted], [redacted]% ([redacted]) covered by [redacted], and [redacted]% ([redacted]) covered by [redacted]. [redacted]

Table 57 Building coverage, by operator (2017)

Operator	Building coverage	
	No.	%
Total no. of buildings in database	[redacted]	
HKBN		
WTT		

Source: London Economics based on OFCA data

In terms of building coverage by type of buildings (Table 58), HKBN covers [redacted]% of all residential buildings covered by at least one operator other than the incumbent; [redacted]% of all business buildings covered by at least one operator other than the incumbent; [redacted]% of all other buildings covered by at least one operator other than the incumbent; and [redacted]% of all mixed buildings covered by at least one operator other than the incumbent.

WTT has a very low share of buildings in the residential sector ([redacted]%), but a very high share of business buildings ([redacted]%) and mixed buildings ([redacted]%). WTT also covers [redacted]% of other buildings.

This indicates that the residential buildings sector will be least affected by the Proposed Transaction. Therefore, particular attention will be paid to the non-residential segment in the analysis in the following sections.

HKBN and WTT cover [redacted]% and [redacted]% of all non-residential buildings in the database, respectively.

Table 58 Building coverage, by building type and operator (2017)

Operator	Residential		Business		Others		Mixed		Non-residential	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total no. of buildings in database	[redacted]									
HKBN										
WTT										

Source: London Economics based on OFCA data

The vast majority ([redacted] of [redacted], or [redacted]%) of buildings covered by WTT is accessed via fibre technology, accounting for approximately [redacted]% of all buildings with at least some coverage of fibre access. A small number of buildings ([redacted] of [redacted], or [redacted]%) is accessed via copper-based technologies, accounting for [redacted]% of buildings accessed via copper. (Table 59)

Similarly, the vast majority of buildings covered by HKBN is accessed via fibre technologies ([redacted] of [redacted], or [redacted]%), covering [redacted]% of all buildings with at least some fibre coverage. A small number ([redacted] of [redacted], or [redacted]%) is accessed via wireless technologies. HKBN also has both wireless and fibre access to a small number of buildings ([redacted]).

Indeed, as Table 59 shows, the only overlap, in terms of access technology, between WTT and HKBN is fibre. Therefore, particular attention will be paid to this segment in the analysis in the following sections.

Table 59 Building coverage, by technology and operator (2017)

Operator	Copper		Fibre[2]		Hybrid fibre/coaxial		Wireless		Wireless + fibre	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total no. of buildings with some coverage in database[1]	[redacted]									
HKBN										
WTT										

Note: (1) Calculated as the number of buildings that are accessed via, for example, fibre by at least one operator, regardless of the building-type. As a building may be accessed via different technologies by different operators (e.g. fibre by [redacted], and copper by [redacted]), the numbers do not sum up to the total number of buildings. (2) Includes FTTB and FTTH.

Source: London Economics based on OFCA data

A1.1.1 Overlapping coverage by HKBN and WTT

This section provides an analysis of the number of buildings currently covered by both HKBN and WTT.

The total number of buildings covered by both HKBN and WTT stood at [redacted] at the time of analysis (Table 60). This represents approximately [redacted]% of all buildings in the database. Of the [redacted] buildings covered by both:

- [redacted] are purely business buildings, accounting for [redacted]% of all purely business buildings in the database;
- [redacted] are purely residential buildings, accounting for [redacted]% of all purely residential buildings in the database;
- [redacted] are purely other types of buildings, accounting for [redacted]% of all buildings classified as Others in the database; and,
- [redacted] are mixed buildings, accounting for [redacted]% of all mixed buildings in the database

When combining all business, other, and mixed buildings – i.e. excluding all purely residential buildings – HKBN and WTT overlap in [redacted] buildings ([redacted]% of all buildings of these types in the database).

Table 60 Buildings covered by both HKBN and WTT, by building type (2017)

Building type	Total no. of buildings in database	Buildings covered by HKBN and WTT	% of all buildings in database
Residential	[redacted]		
Business			
Others			
Mixed			
Total			
Non-residential			

Source: London Economics based on OFCA data

Table 61 shows, for all buildings covered by both HKBN and WTT, the total number of buildings currently covered by 2, 3, or 4 operators (other than the incumbent). In particular, it should be noted that, of the [redacted] non-residential buildings (i.e. excluding the [redacted] purely residential buildings):

- [redacted] business buildings are currently covered only by WTT and HKBN (excluding the incumbent);
- [redacted] other buildings are currently covered only by WTT and HKBN (excluding the incumbent); and,
- [redacted] mixed buildings are currently covered only by WTT and HKBN (excluding the incumbent).

Table 61 Buildings covered by both HKBN and WTT, by building type and no. of operators (2017)

Building Type	Total no. of buildings in database	Buildings covered by HKBN and WTT	No. of operators (excluding incumbent)			% of all buildings in database		
			2	3	4	2	3	4
Residential	[redacted]							
Business								
Others								
Mixed								
Total								
Non-residential								

Source: London Economics based on OFCA data

As Table 59 shows, a large proportion of buildings of both HKBN and WTT are covered by fibre. Indeed, of the [redacted] non-residential buildings covered by both operators (i.e. excluding the [redacted] purely residential buildings covered by both operators), [redacted] ([redacted]%) are covered by fibre technologies by both operators[197]; of these:

- [redacted] purely business buildings currently only have fibre access provided by WTT and HKBN (excluding the incumbent);
- [redacted] other buildings currently only have fibre access provided by WTT and HKBN (excluding the incumbent); and,
- [redacted] mixed buildings currently only have fibre access provided by WTT and HKBN (excluding the incumbent).

Table 62 Buildings covered by both HKBN and WTT with fibre access, by building type (2017)

Building type	Total no. of buildings in database covered by fibre	Buildings covered by fibre by HKBN and WTT	% of all buildings with fibre access in database
Residential	[redacted]	[redacted]	[redacted]
Business			
Others			
Mixed			
Total			
Non-residential			

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Table 63 Buildings covered by both HKBN and WTT with fibre access, by building type and no. of operators (2017)

Building Type	Total no. of buildings in database covered by fibre	Buildings covered by fibre by HKBN and WTT	No. of operators with fibre access to building (excluding incumbent)			% of all buildings with fibre access in database		
			2	3	4	2	3	4
Residential	[redacted]							
Business								
Others								
Mixed								
Total								
Non-residential								

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

A1.1.2 Impact of the Proposed

As the previous sections have highlighted, the Proposed Transaction will likely have the most impact on non-residential buildings, and in particular the business segment, as well as those buildings covered by fibre access. Therefore, particular attention will be paid to these segments in this section; specifically, the next sections focus on:

[197] The remaining [redacted] buildings covered by different technologies by the two operators (e.g. fibre by HKBN, but copper by WTT).

- the impact on **all buildings** (residential, business, and others);
- the impact on the **non-residential** segment;
- the **business** segment only; and,
- the impact on the **other buildings** segment only.

All buildings

Following the Proposed Transaction, the overall number of buildings covered by the merged entity will be [redacted]. This represents [redacted]% of all buildings in Hong Kong with coverage by operators other than the incumbent, an increase of [redacted] percentage points compared to HKBN's share prior to the Proposed Transaction. (Table 64)

Table 64 Building coverage, before and after Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

As the only access technology where HKBN and WTT overlap is fibre (see Table 59), it is important to assess the impact of the Proposed Transaction on the market shares, in terms of buildings covered by this technology. This is shown in Table 65[198].

HKBN already covers the [redacted] of buildings with fibre out of the [redacted] operators included in the database ([redacted] or [redacted]% of all buildings with some fibre coverage). Following the Proposed Transaction, the number of buildings with fibre access covered by the merged entity will rise to [redacted], representing [redacted]% of all buildings with some fibre coverage – an increase of [redacted] percentage points compared to HKBN of alone.

[198] Please note that for the purpose of this analysis Wireless+Fibre was included in the number of buildings covered by fibre.

Table 65 Fibre access building coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of buildings with fibre access in database	[redacted]			
HKBN				
WTT				
[redacted]				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Non-residential buildings

This section provides a similar analysis as the previous section. However, instead of examining the impact on all buildings, this section looks only at the impact of the Proposed Transaction on business, other and mixed buildings (the non-residential segment) – that is purely residential buildings are excluded from the analysis.

The overall number of non-residential buildings covered by HKBN currently stands at [redacted] ([redacted]% of all non-residential covered by operators other than the incumbent), while WTT currently covers [redacted] ([redacted]%) non-residential buildings. Following the Proposed Transaction, the merged entity will cover [redacted] ([redacted]%) non-residential buildings. (Table 66)

Table 66 Non-residential building coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of non-residential buildings in database	[redacted]			
HKBN				
WTT				
[redacted]				

Source: London Economics based on OFCA data

As most non-residential buildings of both operators already have fibre access, the picture is very similar for the shares of non-residential with fibre coverage (Table 67), with the merged entity covering [redacted] out of [redacted] ([redacted]%) non-residential buildings with fibre access by at least one operator other than the incumbent.

Table 67 Non-residential building fibre coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of non-residential buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

In addition to the increase in building coverage of the merged entity, it is important to note, that, following the Proposed Transaction, the merged entity will only have one significant competitor (other than the incumbent) in the non-residential buildings segment.

Business buildings

Following the Proposed Transaction, the overall number of purely business buildings covered by the merged entity will be [redacted], representing [redacted]% of all purely business buildings in Hong Kong with coverage by operators other than the incumbent. This is an increase of [redacted] percentage points compared to HKBN's share prior to the Proposed Transaction, and an increase of [redacted] percentage points compared to WTT's share prior to the Proposed Transaction. (Table 68)

Table 68 Business building coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of business buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

As for business and other buildings, the picture is very similar for the shares of purely business buildings with fibre coverage (Table 69), with the merged entity covering [redacted] out of [redacted] ([redacted]%) purely business buildings with fibre access by at least one operator other than the incumbent.

Table 69 Business building fibre coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of business buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

As for the non-residential building segment overall, [redacted] will be the only significant competitor to the merged entity following the Proposed Transaction (other than the incumbent). [redacted]

Other buildings

Similar to the business segment, the Proposed Transaction will increase the share of other buildings covered by the merged entity. Specifically, WTT currently covers [redacted] ([redacted]%) of all other buildings covered by at least one operator other than the incumbent, while HKBN covers [redacted] ([redacted]%) of other buildings. Following the Proposed Transaction, this number will increase to [redacted] ([redacted]%). (Table 70)

Table 70 Other building coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of other buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

The impact of the Proposed Transaction on the other buildings with fibre access is again similar, with the merged entity covering [redacted] out of [redacted] buildings ([redacted]%), compared to [redacted] ([redacted]%) covered by WTT and [redacted] ([redacted]%) covered by HKBN.

Table 71 Other building fibre coverage, before and after the Proposed Transaction (2017)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of other buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Similar to the purely business segment, the merged entity will also only have one significant competitor (other than the incumbent) in the other buildings segment. However, in contrast to the purely business segment, the likely impact on competition will be smaller due to i) the comparatively small shares of HKBN in this segment, and ii) the comparatively smaller share of other buildings covered by the merged entity following the Proposed Transaction, compared to its main competitor ( ).

A1.2 Building-level analysis of fixed network coverage - 2018

The total number of buildings in Hong Kong, which have fixed network coverage by operators other than PCCW-HKT stood, in 2018, at , an increase of buildings compared to 2017. In addition to the operators covered in the 2017 version of the database, the database for 2018 covers one additional operator [redacted]

The number of buildings covered by HKBN and WTT [redacted] from in 2017 to in 2018 and from in 2017 to to 2018, respectively. However, the proportion of buildings covered by HKBN [redacted] compared to 2017 (% compared to %), while the proportion of buildings covered by WTT [redacted] compared to 2017 (% compared to %).

Table 72 Building coverage, by operator (2018)

Operator	Building coverage	
	No.	%
Total no. of buildings in database	[redacted]	
HKBN		
WTT		

Source: London Economics based on OFCA data

The majority of the buildings covered in the 2018 database, but not in the 2017 database, are residential buildings, with HKBN's share of residential buildings covered [redacted] from [redacted]% in 2017 to [redacted]% in 2018, while WTT's share [redacted]

In terms of non-residential buildings:

- HKBN covers [redacted]% of business buildings present in the 2018 database ([redacted] percentage points compared to 2017); [redacted]% of other buildings ([redacted] percentage points); and [redacted]% of mixed buildings ([redacted] percentage points).
- WTT covers [redacted]% of business buildings present in the 2018 database ([redacted] percentage points compared to 2017); [redacted]% of other buildings ([redacted] percentage points); and [redacted]% of mixed buildings ([redacted] percentage points).

Table 73 Building coverage, by building type and operator (2018)

Operator	Residential		Business		Others		Mixed		Non-residential	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total no. of buildings in database	[redacted]									
HKBN										
WTT										

Source: London Economics based on OFCA data

The number of buildings covered by fibre access has also [redacted] HKBN (from [redacted] in 2017 to [redacted] in 2018) and WTT (from [redacted] in 2017 to [redacted] in 2018), though WTT's share of buildings covered by fibre access has [redacted] (from [redacted]% in 2017 to [redacted]% in 2018), while HKBN's share has [redacted]

Table 74 Building coverage, by technology and operator (2018)

Operator	Copper		Fibre[2]		Hybrid fibre/coaxial		Wireless		Wireless + fibre	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total no. of buildings with some coverage in database[1]	[redacted]									
HKBN										
WTT										

Note: (1) Calculated as the number of buildings that are accessed via, for example, fibre by at least one operator, regardless of the building-type. As a building may be accessed via different technologies by different operators (e.g. fibre by [redacted], and copper by [redacted]), the numbers do not sum up to the total number of buildings. (2) Includes FTTB and FTTH.

Source: London Economics based on OFCA data

A1.2.1 Overlapping coverage by HKBN and WTT

The number of buildings covered by both HKBN and WTT has [redacted] slightly, from [redacted] in 2017 to [redacted] in 2018; of these:

- [redacted] are purely business buildings (compared to [redacted] in 2017), accounting for [redacted]% of all purely business buildings in the database (compared to [redacted]% in 2017);
- [redacted] are purely residential buildings (compared to [redacted] in 2017), accounting for [redacted]% of all purely residential buildings (compared to [redacted]% in 2017);
- [redacted] are purely other types of buildings (compared to [redacted] in 2017), accounting for [redacted]% of all buildings classified as Others in the database ([redacted] in 2017); and,
- [redacted] are mixed buildings (compared to [redacted] in 2017), accounting for [redacted]% of all mixed buildings in the database (compared to [redacted]% in 2017).

Of all non-residential buildings, [redacted] buildings are covered by both HKBN and WTT (compared to [redacted] in 2017), accounting for [redacted]% of all non-residential buildings in the database (compared to [redacted]% in 2017).

Table 75 Buildings covered by both HKBN and WTT, by building type (2018)

Building type	Total no. of buildings in database	Buildings covered by HKBN and WTT	% of all buildings in database
Residential	[redacted]		
Business			
Others			
Mixed			
Total			
Non-residential			

Source: London Economics based on OFCA data

Of the [redacted] non-residential buildings (i.e. excluding the [redacted] purely residential buildings):

- [redacted] ([redacted] from 2017) business buildings are currently covered only by WTT and HKBN (excluding the incumbent);
- [redacted] ([redacted] in 2017) other buildings are currently covered only by WTT and HKBN (excluding the incumbent); and,
- [redacted] ([redacted] from 2017) mixed buildings are currently covered only by WTT and HKBN (excluding the incumbent).

Table 76 Buildings covered by both HKBN and WTT, by building type and no. of operators (2018)

Building Type	Total no. of buildings in database	Buildings covered by HKBN and WTT	No. of operators (excluding incumbent)				% of all buildings in database			
			2	3	4	5	2	3	4	5
Residential	[redacted]									
Business										
Others										
Mixed										
Total										
Non-residential										

Source: London Economics based on OFCA data

Of the [redacted] non-residential buildings covered by both HKBN and WTT, [redacted] are covered by fibre technology by both operators (compared to [redacted] in 2017), with [redacted] of these only having fibre access via HKBN and WTT at present (compared to [redacted] in 2017).

Table 77 Buildings covered by both HKBN and WTT with fibre access, by building type (2018)

Building type	Total no. of buildings in database covered by fibre	Buildings covered by fibre by HKBN and WTT	% of all buildings with fibre access in database
Residential	[redacted]		
Business			
Others			
Mixed			
Total			
Non-residential			

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Table 78 Buildings covered by both HKBN and WTT with fibre access, by building type and no. of operators (2018)

Building Type	Total no. of buildings in database covered by fibre	Buildings covered by fibre by HKBN and WTT	No. of operators with fibre access to building (excluding incumbent)				% of all buildings with fibre access in database			
			2	3	4	5	2	3	4	5
Residential	[redacted]									
Business										
Others										
Mixed										
Total										
Non-residential										

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

A1.2.2 Impact of the Proposed Transaction

Mirroring the analysis in Section A1.1.2, this section provides on an analysis of the potential impact of the Proposed Transaction, based on 2018 data, on **all buildings** (residential, business, and others); the **non-residential** segment; the **business** segment only; and, the **other buildings** segment only.

All buildings

Following the Proposed Transaction, the overall proportion of buildings covered by the merged entity will be [redacted], representing [redacted]% of all buildings in Hong Kong with coverage by operators other than the incumbent (compared to [redacted], or [redacted]%, in 2017). The proportion of buildings covered with fibre access by the merged entity will be [redacted], representing [redacted]% of buildings covered with fibre access by operators other than the incumbent (compared to [redacted], or [redacted]%, in 2017).

Table 79 Building coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

Table 80 Fibre access building coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of buildings with fibre access in database	[redacted]			
HKBN[1]				
WTT				

Note: (1) For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Non-residential buildings

Excluding all purely residential buildings, the merged entity will cover [redacted]% of all non-residential buildings covered by operators other than the incumbent ([redacted] in 2017); and provide fibre access to [redacted]% of all non-residential buildings with fibre coverage by at least one operator other than the incumbent ([redacted] in 2017).

Table 81 Non-residential building coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of non-residential buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

Table 82 Non-residential building fibre coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of non-residential buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Business buildings

As in 2017, the merged entity will cover [redacted]% of all business buildings covered by operators other than the incumbent, as well as provide fibre access to [redacted]% of all business buildings with fibre access by at least one operator other than the incumbent ([redacted] in 2017).

Table 83 Business building coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of business buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

Table 84 Business building fibre coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of business buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

Other buildings

The proportion of other buildings in the database covered by the merged entity will be [redacted]% (compared to [redacted]% in 2017). The merged entity will also cover [redacted]% (compared to [redacted]% in 2017) of all other buildings with fibre access by at least one provider other than the incumbent.

Table 85 Other building coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No	%
Total no. of other buildings in database	[redacted]			
HKBN				
WTT				

Source: London Economics based on OFCA data

Table 86 Other building fibre coverage, before and after the Proposed Transaction (2018)

Provider	Before the Proposed Transaction		After the Proposed Transaction	
	No.	%	No.	%
Total no. of other buildings with fibre access in database	[redacted]			
HKBN				
WTT				

Note: For the purpose of this analysis buildings with fibre access include buildings with FTTB, FTTH and wireless + fibre.

Source: London Economics based on OFCA data

A1.3 Non-residential building coverage by operators other than the incumbent

To get a better understanding of the building coverage, in the non-residential segment, by operators other than the incumbent, OFCA provided us with estimates of the total number of non-residential buildings, obtained from the Buildings Department. Combining these estimates with the building coverage data from the two building databases (Table 87), suggests that, in 2018:

- approximately [redacted]% of all business buildings were covered by at least one operator other than the incumbent;
- approximately [redacted]% of all other buildings were covered by at least one operator other than the incumbent; and,
- approximately [redacted]% of all non-residential buildings (i.e. purely business, other, and mixed buildings) were covered by at least one operator other than the incumbent.

However, it should be noted that these figures do not include certain buildings, such as government buildings. As such, the figures are smaller than the actual total number of buildings in Hong Kong. Therefore, the building coverage numbers are likely overstated.

Table 87 Total number of non-residential buildings in Hong Kong – Buildings Department

Building type	2017			2018		
	Total no. of buildings in database	Total no. of buildings	Proportion of buildings covered	Total no. of buildings in database	Total no. of buildings	Proportion of buildings covered
Business	[redacted]					
Others						
All non-residential						

Source: London Economics based on OFCA data

OFCA also provided us with a list of buildings, compiled from various sources, seeking to identify all buildings and structures in Hong Kong. Combining these estimates with the building coverage data from the two building databases (Table 88), suggests that, in 2018:

- approximately [redacted]% of all non-residential buildings (i.e. purely business, other, and mixed buildings) were covered by at least one operator other than the incumbent.

However, as this database seeks to identify each building, organisations occupying relatively large areas with multiple buildings (e.g. university campus, rural camp sites, etc.) may have multiple entries in this list. In contrast, telecommunications operators may count these organisations as one customer and indicate their network coverage at one of the buildings, rather than all buildings separately. Therefore, these numbers likely understate the building coverage numbers.

Moreover, the database does not distinguish between business and other types of buildings.

Table 88 Total number of non-residential buildings in Hong Kong – OFCA's Full Building List

Year	Total no. of buildings in database	Total no. of buildings		Proportion of buildings covered	
		Raw	Adjusted[1]	Raw	Adjusted[1]
2017	[redacted]				
2018					

Note: (1) In 2017 (2018), [redacted] ([redacted]) buildings were classified as residential in the full building list, but as non-residential in the building coverage database, while [redacted] ([redacted]) buildings were classified as non-residential in the full building list, but as residential in the building coverage database. The adjusted numbers treat these buildings as mixed buildings (included in all non-residential).

Source: London Economics based on OFCA data

Taken together, these numbers suggest that, in 2018, **between [redacted]% and [redacted]% of all non-residential buildings were covered by at least one operator other than the incumbent.**

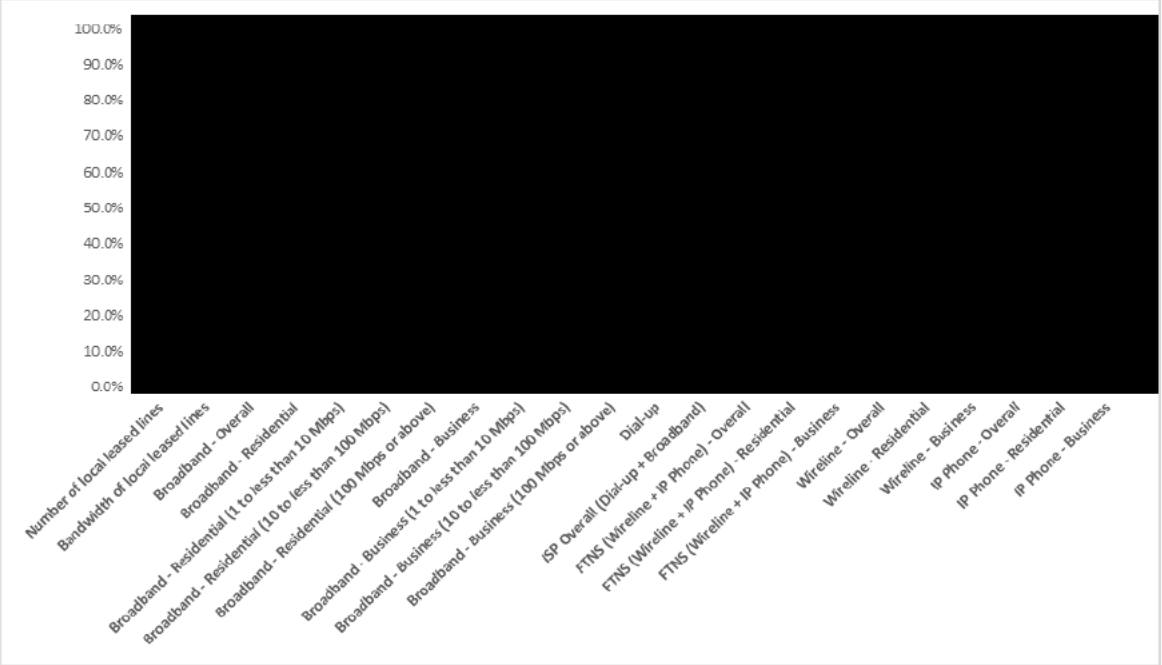
Annex 2 Impact on concentration ratios

Table 89 Impact of the Proposed Transaction on CR4, as of October 2018

Segment	CR4		
	Before the Proposed Transaction (%)	After the Proposed Transaction (%)	Difference
Number of local leased lines	[redacted]		
Bandwidth of local leased lines			
Broadband - Overall			
Broadband - Residential			
Broadband - Residential (1 to less than 10 Mbps)			
Broadband - Residential (10 to less than 100 Mbps)			
Broadband - Residential (100 Mbps or above)			
Broadband - Business			
Broadband - Business (1 to less than 10 Mbps)			
Broadband - Business (10 to less than 100 Mbps)			
Broadband - Business (100 Mbps or above)			
Dial-up			
IAS Overall (Dial-up + Broadband)			
Fixed voice services (Wireline + VoIP) – Overall			
Fixed voice services (Wireline + VoIP) - Residential			
Fixed voice services (Wireline + VoIP) - Business			
Wireline - Overall			
Wireline - Residential			
Wireline - Business			
VoIP - Overall			
VoIP IP - Residential			
VoIP - Business			

Source: London Economics based on OFCA data

Figure 11 Market share of merged entity after the Proposed Transaction, October 2018



Note: [redacted]

Source: London Economics based on OFCA data

Table 90 Impact of Proposed Transaction on HHI, as of October 2018

Segment	HHI - min			HHI - max		
	Before the Proposed Transaction	After the Proposed Transaction	Difference	Before the Proposed Transaction	After the Proposed Transaction	Difference
Number of local leased lines						
Bandwidth of local leased lines						
Broadband - Overall						
Broadband - Residential						
Broadband - Residential (1 to less than 10 Mbps)						
Broadband - Residential (10 to less than 100 Mbps)						
Broadband - Residential (100 Mbps or above)						
Broadband - Business			[700 – 750]			[700 – 750]
Broadband - Business (1 to less than 10 Mbps)						
Broadband - Business (10 to less than 100 Mbps)						
Broadband - Business (100 Mbps or above)						
Dial-up						
IAS Overall (Dial-up + Broadband)						
Fixed voice services (Wireline + VoIP) - Overall						
Fixed voice services (Wireline + VoIP) - Residential						
Fixed voice services (Wireline + VoIP) - Business			[250 – 300]			[250 – 300]
Wireline - Overall						
Wireline - Residential						
Wireline - Business						
VoIP - Overall						
VoIP IP - Residential						
VoIP - Business						

Note: The market share data received did not contain a market share for each operator in the market. Rather, it contained market shares for major players and summarised market shares for all other operators as "Other". Because of this, the impact on the HHI was calculated as a range, as follows:

- HHI min was calculated assuming that the share of "Other" operators is spread evenly across a large number of operators so that the market share of each individual operator is 0%.
- HHI max was calculated assuming that there is only one other operator who captures the total market share of "Other" operators.

The cut-offs for a merger to be under "safe-harbour" conditions are differences in the HHI of 50 and 100 for markets with a post-merger HHI of more than 1,800 and markets with a post-merger HHI of between 1,000 and 1,800 respectively.

Source: London Economics based on OFCA data

LE
London
Economics

Somerset House, New Wing, Strand,
London, WC2R 1LA, United Kingdom
info@londoneconomics.co.uk
londoneconomics.co.uk
@LondonEconomics
+44 (0)20 3701 7700