

OFTA

Report on the Effectiveness of Competition in Hong Kong's Telecommunications Market in 2005:

An International Comparison

Contents

Preface 1					
1	Intro	duction	2		
	1.1	Introduction	2		
	1.2	Study objectives and methodology	2		
	1.3	Structure of this report	3		
2	Regu	latory framework	4		
	2.1	Introduction	4		
	2.2	Regulatory developments	4		
	2.3	State involvement in the incumbent and foreign ownership restrictions	6		
	2.4	The application of asymmetric regulation	7		
	2.5	Local loop unbundling	7		
	2.6	Regulation of VoIP	9		
	2.7	Key conclusions	10		
3	Deve	lopment and effectiveness of competition	12		
	3.1	Introduction	12		
	3.2	Local fixed voice sector	12		
	3.3	Mobile sector	13		
	3.4	Data access sector	16		
	3.5	International services sector	18		
	3.6	Key conclusions	21		
4	Cons	umer benefits	23		
	4.1	Introduction	23		
	4.2	Product innovation and development	23		
	4.3	Take-up of services	27		
	4.4	Cost of services	32		
	4.5	Key conclusions	36		
5	Indus	stry investment	38		
	5.1	Introduction	38		
	5.2	Key results of the 2003 Study	38		
	5.3	Recent telecommunications investment	38		
6	Hong	Kong's overall performance	41		
	6.1	Core strengths	41		
	6.2	Key challenges	41		
Арр	endix:	Study methodology	43		
	Study	objective	43		
	Analy	tical approach	43		
Glo	Glossary 45				

Preface

In August 2002, the Office of the Telecommunications Authority ("OFTA") commissioned Spectrum Strategy Consultants ("Spectrum") to undertake an international benchmarking study to assess the competitiveness of Hong Kong's telecommunications industry relative to other comparable and "best practice" markets. That study ("2003 Study") showed that at the end of 2002, the Hong Kong telecommunications industry was one of the most competitive amongst the review markets and this high level of competition had provided substantial benefits to consumers.

As part of its efforts to regularly monitor the level of market competition and the associated consumer benefits, OFTA commissioned a second study (the "Study") in January 2005 to re-assess the level of competition in Hong Kong and in particular how the level of competition has changed in Hong Kong relative to the other "best practice" markets over the two years of 2003 and 2004.

The Study shows that the Hong Kong telecommunications industry has largely maintained its competitiveness since the end of 2002, and the consumers and businesses in Hong Kong have benefited significantly from the high level of competition.

The report was written entirely by Spectrum's project team. All the views and opinions expressed within this report, therefore, may not necessarily reflect the views and opinions of OFTA.

Furthermore, whilst Spectrum has exercised all reasonable endeavours in undertaking the Study, any assumptions, projections, findings, conclusions and recommendations represent Spectrum's best professional judgement based on the information made available during the course of the engagement.

1 Introduction

1.1Introduction

The 2003 Study stressed the importance of a dynamic, innovative and efficient competitive telecommunications market to support and promote continued social and economic development.

At the end of 2005, telecommunications have continued to become more important. Societies and economies are increasingly dependent on information flows, whether financial, informational or personal in nature. These flows make existing processes more efficient, encourage and support economic development and enhance the development of an information society.

Information flows are facilitated by the provision of high quality infrastructure and the development of innovative products and services. Consequently, the activities of governments, companies and individuals are significantly enhanced by access to high quality telecommunications infrastructure, innovative products and price reductions. These in turn are promoted by competitive telecommunications markets.

Given the importance of telecommunications in ensuring continued economic prosperity and development, the relative competitiveness of a market's telecommunications industries may impact on its relative economic performance. It is, therefore, appropriate to benchmark against international peers to identify areas in which the Hong Kong telecommunications industry performs well and to identify areas in which Hong Kong's performance could be improved.

This requirement is defined in the objectives of the study, as summarised in this report.

1.2Study objectives and methodology

The objectives of the 2005 Study are comparable to those defined for the purposes of the 2003 Study in order to maintain continuity between the two Studies.

Specifically, the purpose of this report is to benchmark and review Hong Kong's performance across four telecommunications sectors (local fixed voice, mobile, data access and international services sectors) in terms of a number of defined parameters categorised according to area of focus.

The Study focused on four key competition issues:

Exhibit 1: Key competition issues addressed in the Study

- · The regulatory framework
 - the extent to which the regulatory framework promotes the development of competition including the strength and effectiveness of the regulator and issues related to the promotion of competition
- The development and effectiveness of competition
 - the degree to which the market has become increasingly competitive and the incumbent's position and market dominance has been eroded, i.e. whether new entrants have been able to gain market share
- The consumer benefits which have been derived from competition
 with a specific focus on take-up of services, use of services and service pricing
- The impact on the investment behaviour of operators – with a specific focus on operator capex investments between 2000 and 2004

Each of the above areas is further elaborated and detailed in the relevant sections.

Hong Kong's performance has been compared against seven "best practice" markets: Australia; Japan; Singapore; South Korea; Sweden; UK; and the US. The "best practice" markets employed for the international comparison in this Study are the same as those included in the 2003 Study.

The Study has sought to use data up to the end of 2004, although where appropriate more recent data has been included. In addition, it has not been possible to continue using all the variables defined in the 2003 Study due to issues over data availability and definitions. Where possible, alternative variables have been used but in certain cases, this has not been possible.

1.3Structure of this report

The following report summarises and presents the results of the benchmarking analysis undertaken. Chapters 2 to 5 highlight Hong Kong's performance for each of the key competition issues detailed above. Chapter 6 details Hong Kong's overall performance. An appendix at the end of the report provides details of the methodology used in the analysis.

2 Regulatory framework

2.1Introduction

The 2003 Study identified the importance of the regulatory framework not simply in terms of market liberalisation and licensing new operators but also in terms of enforcing the regulatory framework and limiting the ability of the incumbent to constrain the development of competition.

Within more developed telecommunications markets, there is increasing standardisation of regulatory approaches on many issues. For example, acceptance of incremental cost approaches for interconnection services, the imposition of asymmetric regulatory frameworks to reflect variations in market power and an emphasis on regulatory transparency and accountability.

This standardisation has to a large extent been driven by the regulators in the review markets and OFTA. Most of these regulators experienced market liberalisation earlier and as a consequence, were required to develop more sophisticated regulatory approaches which have been developed and refined through implementation. The approaches established precedents which have been subsequently adopted by other regulators.

Since 2003, however, regulators have to develop new regulatory frameworks to reflect technological developments and trends and the emergence of new markets. Such developments include, for example, the deployment of next generation networks, voice over internet protocol ("VoIP"), broadband wireless access technologies, fixed-mobile convergence and IPTV (i.e. television services over broadband telecommunications networks).

All of these developments are creating strains on existing regulatory frameworks and create the need for new regulatory approaches. The various approaches adopted in response will have an impact on the underlying competitiveness of the telecommunications industries and are, therefore, relevant to the 2005 Study.

Comparable to the 2003 Study, therefore, the 2005 Study has undertaken an assessment of the regulatory framework and environment in Hong Kong relative to the review markets, with specific reference to the extent to which regulatory frameworks can be viewed as pro-competition and consumer-focused. In addition, the analysis also addresses the changes in regulation that have occurred since the 2003 Study and how the various regulators have addressed recent technological developments.

2.2Regulatory developments

Regulatory developments are largely driven by market conditions and technological advancements, with slight variations in regulatory focus across countries. The recent key regulatory developments in the review markets are summarised below.

spectrum {

Regulator	Key regulatory developments
ACMA (Australia)	 11/05: Proposed safety measures for mobile chat rooms 8/05: Varied licences to allow for short-range wireless broadband communications 7/05: Proposed new phone numbers to supplement number ranges in various locations around Australia 8/04: Strengthened the accounting separation regime for Telstra and a Senate committee recommended that ACMA be given increased powers to force Telstra to improve its telecoms network 7/04: Allowed Telstra to offer customers bundled telephone and digital Pay TV packages 6/04: Recommended that operators cut mobile termination rates and retained its ability to regulate termination rates
OFTA (HK)	 9/05: Conducted consultation on unified carrier licensing regime and arranged to commission a consultancy study to address issues pertinent to fixed-mobile convergence (e.g. interconnection charging arrangement between fixed and mobile networks, intermodal number portability, numbering plan and local access charge arrangement, etc.) 8/05: Conducted 2nd consultation on licensing of broadband wireless access (the 1st consultation was conducted in Dec 2004) 8/05: Conducted consultation on licensing conditions and licence fee structure for the provision of IP telephony services under the new service-based operator licence 1/05: Announced an information framework on the quality of residential broadband services 1/05: Implemented <i>ex-post</i> regulation of tariffs of the fixed incumbent operator 11/04: Announced that 15-year, new mobile carrier licenses will be issued in 2005 and 2006 (when the existing licenses have expired) to the six incumbent 2G mobile operators 10/04: Conducted consultation on the creation of a class licence to regulate resale of telecommunications services on a prepaid basis 7/04: Announced that mandatory Type II interconnection at telephone exchange level will be withdrawn completely by June 2008 (except for buildings meeting the "essential facilities" criterion) 5/04: Issued guidelines on mergers and acquisitions 2/04: Concluded a review of the principles and costing methodology of the Local Access Charge (LAC)
MIC (Japan)	 8/05: Announced IPv6 Transition Field Trial towards the creation of a ubiquitous network society 1/05: Announced that the 1.7 GHz frequency band will be given to one mobile phone operator only, instead of two as previously expected 12/04: Announced plans to deregulate the use of indoor power lines for fast Internet communications as early as 2006 12/04: Announced plans to replace the current system of domestic fixed-line telephone network with the IP system by early 2010s 10/5: Announced plans to replace the current system of offer (PIO) which gets out
(Singapore)	 10/05. Approved revisions to singler's Reference interconnection Oner (RIO), which sets out IDA-approved prices, terms and conditions for interconnection and access to SingTel's network 2/05: Announced its plans to open up the broadband sector through Wireless Broadband Access (WBA) 2/05: Reversed its prohibition on discounted on-net calls 12/04: Announced plans to exempt SingTel from some dominant licensee obligations in the international services sector 12/04: Decided to allow SingTel's rivals more access to submarine cable landing stations to make international services more competitive 7/04: Government upheld IDA's ruling requiring SingTel to sell LLC at cost
MIC (South Korea)	 10/05: Announced mobile Internet services (WiBro) to start by June 2006 12/04: Imposed a US\$10m fine on the mobile operators for handset subsidies 8/04: Introduced Mobile Number Portability (MNP) in a phased manner with SKT subscribers offered MNP first, followed later by LGT and KTF subscribers 7/04: Imposed fines totaling US\$0.4m on five broadband Internet operators, including KT, Hanaro Telecom and Dacom for anti-competitive practices (unfair marketing) in the broadband segment 6/04: Government temporarily banned mobile operators from signing new subs in order to prevent the operators from spending heavily on marketing and invest in networks and facilities instead

Exhibit 2: Recent key regulatory developments

PTS	10/05: Rejected two mobile operators' application to offer 3G services using CDMA
(Sweden)	technology
	 2/05: Issued a ruling that will allow all telecom operators to offer line rental by reselling the fixed line subscriptions of the incumbent
	• 1/05: Ruled that the incumbent must reduce fixed line interconnection fees by an average of
	10%
	 12/04: Rejected a request by mobile operators to delay 3G network roll-out
	 10/04: Ruled that mobile operators must cut prices for incoming calls to a maximum of SEK
	0.8 per minute
	7/04: Ordered the incumbent to resume delivery of copper access to broadband Internet to its
	competitors
OFCOM (UK)	11/05: Published proposals to cut Wholesale Line Rental ("WLR") prices by 8% to 9%
(-)	8/05: Conducted consultations on extension of existing charge controls in 2G mobile voice
	termination market for further 12 months to March 2007
	12/04: Reduced prices by up to 70% for shared access by rivals to BT's local loop for the
	provision of broadband services to consumers
	11/04: Rejected structural separation of BT in favour of a less heavy-handed approach that
	requires BT to provide equal access
	6/04: Ordered operators to reduce mobile termination rates
	 12/03: Tightened regulation of BT's wholesale broadband pricing
	• 12/03: Announced intention to look for opportunities to with draw from regulation as part of its
	"light touch" approach to regulation
FCC (US)	10/05: Granted Verizon waiver to exercise pricing flexibility for certain advanced services
. ,	8/05: Announced requirement of certain broadband and VoIP providers to accommodate
	wiretaps
	11/04: Took control of VoIP regulation from the states, barring states from imposing
	telecommunications regulations on Internet phone providers
	 10/04: Ruled that broadband over power lines access systems would be allowed
	10/04: More flexibility towards market consolidation, for example, the Justice Department
	gave its approval for the buyout of AT&T Wireless by Cingular Wireless
	8/04: Continued debate over role of Unbundled Network Elements (UNEs) in promoting
	deployment and take-up of broadband access technologies
	8/04: Increased flexibility towards Baby Bells (RBOCs) in an attempt to establish parity
	between the phone giants and cable companies. For example, the FCC ruled that fibre
	deployments feeding into copper loops do not have to be leased to competitors at regulated
	rates

Aligned with the rapid adoption of advanced technologies in their respective markets, the Japanese and Korean regulators are seen to have a relatively strong focus on issues relating to technology deployment. For instance, the Korean development and promotion of WiBro - a locally-developed mobile Internet technology based on the 802.16e standard.

Regulators are also concerned with the promotion and maintenance of market competition and ensuring that dominant operators do not abuse their market position to the detriment of end-users or competitors. Hence, most regulators, including OFTA and all the review markets, have in the past implemented different degrees of asymmetric regulations to counter the dominant market position of various operators.

Similar to the regulators in the other review markets, OFTA has been active in developing a regulatory framework conducive for market competition. In addition, OFTA is keeping pace with other review markets in addressing technological developments, given that it is currently addressing issues such as fixed-mobile convergence, IP telephony and broadband wireless access.

2.3State involvement in the incumbent and foreign ownership restrictions

There have been no substantial changes in the positions adopted by OFTA or the review regulators since publication of the 2003 Study with respect to state involvement and the role of foreign ownership.

Hong Kong does not have any government ownership in the incumbent operator, nor does it impose any foreign ownership restrictions. On the other hand, in Australia, Singapore and Sweden¹, the State continues to retain majority positions in the incumbent although in Australia the full exit of the State from the incumbent is currently in preparation. In Japan, the State retains a strong position in the incumbent.

Most markets, however, have no limitations on foreign ownership of new entrants although there are some constraints on potential foreign ownership of the incumbent.

2.4The application of asymmetric regulation

The development, implementation and enforcement of an asymmetric regulatory regime is fundamental for the successful development of market competition.

Without such a regulatory framework, an operator which has a dominant market position can use this position to impede the development of market competition through various forms of anti-competitive business conduct including, for example, predatory pricing, price discrimination, mandatory product bundling and price squeezing (this is particularly important in the provision of wholesale access products).

Given the nature of the various fixed telecommunications industries at liberalisation, the incumbent generally has a dominant market position. This has necessitated the implementation of an asymmetric regulatory framework in order to facilitate the development of market competition, i.e. the regulatory framework imposes more onerous and specific obligations and prohibitions on the dominant operator.

Hong Kong and all the review markets have in the past adopted different degrees of asymmetric regulations.

Generally, most regulators have adopted an *ex-ante* approach to asymmetric regulation rather than an *expost* approach. This reflects the nature of competition in many newly liberalised telecommunications markets. However, as markets become more competitive, i.e. market forces become more influential in determining business conduct, there is a trend to adopt *ex-post* approaches.

In Hong Kong, asymmetric regulation has served the purpose of promoting market competition during the infant stage of market development. In recent years, OFTA has critically reviewed the regulations to ensure that regulatory measures are imposed in a balanced and appropriate manner, do not impose excessive regulatory burdens on market operators and reflect the level of competition in the various markets.

For example, in view of the effective competition established in the fixed services market during the past decade, OFTA concluded that prior tariff approval requirement had become inappropriate and that the appropriate regulatory framework should be *ex-post*. Therefore, OFTA decided on 13 January 2005 to implement *ex-post* regulation on the tariffs of the incumbent operator. Furthermore, OFTA has indicated its intention to adopt the *ex-post* regime on tariff regulation in the unified carrier licence to be issued in the future.

2.5Local loop unbundling

As stated in the 2003 Study, it often takes significant capital investment and time for new entrants to build a local access network to connect with end-users and provide services in competition with the incumbent. This capital investment may be prohibitively expensive and may constrain the development of competition to the possible detriment of consumers.

spectrum {

¹ In Sweden, the incumbent (Telia) merged with the Finnish incumbent (Sonera) to form TeliaSonera. The Swedish State holds 43.50% of TeliaSonera's shares and the Finnish State for 13.18%

In order to increase competition, therefore, a number of regulators have sought to unbundle the legacy copper local fixed voice networks of the incumbents - local loop unbundling ("LLU" or Type II interconnection in Hong Kong). However, this policy has not been adopted by all markets and even it has been implemented, the incumbent has often been able to reduce the competitive impact to a minimal level through various mechanisms.

The 2003 Study concluded that Hong Kong and the US were the leading markets with respect to the LLU process, with the highest proportions of unbundled lines. It was further established that the promotion of LLU in Hong Kong may have accelerated the development of market competition in the local access market and resulted in associated consumer benefits.

For the other review markets, the LLU process continued to make little contribution to the development of competition during the past two years. Consequently, the total number of unbundled lines (whether used for broadband or narrowband services) still amounts to only a small percentage of the total local access lines in these review markets.





Note: (1) Does not include lines provided on a wholesale / resale basis
 (2) Data for year end 2004 except Australia and Sweden (June 2004) and South Korea (2003)
 (3) There are an estimated 784 unbundled lines in Australia. Accurate information on the number of LLU lines in Japan is not available at time of publication. No significant number of unbundled lines in Singapore
 Source: FCC & ECTA

During the past two years, Hong Kong and the US maintained their position as the leading markets with respect to the LLU process. LLU is also understood to have been relatively successful in Japan but accurate information of the exact number of unbundled lines remains unclear at the date of publication.

The relatively rapid LLU process in Hong Kong may have encouraged the development of competition with consequent impacts on market structure and derived consumer benefits.

In a recent review, OFTA concluded that the large-scale deployment of local access networks by new entrants (53% of households as at July 2004) reduced the relevance of LLU. Furthermore, in order to

encourage further roll-out of advanced telecommunications networks, OFTA announced in July 2004 that mandatory Type II interconnection at telephone exchange level would be withdrawn completely by 30 June 2008 (except for buildings meeting the "essential facilities" criterion).

This move reflects the success of the LLU process in Hong Kong, which has fostered competition to the extent that competitors can now afford to deploy their own alternative networks and reduce their dependency on the incumbent's local loop infrastructure. For example, in September 2005, 71% of households in Hong Kong have a choice of at least two access networks.

2.6Regulation of VoIP

Regulators in the review markets are at various stages of developing regulatory frameworks for VoIP. Some of the key regulatory concerns with regard to VoIP are IP interconnection, numbering arrangements and access to emergency services. The key elements of VoIP regulations as adopted by OFTA and the review regulators are summarised below.

Country	Key elements of VoIP regulation		
Australia	 ACMA is currently reviewing regulations relevant to VoIP and is conducting industry consulations ACMA is expected to publish a discussion paper on the subject at the end of 2005 		
Hong Kong	 OFTA issued a regulatory framework for VoIP services in June 2005. A two-class licence regime will be adopted for VoIP services, under which "Class 1 Services" are required to meet relevant licensing conditions applicable to fixed network operators operating conventional telephony services under their carrier licences, while "Class 2 services" are only required to meet minimal licensing conditions in order not to inhibit technological deployment 		
Japan	 MPHPT is looking to standardise IP network technologies in order to improve delivery and quality of VoIP services The issue of electronic numbering arrangements is also being addressed 		
Singapore	 IDA announced in June 2005 that it would issue licences and phone numbers for the provision of VoIP services Under the policy framework, VoIP services will co-exist alongside existing telephony services An 8 digit number starting with "3" will be offered to service providers with minimal regulatory obligations, while those providers who are able to meet full regulatory obligations will be offered an 8 digit number starting with "6" 		
South Korea	 MIC revealed in October 2004 that it would allocated IP-only prefix, 070, that can be used anywhere in the country, for VoIP services A facilities-based operator license or a special service provider registration is required to offer VoIP services 		
Sweden	 PTS started addressing the issue of numbering arrangements for IP telephony services in 2004 		
UK	 Ofcom is reviewing basic service requirements for VoIP providers, such as access to emergency services VoIP services are available with normal phone numbers, similar to those of traditional telephony services 		
US	 The FCC ruled in Nov 2004 that VoIP was not subject to state jurisdiction However, the service is still subject to monitoring by the regulator and to specific regulations, for instance, the FCC announced in Aug 2005 the requirement for certain broadband and VoIP providers to accommodate wiretaps 		

Source: ACMA (Australia), OFTA (Hong Kong), MIC (Japan), IDA (Singapore), MIC (South Korea), PTS (Sweden), Ofcom (UK), FCC (USA)

Amongst the review countries, Singapore, South Korea and the UK can be considered fairly progressive in terms of developing appropriate regulatory frameworks for VoIP services. Although VoIP is not subject to State jurisdiction in the US, there are steps to ensure quality of service and security offered to VoIP customers. For instance, the FCC recently issued an order that VoIP providers must suspend their services to customers that do not have enhanced 911 services.

In Hong Kong, fixed network operators are permitted to operate VoIP services under their current licences. Some have therefore offered VoIP services to the market. The VoIP regulatory framework announced in June 2005 paved the way for the licensing of VoIP services under a services-based operator ("SBO") licence. The framework also introduced a two-class regulatory regime for VoIP services which allows fixed network operators and SBO to operate Class 2 service with minimal licence conditions. This will be conducive to the development of innovative, niche services.

2.7Key conclusions

The Hong Kong regulator continues to adopt a pro-competitive stance on most issues and has periodically adapted the regulatory framework to facilitate effective competition and promote consumer benefits. Only a handful of other markets have been as successful in creating a regulatory environment that develops and manages competition to such an extent.

The Hong Kong regulatory environment continues to be progressive with a strong emphasis on both networkbased and service-based competition. The regulator has consistently sought to create a regulatory framework that is stable, coherent and relevant. Compared to many other markets the resulting framework is very pro-competitive and consumer-focused.

The key conclusions for Hong Kong are summarised below.

spectrum {

Exhibit 5: Key conclusions for Hong Kong

- The Hong Kong regulator continues to be significantly focused on the development of competition and the
 promotion of consumer benefits than the regulator of any other review markets
- In addition, the Hong Kong regulator is also comparatively more balanced in its approach to promoting market competition than other review markets. Apart from implementing asymmetric regulations to ensure market competition, the regulator also ensures that the level of regulation is commensurate with the effectiveness of market competition. This is reflected in OFTA's initiative in implementing ex-post regulation of tariffs of the fixed voice incumbent operator
- Although Hong Kong does not have any general competition laws, the Telecommunications Ordinance appears to cover all the key anti-competitive practices covered by general competition laws in other review markets
- The Hong Kong government continues to have no direct or indirect involvement in the telecommunications industry beyond its regulatory duties. In contrast to many other markets, it has had no ownership in the incumbent or any other operator and has no foreign ownership restrictions for any operator. This has allowed the regulator to adopt policies which it considers most beneficial for Hong Kong and for end-users, rather than being constrained by a relationship with a particular operator in the market. Governments in some of the other markets have only recently relaxed foreign ownership restrictions
- The LLU process in Hong Kong is more advanced than in most other markets and Hong Kong has made significant
 progress in furthering the LLU process in recent years. Unbundling of the local loop facilitated market entry and
 helped to increase the level of competition in the local fixed voice sector in Hong Kong. Given that the policy
 objectives of increasing market competition have been met, mandatory type II interconnection at telephone
 exchange level will be fully withdrawn by 30 June 2008 to promote investment and consumer choice in high
 bandwidth customer access networks
- The Hong Kong regulator issued a regulatory framework for VoIP services in June 2005. This is considered to be comparable to regulators in Singapore, South Korea and the UK

The regulatory framework in Hong Kong has facilitated the entry of new operators and provided an environment conducive to the development of competition. The actual impact of this regulatory framework in ensuring effective and strong competition in the telecommunications industry is discussed in the following chapter.

3 Development and effectiveness of competition

3.1Introduction

The 2003 Study highlighted geographical differentials in the development and effectiveness of competition as measured by changes to relevant market structures. It identified that differences in the liberalisation process, regulatory frameworks and regulatory focus were potential explanatory factors for these geographical variations.

As in the 2003 Study, this Study has assessed the effectiveness of competition as measured by reference to two parameters: First, the market share of the incumbent; and second, the level of market concentration, i.e. how fragmented the market is.

3.2Local fixed voice sector

3.2.1 Background of the Hong Kong market

Competition was first introduced in the Hong Kong local fixed voice sector in 1995 with the licensing of three additional fixed telecommunications network service ("FTNS") operators to compete with the incumbent. In 2000, OFTA further licensed five wireless-based FTNS operators, as well as an FTNS operator to provide telecommunications services over its hybrid fibre coaxial cable ("HFC") network.

The expiry of the moratorium on further licensing of local wire-line-based fixed networks at the end of 2002 marked the full liberalisation of the local fixed voice sector. From 1st January 2003 onwards, there is no longer any limitation on the number of licences that can be issued for fixed networks. OFTA issued three new wire-line-based fixed carrier licences in 2003. Two wireless-based FTNS licences were modified in 2002 to include the operation of wire-line-based FTNS as from 1 January 2003. In June 2005, the FTNS licence for provision of services over HFC network was modified to include the operation of other forms of wire-line-based FTNS.

At the time of publication there are ten wire-line FTNS licensees and one wireless FTNS licensee.

3.2.2 Hong Kong's relative performance²

In comparison to the other review markets, the Hong Kong incumbent has experienced a significant relative decline in its market share of the local fixed voice sector. This decline continued during 2003 and 2004 with the incumbent's market share falling to less than 70%, although throughout 2005 the incumbent successfully slowed and subsequently reversed its monthly residential line loss.

The development of competition in the Hong Kong local fixed voice sector has been facilitated through the build-out of new access infrastructure by new entrants (71% of households have physical access to two or more alternative networks) as well as the use of LLU.

In many other markets, the incumbent has been able to retain relatively strong market positions. This is despite efforts to promote service-based competition through mechanisms such as LLU.

² Due to the unavailability of market share information for all market participants in the local fixed voice sector, this section focuses solely on the market share of the incumbent as an appropriate indicator of market competitiveness. It has not been possible to calculate or use concentration ratios.



Exhibit 6: Local fixed voice sector market share of incumbent operators



Source: Various including Merrill Lynch, CSFB, PTS, OFCOM, ACA & FCC

Although incumbents in most review markets have been losing market share, at the end of 2003-04 all the incumbents in the sample still recorded market shares in excess of 50%. Singapore, Japan and South Korea are markets where new entrants have not been able to secure significant market share from the incumbent.

Only in Sweden have new entrants been more successful in gaining market share than in Hong Kong.

This implies that the Hong Kong has one of the more competitive local fixed voice sectors when compared against the other review markets and if recent trends continue, the Hong Kong local fixed voice sector will soon become the most competitive in the sample.

3.3Mobile sector

3.3.1 Background of the Hong Kong market

The Hong Kong mobile sector remains highly competitive with six existing 2G mobile network operators.

Furthermore, as at December 2005, there are seven mobile virtual network operators ("MVNO"), an increase of 2 MVNOs since the end of 2002.

The sector has, however, recently been associated with some consolidations. For example, PCCW has acquired Sunday and China Mobile Hong Kong is acquiring Peoples Telephone.

The merger between the other two mobile operators – CSL and New World – was announced in December 2005. Telstra, the parent company of CSL, will hold approximately 76% of the merged entity, with New World owning the remaining stakes. The merger will effectively reduce the number of active network operators in the market.

3.3.2 Hong Kong's relative performance

Mobile markets tend to be significantly more competitive than local fixed voice markets. This is primarily a function of the introduction of competition at an earlier stage of market development when compared to local fixed voice markets.

However, due to spectrum limitations and other policy considerations, the number of mobile network operators in all review markets is controlled. Some regulators, however, have licensed more mobile network operators relative to the size of their markets than others. This can be reflected by the population per mobile network operator and is presented below.

Exhibit 7: Average population base per mobile network operator, 2002 and 2004



Note: The figure for the US is for New York State **Source:** Spectrum analysis, EIU

Hong Kong continues to have the lowest population per mobile network operator, reflecting the high competitive intensity of Hong Kong's mobile market. Based on this measure, Japan and South Korea are the least competitive mobile markets.

However, it is noted that the above graph refers to mobile network operators and if the number of MVNOs is considered (especially the UK where there has been significant development of MVNOs), then the population per operator in certain markets is reduced substantially.

In the UK, for example, MVNOs accounted for more than 4 million mobile subscribers as at May 2005, or more than 6% of the total mobile subscriber base. The most successful MVNO operator in the UK, Virgin, accounts for a significant proportion of these subscribers.

MVNOs are also active in Australia, for example, AAPT Mobile and Virgin. In addition, following the impending entrance of a few new mobile operators into the Japanese market, a number of existing MNOs have indicated that they will open their networks to MVNOs.

The exhibit below shows the market shares of the largest mobile network operator (as of year end 2003) in each of the review markets over the period from 1996 to 2Q05.



Exhibit 8: Mobile market share of largest mobile operators



Source: Various including Informa, PTS, CTIA and Merrill Lynch.

Mobile incumbents are still the largest mobile operators in all the review markets except UK. In Singapore, Australia and Sweden, however, the mobile incumbent has steadily lost market share to the new entrants since 2003. The Japanese incumbent has performed relatively better as it was able to maintain its market share in a narrow range between 55% and 60% from 1997 to 2Q05. SKT, the mobile incumbent in South Korea performed strongly as it increased its market share significantly, from 42.7% in 1998 to 51.3% in 2Q05, although this was supported by merger & acquisition activity and the operator has lost market share since 2003.

In UK, the two incumbent mobile operators (Vodafone and O2) are no longer the largest operators by subscriber market share. By the end of 2004, T-Mobile, as a new entrant, has displaced the two incumbents from their positions as the largest mobile operators. This situation has continued into 2Q05.

An alternative measure to assess the development of competition is market concentration, i.e. the extent to which one or any number of market participants remain relatively large within the market. The Herfindahl-Hirschman index ("HHI") of market concentration for the mobile sector in the review markets is detailed below³.

³ See Appendix for a more detailed overview of the HHI.



Exhibit 9: Mobile sector concentration ratio, as measured by HHI



Source: Spectrum analysis

Mobile sector concentration in Hong Kong has been relatively stable over the past 8 years. Hong Kong has the most fragmented mobile sector when compared to the other review markets and can, therefore, be considered the most competitive mobile market.

This is also reflected by the fact that no mobile operator in Hong Kong accounts for more than 30% of the market and only one operator has a subscriber market share greater than 20%. However, the situation may change after the merger between CSL and New World, which was announced in December 2005.

3.4Data access sector

3.4.1 Background of the Hong Kong market

The data access sector in Hong Kong is competitive and broadband services continue to develop rapidly.

The 2003 Study found that total broadband take-up had improved significantly in Hong Kong, reaching approximately 47% household penetration by the end of 2002. Since then, continued network build-out by operators and sustained market competition have further increased take-up of services. As at October 2005, the number of total broadband access lines exceeded 1.6 million, representing a population penetration rate of 23.4%. Among the 1.6 million broadband lines, nearly 1.5 million lines were residential broadband lines, representing a household penetration rate of 65.1%. The incumbent's market share of total broadband subscribers was approximately 54% at the end of 2004.

3.4.2 Hong Kong's relative performance

In many markets, there continues to be strong competition between the telephony operators and cable access television ("CATV") operators in the data access sector. While the high take-up rate of data access

services can, in part, be attributed to rigorous implementation and enforcement of LLU, competition in pricing between telephony and CATV operators has also contributed to this success.



Exhibit 10: Broadband market share of incumbent operators

Source: Informa, OFCOM & FCC

The broadband market share of the Hong Kong incumbent slightly decreased from 2002 to 2004. Compared to the other markets, the Hong Kong incumbent's market share was less than those of the incumbents in Australia, UK, Sweden and Singapore but more than those of the incumbents in South Korea, Japan and the US. The incumbents in the Australia, UK, South Korea, Japan and US successfully increased their market share from 2002 to 2004 which may indicate decreasing levels of competition in the data access sector in these markets. Only the incumbents in Sweden, Singapore and Hong Kong lost market shares in 2004, compared to 2002.

Currently, the top four broadband ISPs in Hong Kong (accounting for more than 90% of the residential market in total) are telecoms carriers or their affiliates. This suggests that the competition in the ISP market is facilities-based rather than service-based. The situation is similar in some of the other review markets, notably the UK and Singapore. This is illustrated in the table below.

Country	ISP	Broadband subs as at 1Q05	Telecoms carrier / affiliation with carrier	Carrier affiliated broadband subs as % of total broadband subs in market (%)
Australia	Telstra	1,202,000	✓	78%
	Optus	227,000	✓	
Hong Kong	PCCW	818,000	✓	99%
	HKCTV	310,000	✓	
	Hutchison	174,832 ⁽¹⁾	×	
	HKBN	203,000 ⁽²⁾	✓	
Japan	Yahoo!BB	4,776,000		35%
	NTT East	3,718,000	✓	
	NTT West	3,153,000	✓	
	eAccess	1,850,000		
Singapore	SingTel	299,000	 ✓ 	100%
	StarHub	232,000	 ✓ 	
South Korea	Korea Telecom	5,556,037	✓	9%
	Thrunet	1,277,433		
	Hanaro	577,256	✓	
	Onse	380,700		
Sweden	Telia	749,000	×	53%
	Bredbandsbolaget	330,000		
	Com hem	165,000		
UK	BT	4,932,000	✓	98%
	NTL	1,443,200	✓	
	Telewest	786,705	 Image: A set of the set of the	
	Thus	92,000		
US	SBC	5,608,000	✓	45%
	Time Warner	4,122,000	✓	
	Verizon	3,944,000	✓]
	Bell South	2,349,000	✓]

Exhibit 11: Leading broadband ISPs and affiliations with carriers

Note: (1) The figure listed in the last column indicated the percentage of the total residential broadband market. (2) Hutchison figure for 4Q04. (3) HKBN figure for end Feb 2005.

(3) HKBN figure for end Feb 200

Source: Informa, Spectrum analysis

3.5International services sector

3.5.1 Background of the Hong Kong market

Hong Kong's international services market was liberalised from 1st January 1999 and the international facilities market on 1st January 2000. The 2003 Study found that Hong Kong has one of the most competitive international services markets amongst the review markets.

The situation has remained largely unchanged since then. There are currently six satellite-based external fixed carrier licensees and 20 cable-based external fixed carrier licensees in Hong Kong. The development of competition has been associated with a continuous increase in the use of international services with the number of outgoing international direct dial ("IDD") minutes per person reaching nearly 710 in 2004 from

approximately 585 in 2002. The use of international services continued to grow in 2005, with the number of outgoing minutes per person reaching 666 for the first ten months in 2005.

The incumbent's share of the IDD sector was approximately 32% at the end of 2004.

3.5.2 Hong Kong's relative performance

One measure that may be indicative of the relative development of competition in the international services sector is international Internet bandwidth and connectivity. The availability of international bandwidth and connectivity is considered essential for new entrants to effectively provide services and to respond to competition from the incumbent.

International connectivity has continued to increase significantly in all the markets between 2002 and 2004.



Exhibit 12: International Internet bandwidth per capita (kbps per capita)

Note: (1) Data represents Internet bandwidth, not traffic, connected across international borders as of June each year.
 (2) International Internet bandwidth refers to layer 3 IP traffic, which is one element of total bandwidth in each country.

(3) International internet bandwidth for Hong Kong includes bandwidth between Hong Kong and Mainland China. **Source:** TeleGeography

Hong Kong has experienced substantial increase in available international Internet bandwidth capacity since liberalisation. After Japan, Hong Kong recorded the largest percentage increase in international bandwidth per capita from 2002 to 2004.

Given that the Hong Kong international services sector was liberalised later than many of the review markets, the impact of increased competition on the market share of the incumbent has been significant since liberalisation.



Exhibit 13: International services market share of incumbent operators

(1) Australia - Teistra; Hong Kong - PCCW; Singapore - SingTei; South Korea - KT; Sweden - Teila; UK - BT; US - AT&T.
 (2) Market share of outgoing IDD minutes. Does not include the introduction of call-back services which were introduced in a number of markets prior to full liberalisation.
 (3) Insufficient data for Japan.

Source: TeleGeography

The market share of the incumbent operator in Hong Kong remained relatively stable during this time. The similar market shares of the incumbents in Hong Kong, Australia, the UK and US indicate that the competitive intensity in these markets may be similar.

In line with the relative stability of incumbent market share in Hong Kong, variations in market concentration in the international services sector has been slight between 2002 and 2004. The market concentration ratios of the IDD sector (as measured by HHI) in each of the eight review markets from 1996 to 2004 are presented below.



Exhibit 14: International services sector concentration ratio, as measured by HHI

Note: (1) Underlying data for outgoing IDD minutes for the year 2004 not available for Japan. **Source:** Spectrum analysis based on TeleGeography data

Since liberalisation, the Hong Kong sector has undergone a transition from a HHI of 10,000 (i.e. complete monopoly) to a far more fragmented market with a HHI of 2,059 by the end of 2004. This makes the Hong Kong international services sector one of the most competitive in the sample.

3.6Key conclusions

Compared to a number of review markets, Hong Kong was relatively late to liberalise certain sectors in its telecommunications industry. However, all the Hong Kong telecommunications sectors have now been fully liberalised.

- Hong Kong liberalised its local fixed voice sector later than a number of other markets but the number of local wireline-based FTNS operators more than doubled from four in 2002 to ten in 2005. This has resulted in relatively high level of market competition as reflected in the relative performance of the Hong Kong incumbent when compared to other incumbent operators;
- Hong Kong was one of the first jurisdictions amongst the review markets to introduce competition in its mobile sector in 1984 and the level of competitive intensity in Hong Kong is significantly higher than all other review markets, as measured by parameters such as HHI and new entrants' market shares;
- In the data access sector, competition increased as the Hong Kong incumbent's share of the broadband market decreased slightly even as incumbents in many other markets significantly increased their market shares from 2002 to 2004; and
- Finally, in the international services sector, Hong Kong has experienced a significant increase in the available international bandwidth, both in absolute and per capita terms, in recent years. In terms of international bandwidth per capita, Hong Kong's performance was stronger than all markets except Sweden and the UK in 2004.

Therefore, despite the relatively late liberalisation of a number of Hong Kong telecommunications sectors, the analysis undertaken in this Study suggests that Hong Kong continues to be one of the leading markets in terms of the effectiveness of competition in the telecommunications industry, with particularly strong levels of competition in the local fixed voice and mobile sectors.

Specific conclusions include:

Exhibit 15: Key conclusions for Hong Kong

- The effectiveness and intensity of competition in Hong Kong's local fixed voice sector is significant as evidenced by the rapid erosion in the market share of the incumbent in the last two years. The deployment of six additional local wireline-based fixed networks after January 2003 has increased the level of competition
- Hong Kong's continued emphasis on the promotion of competition in the mobile sector has resulted in substantial competitive pressures and ensured the effectiveness of competition in the sector. Hong Kong continues to record the lowest mobile market concentration in the sample
- The impact of competition may have been less significant in the data access sector in the past two years. PCCW's share of the broadband access market decreased slightly from 2002 to 2004 and it still had more than 50% market share at the end of 2004. However, it must be pointed out that the incumbents in most of the other markets increased their market share during the two-year period from 2002 to 2004, indicating a potential decrease in competition in these markets
- Measures of competition such as incumbent market share and availability of international Internet bandwidth indicate that competitive pressures have been maintained in the international services sector. IDD market concentration had remained stable between 2002 and 2004. Hong Kong recorded one of the largest increase in international bandwidth (from 13,712Mbps to 53,058Mbps) and bandwidth per capita (from 2.01kbps/capita to 7.60kbps/capita) in the sample from 2002 to 2004. International bandwidth per capita in Hong Kong was also significantly higher than in most other review markets in 2004

The high level of competition in the telecommunications industry in Hong Kong should provide substantial consumer benefits. This is discussed in the following chapter.

4 Consumer benefits

4.1Introduction

As detailed in the 2003 Study, market competition is not an end in itself but a means to an end. Ultimately, the effectiveness of competition has to be judged by the consumer benefits that competition provides. The objective of this chapter, therefore, is to assess the extent to which consumers have benefited from the introduction of competition in Hong Kong and the review markets.

The following analysis addresses three key issues when measuring consumer benefits: the extent of product innovation and development; the take-up of the services (i.e. deployment of local fixed voice lines, the number of mobile and broadband subscribers and the available bandwidth for international services); and the relative cost of services (comparison of service affordability across markets over time).

4.2Product innovation and development

Since 2002, a number of new products and technologies have become increasingly important, specifically, the commercial launch of 3G mobile networks and associated services (for example, mobile video telephony and mobile TV), the development and take-up of VoIP and the large-scale deployment of IPTV.

The following sections provide a summary overview of the state of development in terms of product innovation and commercial deployment of the above in Hong Kong and the review markets.

4.2.1 3G

Operators in many countries worldwide, including emerging markets, have either commercially launched or intend to launch 3G networks. For these operators, the deployment of 3G networks offers the potential to substantially increase the bandwidth offered to mobile subscribers and, therefore, to offer increasingly more complex data services and content, e.g. video telephony, mobile TV and interactive gaming.

Take-up of 3G services has been particularly successful in a number of markets – for example, Japan and South Korea.

To provide a comparative overview, the table below details the 3G operators, their adopted technologies in the review markets and the number of 3G subscribers.

Country	Operators	Adopted 3G technology	3G launch	3G subscribers (2Q05)	Total 3G subs as % of operator's total subs (2Q05)	Total 3G subs as % of total subs in market (2Q05)
Australia	Hutchison	WCDMA	Apr 2003	532,000	56%	3%
Hong Kong	Hutchison CSL SmarTone	WCDMA WCDMA WCDMA	Jan 2004 Dec 2004 Dec 2004	348,000 10,100 26,800	16% 0.7% 2.6%	4.9%
Japan	NTT DoCoMo Vodafone KDDI	WCDMA WCDMA EV-DO	Oct 2001 Dec 2002 Oct 2003	13,710,100 1,299,400 4,319,000	28% 8.7% 18%	22%
Singapore	SingTel M1 StarHub	WCDMA WCDMA WCDMA	Dec 2004 Feb 2005 Apr 2005	21,000 5,400 5,260	1.3% 0.4% 0.4%	0.8%
South Korea	KTF SKT	WCDMA EV-DO WCDMA EV-DO	Dec 2003 May 2002 Dec 2003 Jan 2002	1,800 3,852,000 1,800 7,416,000	32% 39%	30%
Sweden	HI3G Vodafone Tele2 TeliaSonera	WCDMA WCDMA WCDMA WCDMA	May 2003 Mar 2004 Jul 2004 Sep 2004	300,000 61,000 33,000 20,000	100% 4.2% 1.0% 0.4%	4.2%
UK	Hutchison Vodafone Orange O2	WCDMA WCDMA WCDMA WCDMA	Mar 2003 Nov 2004 Dec 2004 Feb 2005	3,021,000 160,000 43,000 10,000	100% 1.2% 0.3% 0.1%	5.8%
US	Cingular	WCDMA	Jul 2004	1,060	Negligible	Negligible

Exhibit 16: Live 3G networks and adopted technologies

Source: Informa

Of the six mobile operators in Hong Kong, four secured 3G licenses in 2001 (Hutchison, CSL, SmarTone and Sunday). This was a function of the 3G licensing regime which offered only four licences.

Apart from Japan and South Korea, take-up of 3G services in the other review markets has been limited so far. The 3G take-up rate in Hong Kong is comparable to the UK and Sweden.

In terms of individual operators, Hutchison in Australia, Sweden and the UK has over 50% of its subscribers on its 3G networks. Apart from this, the South Korean operators appear to be the most successful with 3G subscribers accounting for over 30% of their subscriber bases. In Japan, NTT DoCoMo is most successful, with 28% of its subscribers taking up 3G services.

Hutchison was the first to launch commercial 3G services in Hong Kong in January 2004, and had 16% of its subscriber base on its 3G network in second quarter of 2005. CSL and Smartone launched their 3G service in December 2004. The fourth 3G licensee, Sunday Communications, launched limited 3G services (e.g. datacard service) in June 2005.

4.2.2 VoIP

The increasing deployment of broadband access technologies, whether mobile or fixed in nature, has allowed infrastructure operators and alternative service providers to offer VoIP services to end-users.

spectrum {

Most VoIP products are currently limited to PC-to-PC applications using computer software and equipment connected through a computer. Service providers such as Skype and Vonage have been particularly successful offering VoIP solutions through downloaded or installed computer software.

These services can be accessed at any geographical location.

Skype and Vonage PC-to-PC services are accessible in all the review markets. The take-up rate of VoIP services has been increasing, although this is a recent trend in most markets.

The key VoIP developments in the review markets are summarised in the table below.

Country	VoIP developments	
Australia	 Until 2003, VoIP services in Australia were only offered to business users. Since then, standards for IP networks have matured, driving down costs of entry for operators. There are several service providers offering various VoIP products in Australia, e.g. Skype offers PC-to-PC and PC-to-PSTN telephony, while other operators such as Request Broadband and TransACT offer telephony services via DSL lines and fibre-to-the-curb respectively. 	
Hong Kong	 OFTA issued a regulatory framework for VoIP services in June 2005 and is finalising SBO licensing conditions A number of local fixed voice operators have launched VoIP services 	
Japan	 The Japanese government is reportedly planning to offer VoIP services to mobile phones by 2007 There are reportedly plans to set out a mobile VoIP strategy before the end of 2005 Softbank and NTT recently started offering interconnect VoIP services in a bid to stimulate interest in the market 	
Singapore	 In Singapore, VoIP services have met with limited success in Singapore, where the incumbent operator, SingTel, launched a wholesale service in June 2005, targeted at resellers of international voice services and mobile service providers in the region. VoIP service also offered by StarHub and a few smaller service providers 	
South Korea	 VoIP services were launched by Korea Telecom in 2001 The cable TV systems operators have applied to the regulator to start offering VoIP services The Korean government expects 4 million VoIP subscribers by 2007 	
Sweden	 VoIP services appear to be fairly successful in Sweden, where there were 25 VoIP operators at the end of 2004, compared to 10 to 15 operators a year earlier. 	
UK	 BT is trialling a Multi-Protocol Label Switching technology which will enable VoIP services to be delivered at PSTN quality, and may further increase take-up of VoIP services. 	
US	 The FCC took control of VoIP regulation from the states in November 2004, barring states from imposing telecommunications regulations on Internet phone providers The FCC is committed to allowing IP-enabled services, including VoIP, to evolve without undue regulation There is a requirement for interconnected VoIP providers to provide access to emergency services and of certain broadband and VoIP providers to accommodate wiretaps 	

Exhibit 17: Key VoIP developments

Note: Insufficient information for Japan and US at time of publication. **Source:** Various, including Informa, ACMA, PTS, Ofcom and SingTel

VoIP services have started to experience increasing use amongst both business and domestic users. In the longer term, there is potential for IP telephony to increasingly replace PSTN telephony especially amongst business users and international callers. Hence, regulators in various countries have started to develop a licensing framework for the provision of VoIP, addressing such issues as IP interconnection, numbering and access to emergency services.

4.2.3 IPTV

Rapid advances in broadband access technologies and the increasing convergence between telecommunications and broadcasting have presented opportunities for operators of fixed line networks to

offer IPTV services. Fixed operators are rapidly moving into the IPTV space in order to develop new revenue streams and to compete with incumbent cable and satellite pay TV operators.

The key developments in IPTV in the review markets are summarised in the table below.

Country	IPTV deployment	IPTV subs 2003	IPTV subs 2004
Australia	 TransAct has small IPTV deployment in Canberra Optus is investing in a national broadband network which could pave the way for an IPTV launch 	6,500	10,000
Hong Kong	 PCCW, HKBN and Galaxy operate IPTV services 	205,000	403,000
Japan	 IPTV services were first launched in 2004 by Yahoo!BB 	103,000	241,000
Singapore	 Singapore regulator is now working on a regulatory framework for IPTV, and the incumbent operator, SingTel, has stated its intentions of launching IPTV services Any existing service is likely to be an on-demand PC offering 	300	300
South Korea	 Korea, IPTV developments have been stalled after the regulator banned IPTV service deployment by telecommunications companies until 2006. This has been the result of intense lobbying from cable pay TV operators, who have much political clout given the large scale of their operations Any existing service likely to be an on-demand PC offering Korea Telecom is planning to launch IPTV in 2006 	n/a	15,000
Sweden	 Swedish broadband provider Bredbandsbolaget has signed a deal with an Israel-based video-on-demand solutions provider for its recently launched IPTV service Danish carrier TDC plans to launch IPTV services in Sweden in early 2006 	3,000	7,700
UK	 There are only two IPTV operators (HomeChoice and Kingston), serving approximately 20,000 subscribers at the end of 2004 (Zenith) Following its recent acquisition of Easynet, BSkyB is now looking to launch IPTV services in 2007 	8,900	18,800
US	 Mainly video-on-demand services for now SBC has launched IPTV and is expanding its fibre- optic network to better support delivery of the service Verizon is planning an IPTV rollout 	125,000	237,000

Exhibit 18: Key IPTV developments in selected markets

Note: (1) The subscriber numbers for Hong Kong do not include Galaxy's subscriber number. **Source:** Various, including Informa, Zenith, MPA, Spectrum analysis

Hong Kong is considered to be one of the most advanced IPTV markets amongst the review markets. PCCW is currently the largest IPTV operator in the world.

On the other hand, operators in most of the review markets are only just beginning to explore IPTV service provision. For example, there are no licensed broadband TV operators in Korea at present, primarily because the regulator has announced that it will not be issuing new pay TV licences until at least 2006. In the UK, IPTV operators have not had any significant impact on the overall pay TV market and the incumbent is not expected to launch IPTV services until 2006.

spectrum {

4.3Take-up of services

As detailed in the 2003 Study, competition exerts a downward pressure on tariffs and promotes the deployment of new services, both of which encourage greater usage from existing consumers as well as new consumers. The take-up of services, therefore, is an appropriate indicator of the extent to which consumers have benefited from lower prices and new, innovative services.

This section assesses the take-up of services in each of the four sectors.

4.3.1 Local fixed voice services

In all the review markets except Australia, local fixed voice tele-density per capita (i.e. total number of fixed business and residential telephone lines per inhabitant) has been declining consistently over the past few years. As at 2004, the US had the highest local fixed voice tele-density while Sweden and Australia had the second and third highest tele-densities respectively. Singapore, Japan and South Korea were the only countries with tele-densities below 50% as at 2004. Local fixed voice tele-density per capita rates are shown in the exhibit below.





Source: Various including ITU, ACA, OFTA, MIC, IDA, PTS, Ofcom, FCC and Informa

It is important to recognise that in many markets, demand for local fixed voice access is declining. This reflects, to an extent, the increasing role of mobile telephony in voice communication.

4.3.2 Mobile services

With respect to the take-up of mobile services, each year since 1999, Hong Kong has recorded the highest mobile penetration rate of all the review markets. Hong Kong was also the first market in the sample to achieve a penetration rate in excess of 100% (in 2003). Two other markets, Singapore and the UK, had mobile penetration rates nearing 100% at the end of 2004 (although it is important to recognise the methodological difficulties of penetration rates in excess of 100%, i.e. multiple SIM ownership, inactive accounts etc.).

spectrum {

Mobile penetration rates are shown in the exhibit below.



Exhibit 20: Take-up of mobile services in Hong Kong and the review markets

Note: (1) Percentage indicates mobile subscribers as a percentage of total population
 (2) May not consider role of inactive accounts (a mobile user having more than one SIM card) and different reporting methodologies
 (3) Data for year end

Source: Various including OFTA, PTS, CTIA, IDA, Informa & EIU

In many markets, the pre-paid model has continued to drive mobile take-up due to lower entry costs and increased affordability for lower income segments.

The ratio of pre-paid subscribers to total mobile subscribers for Hong Kong and the review markets is presented below.





Exhibit 21: Ratio of prepaid subscribers to total mobile subscribers (%)

Source: Various including Merrill Lynch, Informa, OFTA, PTS, IDA & Ofcom

The ratio of pre-paid subscribers to total mobile subscribers is the highest in Sweden and the UK, both of which have high mobile penetration rates. The growing importance of pre-paid subscribers in Hong Kong suggests that the take-up of prepaid mobile services has contributed significantly to recent mobile take-up in Hong Kong.

3G services have been commercially launched in all the review markets, but the actual take-up of 3G-enabled services has been relatively constrained. This is detailed below.





In comparison to the other review markets, the development of the 3G-enabled subscriber base has been most significant in South Korea. The commercial launches of new 3G networks in Hong Kong in late 2004 and early 2005 is expected to lead to a significant increase in the number of 3G mobile penetration in 2005 and 2006.

3G will be important in driving the data revenue stream for mobile operators, especially as penetration rates move towards complete saturation. The share of mobile revenues accounted for by data in the review markets is presented below.



Exhibit 23: Mobile data revenues as percentage of total mobile revenues (%)

Source: Informa, PTS and Ovum

It is important to note that the ratio of mobile data revenues to total mobile revenues is dependent on the relative cost of voice and data services in a mobile market. Furthermore, in most markets, the majority of data traffic is created through SMS traffic, for example, in the UK and Sweden.

In Hong Kong, mobile data revenues as a fraction of total mobile revenues more than doubled between 2002 and 2004. However, mobile data revenues as a proportion of total mobile revenues in Hong Kong still lags those of most of the other review markets.

4.3.3 Data access services

With respect to broadband take-up, Hong Kong records the second highest take-up of broadband services. It records a higher broadband penetration rate than all markets except South Korea. Hong Kong's 1.5 million total broadband subscribers in 2004 translated into a population penetration rate of 21%. The exhibit below compares the broadband population penetration rates (i.e. the number of broadband accounts per 100 inhabitants) in the eight review markets from 2000 to 2004.



Exhibit 24: Take-up of broadband services in Hong Kong and the review markets



Furthermore, Hong Kong consumers are deriving benefits from IPTV services. IPTV is a new technology that presents a potential competitive threat to existing technologies (e.g. cable TV) and increases consumer choice.

The take-up of IPTV services in the review markets is shown below.

Exhibit 25: IPTV subscribers in Hong Kong and the review markets (2004)



Take-up of IPTV services has been limited in most of the review markets so far. Hong Kong is the most advanced market in the world, with more than 400,000 IPTV subscribers as at 2004. This is almost double the number of IPTV subscribers in Japan and in the US. The smallest IPTV market is Singapore, with only 300 subscribers.

4.3.4 International services

Hong Kong has experienced a significant increase in the use of international services in recent years. The number of outgoing international minutes per capita is shown in the exhibit below.



Exhibit 26: Outgoing international minutes per capita

Source: TeleGeography & EIU

The growth in outgoing international traffic in Hong Kong post-liberalisation (period from 1998 to 2004) is particularly marked and has continued since the 2003 Study. In this period (1998-2004), Hong Kong's IDD traffic volume per capita increased by 146%. This would tend to suggest that increasing competition after liberalisation has significantly encouraged take-up of international services. Hong Kong recorded the highest international call volume per capita in the world with an average of 707 minutes of outgoing international traffic per capita in 2004. This has increased substantially from the 585 minutes per capita recorded in 2002.

Across the four sectors investigated in this Study, increasing competition in Hong Kong between providers of telecommunications services has boosted take-up significantly. Hong Kong consumers' usage of telecommunications services, as indicated by measurements such as mobile penetration rate, broadband penetration rate, take-up of IPTV and outgoing international minutes per capita, is significantly higher than that of consumers in most of the other review markets.

This indicates that Hong Kong consumers have derived substantial benefits from market competition.

4.4Cost of services

A key benefit that consumers derive from higher levels of competition is a reduction in the cost of using telecommunications services.

The following sections compare the published tariffs of the incumbent operator in the four sectors. It should be noted that, in Hong Kong, operators are bound by licence conditions to charge not more than their published tariffs and it is a normal commercial practice for operators in Hong Kong to offer actual tariffs much lower than the published ones. Hence, the actual tariffs of telecommunications services in Hong Kong are potentially more affordable than indicated in the following charts.

4.4.1 Local fixed voice services

Local fixed voice charges have increased in Hong Kong from 1996 to 2001 mainly due to tariff rebalancing. From 2001 till the end of 2003, local fixed voice charges in Hong Kong remained relatively stable. Although Exhibit 27 below illustrates that the affordability of local fixed voice services in Hong Kong declined from 2001 to 2003, it should be noted that this is due largely to the fact that PPP adjusted exchange rates from Hong Kong dollars to US dollars had increased. In fact, the actual tariffs in Hong Kong dollars had remained stable during the years.

Similarly, local fixed voice charges in the other review markets have more or less stagnated. Up to the end of 2003, local fixed calls in Hong Kong remain more affordable than in most other review markets. Only in Singapore and the UK do local fixed voice calls account for a lower percentage of real disposable income per capita.

From 2004, a number of fixed network operators in Hong Kong started to launch VoIP services. The flat-rate monthly fee of VoIP services offered by competitors to the incumbent is only around 55%-80% of the monthly fee of local fixed telephony services offered by the incumbent.



Exhibit 27: PPP adjusted local fixed voice basket charges as percentage of real disposable income per capita

Note: (1) Basket charges based on 20 x 3 minute local peak calls per month and including subscription charges
 (2) Due to the unavailability of 2003 call tariff and subscription data for the UK, 2002 figures are assumed to have remained unchanged in 2003 (3) Due to the unavailability of 2002 and 2003 call tariff data for Sweden, the call tariff in 2001 is assumed to have remained unchanged in 2002 and 2003
 (4) No 2004 or 2005 data to reflect the significant drop in call charges in Hong Kong resulted from the launch of VoIP services by fixed line operators
 Source: ITU & EIU

Determining the cost of mobile services and changes in price over time is difficult. Mobile operators tend to sell a range of packages which include a variety of bundled minutes and SMSes as well as a range of value-added services including caller ID, call-forwarding and voicemail. Accordingly, the following analysis adopts annual mobile ARPU as a percentage of disposable income per capita as an indicator of service affordability.

In 1996, Hong Kong was one of the least affordable markets for mobile services with ARPU accounting for approximately 10% of annual disposable income. The development of competition in all markets has increased the affordability of mobile services, although this has been most marked in Hong Kong. From being one of the least affordable markets, by 2004 Hong Kong was the most affordable market with annual ARPU accounting for only 1.5% of disposable income. Japan and South Korea were the least affordable markets in 2004 recording the highest percentages, 3.4% and 5.3% respectively.

This increasing affordability may explain the high mobile penetration rate in Hong Kong.



Exhibit 28: Annual mobile ARPU as percentage of disposable income per capita

Note: Personal disposable income per capita based on PPP US\$ at 1996 prices **Source:** Spectrum analysis

4.4.3 Data access services

Price comparison of broadband services between markets is complicated by the varying nature of products offered by operators. The 2005 Study, however, attempted to find a common basis for comparison between the markets (by using a standard broadband package across all review markets) and to determine the relative cost of the benchmarked products when compared against real disposable income.

This is presented below.

spectrum {



Exhibit 29: PPP adjusted annual broadband charges as percentage of real disposable income

Note: (1) Broadband access speeds of 1.5Mbps, except Sweden (2Mbps), UK (2Mbps) and South Korea (not stated). Source: Fixed line incumbent in each market

Source. Thed the incumbent in each market

Broadband costs vary widely between the review markets, reflecting market competition and differential underlying costs.

Hong Kong ranks near the middle of the group of eight review markets in terms of affordability of broadband access. Affordability of broadband access in Hong Kong remained almost unchanged over the two year period from 2002 to 2004, in terms of price as a percentage of real disposable income. The marginal decline in affordability is largely due to the fact that the PPP adjusted exchange rate for Hong Kong dollars to US dollars had strengthened between 2002 and 2004, while effective broadband prices in Hong Kong dollars had remained stable during this time.

As identified in the 2003 Study, it is interesting that even though broadband access is least affordable in South Korea, it records the highest broadband penetration rate in the sample, indicating that other issues may be more important in explaining broadband take-up than just price. Some of the reasons for the high broadband penetration rate in South Korea could be the ubiquity of high-speed broadband networks, the high quality of service provided by operators and active promotion of take-up by the government.

4.4.4 International services

The cost of international services in all the review markets decreased significantly after the introduction of competition. However, the degree of competition in the international sector varies between markets and consequently prices have changed at different rates in different markets.

The following exhibit compares the affordability of IDD calls across the review markets where affordability is indicated by the cost of a basket of IDD calls as a proportion of real disposable income per capita.



Exhibit 30: PPP adjusted annual international basket charges as percentage of real disposable income

Note: (1) Based on blended weighted average of the cost of 3 min calls to the top 5 IDD international destinations (2) Baskets assumes 60 minutes of calls to top 5 IDD international destinations per month (3) No operator specific pricing data except US where data is AT&T prices (4) Does not include promotions
 Source: TeleGeography & EIU

Although IDD calls in Hong Kong remain less affordable than Australia, UK, Sweden and the US, affordability of IDD calls is significantly higher in Hong Kong compared to South Korea, Japan and Singapore.

The data shows that IDD tariffs in Hong Kong have increased between 2002 and 2004 in absolute terms. However, as explained in the preceding paragraph, the increment in call charges in Hong Kong may reflect the published tariffs only, and may have no relevancy to the actual tariffs offered in the market.

Competition in Hong Kong's telecommunications sectors has clearly benefited Hong Kong consumers by forcing prices of many telecommunications services downwards. These price declines have contributed to increasing the affordability of services and encouraging take-up.

4.5Key conclusions

The key conclusion from the analysis presented in this chapter is that Hong Kong consumers have derived substantial benefits from the introduction and development of competition in the telecommunications market.

Specific conclusions for Hong Kong include:

Exhibit 31: Key conclusions for Hong Kong

- Hong Kong has been advanced in launching innovative products and services, such as 3G, VoIP and IPTV. A
 regulatory framework for VoIP was announced in June 2005 and a number of operators have started offering VoIP
 services. Hong Kong had the largest commercial scale IPTV service in the world as at 2004.
- Although the number of local fixed voice lines and fixed teledensity have both declined marginally in Hong Kong in recent years, Hong Kong remains one of the most affordable markets for local fixed voice calls in the sample of eight review markets
- Hong Kong consumers have derived substantially greater benefits than consumers in all other review markets from the high level of competition in the mobile sector. Hong Kong had by far the highest mobile penetration rate at the end of 2004. The decline in mobile prices between 1997 and 2002 was the highest in Hong Kong, compared to the other review markets. Hong Kong was also the most affordable market in the sample for mobile calls in 2004
- The broadband penetration rate in Hong Kong in 2004 was second only to South Korea. The affordability of broadband access in Hong Kong remained almost unchanged during the past two years. However, some of the other review markets have become marginally more affordable than Hong Kong in recent years
- The use of IDD services in Hong Kong has continued to grow rapidly and on a per capita basis, Hong Kong generated the most IDD traffic in the sample in 2004 and experienced the largest increase in IDD traffic from 1998 to 2004. The absolute affordability of international services decreased marginally from 2002 to 2004 but Hong Kong has maintained its position as the fifth ranked market in the sample in terms of affordability, suggesting that its performance was neither worse nor better than that of the other review markets in this regard. It must be noted, however, that actual tariffs charged by Hong Kong operators may be less than the published ones. Hence, international services in Hong Kong could effectively be more affordable than suggested here

Reflecting continuance of the 2003 Study, Hong Kong consumers have experienced significant benefits, both in terms of take-up of telecommunications services and the decline in prices of those services. However, these benefits are sustainable only if service providers continue to make substantial investments. Telecommunications investment trends in Hong Kong and other review markets are discussed in the following chapter.

5 Industry investment

5.1Introduction

The 2003 Study used data provided by the International Telecommunications Union ("ITU") to assess the relative impact of competition on industry investment.

As stated in the 2003 Study, this was considered important as it is investment in networks and technologies, spurred by competition that creates benefits for consumers in the form of new services, lower prices for services and improvements in service quality and delivery. Only through ongoing investment can these consumer benefits be sustained in the future.

At the time of publication, more recent industry investment data from the ITU are not available to allow a time series to be developed.

Consequently, the 2005 Study has adopted a more qualitative approach, focusing on the capital expenditures recorded by the various operators for which information is publicly available, including, where appropriate, explanations for these capital expenditures.

5.2Key results of the 2003 Study

The 2003 Study found that telecommunications investment increased for all review markets between 1991 and 2001. It was argued that there was evidence of a correlation between the level of investment and the extent of market liberalisation.

The 2003 Study concluded that Hong Kong outperformed all the review markets in terms of per capita investment, with the exception of Japan and the UK. It was argued that this level of investment had been necessary to permit market entry by a relatively large number of telecommunications operators and that the relatively high level of investment subsequently supported the development of competition with associated consumer benefits.

The strong investment performance recorded by Hong Kong took it from being one of the least invested markets in 1991 to one of the most invested in 2002. Hong Kong experienced the largest increase in cumulative investment from 1991 to 2002, followed by the UK, South Korea and Japan.

5.3Recent telecommunications investment

Capital expenditures of individual telecommunications operators are indicative of prevailing commercial and regulatory conditions, as operators invest to meet market demand while, in some cases (especially for incumbents), satisfying regulatory requirements.

Since 2002, the capital expenditures of individual operators have tended to decline as the focus of investments moves from infrastructure rollout towards network upgrade and maintenance. There are slight increases in capital expenditure for some operators between 2003 and 2004, mainly due to 3G and broadband infrastructure rollout. The telecommunications investment behaviour of individual operators in the review markets is summarised below.

Exhibit 32: Operator investment trends

Country	Investment trends		
Australia	 Telstra Capex for Telstra in Australia accounted for 26% of total revenues in 2000, but this had declined to 16% by 2003. In 2004, capital expenditure accounted for 18% of total revenues, reflecting an increase in investments in new growth products, including mobile and broadband. Has intentions to rationalise various IT and network platforms while focusing future investments on new technologies, developing core infrastructure network and in developing demand-driven products. 		
Hong Kong	 PCCW PCCW's capital expenditure as a percentage of revenue was 11% in 2001, largely driven by development of local network for broadband services. Since then, capex has centred around upgrade and expansion of network coverage and around demand-driven services. Consequently, the ratio of capex to revenue declined to 9% in 2004. Has indicated that future capital expenditure will be invested in developing its NOW broadband and broadband TV services, as well as in developing convergence networks. SmarTone SmarTone's capex to revenue ratio increased from 10% in 2002 to 20% in 2004. Aligned with SmarTone's 3G network rollout and enhancement of its 2G network. Capex strategy likely to remain unchanged in the coming years, as it continues to improve its mobile network coverage and quality and develops multimedia services for its mobile proposition. 		
Japan	 NTT NTT has invested significant amounts of money in expanding coverage on its FOMA mobile network and in developing FOMA handset functions in the past three years. It is also developing an ultra high-speed broadband network. However, capital investments have declined in recent years, relative to total revenues, with its capex to revenue ratio decreasing from 25% in 2001 to 18% in 2004. KDDI KDDI's capex to revenue ratio declined from 19% to 9% between 2000 and 2004. 		
Singapore	 SingTel Incumbent SingTel's capex to revenue ratio declined from 41% to 11% between 2002 and 2004. 		
South Korea	 Korea Telecom Capex to revenue ratio for Korea Telecom was 15% in 2004, down slightly from 18% in 2002. Its investment focus in recent years has been on developing its high-speed and wireless broadband networks. SKT and KTF Capex to revenue ratio for SKT and KTF were 17% and 16% respectively as at 2004. 		
Sweden	 TeliSonera Capex has seen a slight upturn in 2004, as new growth emerges in the areas of broadband, IP-based services and mobile. Capex to revenue ratio had remained stable over the past two years, at around 25%. 		
UK	 BT BT's capex to revenue ratio remained unchanged between 2003 and 2004, at 13%. BT is focusing capex on the growth area of broadband. Vodafone and O2 Vodafone's capex to revenue ratio declined from 18% to 13% between 2003 and 2004, while O2's increased from 18% to 21%. 		
US	 AT&T (formerly SBC) AT&T's (known as SBC until its merger with AT&T, completed in Nov 2005) capex to revenue ratio has been halved since 2000, from 26% to 13% in 2004. The low capex to revenue ratio was partly attributed to the uncertain US economy and changing regulatory environment. AT&T's capex strategy is now focused on the deployment of a fibre-optics network, development of an advanced IP network, 3G network deployment and integration of the Cingular and AT&T wireless networks. Verizon Verizon is shifting capital investments towards developing new products in order to respond to competition and towards improving network productivity. Its capex to revenue ratio has remained stable at around 17% between 2002 and 2004. 		

Note: (1) Investments by Telstra, SingTel, BT, Vodafone and O2 may be distorted by the range and varying market conditions of their operations outside of their home countries.
 Source: Telstra, PCCW, SmarTone, SingTel, M1, StarHub, Korea, Telecom, SKT, KTE, TeliaSonera, BT, Vodafone, O2

Source: Telstra, PCCW, SmarTone, SingTel, M1, StarHub, Korea Telecom, SKT, KTF, TeliaSonera, BT, Vodafone, O2, AT&T, Verizon, Spectrum analysis

Individual operator investment strategies appear to be largely similar in all the review markets.

In the mobile sector, initial large-scale investment in 3G networks has been undertaken, although there is ongoing investment in terms of coverage and capacity enhancement both across 2G and 3G networks.

In the fixed line market, many operators have longer term plans to deploy new networks, such as broadband access and IP networks (often as part of next generation network plans). Operators also focus on developing products in new growth areas, such as broadband technologies and fixed-mobile convergence.





Source: OECD

Generally, the capex to revenue ratio has decreased since 2000 for operators in the review countries. This is in line with telecommunications infrastructure investment trends for OECD countries, where investments have declined from 28% of revenues in 2000 to 14% in 2003. This is likely to be a function of more cautious investment strategies, particularly after the burst of the IT bubble post 2000.

Investments by individual operators have also tapered off because most operators have completed the deployment of entire new network infrastructures and are now focusing on upgrading and enhancing those networks.

In addition, the cost of network hardware (e.g. 3G networks) is also declining with technological advancement and growing economies of scale. Telecommunications revenues have increased rapidly in the past few years due to expansion in access to networks and the proliferation of new services. Hence, even as operators continue to invest in networks, capex may have declined as a proportion of revenues.

6 Hong Kong's overall performance

This chapter summarises the findings of the Study with respect to Hong Kong's overall performance when compared against the review markets. It highlights areas where Hong Kong performs well but also identifies potential challenges facing the Hong Kong telecommunications industry.

6.1Core strengths

Hong Kong has consolidated its position as one of the most competitive telecommunications markets, not just in the sample of eight review countries but worldwide.

Competition in Hong Kong's telecommunications industry has been effective primarily because of the aggressive market liberalisation and competition policy adopted by the regulator. Hong Kong's efforts to create a pro-competition regulatory environment have already been detailed in previous chapters of this Study and in the 2003 Study.

The pro-competition stance of the regulator and the liberalisation process resulted in a high level of investment in the Hong Kong telecommunications industry. New entrants were able to readily source the required capital to build networks and to compete with the incumbent. This has resulted in the erosion of the incumbent's market shares in the local fixed voice and mobile sectors. In order to promote further investment in advanced telecommunications infrastructure, the Hong Kong regulator will withdraw completely the mandatory Type II interconnection at telephone exchange level by June 2008 in order to remove dependence on the incumbent operator for connection to customers.

As a result of pro-competition regulation, Hong Kong performs strongly relative to the other review markets in a number of key areas. These core strengths are detailed below.

Exhibit 34: Key areas of strength

- A pro-competition and consumer orientated regulator and regulatory framework, with no state interest in any of the market operators and no constraints on foreign ownership of operators
- · Rapid erosion of the market leader's market share in the local fixed voice and mobile sectors
- High take-up of most telecommunication services, with mobile penetration crossing the 100% market in 2003. Hong
 Kong recorded the highest level of IDD traffic per capita in 2004, and the broadband penetration rate in 2004 in
 Hong Kong was lower than only that in South Korea
- Rapid price declines, especially in the mobile sector, where services have become increasingly affordable. In the data access sector, broadband access cost as a percentage of disposable income, at 2% is lower than the average across the sample

The overall competitiveness of the Hong Kong telecommunications industry and the significant competitioninduced consumer benefits have ensured that Hong Kong maintains its position as one of the leading telecommunications markets in the world.

6.2Key challenges

The analysis has also highlighted some areas in which Hong Kong has performed relatively weaker as benchmarked against the other review markets. These include:

Exhibit 35: Key challenges

- Hong Kong has one of the lowest mobile data revenues as a percentage of total mobile revenues amongst the review markets. As at 2004, Hong Kong ranked ahead of only Sweden and the US, with mobile data revenues making up approximately 9% of total mobile revenues.
- The emergence of new technologies and, specifically, the rapid convergence of the fixed telecommunications and media sectors, as well as between the fixed telecommunications and mobile sectors, will continue to pose challenges to existing regulatory frameworks. Regulators in a few of the other review markets have licensed broadband wireless access, and the Hong Kong regulator has also started to develop a licensing framework for broadband wireless access. The Hong Kong regulator is also exploring the issuance of a unified carrier licence to address fixed-mobile convergence. There are also plans to establish a convergent regulator

There are significant regulatory challenges emerging with respect to the regulation of developing and emerging new technologies and services. Many of these will cause strains to existing regulatory frameworks and may create circumstances where existing frameworks are inappropriate to maintain market competition and / or protect end-users. These, therefore, represent significant challenges for OFTA.

In summary, Hong Kong has maintained its status as one of the most competitive markets in the sample. Take-up and usage of services have increased as prices continued to decline. These consumer benefits have been achieved through an aggressive market liberalisation and competition policy and a strong focus on market forces by the regulator. But there are emerging challenges which OFTA will need to address if it is to maintain its relative performance.

Appendix: Study methodology

This chapter provides an overview of the methodology and approach adopted for the Study. It also explains the approach adopted to create the indices and the variables included in the analysis.

Study objective

The primary objective of the Study was to assess the overall competitiveness of the Hong Kong telecommunications industry relative to other comparable and "best practice" markets.

It is recognised that there are numerous factors that explain the level of competitiveness but this analysis has identified six broad areas of concern which together explain the competitiveness of a telecommunications industry. These were:

- The development of competition;
- The regulatory framework which defines and determines the level of competition;
- The effectiveness of competition;
- The level of consumer benefits derived from competition; and
- The investment behaviour of operators in competitive markets

Analytical approach

Selected comparative markets

The Study compared Hong Kong's performance against seven markets: Australia; Japan; Singapore; South Korea; Sweden; UK; and the US. These markets were selected as they are widely seen to have developed and competitive telecommunications industries. It was considered appropriate, therefore, to compare Hong Kong's relative performance against these markets.

The Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index, sometimes known as the "Herfindahl index" or the "Hirschman index" is a commonly accepted measure of market concentration and extensively used by the US Department of Justice when assessing the impact of merger and acquisition activity on the competitiveness of an industry market. It is calculated as:

HHI =
$$\Sigma(a^2 + b^2 \dots y^2 + z^2)$$

where a, b ... y and z are the market shares recorded by the firms active in the defined market sector. For example, if a defined sector had five firms with market shares of 30%, 20%, 20%, 20% and 10%, then the HHI would be:

HHI =
$$\Sigma$$
 (30² + 20² + 20² + 20² + 10²) = 2,200

The HHI takes into account the relative size and distribution of the firms in a defined market sector. A HHI score closer to 0 implies increasing competition with a large number of firms accounting for relatively small and equal proportions of the market. In contrast, a higher HHI score implies a market with a small number of firms and increasing disparity between the market participants, i.e. one or a limited number of participants dominate the market.

The US Department of Justice defines markets in which the HHI is less than 1,000 to be un-concentrated, markets with a HHI of between 1,000 and 1,800 to be moderately considered and those in which the HHI is above 1,800 to be concentrated. Presumptively, any horizontal merger or acquisition activity which increases the HHI by more than 100 points in a moderately concentrated market or more than 50 points in a concentrated market to raise anti-trust concerns under guidelines issued by the Department of Justice and the Federal Trade Commission.

Data sources

The Study sourced data for the variables from a variety of sources. These included:

- Company annual reports
- Regulatory sources;
- Research houses;
- Internal analysis; and
- Trade journals and industry press

At all stages, the authors ensured the consistency, robustness and credibility of sourced data. Where necessary, this involved cross-checking different sources of data and using the primary data source whereever possible.

Glossary

ARPU	Average Revenue Per User: A measure traditionally used by analysts and operators to determine the revenue being derived from individual end-users. Various measures of ARPU exist, for example, total ARPU and APRU minus interconnection, and although relatively simple to compute, it provides no indication of underlying profitability of each user
CATV	Cable Access Television Service: television services delivered via a cable network rather than terrestrially or via satellite
FTNS	Fixed Telephone Network Service: A generic term which refers to the provision of telephony services using fixed (wireline) technologies, rather than wireless systems
GDP	Gross Domestic Product: The total value of goods and services produced by a specific nation within that nation
HFC	Hybrid Fibre Co-axial: Telecommunications network in which optical fibre and co-axial cable are used in different sections of the network to provide higher bandwidth capacity to end-users. The optical fibre cable is used in the backbone component of the network and co-axial cable is used to serve individual end-users
HHI	Herfindahl-Hirschman Index: A measure used by the United State's Department of Justice and the Federal Trade Commission to assess the level of concentration in any defined market
ISP	Internet Service Provider: Company or other entity that provides end-users with access to the Internet. Typically an ISP will have a point-of-presence (PoP) for connection to the Internet in each defined geographic area served into which end-users connect
LLU	Local Loop Unbundling: A process where the incumbent is mandated to offer its local access lines to other competing service providers often at a regulated access charge
MNP	Mobile Number Portability: Regime that allows a mobile subscriber to retain his/her existing mobile number when changing between mobile operators / service providers
MVNO	Mobile Virtual Network Operator: A mobile operator which acquires bandwidth capacity from a Mobile Network Operator on a wholesale basis to provide retail mobile services to end-users without the need to acquire spectrum or build a radio network
PCS	Personal Communication Services: Digital mobile service which generally operates in the 1800-1900 MHz bands. Several technologies are used for PCS including Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile (GSM)
PPP	Purchasing Power Parity: The purchasing power parity process aims to facilitate more accurate comparisons between markets. The use of nominal exchange rates in such practices often does not
OFTA	Office of the Telecommunications Authority: The telecommunications regulator in Hong Kong

{ spectrum

Spectrum Strategy Consultants

7 Temasek Boulevard, #26-04 Suntec Tower One Singapore 038987 Yang-Soon Lee Dr. William Bratton Anish Madan

Consulting team:

Tel: +65 6820 3388 Fax: +65 6820 3389

Barcelona : Brasilia : London : Hong Kong :

Rome : Singapore : Sydney

www.spectrumstrategy.com