

Possibilities for deregulation: a case study of Hong Kong

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Introduction

Since 2004, Hong Kong has embarked on a course of deregulation. Some of the *ex ante* regulations introduced at the beginning of liberalisation have been scaled back as competition in the market has become more effective. This paper focuses on economic regulation on interconnection and access. It examines the deregulation steps that have been taken, the considerations behind them, and discusses the opportunities for further deregulation in the environment of fixed mobile convergence and next generation networks.

Some background on Hong Kong

Hong Kong is a Special Administrative Region of the People's Republic of China. The land area is about 1,100 square kilometres; the population is 6.9 million; and there are around 2.2 million households. The Gross Domestic Product in 2005 was about US\$25,000 per capita, with the services sector accounting for nearly 90 per cent of that figure. Hong Kong positions itself as an international centre for finance, trading, logistics and tourism.

Hong Kong's economic development has been underpinned by an efficient telecommunications infrastructure and high quality telecommunications services at competitive

prices. The market is very competitive and penetration rates are high. Some key statistics of the telecommunications industry in Hong Kong are given in table 1.

Ex ante regulation

Hong Kong has adopted market-driven policies in the telecommunications sector, with all sectors of the Hong Kong telecommunications market having been opened to competition since January 2003. The number of operators is determined by the market, except where physical constraints (e.g. spectrum availability) limit them. All investment in the telecommunications industry is market-driven and there is no government subsidy. The industry is fully privatised and there is no foreign ownership restriction for any type of telecommunications operator, whether facilities-based or services-based. The Office of the Telecommunications Authority (OFTA) regulates the industry under the Telecommunications Ordinance.

It was in 1995 that the local (domestic) fixed network market started a progressive opening-up to competition when three new entrants were licensed to compete with the incumbent. In 2000, licences to new entrants were awarded for wireless technologies (Local Multipoint Distribution Systems, LMDS). The cable

Number of telephone lines	3.8 million
Telephone line density	54% by population
Number of broadband connections	1.65 million
Broadband penetration	23% by population 65% by households
Number of domestic fixed network operators	10 (6 active in retail market)
Number of mobile customers	Post-paid – 4.7 million Pre-paid – 3.8 million Overall – 8.5 million
Mobile service penetration	Overall 123%
2.5G/3G customers as a percentage of all mobile customers	22%
Number of mobile network operators	5 (4 with 3G licences)
Annual revenue from telecommunications services	US\$6.3 billion (2004)
Annual capital expenditure in telecommunications sector	US\$ 1 billion (2004)

Table 1: Key telecommunications statistics in Hong Kong

television operator was also licensed to operate a broadband internet access service over its hybrid fibre coaxial cable network, effectively forming the fifth wireline local fixed network. Since January 2003, the local fixed network market has been fully liberalised.

Like other markets which develop from a monopoly, the incumbent operator remained dominant in the early days of market liberalisation. It was therefore necessary to introduce *ex ante* regulation while the market was not fully effective to protect consumer interest and to foster the development of competition. It was intended that this regulation should act as a surrogate for market forces and could be withdrawn when the market became effective.

The regulation is contained in a combination of legislation, the Telecommunications Ordinance and the conditions of licences issued

under it. One example was that the retail prices of the incumbent operator, including discounts, were subject to *ex ante* approval by OFTA in order to prevent anti-competitive pricing while the incumbent operator retained its dominance in the market. In contrast, the new entrants were only required to publish the ceiling of their prices. This regulation was terminated from January 2005 after considering the status of competition in the market.

Regulation on interconnection and access is by far the most important element of the *ex ante* regulation. The obligation of network operators or 'carriers' to interconnect is contained in the conditions of the licences issued to them. Under these conditions, the licensee is obliged to interconnect with other networks and services and the interconnection charges should be based on the reasonable relevant cost attributable to the interconnection.

Under the Telecommunications Ordinance, OFTA may determine the terms and conditions of interconnection, and issue guidelines on it. Before intervening to make an interconnection determination, OFTA has to consider a number of factors: these include government policy objectives for the telecommunications industry; consumer interests; encouraging efficient investment in telecommunications infrastructure; and the nature and extent of competition among the parties to the interconnection and other relevant factors. That an operator has ‘significant market power’ or ‘dominance’ is not explicitly mentioned in the legislation as a factor to be considered by OFTA, but as for all economic regulation, OFTA has to consider if there is any market failure in deciding whether to intervene.

Therefore, these two market characteristics would be relevant factors in the consideration. In Hong Kong, there is also no specific provision in the legislation on ‘unbundling of network components’, but the definition of ‘interconnection’ has been extended to include “access to, or interconnection with, any element of a telecommunications network on an unbundled basis at any point that is technically feasible”. For this reason, there are two types of interconnection under the Hong Kong legislation: ‘Type I interconnection’ and ‘Type II interconnection’.

Type I is the commonly-known type of interconnection defined in other regulatory regimes such as the EU regulatory framework for electronic services. It refers to interconnection between networks and services such that users connected to one network may communicate with, or gain access to, other users or services connected to other networks.

‘Type II interconnection’ refers to interconnection by one operator to the

customer access networks (e.g. local loops) of another, to enable it to reach its customers. This achieves the same objectives as ‘unbundling of local loops’ in other jurisdictions. New operators were allowed to interconnect to the copper-based local loops at the telephone exchanges of the incumbent operator, so that they could start offering services to their customers before their own customer access networks were rolled out.

Type II interconnection

Apart from legal treatment, there are a number of features which distinguish the Type II interconnection arrangements in Hong Kong from ‘unbundling of local loops’ in other countries.

Firstly, Hong Kong has not unbundled network elements other than the local loops. The new entrants are expected to build their own concentrators, backhauls, switches and trunks so that Type II interconnection would facilitate the emergence of some facilities-based competition. Secondly, the Type II interconnection applied only to the copper local loops which were constructed by the incumbent during the monopoly period and has never been extended to newly-built optical fibre cables or wireless access networks. Thirdly, there was a deliberate attempt to scale back Type II interconnection at the stage of further liberalisation in the local fixed network market in the year 2000, as post-2000 entrants are no longer entitled to Type II interconnection mandated by regulation at the exchanges of the incumbent.

This type of interconnection has been effective in opening up the narrowband fixed network market to competition. At the end of 2004, about 11 per cent of local telephone line users were served by the new entrants through Type II. This, combined with self-built customer

access networks connecting about 19 per cent of local telephone line users, enabled competition to develop in the local fixed network market. The market share of the incumbent declined steadily to the 70 per cent level. However, the existence of Type II interconnection policy has not discouraged roll-out of self-built customer access networks by some new market entrants. This has something to do with the economics for self-built networks in Hong Kong.

Although the total land area is over 1,000 square kilometres, the terrain is hilly and therefore the population is concentrated into much smaller usable land areas. As a result, the population density in the urban areas can reach 50,000 people per square kilometre. Most of them live in multi-storey apartment buildings, with one building in the private sector typically housing 200 units or more. In contrast, a public housing estate can accommodate thousands of families.

The costs of rolling out optical fibres to these buildings can be shared by a large number of potential customers. Estimates say that 80 per cent of the 2.2 million households in Hong Kong are accommodated in around 8,000 buildings and that it is technically feasible, and economically viable, for the new entrants to lay optical fibres to reach those buildings as an alternative to the incumbent's copper local loops. The legislation facilitates the rollout of self-built customer access networks by giving local fixed operators a statutory right of access to the communal areas of apartment buildings (i.e. areas other than those for exclusive occupation by the residents) to install cables and equipment to reach their customers inside the buildings.

OFTA also adopts a number of active measures to facilitate network rollout. These include

co-ordinating road-opening work (to help expedite the issue of excavation permits by the relevant authorities); promoting the provision of adequate equipment rooms and cabling ducts inside buildings; liaising with building managers and property developers (to overcome building access problems); and launching programmes to educate the public (about the merits of facilitating access of multiple networks into their buildings).

Another factor is that the new entrants who came into the market after 2000 have no alternative but to self-build their customer access networks. Even for one of the pre-2000 entrants that was entitled to Type II interconnection, it has instead adopted a policy of self-building – probably because of the perceived advantages of having access networks owned by itself; better control of lead time to serve customers; product differentiation; and the potential to develop higher-performance services for the future.

As a result, facilities-based competition has emerged in the local fixed network market. Apart from 98 per cent coverage of homes by the Digital Subscriber Line-enabled (DSL) local loops of the incumbent operator, over 90 per cent of homes are within the reach of the cable modem service of the cable television network. 71 per cent of homes are within the coverage of the customer access network of at least one other new operator, and 43 per cent are within the coverage of the access networks of at least two other new operators.

The new entrants' customer access networks are typically using fibre-to-the-building technology, with optical fibres laid in underground ducts to a telecommunications equipment room, located on the ground floor or basement of a building. The final connections to the customers' premises in the

building are through Category 5 copper wires laid in the vertical risers and horizontal ducts inside the building.

As a result of facilities-based competition, prices for broadband have dropped to very competitive levels compared with narrowband access, and have stimulated demand.

Broadband penetration of households has reached 65 per cent, and operators have taken advantage of this high uptake to offer IP telephony and IPTV services over the broadband connections. 'Triple-play' services (i.e. services comprising voice telephony, internet access and pay television) are offered by four fixed network operators and their affiliates. New operators have captured 48 per cent of the broadband market.

This level of competition in the market has prompted Hong Kong to review the regulation of Type II interconnection that was introduced in the initial period of market liberalisation. In the short-term, Type II offered more choices to residents in multi-storey buildings, and increased competition. However, it is also viewed as a low-risk approach of connecting those customers. Its existence could dilute the incentive for investment in alternative customer access networks which have the potential to offer more advanced services, rather than relying on the DSL-enabled local loops.

The benefit of Type II has to be weighed against the cost of slowing down the rollout of more modern infrastructure. In view of the expanding coverage of the customer access networks of the new operators, it has been decided that continuing with mandatory Type II interconnection indefinitely can no longer be justified. The Government decided in 2004 to end the mandatory application at the telephone exchanges by the end of June 2008, with the exception of cases where the copper local loops

of the incumbent operator are still 'essential facilities'. For buildings already connected by more than one customer access network, the withdrawal of Type II interconnection for access to the buildings from the telephone exchanges will be sooner: three years after the buildings received these networks.

Most customers in Hong Kong live in multi-storey buildings. With the optical fibres connecting the buildings terminated in the telecommunications rooms on the ground floor or basement of the buildings, the customers on the upper floors have to be connected through in-building wiring systems normally based on copper cables. These cables are routed through in-building risers and ducting systems.

Owing to space limitations, and difficulties in installing additional cables leading to customers' premises once the buildings have been occupied, the in-building wiring systems can become 'bottlenecks' in some cases. For this reason, Type II interconnection to the wiring systems from the equipment rooms or distribution boxes inside the buildings will be continued. Normally, operators negotiate with each other for mutual access to the in-building wiring systems under their control, with OFTA intervening only if these negotiations fail. So far, OFTA has mediated in inter-operator disputes, but no determinations have been requested.

Type I interconnection

This regulation is essentially to achieve the policy objective of 'any-to-any' connectivity. Every user connected to a telecommunications network can communicate with any other user, or access any service, whether or not the other user or service is connected to the same network or another network. Like other regulators, OFTA has implemented *ex ante*

regulation on Type I interconnection. The extent of regulatory attention has depended on whether the interconnection arrangement is symmetric or asymmetric.

Symmetric arrangements

Symmetric Type I interconnection applies between fixed networks for communications between users. The originating network operator pays an interconnection charge to the terminating operator and the charge applies on a reciprocal basis. The *ex ante* regulation in Hong Kong for symmetric Type I interconnection has been applied with a light touch. The network operators have an obligation to interconnect with each other under their licence conditions. There is no specific provision in the legislation to require the dominant operator to publish Reference Interconnection Offers for interconnection.

OFTA has issued guidelines, setting out the charging principles for interconnection and the methodology for calculating the interconnection charges. Also, OFTA has adopted international best-practice that the interconnection charges should be based on the Long Run Average Incremental Costs. With guidance from these OFTA guidelines, the operators are expected to negotiate interconnection agreements on a commercial basis. OFTA may make a determination on the terms and conditions of interconnection if commercial negotiations fail.

The need for imposing the *ex ante* regulation was to address the imbalance in bargaining power between the incumbent and new entrants in interconnection. Without the obligations and OFTA guidelines, the incumbent probably did not have the incentive to interconnect with a new entrant when the entrant had a zero, or small, customer base.

Meanwhile, more than ten years have passed since Hong Kong opened the local fixed network market to competition. The networks that have entered the market have grown in size, and the relative bargaining positions of the network operators have become more balanced. Both the incumbent and the new entrants need to interconnect with each other in order to meet the expectation of their customers. Therefore, there is considerable countervailing power to work against the exercising of any market power in terminating calls.

For this reason, there is increasingly less need for OFTA to intervene in the negotiations; in fact, since liberalisation commenced, there have been just two occasions when OFTA stepped in to determine the interconnection charges between the incumbent and one new entrant. And since 2003, OFTA's intervention hasn't been needed at all in this type of interconnection between two fixed networks.

At this stage, OFTA does not consider that it can completely withdraw *ex ante* regulation on Type I interconnection. In principle, in a competitive market, operators should be free to negotiate terms and conditions for interconnection among themselves. OFTA's guidelines, and the power to determine as a backup, could be viewed as a form of intervention affecting the outcome of negotiations.

However, the appropriate balance must be struck between avoiding undue interference with the market process and minimising uncertainties that increase investment risks and raise entry barriers. Some basic ground rules would still be required; without them, there would be considerable uncertainty and protracted negotiations. So OFTA should, for the time being, continue to impose the obligation to interconnect and lay down the basic rules of interconnection. However, should

the operators negotiate and agree to adopt different terms for interconnection, then OFTA should not interfere with their commercial agreements. Regulation would remain as a backup to resolve disputes which cannot be resolved through commercial negotiations.

Asymmetric arrangements

In Hong Kong, asymmetric Type I interconnection arrangements exist between fixed networks and mobile networks, and between networks and services. In the past, these arrangements have demanded more regulatory attention.

The first type of asymmetric interconnection arrangements exists between fixed networks and mobile networks. A Mobile Party Paying (MPP) arrangement is implemented at the retail level for mobile services; the mobile users pay for the calls they make and receive. At the interconnection level, for a call originating from a fixed network to be terminated on a mobile network – and for a call in the reverse direction – the mobile network operator has to pay either an origination charge or a termination charge, as the case may be, to the fixed network operator. (As far as OFTA is aware, this asymmetric arrangement is rather unique in the world; it is the legacy of treating mobile services as being ‘value-added’ services, when they first appeared in the market.)

As the costs arising from the interconnection charges are borne by the mobile customers, and would not directly affect the decisions of the fixed line customers in choosing their fixed network suppliers, the fixed network operators would not be subjected to competitive pressure to lower the origination or termination charges. Therefore, the market may not be working effectively to restrain the origination/

termination charges. For this reason, the level of these charges of the incumbent has traditionally been regulated by OFTA.

OFTA uses a cost model to work out the origination/termination charges and agrees with the incumbent operator to publish a tariff based on OFTA’s calculations. OFTA has a backup power to make a determination if the incumbent operator does not implement the charges it has worked out.

The current asymmetric arrangement is obsolete and would not be sustainable in the environment of ‘fixed mobile convergence’ (FMC), as user terminals served by the same network operator may be fixed at some times and moving at others. Interconnection rules based on the distinction on whether the user is fixed or mobile would become unenforceable. OFTA has therefore initiated a review on the appropriate interconnection charging arrangement in the FMC environment.

The first question to be addressed in the review is whether any market failure is expected when the existing regulation imposing the asymmetric arrangement is withdrawn. If not, it should indeed be withdrawn. The next question is whether some guidance to the industry on the basic rules of interconnection would still be necessary, in order to provide more certainty and predictability of the regulatory environment after the existing regulation is withdrawn.

If this guidance is warranted, in evaluating options of the basic rules, OFTA aims to identify arrangements that would facilitate the development of convergence services and encourage operators to negotiate efficient interconnection agreements among themselves without regulatory intervention. The arrangements should, in principle, simulate

the outcome of commercial negotiations between operators of comparable bargaining power. A symmetric arrangement would better satisfy these criteria than the existing asymmetric one. This potential change is on the OFTA agenda of consultation with industry in 2006.

The second type of asymmetric arrangement applies to interconnection between networks and value-added services, such as internet access services and international telephone services. The service providers have to pay an interconnection charge to the network operator, to pay for the network resources consumed to connect the services to their users. The levels of the interconnection charges of the incumbent operator have traditionally been regulated by OFTA. A review has been initiated to look at whether market forces are able to constrain the level of these charges; the extent of the constraints differs according to the types of services.

In the case of origination charges for internet access services, the high penetration rate of broadband in Hong Kong would exert considerable pressure on those charges. Dial-up access is used mainly as backup. If the origination charge becomes excessive, users would simply stop using the dial-up access. It is therefore likely that the origination charge for internet access services may be deregulated.

When it comes to the origination of calls from fixed network users to international telephone service providers, and for the termination of incoming international calls to the called parties on the fixed networks, the competitive constraints on the fixed network operators to set the interconnection charges are not so obvious.

For outgoing international calls, the calling parties may, arguably, use (in addition to fixed phones) mobile phones and IP telephone services, but this ability to substitute is still to be assessed. For termination of incoming international calls, the calls can be terminated only by the networks to which the called parties are connected. As part of the review currently in progress, OFTA will examine whether market forces can act effectively to constrain the interconnection charges for call origination and termination.

Next generation networks

As in many other countries, operators in Hong Kong are busy implementing, or planning transition to, next generation networks (NGN). The equivalents of Type I and Type II interconnections to NGN should, in principle, still exist. Up to now, Type I interconnection between IP networks has been based on commercial agreements which are working well, and give no reason for the regulator to intervene. As explained in the section on Type II interconnections, regulated Type II interconnection will be phased out from the middle of 2008 and is unlikely to be re-introduced for NGN. However, one area that may need regulatory attention is interconnection and access to NGN infrastructure for the provision of services, applications and content.

In the NGN environment, intelligence and functionalities for the provision of services embedded in the switches of traditional networks will be moved to the network edges, to reside in the users' devices and servers of services and applications providers. This will enable the separation of facilities operation and services provision. Providers who do not own and operate physical infrastructure will

also be able to offer services, applications and content in addition to the facilities operators.

The benefits of NGN in unbundling services provision and facilities operation would not be realised unless NGN operators opened the access to their network infrastructure to competing service providers. Inevitably, the number of infrastructure operators will be limited by economic and technical factors. Therefore, if the facilities operators do not allow 'open access' to their network infrastructure, oligopoly would develop in the market for services, applications and content. This open access to the NGN would enable competition for services, applications and content over the NGN infrastructure, bringing diversity, choice and innovation to the users. There will also be more opportunities generated for increasing numbers to participate in the market, including small and medium-sized enterprises which do not have the resources to invest in network infrastructure.

However, it is also necessary to preserve the commercial incentive for investment and deployment of advanced network infrastructure based on new technologies. Without such an infrastructure, the market for the services, applications and content would not materialise – after all, NGN involves substantial and possibly risky investment. The return on investment may depend on revenue from services, applications and content provided by the NGN operators themselves over the infrastructure. They may not have the commercial incentive to open their networks to competing services-based operators as they do not want to see revenue diverting to third-party providers. Regulatory intervention to mandate open access at cost-based prices could potentially dilute the incentive to invest.

The issue, then, is to what extent should *ex ante* regulation be employed to achieve this open access? In this regard, OFTA considers that there is no need to create new principles for NGN. The principles applicable to all economic regulation should be applied. *Ex ante* regulation should be employed to deal with market failures that cannot be overcome over time without regulatory intervention.

As is well known, the architecture of the NGN comprises four layers: namely (from bottom to top), the access layer; the transport (core network) layer; the control layer and the applications layer. In the Hong Kong environment, competing access networks have been constructed based on DSL-enabled local loops, fibre-to-the-building and hybrid-fibre-coaxial cable technologies. Four 3G networks are in operation and broadband wireless access (BWA) is planned to be licensed soon.

We can therefore expect that there will be multiple access networks connected to the core networks. There is also no entry barrier to the core network market. With alternative networks emerging, it would be unlikely to see a bottleneck at the access and core network layers. *Ex ante* regulatory intervention at these two layers is therefore unlikely to be justifiable, with the exception of some remote areas where the incumbent's local loops may remain as 'essential facilities' in the foreseeable future. As regards interconnection and access at the upper levels, the control and application layers involve new interfaces that may not have equivalents in the traditional networks. Whether new bottlenecks would emerge at these layers remains to be seen; however, if they do, regulatory attention might be necessary.

Although regulated access may not be warranted for infrastructure that has no

bottleneck issues, experience in Hong Kong tells us that the mere existence of multiple access networks in competition does not automatically lead to open access. Whether the infrastructure operators would adopt a walled-garden or open access policy would depend on whether they viewed the provision of access to third-party service providers as a potential revenue threat to their own services, applications and content – or, conversely, an enhancement to their revenue from increased usage of their network infrastructure.

So far in Hong Kong, the business model commonly adopted by 3G and broadband fixed network operators is to bundle the broadband access with the provision of their own services, applications and content such as IPTV, IP telephony services and 3G content.

In the case of IPTV services, there are three operators in Hong Kong. So far, there has been one commercial agreement concluded between an IPTV service provider and the operator of a broadband network for delivery of the IPTV services; but in this case, the latter does not operate any IPTV services. On the other hand, two other broadband access network operators – who also act as content aggregators and IPTV service providers over their own networks – have yet to open their networks to third-party service providers.

In the case of IP telephony services, the broadband customer access network operators provide services over their own infrastructure to the customers. The users can also access, through their broadband connections, services provided as applications on the public internet. These applications may be provided on the internet by operators within Hong Kong, or by overseas operators. So far, there have been no cases of the broadband customer access network operators offering the

access services to IP telephony service providers under a commercial agreement.

In the case of 3G content, the four 3G network operators have been aggregating and supplying content through their own portals. No commercial agreement for opening up the network to third-party content providers has been concluded. Third-party content may be accessed through the internet, although a combination of the data conveyance charges, the relatively more cumbersome steps involved and the suitability of the internet content for display on handsets with small screens probably discourages such access.

The 3G network licences contain obligations for the network operators to open 30 per cent of the network capacity to third-party content providers or Virtual Mobile Network Operators. However, OFTA does not intend to intervene until third-party content providers have made reasonable attempts to conclude commercial deals for access, but without success. So far, no request for intervention has been received by OFTA.

Although no substantial open access has been achieved at present, users are able to reach services, applications and content supplied over the internet. Such delivery modes would in the future exert competitive pressure on the operators of NGN infrastructure to open their networks to third-party service providers. So long as the NGN users can freely access applications on the internet without blockage or deliberate degradation of performance, service providers would be able to deliver their services to their customers through the internet, at least on a 'best-effort' basis. With an open internet, any walled garden policy of the NGN operators cannot be totally effective.

In the supply of applications over the internet, and in the absence of commercial relationships with the operators of the NGN, the delivery of the packets for the applications over the core and access networks of the NGN would be on a best-effort basis only. The service providers would have the incentive to seek direct access to the NGN under commercial agreement, in order to secure better control of the quality and reliability of the delivery services. NGN operators would also have the incentive to offer direct access with better grades of quality and security than best-effort delivery services, for which the NGN operators would charge a premium.

So there should be reasonable prospects for commercial relationships to be concluded between the NGN operators and the third-party service providers. Relationships forged this way would be more sustainable in the long-term than one imposed by regulation.

In the longer-term, it would be possible for the service providers to set up transmission paths over the public internet with guaranteed end-to-end quality of service for certain types of traffic, for which the service providers or the end-customers would be expected to pay.

There are no grounds to object to the service providers, or the end-customers, being charged for differentiated quality of delivery services over the internet – provided these charges are levied for specific levels of service open to all websites or service providers, on a non-discriminatory basis. The NGN operators should have the commercial incentive to interconnect with other operators to deliver traffic under specific service level agreements and share the additional revenue.

Taken as a whole, it is premature to conclude that *ex ante* regulation is necessary to achieve

open access in the NGN environment. The NGN market is still new and emerging, and business models and relationships are evolving. Premature regulatory intervention could stifle both investment and innovation. Because multiple broadband access networks exist in the Hong Kong environment, there are real opportunities for market forces to bring about open access.

We should allow more time to see whether services-based operators would be able to obtain access to the NGN on a commercial basis. Without the imposition of *ex ante* regulation, the practices of the NGN operators in the market will continue to be constrained by competition law on an *ex post* basis.

Conclusion

Hong Kong's high population and building densities have meant that OFTA has been able to go further down the deregulation road than countries where the 'last-mile' to the users remains an economic bottleneck for the foreseeable future. OFTA has been able to withdraw some existing *ex ante* regulation on the traditional networks, such as setting a termination date for mandatory Type II interconnection (the equivalent of unbundling of local loops in other jurisdictions). Beyond that date (in mid-2008), competitors in the market will generally be facilities-based and not dependent on regulated access to the incumbent's network.

The extent of deregulation has only been possible because of the level of facilities-based competition which, although attributable to Hong Kong's population and densities, may also have been helped by certain regulatory policies for the rollout of competing infrastructure.

The first is the policy to promote competition in the market: competition drives the entrants to

consider self-building their customer access networks in order to differentiate their services from those of the incumbent.

The second is the deliberate policy to contain the scope of Type II interconnection (unbundling of local loops) so that an optimum balance was struck between accelerating competition through access to the incumbent's last-mile and maintaining the incentive for infrastructure investment.

The third are the legislative and administrative measures to facilitate network rollout, such as the statutory right of access into apartment buildings for installation of equipment and wiring systems, and the proactive involvement of the regulator in facilitating road opening and building access.

While facilities-based competition is regarded by many regulators as the desirable goal, if it is applied on its own in the NGN environment it may lead to oligopoly in the market for services, applications and content if the network infrastructure is not opened to third-party service providers. This would then lose the benefits of the unbundling of facilities operation and services provision in the NGN environment. Therefore, OFTA considers that it should promote open access in order to enable a thriving market for services, applications and content to develop over the NGN infrastructure.

However, OFTA does not intend to apply prematurely *ex ante* regulation to the NGN. There is a need to preserve commercial incentive for infrastructure investment. In any case, in an environment where multiple

networks can reach the customer premises, *ex ante* regulation would not be justifiable unless a bottleneck issue could be established in the NGN. OFTA would allow time for business models and business relationships to evolve before considering *ex ante* regulation.

By ensuring that NGN users have unrestricted access to the services, applications and content on the public internet, there may well be sufficient competitive pressure on the NGN operators to offer open access to their networks to third-party service providers; if not, the competing products would simply be accessed through the internet. Direct access to the NGN would enable the service providers to control the level of quality and reliability of service delivery to their customers, while the NGN operators received additional streams of revenue.

So, there is scope for market forces to be allowed to work in order to achieve open access. Should this access fail to materialise, due to bottlenecks in the NGN that were unlikely to be resolved by the market in a reasonable period, OFTA would consider *ex ante* regulation.

In this chapter, I have focused on economic regulation, but social and technical regulation may continue to be required in the NGN environment if the market cannot deliver the desired policy objectives on its own, and if the benefit achieved through regulation exceeds its cost. Social regulation may be required to achieve universal service and to protect public consumer interests, while technical regulation may be needed to facilitate interconnection and interoperability between networks.