The Case Against Auctions in Hong Kong

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(This paper represents work in progress and is subject to further revisions)

August 2000

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A. Auction Arguments

1. The argument for auctions in the allocation of radio spectrum for mobile telecommunications services rests essentially upon two points. First, economic efficiency may be enhanced. Second, they are a cost-effective way to raise funds for the national treasury. For example, both these issues are raised by Paul Klemperer [2] who designed the highly successful UK auctions for 3G licences that raised £22.5 billion (US$33.75 billion), approximately 2.5 per cent of GDP which in Hong Kong is the equivalent of HK$35 billion.

2. Of the two issues, the second, raising funds for the national treasury, is the more easily dismissed in Hong Kong's case. Hong Kong does not have a public debt that needs to be paid off, and has no interest in behaving as if it plans to have one. Further, the taxation rate is low and taxation policy is simple to understand and to administer, so there is no need to explore *more* cost-effective means of raising revenues. (This argument has nothing whatever to do with the entirely separate issue of the need to find *equally* cost-effective alternative forms of taxation, for example, a sales tax.)

B. Windfall for the Treasury?

1. But if Hong Kong does not need to raise money through auctions, should it nevertheless take advantage of a windfall? Many people think it should, but there are several points to be made against it.

2. One is that if an auction were used for this reason it would be an unprecedented and highly opportunistic policy intervention that would introduce an element of uncertainty into the public policy arena. Hong Kong's tradition of macro-economic management on the contrary has been reliance upon the predictable to minimize uncertainty. (For example, keeping public sector spending within the growth limits of the economy.) In particular it would raise doubts about future policy towards licence renewals and the licensing of spectrum for other lines of business, such as broadcast television and services offered over fixed wireless.

3. Another reason is that there should be good cause why the taxation levied on one industrial sector is higher than upon all others. The purely pragmatic argument is simply that the chance arises, but the more sophisticated argument goes along the

[1] I wish to thank SUNDAY for funding the research that went into this paper, and to James Rhyu for his help with the financial model, but I remain solely responsible for any statements and opinions expressed. The paper, including the financial model, represent work-in-progress and is subject to revision. Copies of the final paper and model will be available from the author upon request.
[2] 'What Really Matters in Auction Design', www.nuf.ox.ac.uk/economics/people/klemperer.htm

lines that monopoly rents or abnormal profits may arise from the commercial exploitation of a scarce public resource, such as radio spectrum. In this case, taxing these monopoly rents for the public purse will cause no common harm.

4. The example often used is that of land policy in Hong Kong, but the analogy cannot be pushed too far. Land for private development has little aspect of a public good about it, which is to say that its use by occupants excludes its use by others. On the contrary, radio spectrum for public mobile telecommunications is a widely re-usable resource subject to enlargement through capital expenditure on cell sites and other equipment, through innovation, and so forth. Indeed, the more persons on the network the more valuable the network becomes to everyone. Through the continuous and direct application of capital investment into mobile systems, in addition to the initial capital outlays on building the core networks, competition for subscribers is immediately transmitted into widespread public gain.[3] (See Appendix 1). It is therefore understandable that the pattern *throughout* the1990s was falling handset prices, monthly and airtime charges, in stark contrast to property rentals that fell *only* in times of economic recession.

5. There are more pragmatic reasons, two of them, against an auction for raising public money. The first, which is dealt with in the section H below, is that an auction is highly unlikely to raise much money in Hong Kong. Maybe no more than HK$8.5 billion, or US$1.1 billion. This contrasts with HK$35 billion or US$4.5 billion if the auction went the same way as in the UK, at approximately 2.5 per cent of GDP. US$6.4 million is less than US$165 per capita. The UK auction raised US$580 per capita, while according to Paul Klemperer writing in the *Financial Times* 26 July 2000, the dismal Dutch auction raised only US$2.5 billion, or US$159 per capita, less than a third of the anticipated outcome. Klemperer puts the blame largely upon the poor design of the auction in the Netherlands. It failed to reserve one licence for a new comer, it failed to top the multiple-round ascending 'Anglo' auction process with a sealed "last and final" bid 'Dutch' auction (this prevents incumbents with deep pockets knowing what they need to bid to clinch the licence) and he also emphasizes the crucial importance of preventing collusion and consolidation of bidders through partnerships prior to the bidding process.

6. But the design of an auction cannot guarantee its outcome, even if the TA could prevent collusion and prior partnering, an almost impossible task because Hong Kong does not have Anti-Trust legislation, and the new Telecommunications Ordinance applies to licence conditions, not industrial structure. An auction in Hong Kong would most likely be an embarrassing failure, and the worst of both worlds since auctions may also damage the prospects of local players as global players have the deepest pockets. The knock-on effect this may then have on *local* content providers needs to be examined, but *prima facie* local players would seem to have greater sensitivity towards local content and local providers of content.

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[3] It is estimated that the overall saving to consumers from falling handset prices, monthly rentals and airtime charges between 1995 – 1997 was in the order of HK$6.63 billion. See J. Ure (1998) *The Economic Benefits of Telecoms Liberalization in Hong Kong*, paper for PECC, www.trp.hku.hk. See also Appendix 1.

7. The second pragmatic reason has to do with the very uncertain nature of returns on 3G investment, and that there is a more satisfactory way to tax monopoly rents in the highly unlikely event they should arise. Uncertainty, unlike risk, cannot be insured against. For example, all mobile operators run the risk their technology will be outdated by other advances, but they can spread their risk by buying into other networks or other technologies. However, while 2G operators have faced their markets with reasonable certainty as to what their revenues streams would look like, what subscriber growth would look like, what would happen to future handset prices, and so on, 3G operators are entering totally uncharted waters. 3G is a broadband Internet industry, immature and highly uncertain in almost all its aspects. It is not just high risk (insurable) but a high gamble. The only known way to cope with it is through the use of options, basically keeping as many as possible open, including the option of exit or of non-entry. The Government also has an option, to identify a threshold level of profits beyond which a monopoly rent tax will kick in. Operators fortunate enough to face that situation would then have the choice of paying the excess profits tax or lowering prices to benefit the public and improve their own competitive grip on the market. A good option to exercise.

C. Economic Efficiency

1. The most common argument for auctions is that they ensure that spectrum will go to those companies who value it most. (If the auction is well designed this statement becomes a tautology.) But this argument cannot prove that society will value most the way those companies use the spectrum. Once spectrum is issued the alternatives are history and therefore are not available to the public to choose or to value.

2. So the economic efficiency argument rests upon an article of faith that the value the successful bidders place upon an auction is well grounded. But unless *also* the outcome of the auction is a competitive market that will drive the failures *out* and allow new comers *in*, the issue of efficiency is itself not well grounded. So market structure is vitally important.

3. It is worth quoting Paul Klemperer, advisor to the UK government, commenting in the *Financial Times* 26 July 2000, on the designs of the Dutch and German auctions: ‘Unless governments get smarter in tailoring their spectrum sales more effectively to local circumstances, tougher in their competition policies, and more careful in choosing the resulting market structures, the remaining European spectrum auctions will serve shareholders’ interests rather than those of consumers or taxpayers.’ Auctions alone, therefore, are not sufficient. To make them work effectively a strong anti-trust enforcement is required. Hong Kong does not have the legislation or the practice to go down this road, yet without them auctions are not likely to maximize consumer welfare.

4. What other motives can drive bidders besides a good sense of what will make the business a success? The stock price is clearly a major one, either the need to maintain it, or to exploit it once the licence is secured, for example, by trading part or all of the

franchise, or to make strategic use of it, for example using high share values to purchase interests in other companies. Stock market considerations clearly had a beneficial influence on the outcome of the UK auction. An economic efficiency argument in Hong Kong cannot be made to depend upon the fortuitous state of the stock market. Efficiency is not serendipity.

5. Another strong motive arises from 2G operators wanting to survive in business. There is little or no long-term future for pre-3G operators, and any incumbent operator who fails to win a licence is likely to be forced to sell their network. The costs of building a 3G network from scratch are assumed to be much higher than in the case of building overlay networks in the early years, so incumbents have some advantages, and new entrants will therefore have an incentive to buy up or into existing 2G networks. The business case for doing so is strong because 2G customers can be migrated to the 3G networks. All this adds up to the conclusion that incumbents with sufficient capital resources will bid whatever it takes. Indeed they have an incentive to overbid because failure to secure a licence means short-term death, whereas securing an overbid licence at worst means a delayed death, and possibly living out a comfortable old age on an annuity if later on someone buys the network. Incumbents without the capital resources will simply give up early because they will know they can only secure a licence by overbidding against new entrants who have deep pockets.

6. There is a variant to the above. If incumbents have deep pockets, they can signal their intention to bid whatever it takes and the new entrants will hold off because they know they will have to overbid to win a licence. Only if the auction is designed as it was in the UK to ensure that at least one new entrant was guaranteed a licence will new comers have an incentive to join the bidding. But in Hong Kong there is perhaps one incumbent, two at the outside, with sufficiently deep pockets. This is a very widely held view within the industry in Hong Kong. This means that an auction would have one of two outcomes. (1) Either no new comers bid for a licence, in which case incumbents will win at very little cost; (2) or major international players with deep pockets descend on Hong Kong (*note*: new comers without deep pockets would be disadvantaged from the outset by the need to build 3G from scratch) and outbid all the locals bar one. But unlike the UK auctions, the big players would not substantially outbid each other because they are not incumbents, and they will not regard Hong Kong as a large market nor in the European sense, a strategic one. The major expenditure of the new entrants would most likely not be on the auctions but on buying up the 2G incumbents after the auctions.

7. Why is Hong Kong less strategic for 3G investment than Europe? The simple answers are roaming and size. To be a European player, to have a chance of picking up revenues at both ends of the roaming game, a licence, or at least a part interest in one, in the UK, in France, Italy and Germany is essential. And each of these markets dwarfs Hong Kong. Mainland China is always an attraction, and roaming to Singapore, Taiwan, Korea and Japan, and beyond to the Pacific Rim, does hold great potential, but roaming revenues are still relatively small as a proportion of total revenues. Also broadband wireless Internet content and applications are likely to

remain much more segmented in the Asia-Pacific than across Europe for the foreseeable future.

8. For all these reasons, auction prices will reflect a variety of factors that differ from market to market, and the economic efficiency argument suggests this will be so. But the results of some of these factors, such as stock market prices, strategic bidding, the balance between incumbents and new comers and the deepness of their respective pockets, while they may be efficient for the winning companies, may not be particularly efficient for the Hong Kong economy. And, according to the architect of the successful UK auction, Paul Klemperer, auctions will only produce an efficient allocation of resources if the structure of the industry is regulated to prevent partnering and collusion *prior to* the auctioning process. This is a necessary requirement because auctions alone are not sufficient. Hong Kong does not have the anti-trust legislation in place to empower the TA in this regard, and the TA does not have the resources to enforce it. This simple fact is entirely overlooked by the advocates of auctions in Hong Kong. But the TA does have the powers to select suitable licencees if other procedures are adopted to allocate licences.

D. Auction Prices and Uncertainty

1. What methods can be used to estimate the possible value of a 3G licence through a bidding process in Hong Kong? They fall into two types. First, the benchmark approach which compares Hong Kong to other markets, especially those where auctions have taken place. Second, estimates of discounted future revenue flows arising from a 3G licence.

2. The problem with either of these approaches in the case of 3G is complete uncertainty of the nature of the business. For example, many in the industry believe that voice revenues will continue to be a source of earnings well into the decade, while others expect them to disappear quite quickly into a morass of packet-switched ‘data’. Many in the industry believe that monthly access charges will be sustained, while others believe they will not. Many in the industry believe that the demand for wireless Internet content and applications will rocket, often quoting the recent experience of DoCoMo’s iMode phone in Japan, but others are entirely skeptical of this trend as a major source of revenues for access providers. In particular there are divided opinions as to the respective market power of access and content providers. If access providers have market power they may be able to commit content providers to exclusive agreements and revenue-sharing arrangements, whereas if content providers have the power they will sell to anyone across any network.

3. Regulation is another unknown. Will 3G operators be required to give their customers digital codes so they can unlock themselves from the 3G server? BT and France Telecom have been required to do so. And just how sustainable is the ‘closed garden’ approach to capturing a subscriber in an Internet world? How many alternative networks will be licensed? Will they include the use of 2G spectrum? Will the ITU promote the release further spectrum? Will satellite technology one day provide a serious alternative for urban areas? Will low-intensity laser technology provide an

effective substitute, for example in areas such as shopping precincts where hand-off is not required? What access devices will be permitted, using what frequencies? All manner of alternative mini-computer access devices may become available, including those that provide machine-to-machine communications for installation in homes, offices, vehicles and even in clothing. Finally, will wholesaling be mandated? Will VMNOs steal the market, or will retail prices be driven below wholesale to keep them out, and if so what effect will that have on the value of the business?

4. For all these reasons there is no firm foundation upon which to build a business model of 3G, and therefore business plans can be no more than punts. In some cases business planners are beginning to look towards real option theory to estimate the value of a business according to the options a business plan holds for future management. If the option to choose a different technology, or to partner or merge with another player, or to shift markets are available then they bestow value on the business. (See James Alleman and Eli Noam, eds, 1999, *The New Investment Theory of Real Options and its Implication for Telecommunications Economics*, Kluwer Academic Publishers.) But option theory in industrial markets is just that, highly theoretical, highly mathematical and unlikely to be employed by any of the players interested in the Hong Kong market. In contrast, the option Hong Kong players can exercise is to quit or not enter the business, and that is the option some will take.

E. Benchmarking

1. Comparing across countries of disparate wealth, population size, landmass and so forth is fraught with difficulties. Financial analysts frequently compare across companies that serve similar urban markets, which makes sense insofar as metropolitan cities around the world are far more comparable, like New York, Shanghai, Singapore, Seoul and Hong Kong. In the case of 3G such benchmarking is speculative because the size and number of franchises issued will vary across markets.

2. A compromise would be to compare the per capita price per market and weight the results according to criteria such as per capita income, population densities, penetration ratios, etc, although insufficient data exists for 3G licences so far. But we do know the following: price per capita in the UK was US$580, in France it is set at US$296, in the Netherlands at US$159, and in South Korea US$76. It is also interesting to note that the German critics of Deutsche Telekom argue the price for the control of the US mobile operator VoiceStream is excessive at US$245 per capita.

3. A recent report by Salomon Smith Barney (*Asian Circuits: The 3G Auctions Debate*, 19 June 2000) uses the benchmarking approach to estimate what auction prices might reach in a number of Asian economies, including Hong Kong. They base their analysis *on the UK auction prices* adjusted to take into account (a) the size of the population in the coverage areas, and (b) local variations in existing ARPUs to take account of ‘the difference in subscriber quality across boundaries’. Their estimates come to US$2.84 billion (HK$22 billion) for Hong Kong and US$13.2 billion for South Korea. The figures calculated on a population coverage basis make the licence fee worth US$451 (HK$3,500) per capita for Hong Kong and South Korea.

4. On the basis of these figures Europe seems set to price licences per capita in the range US$150 (Netherlands) - US$300 (France, where four licences will be issued for US$4.7 billion each, and maybe Germany) with the UK as the outrider. In Asia, could Hong Kong reach Salomon Smith Barney's licence fee figure of US$451 per capita? For reasons given throughout this paper it is considered quite unlikely. There is just no business case in Hong Kong to support an auction price of US$2.8 billion (HK$22 billion). Is there a so-called 'strategic case' which goes beyond the limits of the local market? It is truly difficult to see one.

5. In newly industrialized Asia non-auction per capita prices maybe US$80 – US$100, and assuming Hong Kong is at the top end of this range, a licence fee of HK$8.5 billion would seem to be the absolute limit. In fact it would leave no value in the industry over the period of the licence. (Note: this is the *base case* model NPV for Hong Kong on the rather liberal assumptions, spelt out below, of a penetration rate of 110 per cent and an ARPU of HK$600 by 2010 and build-out costs of no more than HK$2 billion. In fact NPV could be substantially lower.) So in reality we are probably looking at a figure considerably below that, maybe less than HK$ 5 billion. It would seem hardly worth sacrificing the principal of non-opportunistic macro-economic policies for that sum, which is certainly a far cry from the excitement aroused around HK$35 billion that followed the UK auction results.

6. At this stage, pending the outcome of the German auction (late August) we regard the UK auction price as exceptional. According to the Smith Group of UK consultants who advised the UK government, using a conventional Net Present Value approach they estimated the value of licences at £1.5 - £2 billion. This corresponds to around HK$3 billion equivalent GDP, which is in the same ballpark as our Hong Kong model. The comment of Nick Graham-Rack, CTO of the Smith Group, was: "We are now beyond all reasonable predictions of what a licence may go for. The threat for the bidders is that they are in a lose-lose situation. If they fail to win a licence they will be penalized for losing the opportunity. If they win, they will be penalized because of the size of the investment." (http://else.econ.ucl.ac.uk/elseco/press/prizes.htm).

7. It is arguable whether companies, even those with deep pockets, would really want to repeat that experience in the case of Hong Kong. If they did it is important to note that the UK auctions were judged a success in terms of the money raised for the national treasury, but something of a financial disaster for the companies. Overall the winning companies, or their shareholders, have lost some US$200 billion in market capitalization since the auctions, plus the payment of US$35 billion in the auction itself. This means a total draining of a quarter of a trillion dollars in the UK, or 15 per cent of GDP, before a single dollar has been spent on the network itself. The negative multiplier impact of this capital drain has to be set off against any positive multiplier effects that may arise from the UK government using the auction revenue to reduce the national debt or increase public expenditure.

8. In the event of a high priced auction in Hong Kong the question would arise, how would these companies *attempt* to recoup their investments?

Are Auction Prices Sunk Costs Without Influence on Prices?

Economists tend to argue that auction prices are like any other sunk cost, they cannot be passed on to the consumer *if effective competition* drives prices down to marginal, or incremental, cost. Business folk and market analysts tend to argue the opposite, that is in practical terms someone has to cover these costs and sooner or later that means the consumer, unless the business goes bust. How to square this circle? At first sight these viewpoints are irreconcilable, but if we imagine a two-stage model the argument would go along the following lines:

Stage 1: prices are set at marginal cost due to fierce competition, and this either (a) drives market growth, or (b) fails to drive the market. If (a) then in Stage 2, industry-wide auction costs can start to be recouped by pushing prices above marginal cost. At each successive stage cost-recovery prices can be strengthened, but unless growth became completely insensitive to prices this would mean that mid-term and long-term growth rates would fall below their potential.

Stage 2: If (b) is the outcome in Stage 1, then the weaker 3G operators are forced to cut their loses, haul back on investment, maybe withdraw from the market completely, leading to industry consolidation. The deep-pocket players could try one more round of marginal cost pricing, in which case the outcomes could be as before, either (a) growth, or (b) no growth. If the outcome is (a) the shift towards cost-recovery prices will start in stage 3, and if consolidation has taken place in stage 2 this will strengthen the tendency. The same consideration as above about slower mid-term and long-term growth would apply. If the outcome is (b) then even the deep-pocket players will start cutting their loses, and the whole market will suffer.

9. So auctions do carry a strong implication of consolidation and industry collusion. We have noted above that a successful auction from the viewpoint of *consumer* welfare requires the backup of vigorous anti-trust regulation, and without that a market dominated by large international corporations answerable to overseas stakeholders will be difficult to control.

10. It is worth noting that a company winning a licence through an auction process, especially if a high price tag is attached, is far less likely to comply with the demands of the regulator if they hinder the recovery of investment costs. There will be an incentive to collude and to price gouge. This is all the more likely in Hong Kong's case because of the lack of anti-trust legislation and the difficulties the regulator inevitably has to enforce the licence conditions and provisions of the Telecommunications Ordinance to combat anti-competitive behaviour. Enforcement requires human resources to carry out investigations, it requires the collection of substantiated information, and by definition the concept of due process involves time

and therefore delay. The consensus of light-handed regulation would very likely be replaced with contentious industry-regulator stand-offs.

F: The UMTS-Forum

1. In 1998 the UMTS Forum compared two models to estimate the business case for 3G. The report states that the model 'indicates that the economics of UMTS are not as attractive as those traditionally associated with establishment of second generation mobile networks. This has to do with the traditionally lower margins of data communication services and the different market situation for UMTS.' (See box for details).

2. The report concluded that the sensitivity of the results was highly dependent upon the assumptions of subscriber revenues. 'An increase in subscriber revenue of 20 % would double the IRR, while a reduction of 20 % would reduce IRR to less than half the initial value.' Subscriber revenue assumptions (set out in chapter two of the report) are derived from forecasts in Europe. These show average revenue per subscriber equivalent to HK$415 in 2000, HK$338 in 2005 and HK$350 in 2010. And the saturation level assumed for Europe in the subscriber forecast to 2010 is 80 per cent. In our base case model for Hong Kong we assume HK$300 in 2001 and HK$600 by 2010, and a saturation rate of 110 per cent, which would indicate a substantially higher IIR. Despite this, our results for Hong Kong are very pessimistic.

3. The report also goes on to say that ' The economic model has indicated that the UMTS business case is sensitive to the investment level. Increased investment levels seriously reduces the internal rate of return, while reduced investments and the possibility of use of already existing sites increases it.' In our Hong Kong model we assume 3G build out costs of HK$10 billion (HK$2 billion x 5 operators), but this assumes overlay on 2G networks and few additional costs for cell sites.

4. The UMTS results are also sensitive to the state of competition. 'The positive effect of sharing the same number of subscribers between two operators instead of four is shown in almost three times the IRR for two operators compared to four.' We assumed for the sake of our Hong Kong model that five licences would be issued.

5. Finally, the report notes that 'All the scenarios considered in the economic simulations show payback times of 7 years or longer.' Our Hong Kong model suggests five, which is an improvement.

6. A follow up study, *The Impact of Licence Cost Levels on the UMTS Business Case*, based upon the original data, was also published in 1998. This shows that a licence fee (auction) of US$10 per capita would reduce the IIR to 17 per cent. A US$50 per capita reduced the IIR to 12 per cent. In our Hong Kong model we have assumed a real discount rate of 15 per cent which would render the latter case commercially void. We note that the per capita licence fees in the UK and the Netherlands both greatly exceed these figures.

The UMTS Forum Model Findings: from *A Regulatory Framework for UMTS: Report no.1*,1998, www.umts-forum.org

"All the scenarios considered in the economic simulations show payback times of 7 years or longer."

Two different economic models have been tried using a common set of assumptions for correlation purposes. These are proprietary models provided by an operator and a manufacturer. The conclusions in this chapter have been drawn when close agreement has been found between the two models.

The models are based on a 10 year business plan which does not take into account the remaining value of the business after 10 years. No parameter elasticity has been assumed when performing sensitivity tests on the model, i.e. there is no assumption that if call prices drop then subscribers usage goes up. The models analyse the project viability of the different scenarios and does not take into account financial impacts due to equity/debt ratios.

The model indicates that the economics of UMTS are not as attractive as those traditionally associated with establishment of second generation mobile networks. This has to do with the traditionally lower margins of data communication services and the different market situation for UMTS. The economics are also highly sensitive to the regulatory and licensing environment. Simulation shows a considerable impact of increasing or decreasing the total UMTS operator investment. Increased investment could result from increased prices for infrastructure hardware and software, high costs for spectrum and other licensing costs, and coverage demands above what is economically justifiable. A 30 % increase in investments would lower the internal rate of return (IRR) with about 40 %. Delayed licence or spectrum payments would not affect the cumulative 10 year cash flow but would reduce the operators risk during the build out phase.

Decreased investments can be a result of sharing of infrastructure resources, either when an incumbent operator re-uses sites and masts already built for a second generation system, or when two operators share the same infrastructure. In one of the calculated cases reusing old infrastructure did double the IRR.

Simulation also shows the very high sensitivity of the business model to subscriber revenue and hence to the accuracy of industry predictions for UMTS revenue. An increase in subscriber revenue of 20 % would double the IRR, while a reduction of 20 % would reduce IRR to less than half the initial value.

G. Modelling 3G in Hong Kong

1. In all models the devil is in the details, and details are hard to come by when uncertainty is the name of the game. The following details are used in the model:

a) Population growth estimates through to 2012 are by simple extrapolation of compound growth rates since the early 1980s.
b) In the base case 2G penetration growth rates 1984-1995 are taken as a proxy for 3G penetration growth rates starting from a base figure of 35,000 3G subscribers in base year 2001. This yields a penetration rate of 110 per cent by 2010, which assumes a certain proportion of users will subscribe to have more than one 3G access device by that date. This may be considered a fairly generous assumption when compared with saturation levels of around 80 per cent used in some models of European markets.
c) Operating costs and costs of customer acquisition are assumed to reflect those of 2G operators today, and to decline at between 1 – 1.5 per cent per annum.
d) The base case makes the assumption that 3G network build out costs are HK$2 billion spread over 2 years. This assumption is fairly modest and reflects the possibility of using existing 2G structures without significant additional costs, and also a rapid decline in equipment costs as global rollouts begin.
e) Financing costs are assumed to be 5 per cent above the inflation rate, which is assumed to remain steady at 5 per cent.
f) A weighted average cost of capital of 13 per cent is assumed.

2. The model, which is developed on an Excel spreadsheet for easy manipulation, is a familiar one, and generates estimates of the Net Present Value of the flow of earnings after interest, taxation, depreciation and amortization for the period 2001 to 2012. In Hong Kong the standard length of licences is ten years, automatically renewable for a further three.

3. The base case model assumes five operators in the market.

4. The revenue model simply assumes an average revenue per user (ARPU) which rises from HK$300 per month to HK$600 per month by 2010 in the base case, that is by 5% inflation + 3% real growth annually. In practice the revenue model will be transformed as voice traffic is packetized and is charging is by byte downloads, or by bit rates, or some other metric, and revenue sources will include access device sales, revenue sharing with content providers and commissions on m-commerce transactions, etc. However, the ARPU assumption can capture the singularly important point that 3G operators must make money and that can be expressed as a per customer income whether it derives directly from the subscriber or not.

H. The Results

1. Base Case: Net Present Value is estimated for the 3G industry as a whole at HK$8.5 billion. This places a cap on an auction price if the revenues of the business are taken as the rational basis for bidding.

2. The variables of interest that need testing for the sensitivity of results are the following:
   a) The ARPU
   b) The penetration rate, or number of 3G accounts per capita
   c) The 3G network build out cost
   d) The number of operators

3. **ARPU**: there is little point in testing for an ARPU lower than HK$600 by 2010 because the NPV is already low. An ARPU of HK$900 by 2010 increases NPV substantially, to HK$17.9 billion. In other words, a 50 per cent in ARPU over ten years increases NVP by 110.6 per cent, a factor of 2.2 per cent.

4. **Penetration rate**: reducing the penetration rate from 110 per cent to 100 per cent of the population by 2010 reduces NPV from HK$8.5 billion to HK$6.1 billion. Lowering it further to 80 per cent, which is a commonly used forecast in models for Europe, reduces NPV to just HK$2.8 billion. Raising the penetration rate to 120 per cent increases NPV to HK$10.3 billion. Clearly NPV is sensitive to changes in rates, but the constraining factor here is, of course, the growth in the addressable population. For example, substantial machine-to-machine usage may emerge, but the question remains how much of this traffic will pass over 3G networks rather than other spectrum?

5. **Build out costs**: raising build out costs to HK$4 billion reduces NPV to a mere HK$0.2 billion. In the case of a penetration rate of 100 NPV heads south into negative territory, -HK$2.3 billion. At 'the European' 80 per cent penetration NPV is –HK$5.6 billion. This is therefore a very serious consideration**. A high auction price would be the equivalent of an increase in the build out cost**.

6. **Number of operators**: Assuming six operators rather than five in the base case reduces NVP to HK$6.9 billion. (If we also assume a penetration rate of 100 per cent NPV drops to HK$3.8 billion.) Reducing the number of operators to four increases NPV to HK$10.2 billion, and to three NPV is HK$11.9 billion. (In these two cases a penetration rate of 100 would produce NPVs of HK$7.1 billion and HK$8.8 billion respectively). **Clearly, Hong Kong cannot have a competitive market in 3G *and* hope to raise substantial funds through an auction**.

7. **Shareholder value:** can be expressed in terms of the cumulative total net income derive from the licensed business. The base case model shows annual net income becoming positive from 2007, and the cumulative total net income becoming positive in 2010. **On this basis, any auction price would wipe out net present value.**

8. **Summary**: the following tables summarize the combinations of assumptions:

Table 1
Assume penetration rate of 3G of 110 per cent of population by 2010
Net Present Value 2001-2012

	HK$2 billion build out costs	HK$4 billion build out costs
ARPU of HK$600 by 2010	HK$8.5 billion = **base case**	HK$0.2 billion
ARPU of HK$900 by 2010	HK$17.9 billion	HK$9.6 billion

Table 2
Assume penetration rate of 3G of 100 per cent of population by 2010
Net Present Value 2001-2012

	HK$2 billion build out costs	HK$4 billion build out costs
ARPU of HK$600 by 2010	HK$6.1 billion	- HK$2.3 billion
ARPU of HK$900 by 2010	HK$14 billion	HK$5.6 billion

Table 3
Assume penetration rate of 3G of 80 per cent of population by 2010
Net Present Value 2001-2012

	HK$2 billion build out costs	HK$4 billion build out costs
ARPU of HK$600 by 2010	HK$2.8 billion	- HK$5.6 billion
ARPU of HK$900 by 2010	HK8.9 billion	HK$0.5 billion

Note: *the assumptions used to change the variables can be altered and this will influence the NPV estimation in the model, but only within narrow limits. For example, if a penetration rate of 110 per cent by 2010 is achieved through rapid early growth and then a rapid slowing down of growth, NPV will be higher than if it were achieved through slower but steady growth up to 2010. Therefore, all the estimates from the model are just that, estimates. It is their order of magnitude that is important.*

9. **Conclusion**:

(i) There seem to be two key variables, or assumptions, that influence NPV for the period 2001-2012. The first is the ARPU which has a substantial positive effect. The question is therefore how realistic is an assumption of a monthly ARPU of HK$900 by 2010? Many people in the industry interviewed for this study thought that HK$600 was reasonable, but HK$900 at this stage seems highly optimistic. Even if broadband wireless Internet takes off like a rocket over the next decade, it remains unclear who will be best positioned to tap into the revenue streams along the value chain.

(ii) The second is the assumption in build out costs for 3G. Anything substantially higher than current 2G build out costs in Hong Kong would threaten to drown the industry in debt. High auction prices would have an exactly similar effect.

(iii) Auctions on their own are insufficient. They need to be backed up by strong anti-trust legislation and regulatory powers to enable the TA to act against industry consolidation, collusion, and anti-competitive partnering *prior to* the auction as well as after it. The TA has no powers to ensure the former, and, if auctions are successful in attracting large bids, it is unlikely the TA would be left with effective powers to confront the latter. This is especially true if the winners are foreign-based global players who come to the conclusion that collusive behaviour is in the best interests of their shareholders, which they may well do if the market fails to develop as robustly as they hope.

(iv) The arguments for auctions relate principally to (a) the money raised for the public purse, (b) the implication that this money represents a taxation on monopoly rent derived from the use of a scarce resource, and (c) the efficient allocation of that scarce resource to those who place the highest value on it. Since Hong Kong has no need for (a) and any attempt to tax the industry to raise public funds would send the wrong signals, this argument does not really apply, notwithstanding the fact that it may be an argument those least familiar with the industry find most alluring.

(v) The point about (b) monopoly rent is that there are equally effective and less damaging ways to collect it in the unlikely circumstance that it should arise in Hong Kong's 3G industry.

(vi) The final point is about (c) efficiency. There is no guarantee that those who value spectrum most highly will use it in ways that is most valued by the community. There needs to be a link between the two propositions before the efficiency argument begins to hold water. In the case of auctions, which (except in cases of pre-qualification) excludes the regulator examining the community interest aspect of the bids, the link relies upon how effective competition is in the market, and what costs are involved in subsequent market exit and entry. The paradox is, the more effective the competitive environment, the less money will be bid in an auction. In the case of Hong Kong, which is not a very large market, and does not have an accessible

European or North American market on its doorstep, a competitive environment and successful auctions would seem to be contradictory proposals.

Appendix 1: Price Reductions in Hong Kong's Cellular and PCN Tariffs

Table 1 – Cellular Market

Changes in the Cellular Telephone Market – Dual Band/D-AMPS				
Charges (Min-Max)	**CSL 1010[1]**	**Hutchison**	**PacLink (now CSL)**	**Smartone**
Handset prices				
1999[2]	$0	$0	$101	$0
1997	$2,280 - 6,900	$485 - $6,080	$650- $4,500	$480 - $15,800
1995	$5,500-$13,800	$3,800 -$9,500	$4,500 - $8,800	$4,500 - $10,800
Monthly rental				
1999	$260 - $ 1,430	$138 - $490	$101 - $288	$168 - $938
1997	$488 - $1,500	$390 - $1,450	$175 - $1,000	$288 - $1,1480
1995	$650 - $1,800	$200 - $1,025	$175 - $725	$120 - $700[3]
Free Airtime (mins)				
1999	150 - 3,000	200 – 1800	101 – 1001	100 – 1,850
1997	120 - 1,010	100 – 1,000	0 – 650	150 - 1,000
1995	100 - 1,250	100 – 1,480	0 – 250	0 – 700[3]
Airtime Charges				
1999	$0.6 - $1.30	$0.40 - $ 1.00	$0.80 - $1.30	$0.5 – $1.00
1997	$1.20 - $2.00	$1.30 - $1.80	$1.30 - $1.85	$1.20 - $3.50
1995	$1.00 - $3.40	$2 - $5	$1.85 - $4.75	$1.60 - $4.00[3]
Notes: 1. CSL also offer a 123 service at lower tariffs. 2.Free handsets. 3. 1993				

Table 2 – PCN Market

Changes in the Cellular Telephone Market – PCS operators				
Charges (Min-Max)	**Extra**	**New World**	**Peoples**	**Sunday**
Handset prices				
1999	$0-$680	$0 -$5,888	$0 - $5,880	$0 - $7,688
1998			$0 - ?	$980 - $2,280
Monthly rental				
	$88 - $488	$98 - $768	$0 - $500	$108 - $308
	$128 - $388	$138 - $488	$0 - $400	$88 - $388
Free Airtime (mins)				
	120 - 1,800	100 - 3000	0 – 1800	100 – 1,000
	100 - 1,000	100 - 700	0 - 1200	100 - 1,000
Airtime Charges				
	$0.5 - $1.00	$0.50 - $ 1.00	$0.45 - $1.00	$0.5 – $1.00
	$0.5 - $1.00	$0.50 - $ 1.00	$0.45 - $1.00	$0.5 - $1.00

OFTA'S BID FOR AUCTIONS

After the UK auctions for third generation (3G) mobile licences raised US$34 billion and the German auctions raised a further US$46 billion the call went up 'here too'. Then came OFTA's second consultation paper on the subject, and the cry went up 'U-turn'. After favouring a beauty contest, was OFTA not now admitting that an auction was the better way? Well, yes and no; yes OFTA now admits that some form of auction is appropriate, but no, not the kind that raised so much money in Europe. OFTA is correct in this view, but does not go far enough. Why is this important and what should OFTA do?

Let me make what sounds like a technical point first. A policy decision should first and foremost be based upon clearly stated and thought through policy objectives. Furthermore, as an economist, I was taught a theorem which said that for each policy objective you need a policy instrument, one instrument cannot efficiently serve two objectives. In other words, aiming to kill two birds with one stone is not a basis for good policy making. You need an extra stone. My first criticism of the second consultation paper is that it does not state the policy objective nearly clearly or loudly enough. It still leaves room for doubt, and for those who are looking for a free lunch. Let me make myself plain.

A number of policy objectives are possible, but two in particular have gained some support. In my view one of them is correct and the other is just plain wrong. The first aim is to develop a highly competitive and vigorous market structure for the development of the 3G business, so competitive in fact that the value any bidder places on a licence in an auction will be low. The second aim is to raise lots of money for the government. These policy objectives are contradictory, and if policy targets both of them it falls between two stools. In economist's jargon, policy is 'under-determined'. I have no problem in principle with a government saying, well we have thought it through, we know are a poor country, we need to prioritize hospitals and schools over broadband mobile Internet access, so 3G will be treated as a luxury for the few and it will be heavily taxed. Even if this is shortsighted thinking, at least it is thinking. But it is not Hong Kong's situation. On the contrary, Hong Kong's economy looks increasingly towards tradeable services, and the e-commerce and content and applications that will be stimulated by a vigorously competitive 3G industry will make an important contribution to future employment and public prosperity.

The key issue therefore is how to ensure that 3G service access is treated from the outset as a cheap mass commodity, and not as a premium priced luxury good? There is a crucial difference in this respect between 2G and 3G. Before 1996 when the six new PCN mobile phone networks started services there was little price competition between the four cellphone operators. This was good for returns on investment, and since everyone had access to a fixed wireline telephone and a mobile pager arguably it did not matter that 2G started life as a luxury product. But 3G is different because its success depends upon a robust development of content and applications services, and they in turn depend upon a mass demand for access to these services. We don't restrict the number of Internet service providers for people who want to surf the Web or send emails, and anyone can have a PNETS licence to operate Internet access for just HK$750. This encourages mass take-up, and we need to do this for 3G. Ideally we need licences that fetch HK$750 in an auction!

Of course, spectrum is a scarce resource which limits the number of licences and therefore raises their market value. OFTA quite rightly proposes to open the access service market by requiring wholesaling of spectrum by licence holders, and by permitting 2G operators to offer 3G-type services as and when their technology permits. My second concern about the consultation paper is that OFTA should also make it much clearer that when additional spectrum becomes available as many additional licences will be issued as there is a demand for them by would-be service providers. This again will deflate the value of the licences. And to emphasize the point, OFTA should issue six licences now rather than four. Keeping them down to four sends the wrong policy signal.

Finally, on the auction proposal itself. The consultation paper rejects both the high-priced money-up-front UK type auction and the lowest wholesale price 'reverse' auction in favour of a 'hybrid' which, after a pre-qualification process, involves a minimum royalty payment plus an auction on a sliding scale royalty payment as and when 3G operating revenues rise above the minimum. May I (modestly, of course) point out that this is a variant of my own proposal in response to the first consultation paper, although I prefer a profits rather than a revenue base. It seems OFTA thinks there are too many clever tax accountants around

to make that one fly. The hybrid has the advantage of spreading the payments and taxing only the super-profits if and when they arise. Hopefully they won't arise, because the price of access will remain too low, but only if there is abundant competition. In my view that would kill off once and for all the idea that the policy objective is to raise money for the treasury rather than develop a high competitive industrial structure.