REPORT FOR BEMOBILE ON RETAIL PRICE DISCRIMINATION

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CONTENTS

EXECUTIVE SUMMARY

Large networks have strong incentives to use high off-net prices as a competition barrier

The central issue examined in this report is whether retail regulation is required to address Digicel's practice of pricing mobile off-net calls at a level that is very significantly above its on-net call price. It is well established in the economic literature that large networks have strong incentives to apply a large mark-up to off-net calls to create a strategic barrier to competition.

In the presence of on-net/off-net price discrimination it is generally most attractive for a subscriber to join the largest network because the on-net price applies to a larger proportion of calls and so the average price that a customer would pay when subscribed to the large network would be lower than when connected to the smaller network. This creates a "network effect" whereby the value of being connected to a network increases with the number of subscribers and makes it very difficult for small networks to compete effectively with the large network.

A small network could attempt to combat this effect by offering "anynet" pricing that matched the average price subscribers were paying to the large network. However, above-cost termination charges limit the ability of small networks to compete in this way. This is because the small network would need to pay a mobile termination charge on a very large proportion of calls. Therefore the small network can effectively face a margin squeeze when there is insufficient margin between the retail price and the termination charge to cover its own costs.

However, even if mobile termination charges are regulated to cost, the "call externality" effect reinforces the network effect and means that the incentive for large networks to set high off-net prices in order to restrict competition remains. Setting high off-net prices will discourage the large network's customers from calling other networks. Because mobile network subscribers receive a benefit from being called they will be deterred from switching to small networks because doing so will mean they will receive a reduced number of calls from the large network. This decreases the utility to consumers of connecting to the small network. That high off-net pricing can be used in this way by large networks to create strategic barriers to entry and expansion by rival networks is well-demonstrated in the economic literature.

To determine whether retail regulation is justified to address the issue of high off-net pricing by Digicel involves establishing whether Digicel holds SMP, which first requires definition of the relevant market. If SMP is found, a retail determination can be made if the criteria set out in section 158 of the NICT Act are satisfied.

Definition of the relevant market

Application of the standard test for substitutability finds that on-net and off-net services fall into a single market. By focusing only on demand-side substitutability, NICTA has defined a narrower market for off-net services alone. A broader market including on-net and off-net services is not only implied by supply-side substitution but it is also more consistent with the commercial reality that firms compete for mobile subscribers' entire domestic calling rather than individual call or SMS types. Indeed the very nature of the issue being considered – that Digicel's pricing of off-net calling is a strategy intended to retain its mobile subscriber base and prevent switching to competing

networks – is consistent with the hypothesis that firms are not competing for a certain individual call type but rather for the customer's entire mobile usage. Therefore, I recommend that NICTA defines the relevant market to be the national retail market for the supply of domestic on-net and off-net mobile voice and SMS services.

Does Digicel have SMP in the relevant market?

There a number of very significant barriers to effective competition in the retail mobile market. Of particular importance is that:

- It is unlikely to be economic for rivals to replicate Digicel's coverage in rural and remote areas which not only means that they cannot contest those customers but also reduces their ability to put competitive pressure on Digicel in urban areas (because mobile customers typically value having access to national coverage even if they make little use of it)
- The high fixed cost nature of mobile networks means that DIgicel, having a very large market share, benefits from substantial economies of scale;
- Digicel is also likely to have other significant cost advantages as a result of its size, given that it is not only the largest PNG mobile services supplier but also has a strong international presence.
- There are high switching costs given the prevalence of SIM locking and the lack of number portability.

Moreover the network effects that are created through on-net/off-net price discrimination create a strategic barrier to entry and expansion that is extremely difficult to overcome given the high market share of Digicel.

The above factors, combined with the observation that Digicel's market share is in excess of 70% (and perhaps very much higher than this) with no evidence to suggest that rivals have been successful in eroding that share despite undercutting Digicel's pricing leads me to conclude that Digicel does hold SMP in the supply of retail mobile services.

Although Digicel's entry into the market has likely brought significant benefits to consumers in the past (for example, through breaking the previous mobile market monopoly, and investing in significantly increased coverage), what is concerning is that having acquired a very high share of subscribers, and likely an even higher share of market revenues such that, given the competition barriers identified above, Digicel's degree of market power has been growing over time and is now very substantial and extremely difficult for rivals to erode without regulatory intervention.

Is retail regulation justified in the PNG mobile market?

The data available to me on traffic flows and market strongly indicate that the extent of price discrimination is severe and is having an acute effect on the extent of inter-network traffic. This implies strong network effects which would form a barrier to effective competition in the PNG mobile market.

Going forward, if regulatory intervention does not occur it appears highly likely that there will continue to be one large network (Digicel) and either one or two small networks that contest only a small niche of customers. In that scenario, efficient investment will be curtailed – the smaller

network will not have the means nor the business case to invest further and Digicel's incentive to invest will be reduced due to muted competition. This leads to a loss of dynamic efficiencies that would result from consumers having access to new and innovative services. There would be little constraint on Digicel's market behavior implying that its degree of market power will continue and strengthen. Given this it seems highly likely that the imposition of a retail non-discrimination rule would satisfy the retail regulation criteria set out in the Act.

1 INTRODUCTION AND CONTEXT

The National Information and Communications Technology Authority (NICTA) has published a report "Public Inquiry into the need for a Retail Service Determination regarding certain mobile telephony services" ("the Discussion Paper"). I have been asked by Bemobile Limited ("bemobile") to prepare an expert report for submission to the NCITA which provides an analysis of whether a retail determination is justified.

The focus of the Discussion Paper is Digicel's retail pricing of calls that originate on the Digicel network and terminate on the bemobile network. The investigation by NICTA was triggered by a letter from bemobile which recommended that a retail service determination was required to address the height of Digicel's off-net pricing. bemobile expressed the view that Digicel's off-net pricing was contrary to the objectives of the National Information and Communications Technology Act ("the NICT Act") and that it also constituted a breach of Sections 50 and 58 of the Independent Consumer and Competition Commission Act 2002 ("the ICCC Act").

In this report I focus on the question of whether a retail service determination is required under the NICT Act. I do so with particular reference to s.158 of the NICT Act which sets out the criteria that must be satisfied if a retail regulation is to be applied. In conducting my analysis I have also had regard to the Objective set out in s.2 of the NICT Act.

I commence my analysis by examining the definition of the relevant market (section 2). I next consider whether Digicel has substantial market power in the relevant market (section 3). Finally, I examine: the competitive effects of on-net/off-net price discrimination with reference to the relevant economics literature; the implications for competition in the relevant PNG mobile market; and whether the retail regulation criteria would be satisfied if Digicel's pricing is addressed by implementing a retail non-discrimination ban (section 4).

My qualifications and experience are set out in Appendix A.

2 MARKET DEFINITION

NICTA notes that the bemobile request to investigate the need for a retail services determination relates to the pricing by Digicel of calls and SMS from the Digicel network to the bemobile network. The question is then whether those services form a market in their own right, or whether there is a broader market. The NICT Act defines a market to mean:

> *a market in the whole or any part of Papua New Guinea for goods and services as well as the goods and services that, as a matter of fact and commercial commonsense are substitutable for them.*[1]

In order to test whether there goods or services that are sufficiently substitutable such that they fall into the relevant market the hypothetical monopolist or SSNIP (Small but Significant Non-Transitory Increase in Price) test is commonly applied. NICTA has had regard to this test in its analysis in that it has considered whether there are services that are substitutes for Digicel to bemobile calls from the customer's point of view. In particular, NCITA has presented an initial view that the relevant market

[1] NICTA Act 2009, section 4(1).

is a national market for the supply of off-net calls and SMS services to the retail customers of mobile network operators.

The type of substitution that has been examined by NICTA is referred to as "demand-side substitution". Demand-side substitution considers the extent to which consumers will switch to other products in response to a price increase of the service in question. Another component of substitutability analysis is "supply-side substitution" assessment. Supply-side substitution considers the response of suppliers of other services in response to the price increase. Thus, a good or service is considered to be in the same market as another if existing firms could render a SSNIP by the hypothetical monopolist unprofitable by reasonably quickly (usually thought to mean in less than 12 months[2]) supplying the same output provided by the hypothetical monopolist without incurring substantial costs or risk. For example, if a supplier of international calling services to Australia could readily expand its operations to supply international calls to New Zealand making a SSNIP on international calls to New Zealand unprofitable, then international calling to both destinations would, on the grounds of supply-side substitution, fall into a single market. Therefore in this example it is not necessary for calls to New Zealand and Australia to be substitutes from the point-of-view of a consumer in order for them to lie in the same market. By only having regard to the demand-side substitution as NICTA appears to have done there is a risk of defining an overly narrow market that does not fully reflect the extent of competitive pressure or the commercial realities of the market place.

The analysis of supply-side substitution is a commonly adopted practice in market definition and is relied on, for example, in New Zealand, Australia and throughout the EU.[3]

Returning to the question of whether there are other services that are in the same market as off-net calls, consider a firm that is a hypothetical monopolist of off-net calls to Network A and implements a price rise of 5-10% over the competitive price for those calls. Firms that supplied mobile originated calls to other networks could readily divert network capacity so as to supply calls to Network A. This is because no significant investment would be necessary in order to supply off-net calls to Network A over and above the facilities needed to supply calls to other networks. Clearly an interconnect agreement with Network A would be required, but in practice in PNG interconnection is a declared service and must be provided. The ability for supply-side substitution to readily occur between the supply of calls to Network A and calls to other networks implies that calls to all networks lie in a single market (on-net and off-net), regardless of whether or not they are demand-side substitutes.

That the application of the supply-side substitutability test above appears somewhat abstract – because in practice firms do not supply calls to some domestic networks but not others – reflects that the commercial reality of the market is that firms compete for the supply of the bundle of all

[2] Malcolm B. Coate and Jeffry Fischer, 2008, A Practical Guide to the Hypothetical Monopolist Test for Market Definition, *Journal of Competition Law and Economics*, 4 (4), pages 1031-1063

[3] New Zealand Commerce Commission, 2003, *Mergers and Acquisition Guidelines*, p. 18, Australian Competition and Consumer Commission (November 2008), *Merger Guidelines*, p. 18, European Commission (EC), 2002, Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03), http://ec.europa.eu/information_society/topics/telecoms/regulatory/new_rf/documents/l_10820020424en00330050.pdf

domestic mobile calls and SMS. That is, the relevant arena of competition is not the supply of mobile services that terminate to Network A (eg, bemobile) but rather the joint supply of mobile voice and SMS service to any domestic network. This is because firms compete for mobile subscribers rather than individual domestic call or SMS types. Indeed the very nature of the issue being considered – that Digicel's pricing of off-net calling is a strategy intended to retain its mobile subscriber base and prevent switching to competing networks – is consistent with the hypothesis that firms are not competing for a certain individual domestic call type.

In conclusion, I recommend that NICTA adopt a market defined as: the national retail market for the supply of domestic on-net and off-net mobile voice and SMS services.

I note that it is possible that there are separate residential and business markets (or alternatively prepaid and post-paid markets). However, because it does not appear that the customer market delineation would impact significantly on the analysis it seems reasonable to adopt a single customer market for current purposes.

3 MARKET POWER ASSESSMENT

NICTA defines dominance to be:

> *the ability of a participant in a market to act substantially independently of its competitors and consumers, and not be unduly constrained in decision-making on price or service by the possible reactions of competitors and customers*[4].

In my analysis I make use of the term substantial market power (SMP) for consistency with the NICTA Act, but I note that NICTA considers that the terms SMP and dominance can be used interchangeably.

NICTA examines whether Digicel is in a position of market dominance by considering a range of factors. In what follows I comment on the factors that seem most relevant to the PNG retail mobile market. I note that the factors listed by NICTA are not a checklist – that is, it is not necessary for each to be satisfied before concluding dominance. Rather, what is relevant is whether the structural conditions of the market are such that competition (or consumers) can place an effective competitive constraint on Digicel.

Market structure is typically concerned with:

- the number of firms in the market, market shares and market concentration (discussed in section 3.1);
- whether there are material barriers to entry and expansion (section 3.2); and
- whether there are other constraints on the actions of the firm, for example constraints from consumers (section 3.3).

Analysis of market conduct and performance measures can also assist in providing a clearer view of whether there is an effective competitive constraint on the market. Assessment of market conduct

[4] Discussion Paper, p, 12.

would include observations on the extent of competitive rivalry between firms and whether anti-competitive conduct has occurred in the past. Examination of price differentials between firms can also help illuminate the degree to which a firm's pricing is constrained by competitive forces. Measures that focus on market outcomes (also referred to as market performance) include, though are not limited to: price trends; international price comparisons; and churn (the percentage of the customer base that switches away from a firm in a given period). Conduct and performance measures for the PNG market are discussed in sections 3.4 and 3.5, respectively.

3.1 MARKET PARTICIPANTS AND SHARES

There are currently three players in the market: bemobile, Digicel and citifon. bemobile was previously entirely publicly owned by the PNG government until Telikom sold a 50% share to a consortium of investors. Digicel entered the PNG market in 2007. It invested heavily and deployed its network significantly beyond the reach of the bemobile network taking its reach into rural areas. citifon has only recently entered the market and is a network wholly owned by Telikom.

NICTA notes that Digicel's market share (presumably of subscribers) is above 70%. bemobile has informed me that it estimates Digicel's current share of subscribers to be 80% or above. There is little available information on the change in market shares over time, however one estimate from the MobileWorld database is that as at end of the first quarter of 2008 Telikom's mobile network (ie, which is now the bemobile network) had 275,000 subscribers and Digicel had around 610,000 subscibers which implies that Digicel held around 70% of subscribers at that time. Given these estimates, Digicel share seems to be increasing. However the most recent trends could be confirmed by NICTA through collection of actual data from the market participants to obtain a more robust and up to date view of the market share trend.

Examination of revenue market shares would provide further useful information to assess the extent of Digicel's market power. Subscriber shares can be somewhat misleading, particularly in the case where there is a high usage of prepaid services because: (1) some consumers will have multiple SIMs and split their purchases across suppliers – what is relevant to the SMP analysis is not whether a customer has purchased SIM from a network but rather the extent to which they purchase voice and SMS services from that network and to what extent; (2) networks may have significant volumes of SIM cards that are inactive and this can affect the calculation of shares; (3) this can lead to substantial variance in the definitions used by each network when calculating subscriber numbers – eg, a definition of subscribers which includes all SIMs active within the last 12 months could clearly give a significantly higher subscriber number than a definition which includes only those SIMs active within the last 30 days. Revenue share tends to therefore provide a better measure of market power than subscribers. My understanding is that bemobile is more active in the consumer market segment than in the provision of services to business customers and as a result would be expected to have a higher share of low ARPU (Average Revenue per User) customers. This implies that its revenue share is lower than subscriber share and that Digicel's revenue market share is likely in excess of 80%.

Such a high level of market share is suggestive of SMP, particularly if it is sustained as the market share estimates referred to above suggest. In the EU single firm dominance is generally considered to arise when market share is above 40%, market shares in excess of 50% are generally considered

as strong evidence of SMP.[5] Clearly Digicel's share is substantially above these thresholds. As NICTA correctly points out "market share is not in itself determinative of market dominance because it is usually the result of a range of competitive circumstances rather than a cause." However, the market share evidence is consistent with a lack of effective competitive constraint on Digicel.

3.2 BARRIERS TO ENTRY AND EXPANSION

Broadly speaking, barriers to entry or expansion are any factor that reduces the contestability of a market. They can include: legal barriers, regulatory barriers, economic barriers[6], strategic barriers and technical barriers. Legal and regulatory barriers could include, though are not limited to, ownership restrictions and the need to acquire licenses.

3.2.1 INFRASTRUCTURE, ACCESS AND INVESTMENT BARRIERS

Control of infrastructure not easily duplicated

An important factor considered by NICTA is "Control of infrastructure not easily duplicated". In respect of whether this factor is relevant, NICTA notes that:

> *Although mobile network platforms are duplicable, more than one network infrastructure may not be economic in many rural and remote regions of PNG. This would indicate that there is first-in advantage. Digicel has national coverage and bemobile has yet to complete its network build-out. This supports the suggestion that Digicel is dominant.*

And on whether this factor indicates SMP, NICTA says:

> *It seems likely that due to the geography of PNG and population dispersion in rural areas, at least some areas of PNG may not be viable for more than 1 more network. Given that national roaming is not available, this factor does seem relevant given the very large sunk costs involved in deploying a network.*

I agree with NICTA's comments. Sunk costs are costs that once incurred cannot be recovered, and thus make entry risky, and hence, less likely to begin with. This is particularly the case in areas that are marginal and where an existing network has a first-mover advantage.

There are two ways in which the natural monopoly characteristics of high-cost areas with low population densities create dominance:

1. Customers in areas where a second network is not viable (ie, natural monopoly areas) would have no choice but to use Digicel, and there is therefore no competitive constraint.
2. Mobile network customers often place a high value on having national coverage, even if they rarely make use of it. That Digicel has network coverage that cannot be replicated will

[5] European Commission (2002), *Commission Guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services,* para 75.

[6] Economic barriers can be identified as those that create cost asymmetries between incumbent firms and potential entrants

make it more attractive not just to customers in areas in the natural monopoly areas but also those that reside within the footprint of other networks.

Ease of market entry

NICTA states that "Market entry is easy from a regulatory perspective, but the current level of competition coupled with first-in advantages may be a commercial barrier to new entry." The overall ease of market entry would depend on a range of issues, including many of the other market power factors, such as economies of scale, access to infrastructure that is not easily duplicated and network effects. As NICTA points out first mover advantage can be a commercial barrier to entry. This effect will be particularly strong in the presence of network effects (discussed below). An additional requirement for entry is access to mobile spectrum.

Easy or privileged access to capital market/financial resources

Due to Digicel's large size, high cashflow relative to its rivals (given their much smaller market share) and well-established multinational presence it seems likely that Digicel would likely have easier access to capital and deeper pockets relative to its market rivals. However I note that bemobile has been granted a loan by the Asian Development Bank for the purposes of expanding its rural coverage in PNG and the Solomon Islands, which at least in respect of bemobile may offset Digicel's advantage to some extent.

3.2.2 SCALE AND SCOPE

Economies of scale

Economies of scale occur where a firm's unit costs reduce with the volume of sales. This effect is common in the supply of telecommunications network services due to the high fixed costs involved in network deployment. NICTA finds that this factor could be relevant in providing a licensee with cost advantages and suggests Digicel is dominant.

Economies of scale are likely to be highly relevant, particularly given the highly disparate market shares of the PNG mobile networks. Although mobile networks are scaleable to some extent, particularly in high-traffic urban areas, in areas where the network is coverage-driven rather than capacity driven economies of scale will be particularly important. Moreover, even in urban areas a network that has a small subscriber base may still have much lower network utilization than a larger rival. That Digicel has traffic volumes that are many times higher than rivals will mean that it will have unit costs that are significantly lower than competitors.

The significant disparity in unit costs between large and small networks is illustrated by the cost estimates prepared by cost modelers WIK-consult who were retained by the Commerce Commission in New Zealand during mobile termination rate proceedings. WIK found, using a model of Australian mobile network costs that even comparing the unit costs of operators with 45% and 25% market

share gives a cost difference of around 36%, and that the costs of a network with very low market share would be more than 4 times that of a network that has 45% market share.[7]

Economies of scope

Economies of scope refer to the fact that a firm can achieve lower unit costs through supplying a broader range of services. NICTA expresses the view that this fact probably is not relevant. It does seem that likely to be less relevant than other factors because all networks would have the ability to provide the full suite of mobile services, with the possible exception of some mobile data services.

Overall size of licensee

NICTA expresses the view in the Discussion paper that the overall size of Digicel is probably not relevant to the current proceedings. It seems likely, however, that Digicel's size and wide presence through the Pacific Islands and beyond would give it a number of advantages including strong purchasing power in procurement of network equipment allowing it to achieve lower costs.

3.2.3 BARRIERS TO CONTESTING CUSTOMERS

Network effects

One of the factors that NICTA identifies as being relevant is network effects. A network effect, also referred to as a "network externality" occurs in the situation where the value of a network to its subscribers increases when a new subscriber joins. On a telecommunications network the addition of a subscriber increases the number of subscribers that all existing customers of the network can communicate with.

Network effects can form a barrier to entry or expansion for smaller players where there are large subscriber networks. For example, in the absence of interconnection, the value gained from joining a larger network will generally exceed the value of joining a smaller network due to the much larger pool of subscribers that can be communicated with on the large network. This can make it difficult for a small network to grow and so it can end up perpetually having a small market share, being primarily limited to small niches of customers who have small closed calling circles.

Interconnection between networks reduces the extent of entry and expansion barriers that derive from network externalities because it allows the subscribers of the small network to communicate with the subscribers of the large network. As explained by Laffont and Tirole: "Interconnection together with uniform (non-termination-based) pricing implies that consumers, when choosing a network, do not take into account the choice of network by the people they want to call."[8] However the implementation of off-net prices that exceed on-net prices re-introduces the network externality. This is because in the presence of on-net/off-net price discrimination customers will generally have the incentive to join the network that has a higher number of subscribers.[9] This

[7] WIK-Consult (November 2010), *Support to the Commerce Commission in its current Standard Terms Determination for the MTR,* p.16.
[8] Laffont and Tirole (2001), *Competition in Telecommunications*, MIT Press, p. 201.
[9] Individual customers will be better off joining the network to which the people that they wish to call are connected to. For some customers this may be the smaller network, but in general it will be the large network because of its larger subscriber base.

price-driven network effect is referred to as a "tariff-mediated network externality" and is widely established in the economic literature as forming a strategic barrier to entry and expansion (for a more detailed discussion of this effect see section 4). In essence the very behavior that is being investigated by NICTA itself creates market power. This supports NICTA's view that network effects are relevant and do indicate dominance by Digicel.

Customer inertia and switching barriers

Other barriers to contesting customers include customer inertia (recognized by NICTA) and customer switching barriers. NICTA highlights the absence of mobile number portability and in the case of postpaid customers, contract terms. Another relevant barrier is the practice of SIM-locking which effectively means that in order to switch network a customer needs to purchase a new phone, thereby increasing the cost of switching considerably.

3.2.4 OTHER STRUCTURAL BARRIERS TO ENTRY AND EXPANSION

Vertical integration

NICTA finds "Digicel's vertical integration of wholesale and retail operations is relevant and, absent regulation, enables cross-subsidisation of retail operations from wholesale revenues." Another way of looking at this is that vertical integration combined with market power in the supply of termination of calls on Digicel's network and a large retail subscriber base gives Digicel the ability to leverage market power from the mobile termination market into the retail market. In particular this enables Digicel to offer significantly lower average prices by virtue of the fact that a large proportion of calls with be to other Digicel customers (ie, on-net).

3.3 OTHER FORMS OF POTENTIAL COMPETITIVE PRESSURE

Absence of or low countervailing buyer power

In markets where there are large buyers that are individually significant (for example, by being strategically important, or simply having a very large expenditure), or where large customers have options for self-supply, those customers can exercise countervailing buyer power thus reducing a firm's ability to act free of constraint in that market. In the PNG retail mobile market, although there would be large business customers, their degree of countervailing buyer power would be limited due to a lack of alternatives.

In the supply of fixed telephony services, for example, large corporate and government customers have the option of constructing private networks that they can use for voice and data services as an alternative to purchasing from fixed telephony suppliers. This gives them countervailing buyer power that they can use to apply competitive pressure to the market. However, in mobile telephony the options for alternatives are more limited. The ability to use WiFi for data services may provide businesses with a degree of countervailing power but the application to voice is more limited[10]and does not appear strong enough to significantly curtail the market power held by Digicel.

[10] One option for customers is to use skype over wifi to place calls from at least some smartphones, however this would result in a lower call quality.

NICTA comments that low countervailing buyer power is: "Probably not relevant given the reciprocal level of terminating interconnection charges" and that this factor is "Supportive of Digicel dominance, but a weak factor."[11] NICTA appears to be referring to the extent of buyer power of parties purchasing wholesale call termination on the Digicel network. Reciprocal termination charges do not necessarily imply strong countervailing buyer power in the wholesale market. It is in Digicel's interests to maintain a high termination charge, even if termination charges are reciprocal, because this can facilitate tacit price collusion. For example as explained by Lopez and Rey,[12] departing from cost-based access pricing allows the large network to foreclose competition and in the presence of customer inertia it has an incentive to insist on the highest possible (reciprocal) access markup. Moreover, high reciprocal termination charges reinforce the strategy of having high off-net/off-net price differentials to discourage communications between networks, thus creating network effects which provide customers with strong incentives to join the largest network.

Customers' ability to access and use information

In regard to customers' ability to access and use information, NICTA notes that this factor "May be relevant, but evidence either way is absent." I note that Digicel no longer appears publishes its off-net rate for prepaid calls on its website. The absence of off-net call price information may create customer confusion and reduce the likelihood of customers calling bemobile and citifon customers for fear of incurring a large unknown charge or because customers may interpret the lack of information as implying that off-net calls are not provided.

3.4 MARKET CONDUCT

Market conduct analysis involves consideration of whether the firms in the market behave in a way that is consistent with what would be expected in an effectively competitive market. One consideration is whether there is evidence of previous anti-competitive conduct. Further information that can shed light on the extent to which a firm faces competitive constraint, is observation on the extent of competitive rivalry between firms. This would include, for example, examining how vigorously a firm responds to its rivals' pricing initiatives. Examination of price differentials between firms can also help illuminate the degree to which a firm's pricing is constrained by competitive forces.

I do not have access to detailed information on the way in which the participants have responded to price changes of other networks, however I have conducted an analysis of current pricing and price differentials for the standard prepaid rates.[13] Differentials between Digicel and citifon are extremely large (see Table 2), which may reflect that Digicel does not see citifon as a true competitor given its limited coverage. Digicel maintains a price premium over bemobile's pricing of around 20% for on-net calls and 72% for off-net calls, which although less than the differential with citifon, is still very significant. The large differential reflects the strategic incentive for Digicel to set high prices for off-net calls to reduce the attractiveness of rival networks as will be discussed in more detail in section

[11] Discussion Paper, p.13.

[12] S. A. Lopez and P. Rey (2007) Foreclosing Competition through Access Charges and Price Discrimination, http://idei.fr/doc/by/rey/foreclosing.pdf.

[13] I note that there are a number of price points and specials available. However due to time constraints I have limited my analysis to prepaid standard pricing.

4. That Digicel's high off-net call price is working as an effective barrier to competition is indicated by the apparent inability of bemobile to erode Digicel's market share.

TABLE 1: STANDARD PREPAID VOICE PRICING (INCLUDING GST)

	On-net price			Off-net price		
	1st minute	Additional minutes	5-minute average	1st minute	Additional minutes	5-minute average
Digicel	0.99	0.11	0.29	1.70	1.70	1.70
BeMobile	0.79	0.10	0.24	0.99	0.99	0.99
Citifon	0.02	0.02	0.02	0.39	0.39	0.39
Digicel-Bemobile differential						
K	0.2	0.01	0.05	0.71	0.71	0.71
%	25%	10%	20%	72%	72%	72%
Digicel-citifon differential						
K	0.97	0.09	0.27	1.31	1.31	1.31
%	4850%	450%	1330%	336%	336%	336%

Source: Operator websites.
Notes: Digicel's peak period applies 8AM –10:59PM (Monday through to Sunday). BeMobile peak rates apply . Citifon's rates do not vary between peak and off-peak.

3.5 MARKET OUTCOMES

Excess pricing and profitability

With regard to excess pricing and profitability, NICTA considers that "This is a relevant consideration generally but needs to be shown to be the case in the PNG market." NICTA conduct some analysis of whether Digicel's pricing is excessive. In doing so it uses the mobile termination rate of 26t to proxy cost. It is not clear why NICTA considers this to be a good proxy for cost. Obviously it is the cost an operator incurs to terminate an off-net call, however it does not necessarily reflect underlying costs of a call end (ie, either origination or on-net call termination). The Samoan regulator's mobile cost model results could be used as a relevant benchmark as an estimate of the cost of providing mobile network services in the Pacific Islands. Although there are clear differences between Samoa and PNG in terms of terrain and population, the Samoan estimate of approximately 15t per minute at least provides a comparator and does indicate that 26t is likely to be an overestimate of PNG mobile service costs.[14] To investigate the issue of excess pricing further, NICTA could request Digicel to provide the necessary cost information and well as information on its country-specific profitability for PNG.

Lack of active competition on non-price factors

[14] The Samoan regulator set the mobile termination rate at 17.7 sene per minute. Source: Office of the Regulator (September 2010), Determination of the Long-term interconnection charges to be applied to fixed and mobile termination services between SamoaTel Limited and Digicel (Samoa) Limited.

NICTA takes the view that "Evidence is wanting on whether this is a relevant factor in this case or not". With the time and information available I have not been able to conduct sufficient analysis to provide a view on this factor. However, I note that relevant considerations may include the levels of customer satisfaction, competition on mobile coverage, investment in data services and network upgrades. While there may have been competition on these elements to date what seems more concerning is that in future these will drop off as Digicel entrenches its dominance through strengthening its market power through network effects.

Churn

Churn measures the proportion of customers leaving a network. Data necessary to examine churn rates is not always available, however it can provide some interesting and useful insights into the workings of competition though care must be taken in interpretation of churn results. On the one hand high churn indicates low barriers to switching, but on the other hand high churn could also imply high customer dissatisfaction or the effects of high off-net pricing by the incumbent. For example, the New Zealand the Commerce Commission concluded that high levels of churn experienced by the smallest network were: "likely to reflect the difficulties small operators faces when competing in a market characterised by high on-net/off-net differentials."[15] As explained by the Commerce Commission:

> *When a large operator offers low on-net and high off-net prices, subscribers of a smaller network are less likely to receive calls and SMS due to the high off-net rates. A high churn rate for a small MNO may therefore be indicative of a barrier to switching to a small network.*
>
> *When an end-user switches from a large network that engages in on-net discounting to small network, they are less likely to receive calls and SMS from subscribers of the large network. This is likely to result in a reduction in value that the end-user receives from their mobile subscription, generating an incentive to churn back to the larger network.* [16]

I am not aware of any publicly available information on the churn rates in PNG, however this is a topic on which NICTA could request data from the parties to further its analysis.

3.6 CONCLUDING REMARKS ON SMP

The above analysis has shown that there a number of very significant barriers to entry and expansion in the retail mobile market(s). Of particular importance is that:

- It is unlikely to be economic for rivals to replicate Digicel's coverage in rural and remote areas which not only means that they cannot contest those customers but also reduces their ability to put competitive pressure on Digicel in urban areas (because mobile customers typically value having access to national coverage even if they make little use of it)

[15] New Zealand Commerce Commission (5 May, 2011), *Standard Terms Determination for the designated services of the mobile termination access services (MTAS) fixed-to-mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging services (SMS))* para 107.
[16] *Ibid*, para 101-102.

- The high fixed cost nature of mobile networks means that DIgicel, having a very large market share, benefits from substantial economies of scale;
- Digicel is also likely to have other significant cost advantages as a result of its size, given that it is not only the largest PNG mobile services supplier but also has a strong international presence.
- There are high switching costs given the prevalence of SIM locking and the lack of number portability.

Moreover the network effects that are created through on-net/off-net price discrimination create a strategic barrier to entry and expansion that is extremely difficult to overcome given the high market share of Digicel.

The above factors, combined with the observation that Digicel's market share is in excess of 70% (and perhaps very much higher than this) with no evidence to suggest that rivals have been successful in eroding that share despite undercutting Digicel's pricing leads me to conclude that Digicel does hold SMP in the supply of retail mobile services.

Digicel's entry into the market has likely brought significant benefits to consumers in the past (for example, through breaking the previous mobile market monopoly, and investing in significantly increased coverage). However, what is concerning is that having acquired a very high share of subscribers, and likely an even higher share of market revenues, the competition barriers identified above mean that Digicel's degree of market power has been growing over time and is now very substantial and extremely difficult for rivals to erode without regulatory intervention.

4 PRICE DISCRIMINATION, NETWORK EFFECTS AND IMPLICATIONS FOR COMPETITION

As was discussed above in section 3.2.3, on-net/off-net price discrimination (referred to in what follows simply as price discrimination) causes a network effect. It is well recognised and demonstrated in the economic literature that the implication of network effects is that price discrimination can be utilised by networks with large subscriber bases to create a strategic barrier to entry or subscriber base expansion by smaller networks.

There are two contributing components to the network effect that arise from price discrimination. The first is that with price discrimination it will be more attractive for subscribers to join the larger network because that results in the on-net price being applied to a larger proportion of calls. The second is that customers value the ability to receive calls, but in the case where a large network engages in price discrimination customers connecting to a small network will find that they receive a reduced number of calls as a result of the large network's high off-net prices. This means that price discrimination by large networks will discourage customers from joining smaller networks.

The remainder of this section:

- Explains in more detail, and with reference to the relevant economic literature, the competition problems that arise where price discrimination by a large network is coupled with high mobile termination rates (MTRs);

- Discusses how call externalities (which arise from the benefit customers receive from being called) further reinforce the strategic incentives that large networks have to price discriminate, thereby creating a strategic barrier to entry and expansion;
- Considers whether outcomes in the PNG mobile market indicate that Digicel is engaging in strategic behavior that has the effect of limiting the ability of smaller networks to compete effectively; and
- Provides comments on the implications for the assessment of whether a restriction on price discrimination would satisfy the retail regulation criteria set out in section 158 of the NICT Act.

4.1 HIGH LEVEL OF PRICE DISCRIMINATION COUPLED WITH HIGH MTRS

On-net/off-net price differentiation results in lower average pricing for large networks

In the presence of price discrimination it is generally more attractive for a subscriber to join the largest network because the on-net price applies to a larger proportion of calls, meaning that the average price that a customer would pay if he/she subscribes to the large network would be lower than what he/she would pay when were connect to the smaller network.

Consider the following illustrative example:

- Network A has a 70% market share
- Network B has a 30% market share
- Both networks charge 20t per minute for on-net calls and K1.0 for off-net calls

If the subscribers that a customer wishes to call are randomly distributed across the two networks then 70% will be on Network A and 30% will be on Network B. The customer will pay 73% more per month if he/she subscribes to the larger network. For example, if the customer uses around 50 minutes per month, he/she would pay:

- K22.00 per month if subscribed to the largest network, Network A (=K1.00x15 K0.20 x 35); and
- K38.00 per month if subscribed to Network B (=K1.00x35 K0.20 x 15).

In this case the large network will be much more attractive to the customer. In order to win subscribers the small network would need to reduce its prices for at least some off-net calls (although as discussed below in section 4.2 even doing so may not allow them to attract a significant share of customers). However, their capacity to do so depends on their ability to cover costs which for off-net calls includes the mobile termination rate.

Findings from the economic literature

That large networks have strong incentives to implement high MTRs and engage in price discrimination in order to restrict competition from smaller networks, and potentially foreclose competition altogether, is clearly recognised and demonstrated in the economic literature.

Laffont, Rey and Tirole (1998) investigate the effects of price differentiation where networks are symmetric and termination rates are unregulated.[17] The authors conclude that in this case differentiation will be inefficient since it will be neither cost- nor demand-based and will lead to a distortion of consumption patterns. Nonetheless such discrimination may intensify competition between *equal* rivals since it will offer stronger incentives to compete for market share (doing so will reduce the termination payment burden). However, if rivals are not equal in size, such price discrimination will harm smaller players and inhibit entry.

Similar conclusions are drawn by Gabrielsen and Vagstad (2008) who note that price differentiation resulting from above-cost termination rates can create switching costs and thereby limit competition between networks.[18]

Lopez and Rey (2009) model the case of competition between a large network and a small network and find that above cost MTRs help the incumbent to retain a dominant position.[19] Lopez and Rey also explain that price discriminating between on-net and off-net calls result in tariff-mediated network effects which result in market foreclosure through the use of a high MTR.

Cabral (2009) uses a dynamic model of competition between two networks.[20] The paper finds that a larger network is always more likely to attract a new customer. Furthermore, it finds that if network effects are sufficiently strong then the larger network tends to increase its share (unless it is already close to 100%). In the specific case of mobile telecommunications, Cabral finds that high termination charges increase barriers to entry and decrease the value of an entrant's network.

One implication of the literature is that MTRs should be set at cost. However, as later literature on calling externalities finds, even with MTRs set at cost large networks will still have the incentive to create network effects through price discrimination which restrict the ability of small networks to compete effectively.

4.2 CALLING EXTERNALITY EFFECT

A "calling externality" occurs when a subscriber receives a positive benefit from being called. Under the calling party pays (CPP) arrangement it is the caller that pays for call. Therefore a called party receives a benefit from being called but does not incur a cost. That subscribers generally do receive a benefit from receiving calls is fairly obvious – mobile phone subscription is not simply for the purpose of contacting others but also because of a desire to be contacted. This is evident, for example, from the observation that consumers do answer a large number of incoming calls (otherwise no calls would be connected) and the widespread implementation of and use of mobile number portability which allows customers to retain the same number when switching so that their contacts can continue to call them.

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[17] Laffont J, Rey P and Tirole J, 'Network Competition II: Price Discrimination', *RAND Journal of Economics*, vol 29(1), Spring 1998

[18] Gabrielsen T and Vagstad S (2008, 'Why is on-net traffic cheaper than off-net traffic? Access markup as a collusive device', *European Economic Review* 52 99–115.

[19] Lopez, A. and P. Rey (2009) "Foreclosing Competition through Access Charges and Price Discrimination,"IDEI Working Paper, Number 570.

[20] Cabral, L. (2009) "Dynamic Price Competition with Network Effects, *mimeo*, New York University.

Because consumers value the ability to receive calls, price discrimination by a large network will reduce the attractiveness of subscribing to a small network when the customer has contacts that remain on the large network. This is because subscribers to the large network will lower the quantity of calls to the subscriber of the small network in response to the high off-net price they face. The implications for the profit-maximising strategy when call externalities are taken into account has been examined in the economic literature. Key findings of the literature include that:

- the call externality leads firms to set off-net prices above on-net prices;
- larger networks will tend to set higher off-net prices than smaller networks; and
- this can be driven by an incentive to restrict competition.

Jeon, Laffont and Tirole (2004) model two symmetric networks in the presence of call externalities and non-linear prices (ie, firms charge subscribers a monthly subscription fee and a per minute rate.[21] They find that both networks regardless of their size will set a usage price for on-net calls that is below marginal costs and the subscription price will be set so as extract consumer surplus. They find that where market shares are equal and in the case where a calling externality does not exist off-net prices would be set at the sum of the origination cost and the termination charge. However, introduction of a calling externality results in strategic incentives to increase the off-net price above cost to reduce the number of calls placed to the competing network with the aim of reducing the value to customers of subscribing to the competing network. Jeon et al find that if the call externality is high enough – in particular if receivers of calls derive more benefit than the calling party does – off-net prices will be set so high that there will be complete connectivity breakdown where off-net calls are entirely eradicated. Jeon et al also find that even for a more moderate call externality (ie, where receivers attach a positive value to receiving calls, but where this is less than the value to the calling party of placing the call), the volume of off-net calls will be sub-optimal.

Analysis by Hoernig (2007) takes into account the potential for cost and demand differences between networks and also accounts for regulatory determination of call termination charges.[22] Hoernig finds that even where termination rates are regulated, a larger network will tend to charge more for off-net calls to account for the utility received by called parties on the other network (a positive externality that is internalised by higher off-net charges). Such differentiation is not necessarily anti-competitive, to the extent that it is simply reflective of differences between the two networks. However Hoernig highlights that price differentiation could also be used for anti-competitive purposes, in which case the on-net/off-net price differential would be larger.

Armstrong and Wright (2009) employ a model which has multiple mobile networks and one fixed network.[23] They find that the off-net prices will exceed the welfare-maximizing price. In particular, they find that the off-net price will be equal to the marginal cost of an off-net call plus a mark-up that accounts for the fact that fewer off-net calls to other networks will reduce the utility of the

[21] Jeon, D. S., J.-J. La¤ont and J. Tirole (2004) "On the Receiver Pays Principle",RAND Journal of Economics, 35: 85-110.

[22] Hoernig S, 'On-net and off-net pricing on asymmetric telecommunications networks', *Information Economics and Policy*, vol. 19(2), pages 171-188, June 2007.

[23] Armstrong, M. and J. Wright (2009b) "Mobile Call Termination in the UK: A Competitive Bottleneck?" in B. Lyons (ed), Cases in European Competition Policy: The Economic Analysis. Cambridge University Press: Cambridge, United Kingdom.

subscribers to those networks given the calling externality. Armstrong and Wright describe this mark-up as being an "anti-competitive motive to set high off-net retail call charges."

4.3 IMPLICATIONS FOR COMPETITION IN PNG MOBILE MARKET

Having established from the economic literature that large networks have incentives to implement on-net/off-net price differentials in order restrict the ability of smaller firms to expand their subscriber base and compete effectively, the next step in the analysis is to examine whether there is evidence that shows Digicel is engaging in this behavior in the PNG mobile market. According to economic literature discussed above where price discrimination is being used to restrict competition the following outcomes may be expected:

- Off-net prices will significantly exceed on-net prices (by more than the difference between the termination rate and marginal cost);
- The off-net/on-net differential will be higher for larger networks;
- Levels of off-net traffic will be sub-optimal; and
- The ability of small networks to increase their market share will be limited.

Empirical analysis can be used to examine whether these outcomes have occurred in PNG.

As demonstrated in Table 2 there are substantial differentials between on-net and off-net prices. Taking the example of a 5-minute call made during peak hours (ie, 8am to 11pm, 7 days per week) the difference between Digicel's off-net and on-net prepaid price is K1.41, 380% in percentage terms. Bemobile's differential is K0.75, or 312%. Citifon's differential is K0.37 or 1850%. In New Zealand the Commerce Commission found that the on-net/off-net differential for voice calls was 56.6% for 2010. It concluded by international comparison that "the extent of on-net discounting in the New Zealand retail mobile market is significant compared to other jurisdictions. The resulting onnet/ off-net price differentials are likely to influence the traffic flows between networks, end-users choice of network and switching behaviour."[24] As a result the Commission commenced monitoring of traffic patterns, the extent of price discrimination and the amount of churn with the ability to quickly impose a prohibition on price discrimination should those indicators continue to indicate that there was a high level of price discrimination and that it was preventing effective competition from evolving.[25] The calculations above show the level of price discrimination to be many times higher in PNG, and thus potentially much more concerning, than in New Zealand.

[24] Commerce Commission (May 2011), MTR STD, para 68.
[25] Commerce Commission (May 2011), p. iv-v.

TABLE 2: PNG MOBILE NETWORK STANDARD PREPAID ON-NET AND OFF-NET PRICING DURING PEAK HOURS, KINA PER MINUTE (INCLUDING GST)

	On-net price			Off-net price			Differential
	First minute	Subsequent minute	5-minute average	First minute	Subsequent minute	5-minute average	per minute
Digicel	0.99	0.11	0.29	1.70	1.70	1.70	1.41
BeMobile	0.79	0.10	0.24	0.99	0.99	0.99	0.75
Citifon	0.02	0.02	0.02	0.39	0.39	0.39	0.37

Source: Operator websites.
Notes: Digicel's peak period applies 8AM –10:59PM (Monday through to Sunday). BeMobile peak rates apply . Citifon's rates do not vary between peak and off-peak.

Consistent with the literature, the size of the on-net/off-net differential (in absolute terms) is highest for the largest operater: for a 5 minute peak call Digicel's average per minute differential is K1.41, as compared with bemobile's at K0.75 and citifon's at K0.37. Moreover the differentials are much higher than the termination rate (more than 5 times in the case of Digicel) implying that the primary reason for price discrimination is not cost-based. That Digicel's differential is the highest reflects the strategic advantage it receives from limiting the number of calls to other networks. Whether it has had this effect can be examined by analysing interconnect data.

Interconnect data shows that over the past 12 months the volume of call minutes from bemobile to Digicel was almost three times the amount of inbound traffic. This shows that, unsurprisingly the large pricing differentials implemented by Digicel have limited the amount of traffic flowing off its network. SMS traffic is closer to being in balance although there is 17% more SMS traffic from bemobile to Digicel than in the opposite direction.

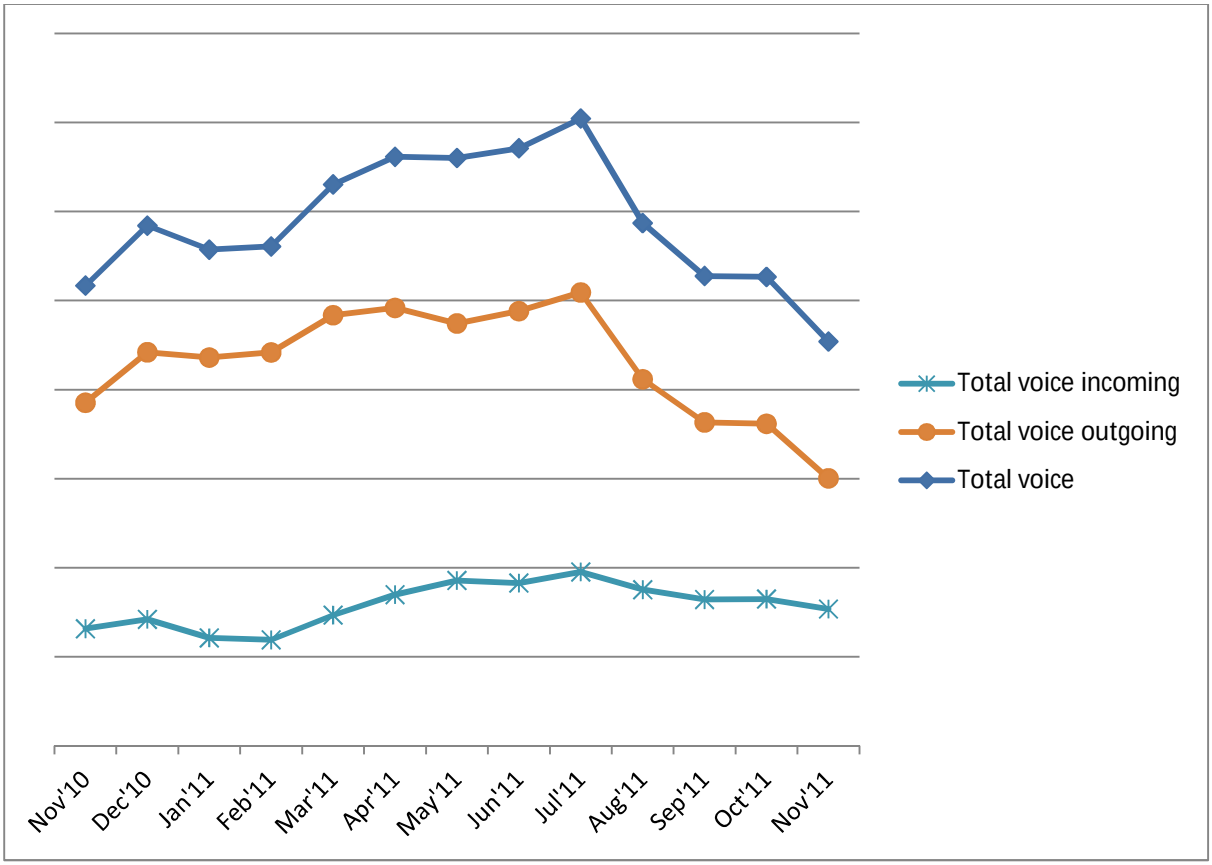
Looking at the trend in traffic volumes over the last year shows a large decline in bemobile's outbound off-net traffic to Digicel over the past 6 months accompanied by a smaller, though steady, reduction in traffic received from Digicel (see Figure 1). Possible explanations for these trends include: (a) a reduction in bemobile's subscriber share; or (b) customers changing their calling patterns such that they make less off-net calls. To establish whether (a) is the correct explanation would require information on trends in subscriber numbers. If (b) is the correct explanation this could indicate that the market is heading towards the connectivity breakdown identified by Jeon et al in the economic literature. Either explanation leads to cause for significant concern:

- if bemobile's subscriber share is reducing despite its pricing being substantially below Digicel's, this may indicate that network effects are preventing it from competing effectively with Digicel[26]; and
- if consumer calling patterns are changing such that an increasingly high proportion of calls are on-net, this implies a sub-optimal level of off-net traffic.

[26] While there are obviously other important drivers of market share – eg, network quality, coverage, customer service – to conclude these were the reasons for a loss in share would require evidence showing that bemobile's performance on non-price factors had recently changed materially.

Additional data the NICTA could collect from the parties to examine traffic patterns in more detail would be the volume of on-net calls for each network and the volume of off-net calls for each network, so as to be able to calculate what proportion of traffic is off-net.

FIGURE 1: MINUTES OF VOICE TRAFFIC BETWEEN DIGICEL AND BEMOBILE (NOVEMBER 2010 TO NOVEMBER 2011)



In summary, the data discussed in this section together with the observations on market share discussed in section 3.1 strongly show that the extent of price discrimination is severe and is having an acute effect on the extent of inter-network traffic. This is strongly suggestive of strong network effects which would form a barrier to effective competition in the relevant PNG mobile market.

Going forward, if regulatory intervention does not occur it appears highly likely that there will continue to be one large network (Digicel) and either one or two small networks that contest only a small niche of customers. In that scenario, efficient investment will be curtailed – the smaller network will not have the means nor the business case to invest further and Digicel's incentive to invest will be reduced due to muted competition. This leads to a loss of dynamic efficiencies that would result from consumers having access to new and innovative services. There would be little constraint on Digicel's market behavior implying that its degree of market power will continue and strengthen.

4.4 ASSESSMENT OF RETAIL REGULATION CRITERIA

This section assesses whether the retail regulation criteria set out in section 158 of the NICT Act would be satisfied by a rule which prohibits retail discrimination between calls terminating on-net

and off-net. I note that I have not examined the effects of setting an off-net price cap. It is my view that implementation of a non-discrimination rule would be more consistent with the six principles that NICTA proposes be used to guide assessments retail price determinations. More generally it is my view that a non-discrimination rule would be more consistent with the promotion of competition than an off-net cap would. Section 158 of the NICT Act requires that the following criteria be satisfied if a retail service determination is to be implemented:

a) *That making a retail service determination for the retail service in respect of an operator licensee for a particular period will further the achievement of objective set out in Section 124 but disregarding Section 124(2); and*
b) *Specifically in relation to the competition objective that -*
    i. *That operator licensee has a substantial degree of market power in the market within which the retail service is supplied; and*
    ii. *In the absence of the retail service determination for that period, that substantial degree of market power is likely to –*
        A. *Persist in the market over that period; and*
        B. *Expose retail customers to a material risk of higher prices and/or reduced service where they acquire the retail service from that operator licensee during that period; and*
c) *Specifically, in relation to the efficiency objective, that the operator licensee will not be prevented from achieving a return on assets during that period sufficient to sustain investment necessary to supply the retail service; and*
d) *The aggregate likely benefits of making that retail service determination outweigh any aggregate likely detriments.*

The first criterion, achievement of the objective set out in 124 of the Act, requires that the "competition objective" (promoting effective competition) and the "efficiency objective" (promoting the efficient use of and investment in telecommunications networks) be further achieved. It seems highly likely that continuing to allow Digicel to engage in its current discriminatory pricing practices is contrary to both of these objectives. While it may be said that Digicel has in the past brought competition to the PNG mobile markets, discriminatory pricing appears to be entrenching Digicel as the dominant player. As discussed previously in this report by virtue of network effects from discriminatory pricing, Digicel now has a very large share of subscribers and price discrimination is actually creating market power through forming a strategic barrier to entry or expansion by existing players. Curbing its market power by prohibiting discriminatory pricing will increase the ability of smaller networks to place a competitive constraint on Digicel and therefore promote the competition objective.

As discussed above in section 4.3, without regulation it seems likely that efficient investment will be reduced. Smaller networks will be deterred from expanding their network coverage given the high risk that they will not be able to attract customers rendering network investment unviable. Digicel itself will have a significantly reduced incentive to invest in improving its network coverage and service quality due to the reduced competitive constraint. Therefore, regulatory intervention that prohibits retail discrimination would promote the efficiency objective.

Criterion b(i) requires that the operator licensee has a substantial degree of market power. As discussed in section 3, it seems clear that this criterion is satisfied. Criterion b(ii) further requires that the SMP is likely to persist in the absence of the determination. It seems highly likely that

Digicel's SMP would persist. Indeed the extent of Digicel's market power may even increase over time as connectivity between networks continues to reduce and customers switch to the large network.

Criterion b(ii) also requires that the SMP will "Expose retail customers to a material risk of higher prices and/or reduced service where they acquire the retail service from that operator licensee during that period". In the absence of regulatory intervention it seems clear that off-net prices would remain high, effectively eliminating off-net traffic. Implementing a non-discrimination ban would be expected to result in a fall in off-net pricing. It is possible that there would be an upward adjustment to on-net prices, if it is the case Digicel would not cover costs if it set anynet pricing at the current on-net price level. It is not clear that this would happen and in any case the disbenefit to consumers of this type of pricing adjustment needs to be set against the large benefits (such as improved service levels that would come from promoting effective competition and investment).

Criterion (c) requires that the operator licensee will not be prevented from achieving a return on assets. A prohibition of discrimination pricing changes the structure of pricing but does not set the level of prices. Therefore Digicel would still have the ability to set the level of mobile prices at a rate that allowed it to cover its costs and earn a return on capital.

Criterion (d) requires that overall the likely benefits of making a retail service determination outweigh the likely detriments. Given the findings of this report that without retail regulatory intervention the network effects that arise from price discrimination will maintain or strengthen Digicel's market power and severely restrict its rivals from competing effectively it seems highly likely that the benefits of a retail non-discrimination rule would outweigh the detriments.

APPENDIX A: CURRICULUM VITAE FOR EMMA LANIGAN

Email: e.lanigan@xtra.co.nz

Nationality: New Zealander
Country of Residence: New Zealand

PROFESSIONAL QUALIFICATIONS

M.A. Economics (with First Class Honours), University of Auckland, New Zealand

B.A. Major in Economics, Minor in Mathematics, University of Auckland, New Zealand

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Emma specialises in analysing regulatory and competition issues, primarily in the telecommunications industry, and has advised clients in Australia, New Zealand, Europe, Asia, the Middle East and in a number of Pacific Island nations. In her consulting career, Emma has worked on a wide range of regulatory and competition projects covering anticompetitive conduct assessment, retail and wholesale pricing strategy utilising economic models of strategic interaction, the establishment of regulatory compliance programs, regulatory policy analysis, cost modelling and the development of access prices, and the assessment of competitive effects of mergers and joint ventures. Industries other than telecommunications in which Emma has advised clients include airlines, health, rail, and pay television.

Recent experience in current role

- Submitted expert economics analysis to the New Zealand Commerce Commission in its standard terms determination for mobile terminating access service, covering the issues of benchmarking and discriminatory pricing.
- Preparation of expert reports for SamoaTel on cost-modelled fixed and mobile termination rates for submission to the Office of the Regulator in the context of an interconnection determination.
- Appeared as an expert witness before the Samoan Telecommunications Tribunal in relation to a matter regarding Digicel Samoa's mobile pricing.
- Provided expert economic analysis to the New Zealand Commerce Commission on behalf of the mobile entrant, 2degrees, in the context of an inquiry into whether mobile termination access service should be regulated, mobile termination rate pricing principles, the welfare effects of regulation and international benchmarking.
- Preparation of market definition and market power analysis of the Bermudan fixed and mobile telecommunications markets.
- Analysis of the competition effects of digital dividend spectrum allocations.
- Preparation of an expert report on international benchmarking of mobile termination rates in the context of an arbitration.

Representative assignments in previous consulting roles

- Analysis of incentives in relation to the provision of mobile co-location in New Zealand.
- Preparing a cost model to determine an access price for pay TV set-top boxes in Australia.
- Developing economic methodology and software for testing compliance with competition law in relation to price squeeze tests, including modelling of the relevant costs.
- Multiple secondments to Telstra to carry out regulatory functions for the Consumer and Business & Government customer units. These roles involved reviewing pricing proposals to check for competition issues, liasing with marketing and pricing staff and presentations to the regulator.
- Part of a team that prepared a bottom-up cost model of network termination services for a Pacific Island telecommunications company.
- Economic modelling of the impact of mobile termination charges on competitive outcomes in Australia.
- Examination of price squeeze issues in relation to NGAN services.
- Assessing the competitive effects of 3G mobile network-sharing arrangements in Australia.
- Analysis of USO costing and funding mechanisms in Australia and New Zealand.
- Market definition and market power analysis of the Japanese mobile market.
- Assessment of the effects of mergers and joint ventures in mobile markets.
- Critically reviewing a cost model of FTTN (fibre to the node) services.
- Developing a price cap methodology for FTTN access pricing.
- Analysis of the macro-economic effects of mobile termination regulation.
- Preparing a cost model to determine international interconnection charges in Fiji.
- Advising Telecom Italia on the drafting and implementation of the EU electronic communications regulatory regime.
- Conducting market definition and market power analyses in the New Zealand, Australian, and Italian telecommunications industries, covering the fixed, broadband and mobile markets.
- Analysing the structure of interconnection charging arrangements and the incentives arising from non-linear pricing structures.
- Assessing the costs and benefits of functional and structural separation.
- Drafting expert witness statements in the context of anti-competitive conduct litigations relating to the telecommunications industry.

PROFESSIONAL HISTORY

Sep 2009 – present *Independent Consultant*

April 2008 –Sep 2009 *Principal,* Concept Economics

2004-2008 *Principal*, CRA International

2003-2004	*Principal*, Network Economics Consulting Group (NECG)
2002–2003	*Managing Consultant*, NECG, Australia
	Secondment to Telstra as a Regulatory Manager
1998–2002	*Senior Consultant, NECG*, Australia/New Zealand
	Secondments to Telecom New Zealand and Telstra
1996–1998	*Consultant*, Ergas & Associates, Australia/New Zealand
1995–1996	*Research Assistant* to Professor Henry Ergas, Centre for Research Economics and Communications, University of Auckland, New Zealand
1995	*Data Analyst*, Process Improvement Team, Airline Accounting Department, Air New Zealand, New Zealand (part-time)

PUBLICATIONS

2009, "Price Squeezes and Vertical Discrimination on Next Generation Access Networks" with Henry Ergas and Eric Ralph. Available at SSRN: http://ssrn.com/abstract=1433170

2002, "3G Network Sharing in the Australian Context." Paper presented at the Tokyo Mobile Roundtable May 2002.

2000, "The New Zealand telecommunications review: issues and perspectives." Paper presented at Industry Economics Conference, 10 July 2000.

1999, "A comparison of international telecommunications prices." With Sam Lovick. March 11, 1999.

1997, "Modeling Interconnection Agreements of Monopolistic Network Providers." Master's thesis, 1997.