

Final Report

Mobile-to-Mobile Termination Economic Issues

Prepared for

Vodafone New Zealand

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Executive Summary

In this report, prepared for Vodafone New Zealand, we examine economic issues related to mobile-to-mobile (MTM) termination raised by the Commerce Commission's Issues Paper that considers undertaking a Schedule 3 investigation into regulation of mobile termination under the Telecommunications Act 2001. Following the focus of the Issues Paper, we concentrate on MTM termination and do not discuss fixed-to-mobile (FTM) termination, as that has already been the subject of a Schedule 3 investigation.

First we examine the issue of problem definition and whether or not there is any market failure that can be solved by regulation of the MTM termination rate. We argue that, in the Issues Paper, the Commission overlooks the basic and important complementarity (in both production and consumption) between MTM termination and the provision of retail mobile services. Put simply, to offer a complete service to retail mobile customers, a mobile network must both use MTM termination services of other mobile networks and supply MTM termination services to them. This is because consumers expect to be able to receive calls and text messages from all networks as well as to be able to make calls and send texts. Termination and retail mobile services are produced and consumed jointly.

In contrast, the Commission characterises MTM termination as a traditional one-way access bottleneck where a sole upstream supplier controls access to an essential input for a downstream retail market. This is not a correct characterisation of the structure of the industry, and a framework of two-way interconnection is more appropriate. The implications are that the incentives a mobile network faces when setting its MTM termination rate are different from those faced by a one-way access bottleneck supplier, and that MTM termination rate setting is more appropriately characterised by bargaining rather than price setting.

Unlike one-way access problems, the link between the MTM termination rate and retail mobile prices is more complex. In particular, we show that, in addition to directly affecting the per-minute off-net price, the MTM termination rate also affects other retail mobile prices as a result of the profit-maximising behaviour of mobile networks. Thus a 'waterbed' effect will exist where downwards regulation of the MTM termination rate may reduce the per-minute off-net price but may increase other retail mobile prices. As was shown in the Commission's FTM investigation, the welfare losses induced by the waterbed effect can be quite large relative to any benefits of regulation.

With this in mind, it is clear that the welfare framework presented in the Issues Paper is incomplete. It considers only potential welfare benefits from a reduction in the per-minute off-net price, but ignores potential detriments arising from increases in other mobile market prices. The Commission's framework would overstate the net benefits from regulation under any given counterfactual and factual scenarios.

We also discuss the interaction between the MTM termination rate and on-/off-net price discrimination in terms of the implications for analysis of competition in the mobile market. Such price discrimination generates 'tariff-mediated network effects', whereby

consumers prefer to belong to the same network as people that they frequently call. However, in general markets with network effects are characterised by relatively intense competition between networks, as the incentive to cut price and expand the size of the network can be stronger than in a market without network effects, everything else equal. The same is true with tariff-mediated network effects, and means that mobile firms compete more intensely under this type of price discrimination than without. This implies that the MTM termination rate affects the intensity of competition among mobile networks, with a higher termination rate being associated with more intense competition.

The result is that, everything else equal, it is possible to show that mobile networks would prefer a relatively low MTM termination rate, so as to minimise the tariff-mediated network effects and reduce the intensity of competition between them. A high MTM termination rate may be a sign of relatively intense competition between mobile networks, rather than a lack of competition.

We also examine on-/off-net price discrimination and the issue of whether it could be considered predatory. In our view there is no evidence that such discrimination as applied in New Zealand is predatory. It has been used by both Telecom and Vodafone for a long time, is used by new entrants to compete with existing networks in other jurisdictions, and there is no evidence that on-net prices in New Zealand are below average variable costs. Thus on-/off-net price discrimination does not have the characteristics that we would expect to observe under a predation strategy.

In terms of the effects of price discrimination in general, we disagree with the Commission that it is only a legitimate business strategy when it reflects cost differences. There are many examples of price discrimination that do not reflect cost differences which do not come under competition scrutiny. In addition, in terms of welfare it is not clear from theory whether or not price discrimination increases or decreases total welfare, and it does make some consumer groups better off. The same is true of on-/off-net price discrimination, and the question as to whether it is harmful for welfare is empirical rather than theoretical.

Finally we examine the way that MTM termination rates are set, and argue that bargaining is the appropriate framework. We demonstrate that even small networks have bargaining power, as larger networks must buy termination services from small networks as well as supply it to them. Thus countervailing bargaining power exists in MTM termination negotiations regardless of the relative sizes of the two networks.

1. Introduction

On 8 August 2008 the Commerce Commission published an Issues Paper on mobile termination that considers the possibility of a Schedule 3 investigation into regulation of mobile termination under the Telecommunications Act 2001. The Issues Paper mainly refers to mobile-to-mobile (MTM) termination, as fixed-to-mobile (FTM) termination has already been the subject of a comprehensive regulatory investigation in the recent past.

Vodafone New Zealand has asked us to examine the Issues Paper from an economic perspective. This report contains our analysis of the main economic issues that the Commission has raised, as well as other relevant issues. This report is not intended to be a comprehensive overview of the economics of mobile termination. Instead our objective is to contribute to the debate by discussing the important economic issues that have arisen as a result of the Issues Paper. As per the focus of the Issues Paper, we concentrate solely on MTM termination.

The remainder of this report is organised as follows. In the next section we discuss the basic issue of problem definition and whether or not there is a market failure that regulation of MTM termination rates can solve. In section 3 we give a brief overview of the economics of MTM termination and discuss what prices the MTM termination rate affects, the likely consequences of changing the MTM rate, and implications of this for analysis of competition between mobile operators and for welfare analysis of potential regulation. Section 4 examines on/off-net price discrimination including competition issues and the possible welfare effects of such discrimination. Finally, section 5 discusses MTM rate setting through bilateral bargaining by mobile networks and the possibility for countervailing bargaining power to exist.

2. Problem Definition

In our view, the Issues Paper does not clearly identify any market failure or inefficiency that regulation of the MTM termination rate will be able to solve. MTM termination is an example of two-way interconnection, with each mobile network both supplying and requiring termination services to and from other mobile networks. The Commission lists the key elements required to provide voice mobile services (paragraph 32): network access, call origination, call conveyance and call termination on other networks. Missing from this list is the fact that mobile networks must also *supply* termination services to other mobile networks in order to offer a complete service to their *own* customers. Mobile customers expect to be able to receive calls from all other mobile customers, as well as being able to make calls to them.

The Commission makes the same omission in paragraph 26, where it states:

The termination service is not part of this retail offering to subscribers, as subscribers do not pay to receive incoming calls/SMS.

While it is true that, under calling party pays, subscribers do not pay for incoming calls or texts, the ability to receive calls and texts is implicit in the service that they buy from the mobile network. Even prepay customers who do not pay explicit monthly fees still expect their mobile phones to be able to receive calls, and indeed a significant fraction of prepay customers receive many more calls than they make. Thus it is not correct to define a separate wholesale termination market as distinct from the retail market. No mobile network would be able to compete in the retail market if it did not both offer termination services to other mobile networks and buy termination services from them. No mobile network would be able to supply termination if it did not also supply retail mobile services. In economic terms, termination and retail mobile services are complements in both production and consumption.

This reveals that MTM termination is quite different from the standard one-way access bottleneck problem where an upstream firm is the sole provider of an essential input required by downstream firms to produce a final retail product. In the classic one-way access problem, a monopoly controls access to the upstream bottleneck, and thus has an incentive to charge an inefficiently high price to downstream firms for access, which flows through into inefficiently high prices in the downstream retail market. This creates economic welfare losses in the downstream retail market, as output is reduced below the socially optimal level in response to the high downstream retail price. In contrast, while each mobile network by definition is the sole provider of termination of MTM calls to its customers, mobile networks also require MTM services from other mobile networks in order to provide calling services to their customers. Thus there is no distinction between 'upstream' and 'downstream' firms in MTM termination that there is in a traditional one-way access problem.

Therefore, MTM termination does not exhibit the characteristics of an access bottleneck. Every firm that requires access to MTM termination will also provide MTM termination to others. The main implication of this is that the incentives a mobile network faces

when choosing its MTM termination rate are quite different to the incentives a monopoly provider of access to a one-way bottleneck faces when setting its access price. We discuss these incentives in section 3 below. Furthermore, since each mobile network both demands and supplies MTM termination, the process of setting MTM termination rates is most appropriately characterised by bargaining, rather than price setting by an upstream monopolist facing a passive downstream demand curve. We discuss bargaining in section 5.

In one-way access problems, the link between the access price and the downstream retail price is simple and clear. However, as we discuss in detail in the next section, it is not the case that a high MTM termination rate, for example, generates inefficiently high overall retail prices for mobile services and leads to excessively high profits of mobile operators. In fact, theory suggests that the intensity of competition among mobile operators at the retail level is *inversely* related to the level of the MTM termination rate – a higher termination rate leads to more intense competition, and vice versa. This stems from the fact that the effects of a change in the MTM termination rate are more complex than the effects of changing the access price in a one-way access situation.

Thus in terms of competitive outcomes in the mobile market, if the MTM termination rate exceeds a TSLRIC estimate of its level, this does not by itself present a problem that needs to be resolved by regulation. The flipside of this argument is that downwards regulation of the MTM termination rate may reduce the intensity of competition between mobile operators, leading to an overall reduction of consumer welfare, once all the effects in the retail mobile market are taken into account.

If the Commission is concerned about entry in the mobile market instead of or in addition to the level of prices in the retail mobile market, in practical terms the level of the MTM termination rate does not prevent mobile operators (whether existing or new) from offering services and packages that are attractive to consumers. There are many dimensions over which mobile operators compete, including bundles and plans as well as handsets, interactive services, branding, international roaming coverage, and so on. By imposing regulation on MTM termination, the Commission may restrict the types of business model that are viable for mobile operators, but we see no particular reason or need to do that.

In summary, MTM termination is not an example of a simple bottleneck access problem, and there is no clear link between the current level of the MTM termination rate and overall economic inefficiencies in the mobile market. Put another way, in the Issues Paper the Commission has not identified a causal link between the MTM termination rate and any of its observations about the current state of the mobile market, nor has it clearly defined an economic problem that MTM termination regulation can solve.

3. MTM Termination Economics

In this section we first discuss the economic issues arising from MTM termination, and how the MTM termination rate affects outcomes in the retail mobile market. As explained above, the appropriate setting is that of two-way interconnection between competing mobile networks.¹ We then consider the implications of this for analysis of competition in the mobile market and for the welfare analysis of potential MTM termination regulation.

3.1. What the MTM Termination Rate Affects

Mobile networks have a large number of sources of revenues and costs, and compete over a number of different prices. Included in this mix are: monthly subscription fees, termination, per-minute charges, and charges for other services such as SMS, voicemail and mobile data. The Commission's view seems to be that the MTM termination rate affects only the price of outgoing off-net calls (and hence the relative price between on- and off-net calls). However, it is relatively straightforward to show, for example, that with on-/off-net price discrimination and two-part pricing, the level of the MTM termination rate also affects the subscription price.²

In its investigation of FTM termination, the Commission acknowledged the existence of a 'waterbed' effect, whereby a change in the FTM termination rate will affect retail prices charged by mobile operators (as well as the FTM retail price set by fixed-line operators).³ The basic intuition underlying the waterbed effect in the FTM case is that each mobile subscriber attracts some (average) amount of FTM calls. Thus FTM termination revenues are part of the per-customer marginal revenue and a change in the termination rate affects the marginal revenue and therefore changes the profit-maximising number of mobile subscribers. As was demonstrated clearly in the FTM investigation, a regulated decrease in the FTM termination rate leads to increases in mobile retail prices.⁴

A similar effect arises in the case of the MTM termination rate, although the effects are slightly more complex because the per-customer MTM terminated minutes depends partly on market share, rather than being a fixed (average) amount per customer. Nevertheless, as we demonstrate in the Appendix of this report, there is a clear link between the MTM termination rate and other retail mobile prices.

¹ Detailed economic analysis of two-way interconnection is contained in Laffont, Rey & Tirole (1998a, 1998b), Carter & Wright (1999), Armstrong (2002), Laffont & Tirole (2000) and Armstrong & Wright (2008).

² See, for example, Armstrong & Wright (2008), section 3.2.

³ See, for example, the Mobile Termination Reconsideration Final Report (21 April 2006), paragraphs 103 to 107.

⁴ In simple theoretical models, the effect operates through the subscription price, but in the FTM investigation the effect was interpreted more broadly across all mobile prices.

As in the FTM case, it can be shown that with on-/off-net price discrimination and two-part pricing, a lower MTM termination rate reduces the per-minute off-net price but increases the mobile subscription price. In contrast with the assumptions in the Issues Paper (e.g. paragraphs 82 – 92), with MTM termination there is not the simple relationship between the access price and a single retail price that occurs in a traditional one-way access bottleneck situation. Thus, as in the FTM case, a ‘waterbed’ effect exists with MTM termination regulation.⁵ This observation has a number of important implications for mobile termination, which we discuss in each of the following subsections.

It is also important to remember that MTM termination is both a source of revenues and costs for every mobile network. When different networks are similar in terms of the types of customers that they have, calling patterns will tend to be balanced, and MTM termination will not directly generate net profits or losses for any mobile network, regardless of the termination rate. Therefore, whether MTM termination directly generates profits or losses for mobile networks depends on the calling profiles of the customers that they have, not the MTM termination rate itself.

However, even if MTM termination revenues and costs are equal due to balanced calling patterns, the MTM termination rate still affects the incentives of mobile operators in terms of the prices they set for retail mobile services, as discussed above and in the Appendix to this report. This occurs when termination rates are reciprocal, but is even more important if MTM termination rates were asymmetric. With asymmetric rates, mobile operators will face strong incentives to attract customers with particular calling patterns.

For example, suppose a particular network pays a lower per-minute MTM termination rate to other networks than the termination rate it receives for terminating incoming calls. In this case it will have an incentive to attract types of customers who tend to receive more calls than they make, and MTM termination will become an important source of profits for the entrant. Asymmetric termination rates therefore have the incentive to distort the business model choices of mobile networks in terms of the types of customer they target. There is clearly no justification for regulation of termination rates to impose this kind of distortion. In addition, welfare transfers between different consumer types are created. If asymmetric termination rates give an entrant incentives to provide attractive offers (financed by net MTM termination profits) to consumers (such as Prepay customers) who tend to receive more calls than they make, these consumer types benefit and are effectively subsidised by other mobile consumer types.

3.2. Implications for Mobile Competition

Given the competition-promoting focus of the Act, an important question is how the level of the MTM termination rate affects the intensity of competition in the retail mobile

⁵ In fact the waterbed effect is quite general and can occur whenever one price of a multiproduct firm is regulated and there are complementarities or other linkages between the demands and/or costs of the regulated service and other services provided by the firm. See Schiff (2008) for detailed discussion.

market. To properly assess this, the implications of on-/off-net price discrimination need to be taken into account. With such price discrimination, mobile customers face a lower relative price to call customers who belong to the same network. This creates a 'network effect' whereby consumers prefer to belong to the same network as the people they tend to call, since calls on the same network are relatively cheaper. These network effects are often referred to as 'tariff-mediated network effects', to separate them from general network effects that come from belonging to a larger network independent of prices.⁶

It is important to distinguish between tariff-mediated network effects and ordinary network effects because the causes of them and their implications are quite different. All telecommunications services exhibit network effects, as these services allow consumers to communicate with others, and this becomes a more valuable service as the network expands. However, with interconnection between networks, these network effects operate at the level of the market as a whole, and are not specific to individual networks.

In contrast, the relevant network for the benefits to consumers that come from tariff-mediated network effects is the group of customers that consumers call at the lower on-net price. While the low price applies to the whole network that the customer belongs to, the actual number of customers that people tend to call is low, for most customers. Tariff-mediated network effects operate at the level of these relatively small 'calling circles'. The fact that a mobile customer can call one million on-net subscribers relatively cheaply is of little consequence to the consumer if the vast majority of these numbers will never be called. In terms of the effect of tariff-mediated network effects on consumers' choice of mobile network, the small calling circle of frequently called numbers is much more important than the price to call other on-net numbers outside this circle. We discuss this further in section 4.

Regardless of what generates the network effects, a general feature of markets with network effects is that competition between networks is relatively intense compared to markets without network effects, everything else equal. The intuition is that, with network effects, cutting price attracts some new customers, which also benefits the network's existing customers and raises their willingness to pay since the network is larger. This latter effect (on the existing customers) is absent in markets without network effects, and means that the potential gains from price cutting are stronger in markets with network effects. This leads to relatively intense competition between competing networks, potentially resulting in low prices, low profits, and high consumer surplus.⁷

In the MTM context, the presence of tariff-mediated network effects created by on-/off-net price discrimination means that mobile networks tend to compete relatively intensely, compared to when there is no such price discrimination. In simple theoretical models with subscription fees and on-/off-net price discrimination, this operates through the subscription fee. Tariff-mediated network effects make attracting customers

⁶ See Laffont & Tirole (2000), box 5.4, for a discussion of tariff-mediated network effects.

⁷ See Farrell & Klemperer (2007) for a discussion of competition in markets with network effects.

more valuable, which causes intense competition between the mobile networks and lower subscription fees. Due to the higher intensity of competition between the networks, profits fall.

Profit-maximising networks with on-/off-net pricing would therefore seek to reduce the intensity of this competition, by eliminating these network effects. In fact, theory suggests that such mobile networks will prefer a *below cost* MTM termination rate, everything else equal.⁸ This would result in a per-minute off-net price below the on-net price, and cause consumers to wish to belong to a smaller network, rather than a larger one. This generates ‘negative network effects’ and reverses the logic of intense competition between competing networks, which enables mobile networks to increase their profits.

Put another way, everything else equal, a high MTM termination rate is associated with relatively intense competition in the retail mobile market when there is on-/off-net price discrimination. This introduces an important tradeoff that we believe the Commission needs to be aware of. Regardless of the effects of the MTM termination rate on the prospects of entry of new networks, a regulated reduction in the MTM termination rate can reduce the intensity of competition among existing networks in the market, with consequently harmful effects on mobile consumers that will need to be taken into account in the welfare analysis (see also the Appendix and section 3.3 below).

This discussion does raise the question of why mobile networks use on-/off-net price discrimination at all, if it leads to relatively intense competition that they would rather avoid. The answer is that it is likely to be the equilibrium outcome of strategic competition between mobile networks. Even though mobile networks may be better off if they could coordinate on no such price discrimination, it is likely that each network has an incentive to use on-/off-net price discrimination given that its rival does not. Thus competitive forces drive the networks to use this type of price discrimination even if it lowers profits. In other words, networks may face a prisoners’ dilemma in terms of the decision about whether or not to price discriminate, where the equilibrium of the game is for both to price discriminate, even though both would be better off in the absence of discrimination. Unless they collude on their pricing strategies, such discrimination may be inevitable. Thus it is not necessarily the case that on-/off-net price discrimination is a sign of lack of competition between mobile networks, and may in fact be a sign of relatively intense competition.

3.3. Implications for the Welfare Analysis of Potential Regulation

The welfare analysis outlined by the Commission in section 6 of the Issues Paper is appropriate for a simple one-way access bottleneck problem, but not for MTM termination (nor for FTM termination). In the Commission’s framework, for example the diagram in paragraph 84, a reduction in the access price flows directly through into reductions in a single retail price. If the access price were originally above cost, these

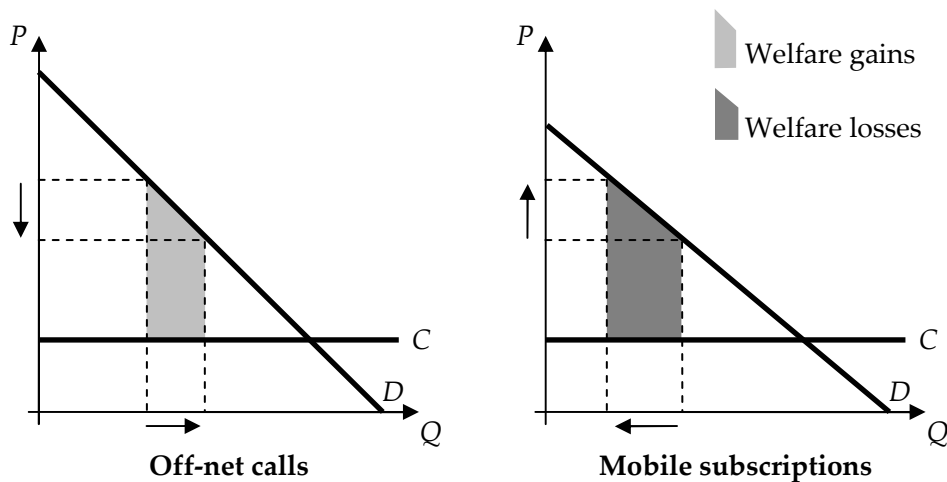
⁸ See Armstrong (2002) and Armstrong & Wright (2008).

reductions translate into the welfare gains shown. This will capture all the relevant welfare effects if the only effect of regulation is a reduction in a single retail price.

However, as discussed above, the MTM termination rate affects subscription prices, as well as the per-minute off-net price, and these two prices move in opposite directions. Reductions in the MTM termination rate also serve to reduce the intensity of competition between mobile networks, by cutting the relative price difference between on- and off-net calls and thereby reducing the importance of tariff-mediated network effects. These factors mean there are offsetting welfare losses in the retail mobile market that need to be taken into account. The Commission’s proposed welfare framework is incomplete and omits some potential detriments of regulation. As such it will overstate the net benefits of regulation for any given counterfactual and factual scenarios.

As was demonstrated in the FTM termination investigation, these offsetting effects have the potential to be quite large, and must be taken into account to calculate the true net welfare effects of regulation. For example, the Commission’s assumptions and modelling in the FTM termination investigation resulted in between 64% and 73% of the gross benefits of regulation being offset by the waterbed effect under a consumer welfare standard, and between 60% and 88% offset under a total surplus standard.⁹

Overall, the welfare analysis needs to be considerably broader than that envisaged in section 6 of the Issues Paper, and should take into account potential effects on all relevant prices in the retail mobile market, as well as effects on the intensity of competition between mobile operators in the presence of tariff-mediated network effects. For example, in contrast to the diagram in paragraph 84 of the Issues Paper, the following diagram illustrates the type of expanded welfare analysis that should be done, to take full account of the potential effects in the mobile market.



⁹ Schedule 3 Investigation into Regulation of Mobile Termination: Reconsideration Final Report, 21 April 2006, Table 13 and Table A2.

It is important to note that welfare losses associated with changes in the subscription price can be large, because if the number of mobile subscribers reduces, the welfare associated with all their usage of the mobile network (over all types of activity) is lost.

More generally, a basic principle of regulatory economics is that a regulator cannot achieve an efficient outcome over multiple variables when it has only a single instrument at its disposal to control all those variables. This is precisely the problem that confronts the Commission in regulating MTM termination: welfare outcomes in the mobile market depend on multiple prices, while the Commission can only control a single instrument (the termination rate). It is therefore vital that the Commission use a properly specified and complete welfare analysis to evaluate the effects of any proposed regulation, which captures all of the potential effects (both positive and negative) in the relevant markets. Otherwise, it is quite feasible that detriments that are omitted from the analysis could outweigh any benefits that were estimated, and regulation could result in a net decrease in economic welfare rather than an increase.

4. On-/Off-Net Price Discrimination

In the Issues Paper, the Commission raises the issue of on- and off-net price discrimination at several points. In this section we consider this issue from an economic perspective, and examine whether it is something that the Commission should be concerned about.

In question 4.1(c) in the Issues Paper, the Commission asks whether on-/off-net price discrimination could be predatory pricing. Predatory pricing is the practice of setting a below-cost price with the intent of either forcing a rival to exit or precluding a potential rival from entering.¹⁰ Exactly how low a price has to be before it is considered predatory is difficult to define, but in general a price below the average variable cost of production is a reasonable benchmark. A similarly efficient rival, faced with such a price, would be forced to exit the market in the long-run or would be deterred from entering, as it would be unable to cover its fixed costs.

With this in mind, we make several observations about on-/off-net price discrimination in mobile networks:

- It has been used by both Telecom and Vodafone in the New Zealand mobile market for several years, covering a significant period before any serious possibility of entry by a third network;
- In other jurisdictions, on-/off-net price discrimination has been successfully used by new entrants as a means of competing with established operators; and
- There is no evidence that the current level of retail prices of on-net mobile calls in New Zealand are below their average variable cost.

These observations suggest to us that on-/off-net price discrimination as applied in New Zealand is not predatory. It certainly does not have the key characteristics that we would expect to observe if the existing networks were following a predation strategy.

Furthermore, it is worth pointing out that predatory pricing is a relatively costly strategy for a firm with a large market share to pursue against a smaller rival. This is because, unless the large firm can further price discriminate between the consumers who are and are not *potential* customers of the smaller rival, the large firm must cut its price to all its customers, which leads to large losses when it has a large market share. Given that Telecom and Vodafone have approximately equal market shares in the mobile market at the present point in time, we believe that it would be unprofitable for either of them to use predatory price discrimination to deter entry or induce exit of a smaller rival.

We also question the Commission's statement at paragraph 35 that on-/off-net price discrimination is likely to be a barrier to entry as it reduces a new entrant's ability to

¹⁰ See Motta (2004), section 7.2 for a discussion.

acquire customers. Data provided to us by Vodafone shows that the vast majority of mobile customers make calls to a very small number of unique other customers, on average each month. This suggests that the relevant groups that an entrant needs to attract are quite small, and it would not be difficult for an entrant to implement strategies that encourage coordinated group switching. For example, the entrant could offer discounts to customers whose family or friends also switch. Such incentive schemes are commonly observed in other markets. In addition, businesses are likely to make their mobile network choices as a whole, rather than at the level of individual employees, and many of their mobile calls are likely to be to other employees of the same organisation. Thus targeting switching by businesses may also not be very difficult.

In terms of the effects of price discrimination in general (regardless of whether or not it is predatory), at paragraph 35 the Commission makes the following statement:

The Commission believes that differentiation between on-net and off-net pricing is not an issue in itself: where such differentiation reflects different costs, it may be a legitimate commercial strategy.

In our view, price discrimination (including on-/off-net discrimination) is generally a legitimate commercial strategy regardless of costs unless there is compelling evidence to the contrary. For example, movie theatres offer discounted tickets to senior citizens when there is clearly no difference in the cost to provide a seat in a movie theatre to a senior citizen or a younger person. Price discrimination that is not based on costs is a common practice in many other industries, including airlines, electricity, public transport, and so on. In addition, it is well known that price discrimination is an efficient way to recover a fixed cost from different market segments that have different demand elasticities, even when the variable costs associated with each segment are the same.

In general, the welfare implications of price discrimination are ambiguous – it is generally profitable for firms, and some consumers may be better off while others will be worse off compared to uniform pricing. In aggregate, price discrimination may either increase or decrease total welfare, depending on the particular circumstances.¹¹ In the specific case of on-/off-net price discrimination, the same ambiguity holds. The question of the effect of such discrimination on welfare is therefore an empirical one rather than a theoretical one. Clearly, there are some benefits to consumers from such discrimination as it reduces the prices that they pay for certain calls. Casual observation of the popularity of offers such as Vodafone's Best Mate discounts, which offer virtually unlimited calling to a few selected numbers for a relatively low fixed price, suggests that the benefits to consumers of the existence of this type of pricing may be quite large. Furthermore, as discussed in the previous section, such price discrimination actually intensifies competition between mobile operators, which benefits consumers overall. Taking all these effects into account, the overall effect on welfare of on-/off-net price discrimination is ambiguous.¹²

¹¹ See Tirole (1998), section 3.2.2 for a discussion.

¹² See Laffont and Tirole (2000), section 5.5.3.

In the mobile context, it is also likely that the total cost per minute of producing a call that originates on one network and terminates on another is higher than the total cost per minute of producing a call that originates and terminates on the same network. In both cases, if the networks have similar coverage and use similar technologies, the total cost of handling the two ends of the call is the same regardless of whether it spans two networks or is contained within one. However, networks must establish costly interconnection facilities between each other, and these costs must be added in the case of a call between networks. Even if MTM termination rates are set at cost and mobile networks did not use price discrimination as a means of competing with each other, we would still expect to see off-net per-minute prices higher than on-net prices, simply due to the difference in costs.

5. Bargaining over MTM Termination Rates

As discussed in section 2, any mobile network that supplies MTM termination services to other mobile networks must also demand MTM termination services from them. Thus every network is both a buyer and a supplier of MTM termination. In this sense, when setting the MTM termination rate, the appropriate economic framework is not of a monopolist choosing a price to maximise its profits facing a passive demand curve. Instead, termination rates are negotiated between networks, and bargaining is the appropriate lens through which to examine the economic interactions.

In paragraph 39, the Commission states:

Market share is one important criterion in determining the degree of market power. In relation to *mobile call termination on each mobile network*, each network operator by definition supplies 100% of its termination market and therefore controls access to its end-users. Every other operator who wants to reach those end-users is dependent on the respective mobile supplier. [emphasis original]

However, this overlooks the co-dependence of mobile networks on each other for MTM termination. This co-dependence means that, regardless of market share, all mobile networks have bargaining power in MTM termination negotiations.

Consider negotiations between a small mobile network having, say, 5% market share, and a larger network having 50% market share. When negotiating over the MTM termination charge that the small network must pay to the large network, the large network must bear in mind that it will also have to negotiate for termination services in the opposite direction. If, in the event of a negotiation breakdown, the small network were to refuse termination services to the large network, for example, then this would result in revenue losses for the large network. Even if the small network only has 5% market share, this would mean that potentially 5% of outgoing calls made by the large network's customers could not be completed. No network would wish to offer such a poor level of performance to its customers, and the large network will not be able to demand whatever MTM termination rate it likes, for fear of provoking such an outcome.¹³ The large network's dependence on the small network for termination services gives bargaining power to the small network.

The bargaining power of the small network is enhanced when there are two competing large networks. In this case, each large network must be concerned that negotiations between it and the small network will break down, while negotiations between the other large network and the small network will be successful. In such a case, a breakdown resulting in the small network refusing termination services to one large network would likely result in a significant number of the large network's customers

¹³ Similar effects arise in credit card networks during bilateral negotiations over the interchange fee. In that case, card issuing banks have the ability to completely hold up merchant acquiring banks and as a result issuing banks have a very strong bargaining position, even if they have very low market share. See Small and Wright (2002).

switching to the other large network that offers customers the ability to make calls to all other networks. In this situation, the small network can leverage the negotiations with the two large networks to enhance its bargaining power against each of them.

As far as we are aware, mobile operators in New Zealand do not have a legal obligation to interconnect (directly or indirectly) with other mobile operators. If there were such an obligation, a small network's bargaining power would be reduced, as it could not credibly threaten to terminate calls from a larger network. However, in the New Zealand situation, such threats are possible and credible, which generates bargaining power.

In any case, the key point here is that the appropriate framework for thinking about setting of MTM termination rates is bargaining, and that small networks have bargaining power even when they are negotiating with much larger rivals. If networks have different preferences about the level of the termination rate, the countervailing bargaining power of small networks will influence the rate that is set. In our opinion, in the Issues Paper the Commission has not appropriately considered the issue of bargaining power in reaching its conclusion (e.g. in section 4) that MTM termination is a bottleneck.

Appendix

The purpose of this Appendix is to illustrate that, with two-part pricing and on-/off-net price discrimination of per-minute prices, the MTM termination rate affects more than the per-minute off-net price, as a result of the profit-maximising behaviour of the mobile networks. We use a simplified model of MTM termination, based on Armstrong (2002). Similar results hold in more complex settings, as in Armstrong & Wright (2008) and Schiff (2008).

Suppose there are two mobile networks, 1 and 2, with market shares s_1 and s_2 . Clearly, $s_2 = 1 - s_1$. We normalise the total market size to 1, so that s_1 and s_2 are also the number of customers of the two networks.

Each network $i = 1, 2$ sets a per-minute on-net price of p_i , a per-minute off-net price of \hat{p}_i and a subscription fee of r_i . For simplicity, we assume that the mobile networks have no costs (so profits just equal revenues). We also consider only MTM termination (ignoring FTM), and assume that the per-minute reciprocal MTM termination rate is a . The basic result that the profit-maximising subscription fee is affected by the level of the MTM termination rate does not depend on these particular assumptions, but these assumptions make the analysis simpler.

Given the prices, demand for minutes of calls by a customer of a mobile network is $q(p_i)$ for on-net calls and $q(\hat{p}_i)$ for off-net calls. Assume that consumers make calls in a balanced fashion, so the probability that a subscriber of either network calls a subscriber of network i is equal to that network's market share, s_i . Thus, for example, the total minutes of calls that originate on network 1 and terminate on-net is $s_1 \times s_1 \times q(p_1)$, since network 1 has s_1 customers, each of which generates $s_1 q(p)$ minutes of on-net calls. Similarly, the total volume of calls that originate on network 1 and terminate off-net on network 2 is $(1 - s_1) \times s_1 \times q(\hat{p}_1)$.

Under these assumptions, the profit of firm i (which is just revenue since we have assumed no costs) is:

$$\pi_i = s_i \times (r_i + s_i p_i q(p_i) + (1 - s_i)(\hat{p}_i - a)q(\hat{p}_i) + (1 - s_i) a q(\hat{p}_i)) \quad (1)$$

The first term in brackets is the per-customer subscription profit. The second term is per-customer profit from on-net calls. The third term is per-customer profit from outgoing off-net calls. The fourth term is per-customer termination profit from incoming off-net calls.

Under two-part pricing with known demands, it is straightforward to show that the profit-maximising per-minute prices equal the respective marginal costs. Since we have assumed no per-minute costs, this implies $p_i = 0$ and $\hat{p}_i = a$ for both networks. Thus we observe that profit-maximisation leads to on-/off-net price discrimination, with the per-minute off-net price greater than the on-net price.

At these per-minute prices, profit of a network becomes:

$$\pi_i = s_i \times (r_i + (1 - s_i)aq(a)) \quad (2)$$

That is, (2) shows that at the profit-maximising per-minute prices, the network makes profits from subscriptions and incoming off-net MTM termination.

Now consider the profit-maximising choice of the subscription fee r_i . From (2) it is clear that this will depend on the MTM termination charge a . This is because each mobile subscriber attracts off-net termination profits of $(1 - s_i)aq(a)$. In other words, the MTM termination rate affects the network's marginal revenue per subscriber, and therefore affects the profit-maximising subscription fee.

However, the interaction between the MTM termination rate and the subscription fee is slightly complex, because the volume of incoming off-net calls per subscriber that a network receives depends on its market share, which depends in part on the subscription fee. In addition, market shares depend on the value that consumers get from making calls, which depend on the per-minute prices and hence also the MTM termination rate.

To investigate further, we need to make an assumption about how each network's market share is determined. In the literature on two-way interconnection, it is common to use a Hotelling product differentiation model. In the Hotelling model, the market share of firm i is:

$$s_i = \frac{1}{2} + \frac{1}{2t}(u_i - u_j) \quad (3)$$

where t is the 'transportation cost' parameter that reflects the degree of horizontal differentiation of the firms, and u_i is a consumer's net utility from joining network i . In our model above, at the profit-maximising per-minute prices of $p_i = 0$ and $\hat{p}_i = a$, each customer of network i makes $s_i q(0)$ minutes of on-net calls and $(1 - s_i)q(a)$ minutes of off-net calls. If $v(p)$ is the consumer surplus (per consumer) from making calls at a per-minute price p , then a consumer's net utility of subscribing to network i at the profit-maximising per-minute prices is:

$$u_i = s_i v(0) + (1 - s_i)v(a) - r_i \quad (4)$$

That is, the benefits to a consumer of belonging to network i are the consumer surplus from outgoing on-net calls, plus the consumer surplus from outgoing off-net calls, minus the subscription fee. Using (3) and (4) we can find the market share of network i as a function of the subscription prices and MTM termination rate:

$$s_i = \frac{1}{2} - \frac{r_i - r_j}{2(t - v(0) + v(a))} \quad (5)$$

This shows that the market share of each network depends on the MTM termination rate (via the consumer surplus that consumers get from outgoing off-net calls) as well as the subscription prices. Intuitively, the MTM termination rate affects the surplus that consumers get from making off-net calls, which affects their utility from belonging to a network, and thus the market share of each network at given subscription prices. We can also see that the MTM termination rate also affects the responsiveness of market share with respect to the subscription price, i.e. the derivative $\partial s_i / \partial r_i$ depends on the level of a .

Finally, returning to equation (2), we are in a position to evaluate the factors that affect the profit-maximising choice of subscription fee. The first-order condition for the subscription fee is:

$$\frac{\partial \pi_i}{\partial r_i} = \frac{\partial s_i}{\partial r_i} [r_i + (1 - s_i) a q(a)] + s_i \times \left[1 - \frac{\partial s_i}{\partial r_i} a q(a) \right] = 0$$

or,

$$\frac{\partial s_i}{\partial r_i} [r_i + (1 - 2s_i) a q(a)] + s_i = 0 \quad (6)$$

From (5), we have

$$\frac{\partial s_i}{\partial r_i} = - \frac{1}{2(t - v(0) + v(a))} \quad (7)$$

Since the firms are symmetric, we look for a symmetric equilibrium where they charge the same subscription fees, i.e. $r_1 = r_2 = r^*$, which also implies $s_1 = s_2 = \frac{1}{2}$. Using this and substituting (5) and (7) into (6), we get the equilibrium rental:

$$r^* = t - v(0) + v(a)$$

In equilibrium, rentals are increased by the degree of product differentiation (t), decreased by the surplus that consumers get from on-net calls ($v(0)$) and increased by the surplus that consumers get from off-net calls ($v(a)$). In terms of the effect of the MTM termination rate on the equilibrium subscription fee, we have:

$$\frac{\partial r^*}{\partial a} = v'(a) < 0$$

This is negative since an increase in the MTM termination rate increases the per-minute price for outgoing off-net calls, which reduces per-customer consumer surplus from these calls. Thus we have demonstrated a link between the MTM termination rate and the subscription fee, and a lower MTM termination rate will lead to an increase in subscription fees. Intuitively, a higher MTM termination rate increases the equilibrium per-customer profits that the networks make from MTM termination. This increases the

marginal revenue per customer, which induces the networks to cut the equilibrium subscription fees as a result of their profit-maximising behaviour.

References

- Armstrong, M. (2002). The theory of access pricing and interconnection. In M. Cave, S. Majumdar & I. Vogelsang (eds.), *Handbook of Telecommunications Economics*, Volume 1, North-Holland.
- Armstrong, M. & J. Wright (2008). Mobile call termination. *Mimeo*, National University of Singapore.
- Carter, M. & J. Wright (1999). Interconnection in network industries. *Review of Industrial Organisation*, 14: 1-25.
- Farrell, J. & P. Klemperer (2007). Coordination and lock-in: Competition with switching costs and network effects. In M. Armstrong & R. Porder (eds.), *Handbook of Industrial Organization*, Volume 3, North-Holland.
- Laffont, J.-J., P. Rey & J. Tirole (1998a). Network competition I: Overview and non-discriminatory pricing. *RAND Journal of Economics*, 29: 1-37.
- Laffont, J.-J., P. Rey & J. Tirole (1998a). Network competition II: Price discrimination. *RAND Journal of Economics*, 29: 38-56.
- Motta, M. (2004). *Competition Policy: Theory and Practice*. Cambridge University Press.
- Schiff, A. (2008). The “waterbed” effect and price regulation. *Review of Network Economics*, 7: 380-402.
- Small, J. & J. Wright (2002). The bilateral negotiation of interchange fees in payment systems. *Mimeo*, National University of Singapore.
- Tirole, J. (1988). *The Theory of Industrial Organization*, MIT Press.