



# **Welfare analysis of implications of reduced mobile termination rates**

**A REPORT PREPARED FOR VODAFONE HUTCHISON AUSTRALIA**

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<b>Executive summary</b>	<b>iii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 The ACCC has greatly reduced MTAS rates in the last decade	1
1.2 Fixed-to-mobile (FTM) pass through has been disappointing under regulation	3
1.3 Analysys Mason has only estimated the welfare impacts of reduced MTAS rates in the market for FTM calls	4
1.4 Structure of this report	4
<b>2 Welfare modelling framework and assumptions</b>	<b>5</b>
2.1 Estimating the welfare effects of reduced MTAS rates	5
2.2 The welfare model methodology	7
2.3 Key welfare modelling assumptions	17
<b>3 Modelling results</b>	<b>27</b>
3.1 Consumer welfare is declined over time under our base case results	27
3.2 Consumer and total welfare is decreasing under most sensitivity tests	29
3.3 Conclusions and Analysis	34

# Welfare analysis of implications of reduced mobile termination rates

## Figures

Figure 1: Welfare effects of a reduction in the price of FTM calls	9
Figure 2: Welfare modelling of the waterbed effect	13
Figure 3: Annual welfare effects of regulating price decreases for the MTAS	28

## Tables

Table 1: ACCC 2004 MTAS Pricing Principle Determination	2
Table 2: Model data inputs and sources	22
Table 3: Aggregate welfare effects of regulating price reductions for the MTAS	28
Table 4: Aggregate welfare effects 2004-05 to 2009-10 with different waterbed effect assumptions	30
Table 5: Aggregate welfare effects 2004-05 to 2009-10 with different elasticities	32
Table 7: Aggregate Welfare effects 2004-05 to 2009-10 with different waterbed, elasticity assumptions and FTM call types	33

## Executive summary

Frontier Economics (Frontier) has been asked by Vodafone Hutchison Australia (VHA) to develop an economic model to analyse the welfare effects of past reductions in the price of the mobile terminating access service (MTAS), and prepare a report in relation to this modelling activity.

In particular, VHA has asked us to extend the welfare analysis of past reductions in the price of the MTAS in Australia beyond that previously undertaken by Analysys Mason for the ACCC in 2009.

### ***Reductions in the price of the MTAS can impact on social welfare in a number of different ways***

Reductions in the price of the MTAS can impact the welfare of two kinds of consumers:

- Fixed line subscribers who make calls to mobile subscribers
- Mobile subscribers who receive calls from fixed line consumers, and who make calls between themselves.

The ways in which reductions in the price of the MTAS impact on consumer, producer and social welfare are, in some instances, direct and clear. In other ways, however, the effects can be subtle and less obvious. In this regard, reductions in the price of the MTAS are likely to:

- Lead to reductions, at least to some extent, in the price of fixed-to-mobile (FTM) calls. To the extent these calls are initially priced above their underlying cost of production, this decrease in price is likely to improve both consumer and social welfare. The welfare of suppliers (i.e. producer surplus) of FTM calls will also increase if reductions in the price of the MTAS are not passed through in full to consumers of FTM calls.
- Increase the value of mobile subscriptions. This is because any increase in the volume of FTM calls that follows a reduction in the price of the MTAS will be likely to be valued by the mobile subscribers who receive (and largely do not have to pay) for these calls. This indirect effect of reduced MTAS rates will increase consumer, producer and social welfare.
- Lead to increases in the price of retail mobile services. This is because reductions in the price of the MTAS will reduce the marginal revenues mobile network operators (MNOs) acquire from subscribers to their network, thereby decreasing the extent to which MNOs are prepared to compete for subscribers on their networks. This so-called ‘waterbed effect’ is recognised in both the academic literature and in a range of regulatory decisions with respect to the MTAS. It has also been shown in empirical studies from overseas jurisdictions. To the extent reductions in the price of

the MTAS lead to increases in the prices of retail mobile services, this will be likely to lead to a lesser number of mobile subscriptions than would otherwise be the case in the absence of lower prices for the MTAS. In turn, this reduction in mobile subscriptions will be likely to reduce consumer and social welfare.

- Indirectly reduce consumer and social welfare because the lesser number of mobile subscribers means that other subscribers – both fixed and mobile – will have less mobile subscribers that they can call. The consequent reduction in mobile-to-mobile (MTM) and FTM calls will decrease consumer, producer and social welfare. The reduction in mobile subscribers will also reduce the welfare of fixed-line subscribers who will now receive less mobile-to-fixed (MTF) calls than would have otherwise been the case if subscription levels had been higher.

It is clear, therefore, that reductions in the price of the MTAS can increase and decrease consumer and social welfare in a number of different ways. Whether consumer and social welfare will increase or decrease overall, however, is not clear. Instead it will depend on a number of key factors, including the extent of FTM pass-through; the extent of the waterbed effect; the extent to which lost mobile subscribers receive calls from other fixed and mobile subscribers; and the responsiveness of calls and mobile subscription levels to changes in the prices of these services.

### ***Previous studies of welfare effects in Australia are limited***

The previous analysis conducted for the ACCC by Analysys Mason considers the first of the welfare effects set out above – that is, the extent to which reductions in the price of the MTAS led to reductions in the price of FTM calls. Given the Analysys Mason analysis assumes that the price of the MTAS (and by extension the price of FTM calls) lies above its underlying cost of production, this study unambiguously finds that reductions in the price of FTM calls over the period from 2004-05 to 2008-09 led to increases in consumer and social welfare.

We believe, however, that a proper analysis of the welfare effects of reductions in the price of the MTAS should be extended to cover the other welfare effects referred to above. Of greatest importance, a full welfare analysis must consider the impact of the waterbed effect on consumer and social welfare.

In this report, we have extended the analysis of Analysys Mason to capture a broader range of welfare effects than simply the increase in welfare that follows from reductions in the price of FTM calls. In doing this, we have had regard to a broader welfare model previously constructed by the New Zealand Commerce Commission to analyse the welfare effects of reduced prices for the MTAS. We have also extended the period of our analysis to cover the period from 2004-05 to 2009-10.

### ***Past reductions in the price of the MTAS may not have improved consumer and social welfare***

The analysis contained in our report leads us to conclude that:

- First, expanding the analysis of the welfare effects of reduced MTAS prices to include effects experienced in retail mobile markets means it is not clear whether consumers and society as a whole were made better or worse-off as a result of reduced prices for the MTAS over the period from 2004-05 to 2009-10.
- Second, while reductions in the price of the MTAS are likely to improve consumer surplus for fixed-line subscribers, it is also likely to reduce welfare for mobile subscribers. Whether the gains to fixed-line consumers exceed the losses for mobile consumers depends crucially on the size of the waterbed effect relative to the extent of FTM pass-through. If FTM pass-through is low and the waterbed effect is high, it is almost certain that consumers as a whole will be worse-off as a result of reductions in the price of the MTAS.
- Third, changes to key assumptions regarding the own-price elasticities of demand for FTM calls, MTM calls and mobile subscriptions can greatly reduce any welfare gains one might expect from reductions in the price of the MTAS.
- Fourth, our analysis of FTM call price changes in Telstra's Annual Reports and the ACCC's imputation testing reports lead us to conclude that business consumers are likely to have benefitted far more from reductions in FTM call prices than residential consumers in the past.

Based on conservative assumptions about the level of the waterbed effect, elasticities of demand and the proportion of FTM and MTM calls received by marginal subscribers, our analysis shows that the greatest beneficiaries of past reductions in the price of the MTAS have been fixed network operators (FNOs). While consumers have benefited under our conservative set of assumptions, their benefit is less than 10 per cent of that enjoyed by FNOs. This is because of the extent to which FNOs have been able to hold-on to a large proportion of reductions in the price of the MTAS through low levels of FTM pass-through, and the extent to which mobile consumers suffer offsetting welfare detriments as a result of the waterbed effect.

Once we test for less conservative assumptions, it becomes less clear that consumers and society as a whole have benefited from past reductions in the price of the MTAS. In one sensitivity test, consumers were made worse-off by more than \$3.2 billion; and society as whole was made worse-off by more than \$1.1 billion over the modelled period. Indeed, our analysis suggests it is possible that the only beneficiaries of reductions in the price of the MTAS have been FNOs, of which Telstra would be the most significant. In contrast, MNOs, consumers and society as a whole may well have been substantially worse off as a

result of reductions in the price of the MTAS over the period from 2004-05 to 2009-10.

***Whether consumers and society are better or worse-off will be heavily influenced by the relative state of competition in fixed and mobile markets***

It is an inescapable reality that regulators face a trade-off when considering how much (if any) they should reduce the price of the MTAS.

In simple terms, reductions in the price of the MTAS represent a reduction in costs for FNOs, and a decrease in revenues for MNOs. The extent to which consumers and society as a whole will be better or worse-off depends in absolute and relative terms on:

- How much of the input cost reduction FNOs pass on to fixed consumers in the form of lower FTM prices (i.e. the extent of FTM pass-through)
- How much MNOs are able to recover their lost termination revenue from their subscribers (i.e. the extent of the waterbed effect).

In turn, the extent of FTM pass through and the waterbed effect will be heavily determined by the state of competition in each of the fixed and mobile sides of the market. If competition over the provision of fixed-line services is weak, we would expect the level of FTM pass-through to also be low. This would appear to be the case in Australia, where the ACCC has consistently observed that competition in fixed-line markets is weak, and that past levels of FTM pass-through have been poor.

Conversely, if competition over the provision of mobile services is strong, we would expect that the extent of the waterbed effect would also be strong. That is, MNOs would be closer to operating under a “zero profit constraint” whereby any reductions in the price of the MTAS will need to be followed by increases in retail prices for mobile services in order for MNOs to remain profitable. We note that the ACCC has consistently observed over the years that the retail mobile market appears to be more competitive than fixed-line markets.

It follows, therefore, that where competition in retail mobile markets is stronger than competition in fixed-line markets, we would expect that the waterbed effect may be stronger than the level of FTM pass-through. Where this is the case, the ACCC should expect that reductions in the price of the MTAS will, on balance, be far less likely to be welfare enhancing for consumers and society as a whole, and may indeed be welfare reducing.



# 1 Introduction

Frontier Economics (Frontier) has been asked by Vodafone Hutchison Australia (VHA) to develop an economic model to analyse the welfare effects of past reductions in the price of the mobile terminating access service (MTAS), and prepare a report in relation to this modelling activity.

In particular, VHA has asked us to extend the welfare analysis of past reductions in the price of the MTAS in Australia beyond that previously undertaken by Analysys Mason for the ACCC in 2009.<sup>1</sup>

## 1.1 The ACCC has greatly reduced MTAS rates in the last decade

The MTAS – or variants of it – has been a declared service under the Competition and Consumer Act (CCA) since the introduction of Part XIC into the Trade Practices Act in 1997.

In the early periods of regulating access to this service, however, the Australian Competition and Consumer Commission (ACCC) realised that the MTAS was unlike other regulated telecommunications access services. In particular, the ACCC recognised that:

- More than one access provider provided the MTAS. Indeed, it was provided by a number of different mobile network operators (MNOs) that were otherwise in competition with each other to win subscribers to their mobile networks.
- Regulation of the MTAS may have impacts on prices for retail services provided by MNOs. In particular, it believed that the prices for retail mobile services are linked to prices for the MTAS. In this regard, the ACCC observed that:

The revenue streams from GSM [i.e. mobile] termination, mobile access services and outgoing call services are interdependent, such that with effective competition a change in one revenue stream will, in the long term, be associated with an offsetting change in another stream.<sup>2</sup>

As a result of these and other reasons, the ACCC proposed a unique pricing principle for access to the service. In particular, it adopted a retail benchmarking pricing principle whereby reductions in the price of the MTAS were to be linked to reductions in the price of retail mobile services. Under this pricing principle,

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<sup>1</sup> See Analysys Mason, *Regulatory Treatment of Fixed-to-Mobile Passthrough*, October 2009.

<sup>2</sup> ACCC, *Pricing Methodology for the Termination Service*, Final Report, July 2001 at p. 5.

the price of the MTAS would be required to decrease at the same rate as reductions in the average retail price of mobile services.<sup>3</sup>

Following a review of pricing outcomes for retail mobile services during the ACCC's 2004 Mobile Services Review, the ACCC chose to move away from this pricing principle. Instead, it decided that the price of the MTAS should reduce in steady increments over a glide path toward the underlying total service long-run incremental cost (TSLRIC) of providing the service.<sup>4</sup> Under a pricing principle determination released in June 2004, the ACCC set a glide path of rate reductions that would see the price of the MTAS decrease according to the schedule of rates set out in Table 1 below.

Table 1: ACCC 2004 MTAS Pricing Principle Determination

Period	MTAS Price
1 July 2004 – 31 December 2004	21 cpm
1 January 2005 – 31 December 2005	18 cpm
1 January 2006 – 31 December 2006	15 cpm
1 January 2007 – 30 June 2007	12 cpm

Source: ACCC, Pricing Principles for the Mobile Terminating Access Service, 30 June 2004

Subsequently, the ACCC released new pricing principles in 2007, which saw the price of the MTAS reduce to 9 cpm.<sup>5</sup> This rate was maintained in a subsequent pricing principle released in 2009,<sup>6</sup> and the regulated rate of the service presently remains at this level.

The ACCC is now considering whether the price of the MTAS should be set in accordance with the existing TSLRIC pricing principle, and whether the price of the service should be reduced further.

<sup>3</sup> *Ibid*, at p. 6.

<sup>4</sup> Where TSLRIC was augmented to include a contribution toward the common costs of providing the service – so called “TSLRIC+”.

<sup>5</sup> ACCC, *MTAS Pricing Principles Determination 1 July 2007 to 31 December 2008*, Report, November 2007.

<sup>6</sup> ACCC, *Domestic Mobile Terminating Access Service Pricing Principles Determination and indicative prices for the period 1 January 2009 to 31 December 2011*, March 2009.

## 1.2 Fixed-to-mobile (FTM) pass through has been disappointing under regulation

A key motivation for the ACCC's decisions to continue to declare the MTAS has been concerns about the effects of above-cost prices for the service on competition in the market for fixed-line services. As a result of this, the ACCC has always hoped that reductions in the price of the MTAS would lead to increased competition in the market for fixed-line services, with consequent reductions in the price of fixed-line telecommunications services – especially in relation to the provision of calls from fixed-line consumers to mobile consumers (so-called “fixed-to-mobile (FTM)” calls).

Where competition is not effective in the market for fixed-line services, however, there is always a risk that reductions in the price of the MTAS will not be ‘passed-through’ in full to consumers of fixed-line services. For instance, and as noted by the ACCC in 2004:

Basic economic analysis would suggest that a profit-maximising monopolist with constant long-run incremental cost would, *ceteris paribus*, pass-through 50 per cent of any cost reduction, while a totally competitive market would (again, everything else being equal) pass-through the entire cost saving in lower retail prices.<sup>7</sup>

At the time of its decision to start significant reductions in the price of the MTAS in 2004, the ACCC was nonetheless hopeful that reductions in the price of the MTAS would help to promote competition in fixed-line markets such that the price of FTM calls might decrease by *more* than the regulated reductions in the price of the MTAS. In this regard, the ACCC noted in 2004 that:

... as competition in the market within which FTM services are provided improves, it is possible that reductions in the price of the MTAS could lead to even greater absolute reductions in the price of FTM (and other fixed-line services) call minutes.<sup>8</sup>

History has shown, however, that these hopes have not come to fruition, with the ACCC observing in 2009 that:

The ACCC is disappointed with respect to reductions in retail FTM prices, as it appears no significant reduction in retail FTM prices has emerged despite earlier expectations.<sup>9</sup>

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<sup>7</sup> ACCC, *Final Decision on whether or not the Commission should extend, vary or revoke its existing declaration of the mobile terminating access service*, June 2004, at p. 222.

<sup>8</sup> *Ibid.*, at p. xii.

<sup>9</sup> ACCC, *Domestic Mobile Terminating Access Service Pricing Principles Determination and indicative prices for the period 1 January 2009 to 31 December 2011*, March 2009 at p. 22.

### 1.3 Analysys Mason has only estimated the welfare impacts of reduced MTAS rates in the market for FTM calls

If FTM pass-through is incomplete, it is reasonable to ask whether it is welfare enhancing to mandate reductions in the price of the MTAS. To assist in this regard, the ACCC commissioned Analysys Mason in 2009 to estimate whether reductions in the price of the MTAS since 2004 have increased consumer and social welfare. Analysys Mason was also directed to consider whether the gains from regulation would have been greater had the ACCC also mandated that reductions in the price of the MTAS should have been passed-through in full in the price of FTM calls.

To analyse the welfare effects of past reductions in the price of the MTAS, the Analysys Mason study focussed primarily on the impacts of reduced MTAS rates on the prices of FTM calls. In this regard, Analysys Mason concluded that:

... regulating MTAS does increase the overall social surplus ... the combined producer surplus for MNOs and FNOs decreases as a result of regulation. However, this is more than compensated by the increase in consumer surplus.<sup>10</sup>

One observation with respect to this analysis, however, is that it did not seek to estimate the size of any welfare effects that might be likely to occur in other related markets. In particular, it did not estimate the welfare effects that might be expected to have followed reductions in the price of the MTAS in the market for retail mobile services.

To help analyse the broader effects of past reductions in the price of the MTAS, VHA has asked us to extend the analysis conducted by Analysys Mason to take account of impacts these rate reductions would be likely to have had in the retail mobile services market.

### 1.4 Structure of this report

The remainder of this report is structured so that:

- Section 2 explains the methodology and input assumptions we have applied to estimate the broader range of effects than those measured by Analysys Mason
- Section 3 sets out the results of our modelling, and analyses the implications of these results.

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<sup>10</sup> Analysys Mason, *op. cit.*, at p. 1.

## 2 Welfare modelling framework and assumptions

In this section of our report, we set out:

- the methodology we have used to estimate the welfare effects of reduced MTAS rates over the period 2004-05 to 2009-10
- the assumptions we have made when choosing inputs for this model.

### 2.1 Estimating the welfare effects of reduced MTAS rates

#### 2.1.1 There are a number of welfare effects that must be considered

Reductions in the price of the MTAS will be likely to have a number of conflicting impacts on social welfare with respect to the production and consumption of fixed and mobile telecommunications services. For instance, reductions in the price of the MTAS will be likely to have the following effects:

- First, reductions in the price of the MTAS will likely lead to some level of reduction in the price of FTM calls. This will increase social welfare with respect to the production and consumption of these calls to the extent consumers value these calls at more than the marginal cost of producing them.
- Second, for reasons set out in section 2.2.2 below, reductions in the price of the MTAS will likely lead to increases in the price of retail mobile services, relative to what they would be in the absence of these reductions. In turn, this will be likely to lead to reductions in the level of mobile subscriptions relative to what they otherwise would have been, with a consequent reduction in social welfare to the extent these network subscriptions generate benefits greater than the marginal cost of providing them.
- Third, the reduction in mobile subscribers will also reduce welfare for other fixed and mobile subscribers who lose the benefit they would otherwise enjoy from calling these subscribers.

Whether or not the benefits to social welfare from reductions in the price of the MTAS will outweigh the losses in social welfare is not clear. It will depend on a range of factors, including the extent of FTM 'pass-through'; the extent of lost MTAS revenues MNOs seek to recover through increased prices for retail mobile services, and the way they attempt to do so; the responsiveness of fixed-line and mobile consumers to any consequent changes in prices; and the value of

calls made by both fixed and mobile consumers to those subscribers that may be lost following reductions in the MTAS.

## 2.1.2 Previous approaches to estimating welfare effects have focused on only some of these effects

During 2009, the ACCC engaged Analysys Mason to estimate the welfare effects of regulated reductions in the price of the MTAS.<sup>11</sup> In doing so, it focused on the welfare gains that would follow from reductions in the price of the MTAS for callers of FTM calls. On the basis of this analysis, Analysys Mason was able to estimate the direct welfare effects on FTM callers of different types of regulation, including by way of imposing regulations that mandated FTM pass-through.

While this analysis enables the ACCC to understand the welfare gains that might follow from the first of the effects set out in section 2.1.1 above, it does not attempt to measure any of the other welfare effects.

VHA has asked us to extend the modelling previously conducted by Analysys Mason to attempt to capture the other welfare gains and losses referred to in section 2.1.1 above. In order to do this, we have had regard to the welfare model used by the New Zealand Commerce Commission (NZCC) when it sought to estimate the welfare effects that might follow from alternative forms of regulation of the MTAS.<sup>12</sup>

The benefit of a model of this type is that it goes beyond simply capturing the direct benefits to consumers of FTM calls from a reduction in the price of the MTAS, and seeks to capture other social welfare benefits and costs that will follow from reduced prices for the service. In particular, the methodology we have used provides a mechanism for capturing:

- The direct welfare loss created by the lesser number of mobile subscribers that would follow if reduced MTAS rates lead to an increase in retail mobile charges over and above those that would arise without reductions in the price of the MTAS
- The indirect welfare loss for fixed and mobile consumers that follows from having less mobile subscribers for them to call.

We believe it is important that this fuller range of effects are captured if we are to better understand the overall welfare effects of a reduction in the price of the MTAS.

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<sup>11</sup> The results of this analysis are set out in Analysys Mason, *op. cit.*

<sup>12</sup> A public version of the NZCC's model can be found at <http://www.comcom.govt.nz/mobiletomobiletermination/>. The model can be found under the tab "Draft Report – 30 June 2009".

## 2.2 The welfare model methodology

The model we have developed to estimate the broader suite of welfare changes that would be likely to follow from a reduction in the price of the MTAS involves a number of discrete steps – each aimed at estimating the three key effects detailed in section 2.1.1 above. The individual steps are summarised below, with an indication of the key inputs needed to model each effect. The full set of inputs we have used in our analysis is summarised in section 2.3 below.

### 2.2.1 The direct welfare gains from lower FTM prices

The first welfare effect modelled in our analysis involves the direct welfare gains that follow when reduced MTAS rates lead to lower prices for FTM calls. This is the welfare gain measured by Analysys Mason in the work it previously conducted for the ACCC.

In order to measure this effect, we first assume that the MTAS is an input acquired by providers of FTM calls in order for fixed-line consumers to make calls to mobile subscribers. Consistent with the model developed by Analysys Mason, the assumptions we use in our model mean that the price of the MTAS lies above its total service long-run incremental cost of production, inclusive of a contribution toward the recovery of common costs (i.e. TSLRIC+). Further, we assume that there are other costs involved in the provision of FTM calls, including the costs of fixed-line origination of these calls and the costs of transmission so that the call can progress from a fixed-line caller to the mobile network of the consumer receiving the call. Finally, the assumptions we adopt in our modelling mean that the retail price of FTM calls lies above the TSLRIC+ of providing these calls, and that the extent of this difference is greater than the difference between the price of the MTAS and its underlying costs of production. These assumptions are summarised in equations (1), (2), (3) and (4) below:

$$P_{MTAS} > TSLRIC+_{MTAS} \quad (1)$$

$$TSLRIC+_{FTM} = TSLRIC+_{MTAS} \text{ plus } TSLRIC+_{FTM \text{ other}} \quad (2)$$

$$P_{FTM} > TSLRIC+_{FTM} \quad (3)$$

$$(P_{FTM} - TSLRIC+_{FTM}) > (P_{MTAS} - TSLRIC+_{MTAS}) \quad (4)$$

Where  $P_{MTAS}$  and  $P_{FTM}$  are the price of the MTAS and the retail price of a FTM call respectively; and  $TSLRIC+_{MTAS}$ ,  $TSLRIC+_{FTM \text{ other}}$  and  $TSLRIC+_{FTM}$  are the

underlying TSLRIC+ of each of the MTAS, the other elements needed to provide a retail FTM call and the full TSLRIC+ of providing a FTM call.

Importantly, equation (4) suggests that fixed-line operators make a margin over the incremental cost they face (inclusive of a contribution towards their common costs) when providing a FTM call to consumers.<sup>13</sup>

From this starting point, we can then estimate the welfare gains that flowed from a reduction in the price of the MTAS over the modelled period. To do this, we have to take account of two effects:

- First, a reduction in the price of the MTAS is assumed to lead to a decrease in the price of FTM calls. If we assume the same initial elasticity of demand as that modelled by Analysys Mason and that the demand curve for FTM calls is linear, we are able to estimate what level of output should have followed from this reduction in the price of FTM calls. In other words, the decreased price for FTM calls should have led to a movement along the FTM demand curve.
- Second, however, we have observed that the increase in demand for FTM calls was higher than that predicted by the assumed elasticity of demand for FTM calls in the early years of the model; and lower in the later periods of the model. Consistent with the approach used by Analysys Mason in its welfare analysis, we have therefore needed to make assumptions about the extent to which demand for FTM calls “shifted” due to exogenous factors from one year to the next.<sup>14</sup> In order to simplify our modelling, we have assumed that the shift of the demand curve for FTM calls occurred on the first day of each period.

Given these assumptions, we are then able to model the first round of welfare changes with respect to the provision of FTM calls following a reduction in the price of the MTAS (and the consequent reduction in the price of FTM calls). In doing so, it should be noted that we have not had to make assumptions about the extent of FTM pass-through during this period. By relying on actual data regarding prices of FTM calls, we have not had to make any predictive assumptions about what the level of FTM pass-through would have been under regulation. We have assumed, however, that the only factor driving decreases in FTM call prices over the modelled period is reductions in the MTAS rate. This is consistent with assumptions made by Analysys Mason, who appear to have

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<sup>13</sup> Where the input cost for the MTAS faced by a fixed-line operator is the price of the MTAS, and not the underlying cost of providing the service, as set out in equation (1).

<sup>14</sup> In this regard, Analysys Mason notes that “changes in consumer surplus are based on the demand curve of that year, which will shift compared with previous years to match through the new price/quantity point. The reason for the shift can be attributed to exogenous growth in calls, based on increased demand resulting from more mobile phones to call, for instance.” See Analysys Mason, *op. cit.*, at p. 37.

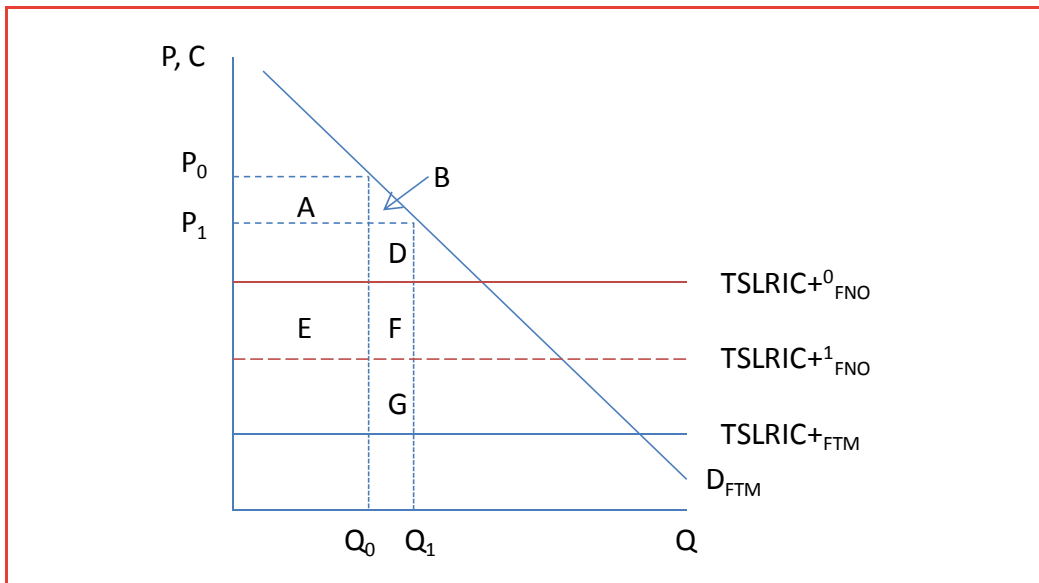


assumed that the non-MTAS costs of providing FTM calls remained constant over the modelled period.

The modelled welfare effects from a reduction in the price of FTM calls are shown diagrammatically in Figure 1 below. In this regard,  $TSLRIC+^0_{FTM}$  represents the underlying cost faced by a FNO when providing a FTM call to consumers. This cost includes the price it pays for the MTAS. It follows, therefore, that a reduction in the price of the MTAS will lead to a reduction in the costs it faces when providing FTM calls. This is represented by a downward shift in the underlying cost of providing FTM calls to  $TSLRIC+^1_{FTM}$ . In this context, a reduction in the price of FTM calls from  $P_0$  to  $P_1$  is assumed to lead to an increase in demand for the service from  $Q_0$  to  $Q_1$ .<sup>15</sup> As a result of this, four effects follow:

- Consumers of FTM calls will enjoy an increase in consumer surplus equal to the area A + B
- Producers of FTM calls will have an *increase* in their producer surplus equal to the area D + E + F – A
- MNOs will have a *decrease* in producer surplus equal to the area E – G
- Society as a whole will experience an increase in social welfare equal to the area B + D + F + G.

Figure 1: Welfare effects of a reduction in the price of FTM calls



Source: Frontier Economics

<sup>15</sup> It should be noted that the welfare changes shown in Figure 1 are based off the “shifted” demand curve, which assumes that demand for FTM calls shifted on the first day of the period under consideration.

## 2.2.2 The direct welfare losses from higher mobile subscription charges

The second welfare effect modelled in our analysis relates to the increase in retail mobile prices one should expect to follow from a decrease in the price of the MTAS. This effect is sometimes referred to as the “waterbed effect”. In essence, the theory of the waterbed effect rests on the notion that each mobile subscriber brings to a MNO two streams of revenue – wholesale revenue, in the form of MTAS payments for calls made to the subscriber<sup>16</sup>; and retail revenues, in the form of retail prices paid for calls made by that consumer. In this respect, Genakos and Valletti note that:

Since a mobile network is a bottleneck for received calls, money can be made over termination. Thus, each potential mobile customer comes with a termination rent. This does not imply, however, that mobile firms will necessarily make supernormal profits overall. In fact, if there is enough competition among mobile networks, then competition will exhaust this rent, and operators will offer subsidized prices to their mobile customer. ... If regulation cuts somehow the termination rent, then the subsidy to mobile customers will be reduced too. In the limiting case, no subsidy could be given at all to consumers if regulation eliminates entirely any termination rent.<sup>17</sup>

Importantly, it also need not be the case that the waterbed effect only occurs where there is perfect (or effective) competition between MNOs. Even if competition between MNOs is only weak, it will still be the case that decreases in the price of the MTAS would be expected to lead to increased prices for retail mobile consumers. This is because reducing termination rates will still alter the profits MNOs can expect to earn from calls made to their subscribers, and therefore the extent to which they will compete to acquire subscribers in order to attain those profits. Theory suggests that even where there is imperfect competition between MNOs, a decrease in the price of the MTAS would be likely to lead to an increase in the retail price of mobile services.

The notion that decreased prices for the MTAS will be likely to lead to increased prices for retail mobile services is well supported in the economic literature.<sup>18</sup> It has also been recognised in court<sup>19</sup> and regulatory decisions<sup>20</sup>, and has been empirically observed across a number of jurisdictions.<sup>21</sup>

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<sup>16</sup> Other wholesale revenues may include the receipt of termination payments for providing SMSs to their subscribers – so-called “SMS termination” revenues.

<sup>17</sup> Genakos, C and Valletti, T., *Seesaw in the Air: Interconnection regulation and the Structure of Mobile Tariffs*, CEP Discussion Paper No 1045, February 2011 at p. 6.

<sup>18</sup> See, for instance, Genakos, C. and Valletti, T., *op. cit.* and Wright, J., (2002) “Access Pricing under Competition: an Application to Cellular Networks.” *Journal of Industrial Economics*, 50: 289-316.

<sup>19</sup> See, for instance, UK Competition Commission, *Determination between Ofcom and Hutchison 3G UK Limited and Ofcom and British Telecommunications plc, under section 193 of the Telecommunications Act (Act) in regard to Mobile Phone Wholesale Voice Termination charges*, dated 16 January 2009 at para [8.63 – 8.115].

To model this effect, we have adapted the approach previously taken by the NZCC to model how reductions in the price of the MTAS will be likely to lead to increases in the retail prices of mobile services. In this regard, the NZCC followed a 3-step approach to estimate the impact of reduced MTAS prices on retail mobile prices:

- First, it estimated the amount of MTAS revenue MNOs would lose following a reduction in the price of the MTAS.
- Second, it then made assumptions about what proportion of this lost revenue MNOs would seek to recapture via increased prices for retail mobile services.
- Third, it then looked at the existing level of average revenue per user (ARPU) and estimates of the elasticity of demand for mobile subscriptions and determined what increase in ARPU would be necessary to recover the proportion of lost MTAS revenue assumed in the second step above. In turn, this meant decreases in the price of the MTAS gave rise to a higher ARPU for mobile subscribers and a consequent reduction in mobile subscription levels relative to what would have occurred in the absence of a reduction in the price of the MTAS.<sup>22</sup>

In our model, however, we have made one additional change to reflect market conditions here in Australia. In particular, past increases ARPU have not always been associated with decreases in the level of retail mobile subscribers. That is, despite mobile ARPU increasing over the modelled period, the overall number of subscribers in Australia has grown substantially. This suggests there are likely to be other factors at play that are influencing demand for mobile subscriptions other than simply the retail prices for mobile services. In other words, there are also likely to be “shift” factors that are pushing the demand curve for mobile subscriptions out at any given price over time.

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<sup>20</sup> See, for instance, Ofcom, *Wholesale mobile voice call termination: Preliminary consultation on future regulation*, 20 May 2009, at para [5.13] and NZCC, *Final Report on whether the mobile termination access services (incorporating mobile-to-mobile voice termination, fixed-to-mobile voice termination and short-message-service termination) should become designated or specified services*, 22 February 2010, at para [131] on p. 51. While different regulators have acknowledged the existence of a waterbed effect, their views as to the strength of the waterbed effect tend to vary. Their views are often influenced by perceptions as to the extent of competition in retail mobile markets in their jurisdiction.

<sup>21</sup> See, for instance, Genakos, C. and Valletti, T. *op. cit.* and Cunningham, B. M., Alexander, P. J., and Candeub, A., (2010), “Network growth: Theory and evidence from the mobile telephone industry.” *Information Economics & Policy*, 22: 91-102.

<sup>22</sup> In reality, the extent to which retail prices increase following a decrease in the price of the MTAS will depend on a range of factors, including the state of competition with respect to the retail provision of mobile services and the way this impacts on the profit maximising level of retail mobile prices following a decrease in the price of the MTAS. In that respect, choosing a set percentage of lost MTAS revenues that MNOs would seek to recover from increased retail mobile charges is a somewhat ‘rough’ way to measure the extent of the waterbed effect. For this and other reasons, we conduct sensitivity tests around the extent of the waterbed effect in section 3.2.1 of this report.

To accommodate this within the modelling, we follow the same approach followed by Analysys Mason when modelling decreases in the price of FTM calls. That is, we assume that the demand for mobile subscriptions shifts from one period to the next to match through the new price/quantity value for that year. Consistent with the method for modelling shifts in the demand for FTM calls, we make the simplifying assumption that this shift occurs on the first day of each period. We use this demand curve to estimate the welfare effects from an ARPU for mobile subscribers greater than that which would have occurred in the absence of reductions in the price of the MTAS.

The welfare modelling of the waterbed effect is illustrated diagrammatically in Figure 2 below. This shows how a reduction in the price of the MTAS leads to a reduction in MTAS revenue equal to the area A – B. Based on an assumption regarding what proportion of this lost revenue is sought to be recovered via increased levels of ARPU, we can then estimate how much the price of mobile subscriptions would rise in a given period to recover this amount of revenue. This gives effect to a lower level of mobile subscriptions than would otherwise be the case. We also assume, consistent with the modelling of the NZCC, that the TSLRIC+ of providing mobile subscription lies below the initial price of the service. The welfare effects from a reduction in the price of the MTAS would then involve:

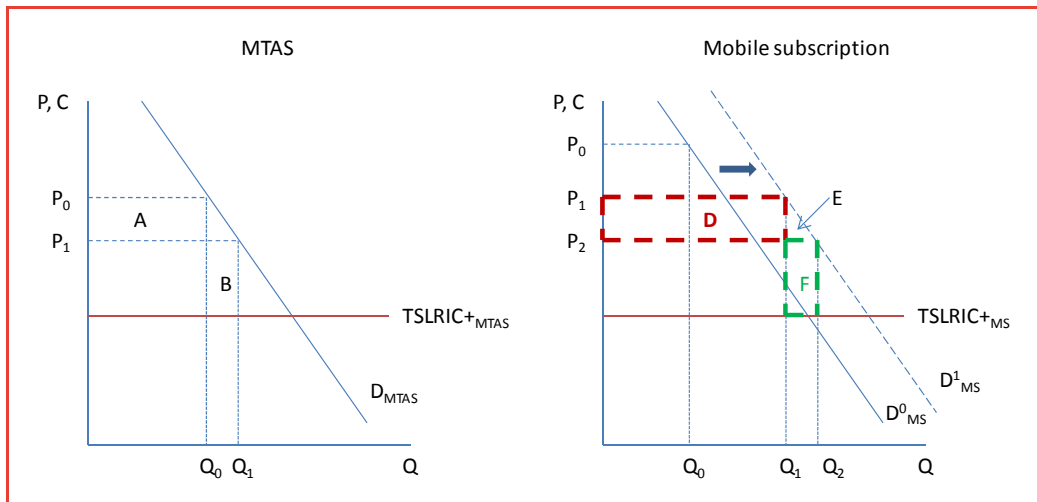
- A decrease in consumer surplus equal to the area D + E
- An increase in producer surplus equal to the area D – F
- A net loss in social welfare equal to the area E + F.<sup>23</sup>

To the extent price might, for instance, be lower (and output higher) in the period than that predicted by the model, this would be reflected by a shift in the demand curve so that the demand for mobile subscriptions shifts to encompass the new price/quantity point. In Figure 2 below, this is represented by the shift in the demand curve from  $D_{MS}^0$  to  $D_{MS}^1$ .

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<sup>23</sup> In estimating welfare effects in the market for mobile subscriptions, we do not include changes in producer and consumer surplus with respect to the provision of the MTAS. This is because these effects are already captured in our analysis of the welfare effects in the market for FTM calls. For instance, the area of gain D-F for MNOs as a result of increased subscription charges is set to offset (to whatever assumed extent) the loss in MNO producer surplus of E-G from reductions in the price of the MTAS in Figure 1. Similarly, the gain in consumer surplus from reductions in the price of the MTAS are reflected in the increased consumer surplus in Figure 1 that follows whenever reductions in the price of the MTAS are passed-through to consumers of FTM calls.

Figure 2: Welfare modelling of the waterbed effect



Source: Frontier Economics

### 2.2.3 The indirect welfare loss for fixed and mobile subscribers from lower mobile subscriptions

The final welfare effect we have modelled relates to the loss in welfare resulting from both fixed and mobile consumers having less mobile subscribers to whom they can make calls than would otherwise have been the case in the absence of reductions in the price of the MTAS. That is, it is generally assumed that consumers will only make calls to other people if they value these calls at least as much as the price they have to pay for them. In other words, the actual making of calls indicates that consumers attach a positive valuation to making these calls.

If a decrease in the MTAS leads to a lower level of mobile subscribers than would otherwise be the case, this means there will be less mobile subscribers that remaining fixed and mobile network subscribers will be able to call. Accordingly, fixed and mobile subscribers will make less calls than would otherwise be the case if subscriptions levels had not fallen, and therefore will no longer enjoy the positive valuation they made from making these calls.

In order to measure the lost welfare that follows from the reduction in mobile subscription for remaining fixed and mobile network subscribers, we have utilised the approach used by the NZCC to measure this effect. In this regard, the NZCC separately measured the loss in welfare for remaining fixed and mobile subscribers from a reduction in mobile subscription levels. With respect to the lost welfare for fixed-line consumers, this involves:

- First estimating the average number of FTM calls made to each mobile subscriber. This involves dividing the number of FTM calls/minutes by the number of mobile network subscribers in a given period.

- Second, estimating the proportion of this average number of calls that would be received by those “marginal” subscribers that would cease to subscribe to a mobile network if ARPU increased. This then gives a number of FTM calls that fixed-line consumers will be unable to make to mobile subscribers who will not subscribe to a mobile network as a result of ARPU being higher than it otherwise would be without regulation of the MTAS.
- Third, these calls are then valued by plotting a demand curve for marginal subscribers, which represents the value of these calls to the marginal subscriber. This is plotted using the elasticity of demand for FTM calls.

Using the demand curve for calls to marginal subscribers and the same estimates of the TSLRIC+ of providing FTM calls that we used to estimate the direct welfare effect of reductions in the price of FTM calls, we are then able to estimate changes in consumer surplus, producer surplus and total welfare for those FTM calls that cannot be made to those consumers who do not subscribe to mobile networks as a result of reduced MTAS rates.

With regard to the lost welfare for mobile subscribers, the analysis similarly involves:

- First estimating the number of MTM calls made to each subscriber. To do this, we divide the total number of MTM calls by the number of mobile subscribers. This gives an average number of MTM calls per subscriber.
- Second, we again estimate what proportion of these calls would be made to the marginal subscriber.
- Third, we then value the calls that would not be made to the marginal subscribers who will not subscribe to a mobile network due to the higher ARPU following the higher price for the MTAS. We do this by again plotting a demand curve for calls to the marginal subscribers who do not subscribe to a mobile network.

Using this approach, we are again able to estimate consumer surplus, producer surplus and total welfare effects for those MTM calls that were unable to be made to those subscribers that did not subscribe because of the lower price for the MTAS and higher level of ARPU.

It should be noted, however, that the magnitude of the welfare changes resulting from this third round of welfare effects is small in comparison to the first two effects referred in sections 2.2.1 and 2.2.2 above.

#### 2.2.4 Limitations to our analysis

While our analysis seeks to capture a number of the broader welfare effects that are likely to follow from reductions in the price of the MTAS, there are some limitations to our analysis.

## Welfare modelling framework and assumptions

First, it is not clear how reductions in the price of the MTAS will impact competition between telecommunications networks operators in a broader sense. For instance, and as set out in a separate report we have prepared for VHA with respect to the implications of adopting a depreciated actual cost (DAC) methodology to determine prices for the MTAS<sup>24</sup>, reductions in the price of the MTAS will impact on different telecommunications operators in different ways. This is because some network operators – such as Telstra and Optus – are vertically integrated operators of both fixed and mobile networks. In contrast, other operators – such as VHA – are only operators of a mobile network. This means that where the competitive pressures in the fixed-line side of the market are weaker than competitive pressures in the mobile side of the market, it is likely that vertically integrated fixed-line operators will be able to benefit from reductions in the price of the MTAS at the expense of mobile-only operators. This is because the weaker competitive pressures in the fixed-line side of the market may enable fixed-line operators to retain some of the reductions in the price of the MTAS through low levels of FTM pass through; while MNOs may be unable to recover all of their lost profits from reductions in the price of the service if the waterbed effect is weak.

While our analysis seeks to capture some of the more direct effects of rate reductions with respect to the provision of fixed and mobile telecommunications services, it is unable to measure the broader impacts on competition between different types of network operators that might result from reductions in the price of the MTAS.

Second, our analysis does not consider whether there are other ways that fixed-line operators may seek to use reduced MTAS rates to lower prices for other fixed-line services. That is, it is sometimes suggested that fixed-line operators may pass-through reductions in the price of the MTAS through reductions in the price of other fixed-line services (such as, for example, through lower national long distance or international call prices). Conceptually, we have some concerns with these claims. In the first instance, economic theory suggests that firms will change the price of services where there is a change in the marginal cost of providing these services. In the case of FTM calls, a decrease in the MTAS rate leads to a decrease in the marginal cost FNOs face when providing these services. Hence, it makes sense that reductions in the price of the MTAS should lead to some level of reduction in the price of FTM calls.<sup>25</sup> It is not clear, however, how a decrease in the price of the MTAS reduces the marginal cost of providing other types of calls over fixed-line networks. It is not clear to us,

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<sup>24</sup> See, Frontier Economics, *Use of depreciated actual costs to set mobile termination rates*, July 2011.

<sup>25</sup> Similarly, reductions in the price of the MTAS reduce the marginal revenue a MNO earns when a consumer subscribes to its network. It is this change in marginal revenues that leads to a lesser incentive to compete hard at the retail level to acquire the customer, and hence the increase in retail mobile prices referred to as the ‘waterbed effect’.

therefore, why a fixed-line operator would reduce the prices of other call products if the price of the MTAS were to decrease. Secondly, however, even if reductions in the price of the MTAS were being passed through to consumers in the form of reductions to the price of other call services, this would suggest to us that fixed-line operators do not believe consumers are overly responsive to reductions in the price of FTM calls. That is, they believe consumers will respond better to reductions in the price of other fixed-line services. Where this is the case, we believe this suggests that an own-price elasticity of demand estimate for FTM calls of -0.6 may be too high.

Third, our analysis does not seek to estimate the welfare gain mobile subscribers might experience if lower FTM call prices lead to increases in the volume of FTM calls. That is, increases in the number of FTM calls will increase social welfare with respect to the consumption of mobile phone services to the extent these calls are valued by mobile subscribers.<sup>26</sup> In terms of our modelling, this could be reflected via a further shift outward in the demand for mobile subscribers following a reduction in the price of the MTAS. This would have the effect of leading to a slightly higher number of mobile subscribers than is modelled in our analysis, a slightly higher level of consumer welfare, and a slightly lower increase in ARPU following a reduction in the price of the MTAS. Importantly, however, we believe this effect is likely to be trivial in our analysis. This is because data provided to us by VHA suggests that only approximately 20 per cent of calls made to mobile subscribers come from fixed-line consumers. Further, consumers enjoy a number of services when they acquire a mobile subscription, including the ability to make and receive MTM, make MTF calls and receive FTM calls. They also enjoy the ability to make and receive SMSs and MMSs; and consume data services. For this reason, the receipt of FTM calls represents only a small portion of the value of a mobile subscription. Given our model suggests that reductions in the price of FTM calls have led to only modest increases in the volume of FTM calls as a result of reduced MTAS rates over the modelled period, this suggests this additional welfare effect is likely to have been trivial. Accordingly, we do not believe exclusion of this effect is likely to change the conclusions of our analysis.

Fourth, our analysis also does not seek to estimate the welfare loss fixed-line subscribers will suffer as a result of there being a smaller number of mobile subscribers that will make MTF calls to them. Again, we expect this effect to be small, and largely offset by the effect referred to at point 3 above.

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<sup>26</sup> In this regard, we assume that mobile subscribers generally attach some positive value from receiving calls from fixed-line consumers. In some instances, however, it is possible that mobile subscribers may not value additional calls made to them from fixed-line subscribers. This might be the case, for instance, where mobile subscribers receive unwanted prank or marketing calls. By and large, however, we assume mobile consumers will generally attach some value to calls made to them.



## 2.3 Key welfare modelling assumptions

As indicated above, VHA has asked us to extend the analysis previously conducted by Analysys Mason to capture the broader welfare effects that are likely to follow from a reduction in the price of the MTAS. In particular, VHA has asked us to estimate what are likely to be the total welfare effects that would have occurred as a result of past reductions in the price of the MTAS over the period from 2004-05 to 2009-10.

When analysing these welfare effects, we are essentially being asked to compare two states of the world:

- One, where the price of the MTAS has been regulated (the “factual” scenario).
- Two, where the price of the MTAS had not been regulated (the “counter-factual”).

Once these two states of the world have been modelled, we can then estimate the differences in consumer surplus, producer surplus and total welfare that exist between these two states of the world.

In order to model these welfare effects, we have had to make a number of assumptions about the state of the world under each scenario. The key assumptions we have made for each state of the world are summarised below.

### 2.3.1 Input assumptions under the factual of regulation

Under the factual scenario, we have largely relied on publicly available data to determine market outcomes that occurred over the modelled period. In particular, we have:

- Set the regulated price of the MTAS in accordance with the rates set out in the ACCC’s June 2011 MTAS Discussion Paper.
- Adopted the estimates of the underlying cost of providing the MTAS used by Analysys Mason in its analysis for the ACCC, which are derived from estimates of the TSLRIC+ of providing the service made by WIK Consult and earlier estimates of cost set out in the ACCC’s 2004 Mobile Services Review.
- Estimated the retail price of FTM calls based on the average FTM revenue per minute for PSTN and ISDN FTM calls contained in Telstra Annual Report data over the modelled period. As a sensitivity, we have also used the average revenue per minute for PSTN FTM calls only, using data from the ACCC’s quarterly imputation testing reports.
- Applied the same estimate of the non-MTAS other costs of providing a FTM call as that used by Analysys Mason in its report for the ACCC.

- Estimated the total volume of FTM call minutes (and by implication the volume of MTAS minutes) for the market as a whole by scaling up the volume of PSTN and ISDN FTM call minutes in Telstra's Annual Reports over the relevant period. When we run the sensitivity using the PSTN FTM average revenue we use PSTN FTM call minutes only. Telstra's FTM volumes have been scaled up by dividing its reported volume of call minutes by estimates of Telstra's market share for fixed services, as set out in ACCC and Australian Communications and Media Authority (ACMA) reports.
- Derived a series of annual demand curves for FTM calls using an elasticity of demand of -0.6. This is the same figure used by Analysys Mason in its report for the ACCC, and is based on previous estimates of this figure by the ACCC. We have also conducted sensitivity testing of our results using an alternative estimate of the elasticity of demand for FTM calls of -0.216 based on analysis previously conducted by Vodafone in 2007.<sup>27</sup> We have also shifted the demand curve for FTM calls at the start of each period so that it is consistent with actual observations of the average price and quantity of FTM calls for this period, and the elasticity of demand estimate we have used. This appears to be consistent with the approach taken by Analysys Mason.
- Estimated the price of mobile subscription using publicly available data of the average revenue per user (ARPU) set out in Telstra Annual Reports over the modelled period. This ARPU estimate is based only on retail revenues (i.e. it excludes MTAS revenues), and includes revenue from selling hardware (e.g. mobile phone sales).
- Estimated the total volume of mobile subscribers for the market as a whole based on Telstra, Optus, Hutchison and Vodafone annual reports and data provided by VHA.
- Derived a demand curve for mobile subscriptions using the data on mobile subscriptions and ARPU levels set out above, and an estimate of the elasticity of demand for mobile subscriptions of -0.43. This is based on the elasticity of demand for mobile subscriptions used by the NZCC in its modelling of the welfare effects of reducing the price of the MTAS. We have also conducted sensitivity testing of our results using an alternative estimate of the elasticity of demand for FTM calls of -0.55 based on analysis previously conducted by Vodafone in 2007.<sup>28</sup> To maintain consistency with our treatment of demand for FTM calls, we have shifted the demand curve for mobile subscriptions at the start of each period so that it is consistent with actual observations of the

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<sup>27</sup> Sandbach, J., *Welfare implications*, The Economics of Mobile Prices, Vodafone Policy Paper Series, Number 7, November 2007.

<sup>28</sup> *Ibid.*

ARPU and quantity of mobile subscriptions for this period, and the elasticity of demand estimate we have used.

- Estimated an average price per minute for mobile calls by dividing total revenues for Vodafone by the total number of mobile call minutes during each year of the modelled period. This is based on data provided to the ACCC for the Division 12 Record Keeping Rule (RKR) requirements.

### 2.3.2 Input assumptions under the counterfactual of no regulation

Under the counter-factual scenario where it is assumed the price of the MTAS has not been regulated, we have assumed that:

- The price of the MTAS would have stayed at the original level of 22.5 cpm that existed in the market in 2003-04 – i.e. before the ACCC commenced reducing prices in line with its 2004 MTAS Pricing Principles Determination. This is consistent with the price level assumed by Analysys Mason in its welfare analysis for the ACCC.<sup>29</sup>
- The retail price of FTM calls would have stayed at the average retail revenue per minute of 38.5 cpm set out in Telstra's 2003-04 Annual Report. This is consistent with the price level assumed by Analysys Mason, and set out in the ACCC's 2004 Mobile Services Review.

In order to determine the levels of consumer surplus, producer surplus and total welfare that would have existed under these prices, we have used the demand curves described in section 2.2.1 above. As indicated above, however, the demand curve has been shifted for each period to reflect exogenous factors that are influencing levels of demand other than simply changes in the price of the MTAS. The combination of the different MTAS and FTM prices assumed under the counter-factual and the shifted demand curves for FTM and mobile subscription services has enabled us to derive assumed levels of output for FTM calls and mobile subscriptions under the counter-factual of no regulation.

In order to derive price levels for mobile subscription (i.e. ARPU) under the counterfactual, however, we have also needed to make assumptions about the level of the 'waterbed effect'. In this regard, we have asked how much lower would the price of mobile subscription have been had MNOs not needed to

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<sup>29</sup> In reality, we believe it is possible MNOs may have decreased the price of the MTAS in the absence of regulation of the service. This is because it is unlikely the unregulated price of the MTAS would remain profit maximizing over the full modeling period. The effect of maintaining consistency with the counter-factual price assumed by Analysys Mason is that the consumer and social welfare gains with respect to lower FTM call prices will be greater than they may otherwise have been, but the consumer and social welfare detriments from higher mobile subscriptions charges may also be greater.

increase ARPU levels to capture some proportion of lost profits in the factual of regulation as a result of lower MTAS prices. This lower counter-factual price for mobile subscriptions required us to make assumptions about:

- The proportion of lost termination profits that MNOs would seek to recapture in higher prices for mobile subscription in the factual of regulation. Here, we assume for our base case that MNOs would seek to recover 50 per cent of lost profits, in line with the base case assumption made by the NZCC in its analysis of the welfare effects of reduced MTAS rates.<sup>30</sup> The existence of a strong waterbed effect is also supported by the findings of Genakos and Valletti, who find in relation to MTAS rate reductions in a number of overseas jurisdictions that:

... although regulation reduced termination rates by about 10% to the benefit of callers to mobile phones from fixed lines, this also led to a 5% increase (varying between 2%-15% depending on the estimate) in mobile retail prices.<sup>31</sup>

It should be noted that given MTAS prices may be lower than those of retail mobile services (and that revenues from retail mobile services are significantly higher than those from the MTAS), this may imply a level of lost MTAS revenue being recovered from retail mobile services of greater than 50 per cent. Hence, we have also conducted sensitivity tests using higher waterbed effect levels of 75 and 100 per cent.

- The underlying cost of mobile subscription. In this regard, we have estimated the underlying cost of mobile subscription to be 69 per cent of ARPU for each year. This percentage figure is based on a weighted average of the mobile EBITDA for Telstra and Optus for 2007-08 as stated in their annual reports. This is broadly consistent with the 70 per cent figure used by the NZCC in its welfare modelling analysis.<sup>32</sup>

### 2.3.3 Other assumptions

In order to make estimates of the change in consumer surplus, producer surplus and total welfare from the lost FTM and MTM calls that consumers will be unable to make following reductions in the level of mobile subscription under regulation, we have:

- Assumed in our base case that the marginal mobile subscriber receives approximately 35 per cent of the amount of FTM and MTM call minutes that the average subscriber would receive. The logic underpinning the notion that a marginal subscriber receives less call minutes than the average subscriber is

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<sup>30</sup> See row 34 of “Key assumptions” sheet in the NZCC welfare model.

<sup>31</sup> Genakos, C., and Valletti, T., *op. cit.*, at p. 2.

<sup>32</sup> See row 43 of “Key assumptions” sheet in the NZCC welfare model.

that those subscribers who will value a mobile phone subscription less (and therefore be more likely to stop subscribing once mobile prices rise) will be those who use their phone less. To determine what proportion of average call minutes that the marginal subscriber receives, we have relied on estimates of the pre-paid subscriber revenues as a share of average subscriber revenues in Telstra's Annual Report.<sup>33</sup>

- Derived a demand curve for MTM calls using:
  - An estimate of the average retail revenue per minute based on dividing mobile revenue by the number of call minutes in Telstra's Annual Report.
  - An estimate of the own-price elasticity of demand for MTM calls of -0.59, based on the assumption used by the NZCC in its modelling of the welfare effects of reducing the price of the MTAS. We have also conducted sensitivity testing of our results using an alternative estimate of the elasticity of demand for MTM calls of -0.9 based on analysis previously conducted by Vodafone in 2007.<sup>34</sup>
  - An estimate of the number of MTM call minutes made by the marginal subscribers to other mobile subscribers based on data provided to us by VHA. This is also based on the assumption that these minutes per subscriber are 35 per cent of the average minutes. Average subscriber minutes are derived from VHA data.

We have also assumed, for the purposes of the analysis contained in our interim results, that all demand curves are linear. This is different to Analysys Mason, who has assumed that demand curves are constant elasticity demand curves.

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<sup>33</sup> This assumption is also consistent with that assumed by the NZCC in its welfare analysis. See row 38 of "Key assumptions" sheet in the NZCC welfare model.

<sup>34</sup> Sandbach, J., *op. cit.*

### 2.3.4 Summary of input assumptions

The assumptions, and the source or material used in making these assumptions, are summarised in Table 1 below.

Table 2: Model data inputs and sources

Data input	Purpose for modelling	Values	Source
Unregulated MTAS price (cpm)	Counterfactual price for modelling welfare changes of actual MTAS prices	22.5 cpm all years 2003-04 to 2009-10	Analysys assumption, from ACCC mobile services review report 2004
Retail FTM price without MTAS regulation	Counterfactual price for modelling welfare changes of factual FTM prices and rise in subscription price (latter via waterbed effect)	38.5 cpm all years 2003-04 to 2009-10	Analysys assumption, from ACCC mobile services review report 2004
Regulated MTAS price (cpm)	Factual values for MTAS price for measuring welfare effects compared to counterfactual MTAS price.	2004-05: 19.5 cpm 2005-06: 16.5 cpm 2006-07: 13.5 cpm 2007-08 onwards: 9 cpm	ACCC MTAS discussion paper June 2011. Weighted average for year as applicable.
Retail FTM price under MTAS regulation (cpm)	Factual values for FTM price for measuring welfare effects compared to counterfactual FTM price.	2004-05: 35.8 cpm 2005-06: 33.2 cpm 2006-07: 31.4 cpm 2007-08: 31.6 cpm 2008-09: 32.1 cpm 2009-10: 31.4 cpm  Sensitivity values (PSTN only): 2004-05: 39.0 cpm 2005-06: 37.0 cpm 2006-07: 36.0 cpm 2007-08: 36.6 cpm 2008-09: 37.7 cpm 2009-10: 37.0 cpm	Telstra annual report data, average FTM revenue per minute for PSTN and ISDN calls. Sensitivity values are for PSTN calls only and are from ACCC imputation reports for Telstra.

Data input	Purpose for modelling	Values	Source
Retail mobile subscription price with MTAS regulation	Factual values for mobile subscription price for measuring welfare effects compared to counterfactual subscription price (plus allowance for modelled waterbed effect).	2004-05: \$500.43 2005-06:\$509.67 2006-07:\$547.00 2007-08:\$618.85 2008-09:\$609.56 2009-10:\$627.25	Telstra Annual report. Mobiles ARPU for retail revenues only, including hardware.
Mobile termination cost (cpm)	Measuring producer surplus levels and changes in the MTAS market.	2003-04: 9cpm 2004-05 to 2007-08: 6.6 cpm After 2007-08: 6.2 cpm	Analysys assumptions derived from Wik model outputs from ACCC MTAS determination 2009 and ACCC MTAS review 2004
Other FTM costs (cpm)	Add to mobile termination cost for determining total FTM cost for measuring producer surplus levels and changes in the FTM market.	5 cpm all years 2003-04 to 2009-10	Analysys model assumption, from ACCC mobile services review report 2004
% mobile pass through (waterbed effect)	% of net fall in MTAS producer surplus that is to be recovered from increase in mobile subscription net producer surplus	Base:50% Sensitivity 1: 75% Sensitivity 2:100%	Frontier/VHA assumptions
FTM and MTAS minutes no MTAS regulation	Counterfactual quantity of minutes as starting value for calculating exogenous demand change. Latter is used for determining welfare changes under factual.	5,869.4 m 2003-04 to 2009-10 (and sensitivity of 4,351.3 m for PSTN only).	Estimates of PSTN and ISDN FTM minutes from Telstra Annual report, escalated by 1/(Telstra fixed line market share). Market share from ACCC and ACMA data. Sensitivity value is for PSTN minutes only.

Data input	Purpose for modelling	Values	Source
FTM and MTAS minutes with MTAS regulation	Quantity of FTM and MTAS minutes for welfare modelling of MTAS and FTM and price falls under factual.	2004-05: 6,250.0 m 2005-06: 6,500.2 m 2006-07: 6,595.6 m 2007-08: 6,591.7m 2008-09: 6,360.8 m 2009-10: 6,192.4 m  Sensitivity values (PSTN only): 2004-05: 4,633.5 m 2005-06: 4,819.0 m 2006-07: 4,769.1 m 2007-08: 4,766.2 m 2008-09: 4,599.3 m 2009-10: 4,477.5 m	Estimates of PSTN and ISDN FTM minutes from Telstra Annual report, escalated by 1/(Telstra fixed line market share). Market share from ACCC and ACMA data. Sensitivity values are for PSTN minutes only.
Mobile subscribers with MTAS regulation	Quantity of mobile subscribers for welfare modelling of subscriber price increase with MTAS regulation under factual.	2004-05: 18.0 m 2005-06: 19.3 m 2006-07: 20.7 m 2007-08: 22.0 m 2008-09: 24.2 m 2009-10: 25.4 m	Telstra, Optus, Hutchison and Vodafone annual reports and data provided by VHA.
Mobile subscription cost (% sub price)	For determining change in producer surplus from subscription price increase under factual.	69% of retail subscription price all years 2003-04 to 2009-10	Weighted average of 2007-08 mobile EBITDA margin for Telstra and Optus from annual reports. Figure of 69% is determined as (1-ave EBITDA margin of 0.31).
FTM own price elasticity	Slope of demand curve for FTM minutes. Determines change in minutes for change in FTM price.	Base: -0.6 (ACCC) Sensitivity: -0.216 (V)	ACCC estimate used by Analysys for F2M pass through report and Vodafone 2007 paper by Sandbach.
Mobile subscription own price elasticity	Slope of demand curve for subscriptions. Determines change in subscriptions for change in subscription price.	Base: -0.43 (CC) Sensitivity: -0.55 (V)	Commerce Commission assumption and Vodafone 2007 paper by Sandbach.



Data input	Purpose for modelling	Values	Source
MTM own price elasticity	Slope of demand curve MTM calls. Used to determine welfare change for reduction in MTM minutes from reduction in MOU by loss of marginal subscribers.	Base: -0.59 (CC) Sensitivity: -0.9 (V)	Commerce Commission assumption and Vodafone 2007 paper by Sandbach.
MTM price	Starting value for modelling impact of decrease in subscriptions from increase in subscription price on the number of MTM calls.	2004-05: 35.2 cpm 2005-06: 28.1 cpm 2006-07: 30.0 cpm 2007-08: 32.4 cpm 2008-09: 34.0 cpm 2009-10: 34.0 cpm	Vodafone average retail revenues per minute from Division 12 RKR data. Figure for 2009-10 is assumed same as 2008-09.
FTM minutes per <i>marginal</i> mobile subscriber (% of average subscriber minutes)	Determines decrease in total FTM minutes from loss of marginal subscribers with increase in the mobile subscription price.	35%	Pre-paid subscriber revs as share of average subscriber revs in 2009-10 from Telstra annual report 2010
MTM minutes per <i>marginal</i> mobile subscriber (% of average subscriber minutes)	Determines decrease in total MTM minutes from loss of marginal subscribers with increase in the mobile subscription price.	2004-05: 251 2005-06: 408 2006-07: 438 2007-08: 413 2008-09: 405 2009-10: 506  These are based on 35% of average as above).	Pre-paid subscriber revs as share of average subscriber revs in 2009-10 from Telstra annual report 2010, applied to VHA average mobile to mobile minutes per mobile subscriber.



## 3 Modelling results

In this section of our interim report, we set out the results of our modelling analysis based on the assumptions set out in section 1 above. These results show the effects of a reduction in the price of the MTAS on each of:

- Consumer surplus, measured as the sum across both fixed and mobile consumers
- The producer surplus of FNOs
- The producer surplus of MNOs
- Total welfare, which is essentially the sum of the preceding three effects.

These effects capture all three types of effect described in section 2.1.1 above.

Our results are set out so that we first estimate the changes in consumer surplus, producer surplus and total welfare under a base case scenario using the core assumptions described in section 2. We then run a number of sensitivity tests based on changes in:

- The amount of lost MTAS profits MNOs would seek to recover via increased prices for mobile subscription.
- The own-price elasticities of demand for each of FTM calls, MTM calls and mobile subscriptions.
- The use of only PSTN FTM call prices and volumes of minutes rather than combined PSTN and ISDN prices and minutes.

We set out some high-level conclusions from our analysis in section 3.3 below.

### 3.1 Consumer welfare is declined over time under our base case results

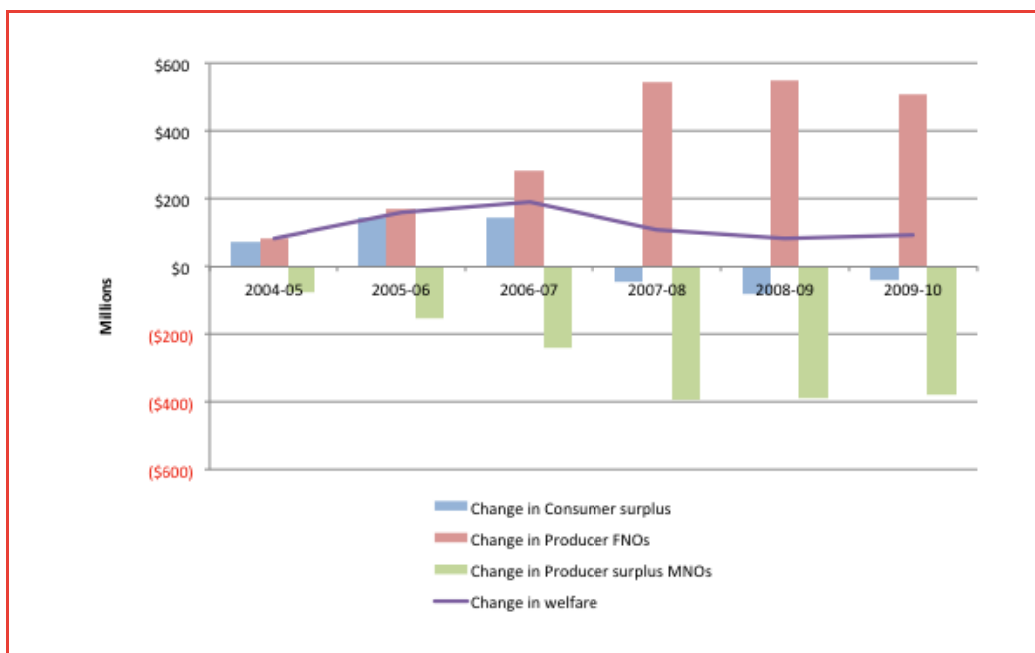
The aggregate welfare effects over the period 2004-05 to 2009-10 are shown in Table 3 below. These welfare effects are then displayed for each of the financial years in graphical form in Figure 3.

Table 3: Aggregate welfare effects of regulating price reductions for the MTAS

Welfare type	2004-05 to 2009-10
Change in consumer surplus	\$205,386,089
Change in FNO producer surplus	\$2,142,935,600
Change in MNO producer surplus	(\$1,628,067,602)
Overall change in welfare	\$720,254,086

Source: Frontier Economics

Figure 3: Annual welfare effects of regulating price decreases for the MTAS



Source: Frontier Economics

The key finding under our base case is that extending the welfare analysis to capture more than simply the direct welfare effects that occur with respect to FTM calls shows that:

- The welfare gains for consumers are significantly lower than those that would be estimated if we only had regard to the direct welfare effects in the market for FTM calls. This is due to the price for mobile subscription being higher under MTAS regulation than it otherwise would be in the absence of regulation. Indeed, in some years, the net gain to consumers across both fixed and mobile markets is negative.
- The major beneficiaries of reduced MTAS rates are FNOs. This is because they appear able to pocket some of the reduction in MTAS by not fully passing through these lower rates to consumers of FTM calls. This gain has

increased as both the market for FTM calls has grown, and reductions in the price of the MTAS have increased.

- MNOs are significantly worse off as a result of reductions in the price of the MTAS. This is largely because they are only able to recover 50 per cent of lost MTAS profits via increased prices for retail mobile calls.

Importantly, the results also show that where the level of FTM pass-through reduces, the net gains for consumers are significantly lower. This is evident in the contrast between the impact on consumer welfare of MTAS rate reductions in the period between 2004-05 and 2006-07, compared with the period from 2007-08 to 2009-10. In this regard, our analysis of available data showed that while the price of FTM calls decreased from 38.5 cpm to 31.4 cpm over the period from 2004-05 to 2006-07, FTM call prices were still at this level in 2009-10. This was despite the price of the MTAS falling from 12 cpm to 9 cpm on 1 July 2007. In these circumstances, reductions in the price of the MTAS are providing little benefit to fixed-line consumers such that any level of waterbed effect will generate welfare losses for consumers as a whole.

## 3.2 Consumer and total welfare is decreasing under most sensitivity tests

Below we report the results of changing a number of key assumptions.

### 3.2.1 Changes in waterbed assumptions

The first input we have conducted sensitivity testing for the proportion of lost MTAS profits that MNOs seek to recover via higher prices for mobile subscription than those that would be expected in the absence of regulation of the MTAS. In this regard, we have re-run our analysis assuming MNOs are able to recover 75 per cent and 100 per cent of lost MTAS profits via higher prices for mobile subscriptions than would be the case in the absence of regulation.

In conducting this analysis, it is important to note that increases in the price of mobile subscriptions may not be high in absolute terms if MNOs seek to recover lost MTAS revenues. For instance, our model shows that if MNOs seek to recover 100 per cent of lost revenues via increased prices for mobile subscriptions, this will lead to the price of mobile subscriptions being less than 5 per cent higher than what they would be in the absence of regulation. This low percentage increase reflects the fact that MNOs now recover a much greater proportion of their revenues from retail mobile services than they do from the MTAS. Notwithstanding this, small increases in the price of mobile subscription can still have significant consumer surplus, producer surplus and total welfare effects due to the large numbers of mobile subscribers that now exist in Australia.

Table 4: Aggregate welfare effects 2004-05 to 2009-10 with different waterbed effect assumptions

Welfare type	50% (base)	75%	100%
Change in consumer surplus	\$205,386,089	(\$755,220,651)	(\$1,708,860,605)
Change in FNO producer surplus	\$2,142,935,600	\$2,130,098,340	\$2,117,533,715
Change in MNO producer surplus	(\$1,628,067,602)	(\$907,622,175)	(\$186,624,019)
Overall change in welfare	\$720,254,086	\$467,255,515	\$222,049,091

Source: Frontier Economics

The clear observation from this sensitivity analysis is that if MNOs seek to recover a greater proportion of lost profits from reductions in the price of the MTAS via increased subscription charges:

- Consumers will, on balance, be worse off under regulation under both the scenarios we have modelled. The intuition behind this result is that fixed consumers do not benefit in full from the reduction in the price of the MTAS via lower FTM calls – i.e. FNOs are able to pocket some of this reduced MTAS price via less than complete pass through. On the other side of the ledger, however, MNOs are able to recover a significant (and, in the case of a 100 per cent waterbed effect, full) amount of the lower profits from lower MTAS prices via increased mobile subscription charges. In other words, the consumer detriment from the waterbed effect is complete (or almost complete), while the consumer gain from lower FTM prices is only partial.
- The gain for FNOs is reduced as MNOs are able to recover more lost profits via increased subscription charges. This is because higher subscription charges leads to FTM consumers having less mobile subscribers to call, and hence lower profits for FNOs due to the lower level of FTM calls. However, this effect is small.
- As MNOs are able to recover more of their lost MTAS profits through higher subscription charges, their overall loss in profits declines and in fact tends towards zero as the level of the waterbed effect approaches 100 per cent. The reason that MNOs are still worse off as a result of regulation of the MTAS even where they are able to recover 100 per cent of lost MTAS profits through higher prices for mobile subscription is because of the loss in surplus resulting from less MTM calls being made as a result of higher ARPUs leading to lower levels of mobile subscribers.

Overall, the results clearly show that in the absence of full pass-through of lower MTAS prices into the retail price of FTM calls, consumers and society as a whole will be made worse-off as the level of the waterbed effect increases. What is unambiguously clear, however, is that with less than full FTM pass-through, FNOs clearly are the major beneficiary of reductions in the price of the MTAS. This is also significant because the major provider of fixed line telecommunications services is Telstra, who is also competing to provide mobile services to consumers. In contrast, mobile-only operators – such as VHA - will have no offsetting gain from the fixed-line side of their business following reductions in the price of the MTAS.

### 3.2.2 Changes in elasticity assumptions

The second set of inputs we have changes are the assumptions we have used for the own-price elasticities of demand for FTM calls, MTM calls and mobile subscriptions. In the base case, we relied on elasticity assumptions previously used by the ACCC and the NZCC. Under our sensitivity testing, however, we have applied estimates previously made by Vodafone Group. These changes have the effect of:

- Reducing the sensitivity of FTM calls to changes in the price of the service. As a result of this, fixed-line consumers will experience a smaller increase in consumer surplus following a reduction in the price of FTM calls. It also reduces the increase in producer surplus FNO operators experience following reductions in the price of the MTAS due to the lower demand response to any passed-through reduction in the price of FTM calls.
- Increasing the sensitivity of MTM calls to changes in the price of the service. This has the effect of reducing the loss in consumer surplus that mobile subscribers experience due to the smaller level of mobile subscriptions following an increase in the price of mobile subscriptions.
- Increasing the responsiveness of mobile subscribers to changes in the price of mobile subscriptions. This has the effect of leading to a greater reduction in mobile subscribers following a reduction in the price of the MTAS. In turn, this leads to greater losses in consumer surplus due to both the direct effects of reduced mobile subscriptions, and the indirect effect of other fixed and mobile subscribers having less people to whom they can make FTM and MTM calls.

Table 5: Aggregate welfare effects 2004-05 to 2009-10 with different elasticities

Welfare type	Base case	Alternative elasticities
Change in consumer surplus	\$205,386,089	(\$151,932,896)
Change in FNO producer surplus	\$2,142,935,600	\$1,682,035,173
Change in MNO producer surplus	(\$1,628,067,602)	(\$1,896,871,224)
Overall change in welfare	\$720,254,086	(\$366,768,946)

Source: Frontier Economics

Importantly, the results set out in Table 4 show that consumers and society as a whole will be worse off under the elasticity assumptions contained under our sensitivity testing. The essential intuition here is that the gains to FTM consumers will be overwhelmed in circumstances where there is little consumer response to reductions in the price of FTM calls relative to a situation where there is a greater consumer response to increases in the ARPU for retail mobile services. In essence, fixed consumers have relatively smaller responses (and hence welfare gains) in response to price falls compared to the response of mobile consumers to increases in the price of retail mobile services.

### 3.2.3 PSTN only FTM call prices and minutes

In this sensitivity, we model the welfare effects only with respect to changes in the price and quantity of PSTN FTM services. To do this we use estimates of PSTN FTM price per minute from the ACCC's imputation testing data combined with estimates of PSTN FTM minutes taken from Telstra's annual reports. This contrasts with the base case where combined estimates for PSTN and ISDN FTM prices and call minutes are used.

The major changes from the base case are the move from a gain in consumer welfare to a large loss in consumer welfare and the fall in overall welfare rather than a gain (see Table 6 below). This is driven by the lower level of FTM-pass through that has occurred with PSTN FTM calls following reductions in MTAS rates than with all (PSTN and ISDN) calls, as well as the lower volume of calls over which this more limited degree of pass-through has occurred.

We expect that this result can be in part attributed to greater competition in higher volume business services that would have seen more pass-through in ISDN call rates than for PSTN calls.



Table 6: Aggregate welfare effects 2004-05 to 2009-10 for PSTN FTM calls only

Welfare type	Base case	PSTN call prices and minutes
Change in consumer surplus	\$205,386,089	(\$1,308,443,079)
Change in FNO producer surplus	\$2,142,935,600	\$2,439,018,416
Change in MNO producer surplus	(\$1,628,067,602)	(\$1,396,068,641)
Overall change in welfare	\$720,254,086	(\$265,493,304)

Source: Frontier Economics

### 3.2.4 All changes in assumptions

In Table 6 below, we bring together the sensitivity tests together to analyse their combined impact on our welfare effects. We do this for the different elasticity and FTM call price and volume assumptions under both a 75 per cent and 100 per cent waterbed effect assumption.

Table 7: Aggregate Welfare effects 2004-05 to 2009-10 with different waterbed, elasticity assumptions and FTM call types

Welfare type	Base	75% waterbed plus different elasticity, FTM call price and volume assumptions	100% waterbed plus different elasticity, FTM call price and volume assumptions
Change in consumer surplus	\$205,386,089	(\$2,357,517,455)	(\$3,245,909,522)
Change in FNO producer surplus	\$2,142,935,600	\$2,357,306,718	\$2,344,110,511
Change in MNO producer surplus	(\$1,628,067,602)	(\$836,703,767)	(\$216,794,090)
Overall change in welfare	\$720,254,086	(\$836,914,504)	(\$1,118,593,100)

Source: Frontier Economics

### 3.3 Conclusions and Analysis

The analysis set out above leads us to make a number of conclusions:

- First, expanding the analysis of the welfare effects of reduced MTAS prices to include effects experienced in retail mobile markets means it is less clear whether consumers as a whole are better or worse-off as a result of reduced prices for the MTAS.
- Second, while reductions in the price of the MTAS are likely to improve consumer surplus for fixed-line subscribers, it is also likely to reduce welfare for mobile subscribers. Whether the gains to fixed-line consumers exceed the losses for mobile consumers depends crucially on the size of the waterbed effect relative to the extent of FTM pass-through. If FTM pass-through is low and the waterbed effect is high, it is almost certain that consumers as a whole will be worse off as a result of reductions in the price of the MTAS.
- Third, changes to key assumptions regarding the own-price elasticities of demand for FTM calls, MTM calls and mobile subscriptions can greatly reduce or eliminate any welfare gains one might expect from reductions in the price of the MTAS.
- Fourth, our analysis of FTM call price changes in Telstra's Annual Reports and the ACCC's imputation testing reports lead us to conclude that business consumers are likely to have benefitted far more from reductions in FTM call prices than residential consumers in the past.

Based on the conservative assumptions around the level of the waterbed effect, elasticities of demand and the type of the types of FTM calls included, our analysis shows that the greatest beneficiaries of past reductions in the price of the MTAS have been FNOs. While consumers have benefited under our conservative set of assumptions, their benefit is less than 10 per cent of that enjoyed by FNOs. This is because of the extent to which FNOs have been able to hold-on to a large proportion of reductions in the price of the MTAS through low levels of FTM pass-through and the extent to which mobile consumers suffer offsetting welfare detriments as a result of the waterbed effect.

Once we start to test for less conservative assumptions than those set out in our base case, it becomes less than clear that consumers and society as a whole have benefited from reductions in the price of the MTAS. Indeed, our analysis suggests it is possible that the only beneficiaries of reductions in the price of the MTAS have been FNOs, of which Telstra would be the most significant. In contrast, MNOs, consumers and society as a whole may well have been substantially worse off as a result of reductions in the price of the MTAS over the period from 2004-05 to 2009-10.

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