

MTAS Regulation Quantitative Analysis

Prepared for

Vodafone New Zealand

Authorship

This document was written by Aaron Schiff and John Small.
aaron.schiff@covec.co.nz | (09) 916 2012

We help organisations to solve problems and make decisions using our core skills of economics, forecasting, research and public policy.

© Covec Ltd, 2009. All rights reserved.

Disclaimer

Although every effort has been made to ensure the accuracy of the material and the integrity of the analysis presented herein, Covec Ltd accepts no liability for any actions taken on the basis of its contents

Contents

Executive Summary	1
1. Introduction	6
2. Counterfactual and Factual Scenarios	7
2.1. The Counterfactual	7
2.2. The Factual	7
2.2.1. The Factual in 2010	7
2.2.2. Benchmarking the Current Level of Mobile Termination Rates	8
2.2.3. Cross-Checks of the Commission's Benchmarks	11
2.2.4. Response to WIK-Consult	13
2.2.5. Benchmarking the Change in Mobile Termination Costs over Time	14
3. The Retail Fixed-to-Mobile Market	16
3.1. FTM Welfare Modelling	16
3.2. FTM Pass-through	17
3.2.1. Inconsistencies in the Commission's Assumptions	17
3.2.2. FTM Pass-through Analysis	17
3.2.3. Competition and Margins in the FTM Market	23
3.2.4. The Importance of FTM Pass-through	25
3.2.5. FTM Pass-through Summary	25
4. The Retail Mobile Market	26
4.1. The Waterbed Effect	26
4.1.1. The Waterbed Effect from FTM Termination Regulation	26
4.1.2. The Waterbed Effect from MTM Termination Regulation	27
4.1.3. Transfers and Distribution of the Waterbed Effects	28
4.1.4. What Determines the Size of the Waterbed Effect?	29
4.1.5. Modelling the Waterbed Effect	31
4.2. Effects on Competition in the Retail Mobile Market	34
4.2.1. Relationship between MTRs and Retail Mobile Prices	34
4.2.2. Market Shares and Traffic Imbalances	34
4.2.3. Effects of Changing the MTR on Mobile Market Competition	35
5. Values of Other Parameters	38
6. Revised Cost-Benefit Results	39
7. Welfare Transfers	41
Appendix: Modifications to the MTAS Quantitative Model	43
References	46

Executive Summary

1. The Commerce Commission is investigating whether mobile termination access services (MTAS) should become designated or specified services under the Telecommunications Act. The MTAS include mobile-to-mobile (MTM) voice termination, fixed-to-mobile (FTM) voice termination, and short-message-service (SMS) termination.
2. At Vodafone New Zealand's request, we have reviewed the quantitative and competition analysis contained in the Commission's Draft Report in this investigation. We have also reviewed the accompanying cost-benefit spreadsheet model released by the Commission. This report details our findings. Together with this report, we have supplied a modified version of the spreadsheet model, which reflects various changes we believe should be made. The views expressed in this report are our own and not necessarily those of Vodafone.
3. Our review uncovered a number of serious problems with the Commission's analysis. There are errors in the spreadsheet model, and the Commission has made a number of unjustified and incorrect assumptions regarding some of the key parameters. The cumulative effect of these errors is that the Commission significantly overestimates the net economic benefits of regulation. In fact, regulation will reduce economic welfare relative to the undertakings that have been provided by Vodafone and Telecom. The Commission's analysis of the effects of regulation on competition in the FTM and retail mobile markets is also deficient. In our view the most likely effect of regulation is that fixed-line firms will be made better off at the expense of end users.

4. Our main findings are as follows:

An incorrect counterfactual scenario is used

5. The Commission's counterfactual is only based on the undertakings provided by Telecom and Vodafone, while 2degrees is ignored because the Commission believes their undertaking cannot be accepted. This is in spite of the fact that 2degrees will shortly enter the market. The Commission's cannot reach a conclusion about the effects of regulation on competition in the mobile market without also considering 2degrees. The commercial agreement between Vodafone and 2degrees is a relevant counterfactual scenario that the Commission must consider, and it should assess the effects of regulation on 2degrees relative to this counterfactual.

An incorrect factual scenario is used in 2010

6. The factual scenario used by the Commission assumes that the same mobile termination rate (MTR) will prevail in 2010 as in the undertakings. However, if the Commission recommends regulation and the Minister decides to regulate, the existing mobile termination deeds will terminate and the undertakings will not apply. Given that regulation will not commence until 2011, it is therefore likely that the MTR in 2010 will be higher under regulation than it will be otherwise, and regulation will create economic detriments relative to the undertakings in 2010 that the Commission has not modelled.

The benchmarking of MTRs is deficient

7. There are a number of serious problems with the Commission’s benchmarking of MTRs:
- The Commission has continued to ignore the issue of comparability, despite acknowledging its importance and despite compelling evidence that local conditions play a significant role in determining the cost of mobile termination.
 - The Commission benchmarks against cost model rates when there are good reasons why regulators in other countries have regulated MTRs at levels greater than estimated by their cost models, including the possibility that some mobile cost models may embody an unachievable standard of efficiency.
 - The benchmarking is inconsistent with the Commission’s proposed initial pricing principle (IPP) that requires benchmarking against regulated prices in comparable countries. This inconsistency with the IPP risks estimating benefits of regulation greater than will actually occur when the IPP is applied.
 - The Commission omits relevant benchmarks from Greece and Hungary where MTRs have been regulated on the basis of bottom-up LRIC models, and it includes France where the cost model is entirely based on historical costs.
 - The Commission uses inappropriate cross-checks on its benchmarking.
8. Table 1 shows our amended benchmarks including Greece and Hungary, excluding France, and adjusting the Australian cost estimate to reflect the ACCC’s decision that its cost model produces an under-estimate of the cost of mobile termination in Australia. Taking account of comparability and asymmetric risk, our view is that a reasonable estimate of cost in New Zealand is the 75th percentile of these costs (10.89 cpm). To be consistent with the IPP, regulated rates should be used, giving at least 12.38 cpm.

Table 1 Amended MTR benchmarks (NZD cpm).

Country	Cost estimate	Regulated MTR
Australia	10.13	10.13
Austria	n/a	10.76
Denmark	11.77	12.83
Greece	10.28	16.33
Hungary	11.04	15.68
Israel	7.16	9.09
Malaysia	5.23	5.23
Netherlands	10.44	18.01
Norway	9.53	11.93
Spain	n/a	13.84
Sweden	6.96	8.12
UK	12.52	13.36
Median	10.21	12.38
75th Percentile	10.89	14.30

The benchmarking of changes in termination costs over time is deficient

9. The Commission ignores relevant information from Australia, Israel and Malaysia when benchmarking the rate of change of mobile termination costs over time, in spite of considering these countries as relevant benchmarks for the level of the MTR. Across all countries for which information is available, the median change in cost is -4.7% per annum, in contrast with the Commission's assumption of -10% per annum.

The FTM welfare modelling contains errors

10. The Commission's welfare model does not allow for the fact that the MTR and FTM price may be higher under the factual compared to the counterfactual in any year. This will occur in 2010 and may also occur in other years if FTM pass-through is not as high as the Commission has assumed.

There are inconsistencies in the FTM pass-through assumptions

11. A lower MTR is assumed to increase FTM pass-through in the factual but not the counterfactual. If the Commission is correct that a lower MTR will promote competition in the FTM market then pass-through must increase in both scenarios.
12. Under the factual the Commission assumes FTM pass-through begins to increase from 2008 but regulation does not occur until 2011. The increase in pass-through cannot be assumed to begin until 2011.

The FTM pass-through assumptions are not supported by empirical evidence

13. The Commission's method of estimating FTM pass-through from the historical data is biased because it ignores other factors in addition to the falling MTR that the Commission acknowledges will have increased competition and therefore reduced prices in the FTM market. The Commission significantly overestimates the reduction in the FTM price that is attributable to a reduction in the MTR.
14. We have carefully analysed the historical data on the FTM market using econometric models that do not suffer from this bias. We find that the best estimate of annual FTM pass-through in response to a change in the MTR is 41%. There is no evidence that pass-through has increased over time or when the MTR falls.

There is no evidence of a link between the level of the MTR and the intensity of competition in the FTM market

15. We have analysed the margin between FTM retail prices and the MTR over time and this margin has increased when the MTR has been falling. From 1997 to 2008 the MTR reduced by 33 cpm while the FTM margin increased by more than 7 cpm. This is at odds with the assumption that a falling MTR will increase competition in the FTM market, as markets that are more competitive display smaller margins between prices and costs.
16. It therefore seems very unlikely that the relatively small reduction in the MTR (by historical standards) proposed by the Commission will generate a significant increase in competition in the FTM market when the large reduction in the MTR that has already occurred has failed to do so.

The Commission incorrectly characterises the nature of the waterbed effect

17. The waterbed effect is described as a mechanism of 'revenue recovery', when in fact it represents an optimal response by profit-maximising firms to a change in incentives caused by regulation. The Commission fails to properly understand what drives the waterbed effect and therefore underestimates its size.

The waterbed model contains errors

18. The Commission fails to allow for elasticity of mobile subscription demand when calculating the increase in retail mobile prices that will occur under the waterbed effect. The result is that the increase in mobile prices is under-estimated and the results produced by the waterbed model do not accord with the Commission's own assumptions. Correcting this error alone eliminates about half of the Commission's estimate of the net consumer benefits of regulation.
19. As in the FTM welfare model, the waterbed model also assumes that the MTR in the factual is always less than in the counterfactual, which will produce incorrect results.

The size of the waterbed effect is underestimated

20. The error described above means the Commission underestimates the waterbed detriments embodied by its own assumptions. In addition to this, the Commission incorrectly assumes that the waterbed effect decreases with penetration and so will be smaller than in its previous mobile termination investigation. In fact the opposite is true and the waterbed effect will be greater when penetration is higher. The Commission also ignores the fact that MTM regulation will generate a waterbed effect.
21. The Commission's waterbed model is also inconsistent with its conclusion that regulation will promote competition in the mobile market. If so, mobile pass-through and the size of the waterbed effect should increase over time under regulation.

The analysis of the effects of regulation on competition in the mobile market is inadequate

22. The Commission fails to fully understand the effects of MTR regulation on mobile operators and competition in the mobile market. By concentrating on termination costs only, it misunderstands the relationship between MTRs and mobile market outcomes including prices. The Commission also erroneously concludes that market data shows a link between market shares and traffic imbalances between networks.
23. By only performing a partial analysis, the Commission overlooks the fact that a reduction in the MTR will reduce the intensity of competition between mobile networks as it reduces their incentive to compete for new customers. The Commission also ignores the negative effects of FTM termination regulation on all mobile operators including entrants and the fact that this will make entry more difficult.
24. The Commission does not demonstrate how regulation will cause competition to increase or prices to reduce in the mobile market relative to what is already occurring with the entry of 2degrees and other changes such as the introduction of MVNOs.

The net economic benefits of regulation are negative

25. After correcting the errors in the Commission’s cost-benefit model and changing some of the parameters to more plausible values, we find that regulation will create significant economic detriments relative to the existing undertakings put forward by Vodafone and Telecom.
26. Table 2 shows our cost-benefit results when we use the Commission’s benchmark for the level of the MTR in 2009 (7.2 cpm). Regulation creates significant economic detriments relative to the existing undertakings, both for consumers and in total. These results differ from the Commission’s largely because the Commission’s assumptions about FTM pass-through are too optimistic compared to what can be supported by the historical evidence from the FTM market, and the Commission underestimates the size of the waterbed effect.

Table 2 Modified cost-benefit results using the Commission’s MTR benchmark (NPV \$m).

	Consumer Surplus	Total Surplus
Linear	-242.8	-45.1
CED	-274.0	-78.8

27. Table 3 shows our results when the median of regulated MTRs (12.38 cpm) is used to set the level of the termination rate in 2009, to be consistent with the proposed IPP. In this case regulation also creates significant economic detriments relative to the existing undertakings.

Table 3 Modified cost-benefit results using the median of regulated MTRs (NPV \$m).

	Consumer Surplus	Total Surplus
Linear	-109.0	-27.1
CED	-118.7	-37.5

Regulation will create large welfare transfers between consumer groups

28. In addition to creating economic detriments, regulation also generates significant welfare transfers between consumer groups, which we believe the Telecommunications Act does not envisage. Mobile consumers will be worse off, and prepay customers may be particularly negatively affected. Furthermore, if FTM pass-through is not as high as the Commission assumes, telecommunications firms are the only beneficiaries of regulation and all end users will be made worse off.

1. Introduction

29. The Commerce Commission is investigating whether mobile termination access services (MTAS) should become designated or specified services under the Telecommunications Act. The MTAS include mobile-to-mobile (MTM) voice termination, fixed-to-mobile (FTM) voice termination, and short-message-service (SMS) termination.
30. At the end of June, the Commission released a Draft Report giving its preliminary views.¹ A significant part of the Draft Report related to quantitative cost-benefit modelling that the Commission conducted to estimate the economic welfare effects of regulation of the MTAS. The Commission's basic framework involves specifying a counterfactual (unregulated) and factual (regulated) scenario, and then calculating the net welfare effects of moving from the counterfactual to the factual. Welfare effects are calculated in the FTM and retail mobile markets. In addition, the Commission presents some analysis of the effects of regulation on competition in the mobile market.
31. Vodafone New Zealand has asked us to review the Commission's quantitative and competition analysis. We reviewed the Draft Report and the accompanying spreadsheet model released by the Commission. This report presents our findings. Together with this report we are supplying a modified version of the Commission's spreadsheet model, reflecting various changes that we believe should be made, as explained in this report. In our modified spreadsheet, cells that we have changed are highlighted in purple, and the Appendix to this report briefly describes all the changes.
32. The views expressed here are our own and not necessarily those of Vodafone.

¹ *Draft Report on whether the mobile termination access services (incorporating mobile-to-mobile termination, fixed-to-mobile termination and short-message-service termination) should become designated or specified services*, Commerce Commission, 30 June 2009.

2. Counterfactual and Factual Scenarios

33. In this section we discuss the particular assumptions the Commission has made about mobile termination rates and competition in the counterfactual and factual.

2.1. The Counterfactual

34. The counterfactual is the state of the world absent regulation. The Commission uses the undertakings provided by Vodafone and Telecom to define the counterfactual. The Commission believes that the undertaking provided by 2degrees is not capable of being accepted, and it has therefore ignored 2degrees in the development of its counterfactual scenario.
35. However, 2degrees has committed to enter the market, has built a network, and will begin competing for customers very soon. Therefore, regardless of whether the Commission can or cannot accept 2degrees' undertaking, the Commission must consider the presence of 2degrees in the market as part of the counterfactual (and the factual). In particular, in the counterfactual world there will be an MTR for FTM and MTM termination on 2degrees' network, and 2degrees will compete with Vodafone and Telecom. The Commission must include these facts in its analysis. The commercial agreement between Vodafone and 2degrees is a relevant part of the counterfactual scenario, as is any such agreement between Telecom and 2degrees.
36. Ignoring these facts is a serious flaw in the Commission's analysis, because a major part of the Commission's argument in favour of regulating the MTAS is that it will promote competition in the mobile market. The Commission cannot reach such a conclusion without considering the effects of regulation on all competitors in the mobile market. We discuss this further in section 4.2 below, but for now we note that regulation will reduce the FTM termination revenues that 2degrees receives, and the effects of MTM and SMS termination regulation on 2degrees must be assessed with reference to existing commercial agreements.

2.2. The Factual

37. The factual scenario is based on the Commission's benchmarking against mobile termination cost estimates in other countries.

2.2.1. The Factual in 2010

38. The Commission assumes that regulation will apply from 2011. Taking into account the nature of the regulatory process, we agree with this assumption. However, the factual incorrectly assumes that the MTR in 2010 will be the same as that under the counterfactual. It is our understanding that the existing MTR deeds will terminate upon MTAS designation, which, if the Commission recommends regulation and the Minister decides to regulate, must occur before the start of the Standard Terms Determination process, probably in late 2009 or early 2010.
39. This means that the Commission cannot use the counterfactual MTR in 2010 (derived from the undertakings) as the factual MTR in 2010. It is not entirely clear how the MTR

in 2010 will be determined if the MTAS are regulated, but in our view it is likely that the MTR will remain at the level prevailing at the end of 2009 (15 cpm). In 2010 the MTR will therefore be lower in the counterfactual scenario compared to the factual. As we discuss in section 3.1 below, the Commission's cost-benefit model does not allow for this possibility and needs to be modified to correctly calculate the net welfare losses that regulation will create in 2010.

2.2.2. Benchmarking the Current Level of Mobile Termination Rates

40. The Commission has updated its benchmarking of mobile termination costs and estimated these at 7.2 cpm for 2009, which represents a small increase compared to the benchmarking in the Commission's comments on the MTAS undertakings.² We have already provided the Commission with a report detailing our views on its benchmarking,³ and these views have not changed with regard to the revised benchmarking in the Draft Report.
41. We are concerned that the Commission has continued to ignore the issue of comparability, despite acknowledging its importance (e.g. ¶464 & 469). The wide range of cost estimates in the Commission's benchmarking set (from NZ 4.83 cpm to 12.52 cpm) and the simulations conducted for the Commission by WIK-Consult demonstrate that local factors are very important for determining the cost of mobile termination (see also our discussion of WIK-Consult's results in section 2.2.4 below). This highlights the fact that there is no single mobile termination cost that is appropriate for all countries.
42. Among the countries in the Commission's benchmarking set, we note again that Norway is the most comparable to New Zealand, with similar population, land area and population density. Norway does however have a significantly greater real GDP per capita, which is likely to lead to a higher volume of calls and lower per-minute costs, everything else equal. The estimated termination cost in Norway is NZ 9.5 cpm, which is greater than the median, and so when comparability issues are taken into account this suggests that the median of the Commission's dataset will underestimate the cost of mobile termination in New Zealand. We note that the Norwegian regulator currently regulates termination rates at about 25% above its estimate of cost.
43. We also find it surprising that the Commission has benchmarked against cost model estimates for other countries when the regulators in those countries have been reluctant to set regulated MTRs on the basis of these estimates. In Australia, the ACCC has stated that it considers the cost model to be a lower-bound estimate, because the model does not fully reflect all the constraints faced by mobile operators.⁴ With estimates from the cost model around AU 6 cpm, the ACCC has consistently regulated the MTR at AU 9 cpm, to reflect its belief that the cost model produces an under-estimate of the true cost of an efficient Australian mobile operator.

² Table 27 of the Draft Report.

³ *Benchmarking Mobile Termination Rates*, Covec, 6 May 2009.

⁴ See page 1 of *MTAS Pricing Principles Determination 1 July 2007 to 31 December 2008*, ACCC, November 2007, and page 28 of *Domestic Mobile Terminating Access Service Pricing Principles Determination and indicative prices for the period 1 January 2009 to 31 December 2011*, ACCC, March 2009.

44. Furthermore, in order to be consistent with the initial pricing principle (IPP) proposed in the Draft Report, the Commission must benchmark against cost-based *prices*, rather than cost estimates. As we have already submitted to the Commission in our benchmarking report, many regulators have found good reasons to set regulated termination rates higher than cost modelled rates. Any benchmarking conducted under the IPP would have to take this into account. Since the Commission's cost-benefit analysis aims to estimate the net benefits of regulation, which would involve implementing the IPP, it is necessary for the MTR used in the cost-benefit model to be consistent with the IPP. Failing to do so risks over-estimating the benefits of regulation that will actually occur once the IPP is applied.
45. In addition to the nine countries the Commission has benchmarked against, we have identified two more – Greece and Hungary – that have recently regulated MTRs on the basis of LRIC models. While we understand that the cost models used in both of these countries included some historical cost information from operators, the Commission has indicated that such models are acceptable for benchmarking against:⁵
- The Commission's preliminary view, reflected in the preference for MTAS prices to be based on BU modelling, is for cost inputs to be forward looking or current costs although the Commission accepts that models may include some historical costs.
46. The Greek regulator (EETT) completed its mobile termination investigation in 2008 and the regulated rates were published in the Greek Official Gazette on 5 November 2008.⁶ We understand that a bottom up LRIC model was used and EETT set regulated rates on a three-year glide-path, ending in a cost of €0.0495 per minute from 1 January 2011. The current regulated rate for all operators is €0.0786 per minute.
47. The Hungarian regulator (NHH) issued its final determination on mobile termination on 16 December 2008.⁷ Again we understand that the regulator used a bottom up LRIC model. It set regulated rates on a three-year glide-path, ending in a cost of HUF11.86 per minute from 1 December 2010. The current regulated rate for all operators is HUF16.84 per minute.
48. Given the Commission has indicated that models incorporating historical costs are acceptable for benchmarking against, both Greece and Hungary should be included in the benchmarking set. We have calculated exchange rates on the same basis that the Commission used in the Draft Report. The 2007 PPP rates against the New Zealand dollar are 0.4545 for Greece and 85.5577 for Hungary.⁸ The ten-year average nominal

⁵ Letter from Tom Forster to Richard York, 22 July 2009.

⁶ Notification of regulation and publication of the regulated rates in the Greek Official Gazette is available at http://www.eett.gr/opencms/opencms/admin/downloads/Announcements/FEK2260_B_051108_Dec498_046.pdf (page 32174).

⁷ The final decision is available at <http://www.nhh.hu/dokumentum.php?cid=17815>. The regulated rates are given in section E on page 4, as is a reference to the use of a BU LRIC model.

⁸ Obtained from the source used by the Commission at <http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/weoselco.aspx?g=2001&sg=All+countries>.

exchange rates are 0.5082 for Greece and 129.2350 for Hungary against the New Zealand dollar.⁹ Averaging across the PPP and average nominal exchange rates gives rates of 0.4814 for Greece and 107.3964 for Hungary.

49. Furthermore, it is our understanding that the cost model used by ARCEP in France is entirely based on historical costs. The Commission has indicated that such models are not acceptable for benchmarking against, and therefore France should be excluded.
50. We have updated the Commission's benchmarking to include Greece and Hungary and exclude France. In addition, we strongly believe that for Australia it is appropriate to benchmark against the regulated rate of AU 9 cpm, given the ACCC's clear statement that the estimate produced by its cost model is too low.
51. Table 4 shows our revisions to the Commission's benchmarks. The median cost estimate is 10.21 cpm and the 75th percentile is 10.89 cpm. As above, the cost estimates continue to span a wide range. It is therefore still preferable to adjust these estimates to account for local conditions.

Table 4 Cost model benchmarks.

Country	MTR (Forex)	Currency	FX rate	MTR (NZD cpm)
Australia	0.0900	AUD	0.8872	10.13
Denmark	0.5400	DKK	4.5881	11.77
Greece	0.0495	EUR	0.4814	10.28
Hungary	11.8600	HUF	107.3964	11.04
Israel	0.1730	NIS	2.4171	7.16
Malaysia	0.0873	MYR	1.6669	5.23
Netherlands	0.0560	EUR	0.5364	10.44
Norway	0.0480	NOK	5.0379	9.53
Sweden	0.3675	SEK	5.2834	6.96
UK	0.0478	GBP	0.3813	12.52
Median				10.21
75th Percentile				10.89

52. As discussed above, we believe it is appropriate in this case for the Commission to benchmark against current regulated prices, rather than cost model estimates, to be consistent with the IPP and because other regulators have set regulated rates higher than their cost model estimates for various valid reasons.
53. In our earlier benchmarking report provided to the Commission we presented benchmarks of currently regulated rates for countries that have regulated mobile termination prices on the basis of forward-looking cost models.¹⁰ We have updated this

⁹ These are the averages of daily exchange rates for the period from 12/05/99 to 11/05/09, obtained from the PACIFIC Exchange Rate Service at <http://fx.sauber.ubc.ca>.

¹⁰ *Benchmarking Mobile Termination Rates*, Covec, 6 May 2009, Table 7.

benchmarking (our figures for May 2009) to include Greece and Hungary using the regulated rates and exchange rates described above, and to exclude France. Table 5 shows our results. The median regulated MTR is 12.38 cpm and the 75th percentile is 14.30 cpm.

Table 5 Benchmarking against regulated rates.

Country	MTR (NZD cpm)
Australia	10.13
Austria	10.76
Denmark	12.83
Greece	16.33
Hungary	15.68
Israel	9.09
Malaysia	5.23
Netherlands	18.01
Norway	11.93
Spain	13.84
Sweden	8.12
UK	13.36
Median	12.38
75th Percentile	14.30

54. In summary, if modelled mobile termination costs are used as the benchmark then Australian rate should be adjusted to reflect the ACCC's view that the cost model produces an underestimate, Greece and Hungary should be included and France should be excluded from the benchmarking set. Once comparability is considered, the cost estimate for New Zealand should exceed that of Norway. Allowing also for asymmetric risk, this suggests using the 75th percentile of the cost model benchmarks, or 10.89 cpm. However we believe that regulated rates should be used instead of cost model rates for the reasons discussed above. This gives a benchmark MTR of 12.38 cpm if the median of the regulated rates is used, or 14.30 cpm if the 75th percentile is used to further allow for asymmetric risk.

2.2.3. Cross-Checks of the Commission's Benchmarks

55. The Commission also presents two 'cross-checks' on its benchmarking (§528-543). The first cross-check is the EC recommendation of an MTR of around NZ 4.5 cpm in 2012. The Commission correctly recognises (§530) that this is a LRIC estimate excluding common costs and increases the cost estimate by 10% to arrive at 4.95 cpm.
56. However, the EC's view of common costs for a mobile network is very broad and their definition of the LRIC of mobile termination would exclude all costs that are not directly driven by the volume of traffic terminated.¹¹ The EC itself estimates the level of common costs at 25% of the cost of termination. It is likely that the percentage of these costs

¹¹ EC Staff Working Document SEC(2009) 599, 7 May 2009.

would be higher in New Zealand than in Europe due to different traffic volumes. Importantly, the EC's definition of the LRIC of mobile termination appears to exclude costs of the coverage network. This is the minimum network required to provide the operator's coverage. The amount of these common costs in comparison with total costs is likely to be substantial, particularly in New Zealand, and we believe these costs will significantly exceed 10%.

57. It is possible to illustrate the magnitude of common costs using the simulations performed by WIK-Consult in its first report for the Commission.¹² In the case of a mobile network, these costs are fixed with respect to traffic as the network will have to provide coverage before it can handle any calls. WIK's results give estimates of how average costs vary for different types of country as traffic volumes change. Assume a total cost function of the form $TC = f + cq$ where f includes the cost of coverage and c is the variable cost of traffic. If we have two cost estimates TC_1 and TC_2 and two corresponding volumes q_1 and q_2 , the amount of the fixed cost can be estimated as:

$$f = \frac{TC_2q_1 - TC_1q_2}{q_1 - q_2}$$

58. WIK shows (Table 1 of their report) what happens to average costs as volume changes. For example, for the 'SD' country, a traffic volume of 4.2 billion minutes is associated with an average cost of €3.51 cpm, or a total cost of about €147m. When the volume reduces to 2.974 billion minutes, average cost is €3.88 cpm, or a total cost of about €115m. Using the formula above, this gives a fixed cost of about €38 m, or between 26% and 33% of the total cost depending on which of the two total cost figures is used.
59. Similar calculations using WIK's results for the 'LS' country give fixed and common costs of between 50% and 58% of total costs. The higher percentage compared to the 'SD' country reflects the larger size of the 'LS' country and therefore higher coverage costs.
60. This suggests that the fixed and common costs associated with the coverage network in New Zealand will not be less than 26% of total costs, and are likely to be higher. Using a conservative estimate of 33%, the EC recommendation of NZ 4.5cpm in 2012 becomes 6.7 cpm. This significantly exceeds the Commission's benchmark of 5.2 cpm for that year.
61. The second type of cross-check that the Commission uses is to compare its mobile termination cost estimates to on-net prices from various Vodafone and Telecom plans. The Commission's analysis calculates effective per-minute prices under the assumption that consumers use all of the minutes and texts available in their bundle. While some consumers may do this, it is our understanding that the average consumer does not use their entire bundle every month. Mobile operators will anticipate this when setting prices, and the actual average on-net prices will be higher than those calculated by the Commission. To use on-net prices as a cross-check on benchmarking would require information about actual usage for the particular plans the Commission refers to.

¹² *Cost Driver Sensitivity Analyses with Mobile Cost Models*, WIK-Consult, 22 December 2008.

62. Furthermore, in our view using plan prices as a cross-check on mobile termination cost benchmarking is extremely difficult, as every bundle includes a number of different components (e.g. voice, text, data, and other services), and the mobile network will price on the basis of the value of the overall bundle as a whole to consumers (including expected termination revenue). This is further complicated by the fact that plans designed to attract closed user groups will be priced depending on the value of the group as a whole, and conducting the analysis at the level of an individual plan will therefore lead to erroneous conclusions about costs.

2.2.4. Response to WIK-Consult

63. Together with the Draft Report, the Commission supplied a report by WIK-Consult discussing submissions made by parties on benchmarking and mobile cost issues.¹³ We generally agree with WIK's statements (page 4) regarding the use of LRIC versus LRIC+ (where the '+' includes a markup for common costs) to determine the cost of mobile termination. As WIK state, there is no particular reason why termination should not recover some of the common costs.
64. However, we disagree with WIK's views on some other issues. In terms of the standard of efficiency applied to mobile operators, WIK state that only 3G costs should be considered as it is more efficient than 2G (page 5). It is important to realise that a 3G network is only cheaper (in terms of average costs) if there is a sufficient volume of traffic carried on the network. It is not feasible for an existing 2G operator to move all of their traffic from their 2G network to 3G instantaneously, as many customers will need upgraded handsets. Once handset replacement costs are taken into account, it is also not necessarily the case that an immediate switch to 3G would be socially optimal, even given that the per-unit traffic costs will be lower on 3G at sufficiently high volumes. From a welfare point of view, a gradual transition to 3G may be preferable as handsets can be replaced as they become older.
65. Furthermore, a new 3G entrant will not be able to achieve efficient scale immediately, even under ideal conditions. This means that the competitive pressure on existing operators from new 3G-only entry is not as strong as WIK suggest it is.
66. Taking these factors into consideration, we maintain our view that modelling 3G costs only imposes an efficiency standard that would not be met in a workably competitive mobile market at the current point in time. We refer again to the quotes from the Australian Competition Tribunal on these issues in our submission on benchmarking of MTRs.¹⁴
67. In our submission, we also commented on WIK's cost estimates for countries with different characteristics. WIK responded that the largest cost difference was less than 20% (page 8). However, these cost estimates assume very different traffic volumes for the different hypothetical countries. In particular, the 20% cost difference between the 'large sparse' and 'small dense' countries is associated with an almost three times

¹³ *Review of Submissions by Operators and Reports by Consultants relating to the NZ Commerce Commission's MTAS Investigation*, WIK-Consult, 9 June 2009.

¹⁴ *Benchmarking Mobile Termination Rates*, Covec, 6 May 2009, paragraphs 69 – 71.

greater volume of traffic in the large country compared to the small country. Given the economies of scale that exist in mobile networks, this increase in volumes will offset much of the additional costs required to cover a larger area in the large country. It is therefore quite misleading to claim that countries with different characteristics will have similar costs, without controlling for volume effects.

68. Indeed, one of the main points of our analysis of WIK's results was to show that average costs are quite sensitive to volumes, taking country characteristics as given. We did this by using WIK's cost-volume elasticities to estimate the change in average costs if volumes for WIK's hypothetical countries were reduced to New Zealand levels. We disagree with WIK (page 11) that this is an 'apples and oranges' comparison. We showed that differences in traffic volumes and other characteristics should be taken into account when making inferences about costs for New Zealand.
69. At several points in their report, WIK refer to a recommendation by the European Commission in 1998 that benchmarking of interconnection charges should use an estimate below the median, such as the average of the three lowest figures. We note WIK state this recommendation was made at a time when cost modelling was not prevalent. For this reason we believe that this type of benchmarking methodology should not be adopted for MTRs at the current time.
70. Finally, with regard to benchmarking WIK state (page 14):

The assumptions underlying the Commission's exercise is [sic] that there is a typical value for the cost of termination in a mobile network and that observations of cost levels resulting from relevant costing exercises would encompass this typical value.

We agree with this interpretation of the Commission's approach. However, we do not agree that there is a 'typical value' for the cost of mobile termination. As WIK's results and the Commission's own benchmarks show, there is considerable variation in the estimated cost of termination across countries. Given this evidence of variation, the Commission's estimation of a 'typical value' for the cost without regard for comparability is deficient, and could be improved by taking local conditions into account, as we discussed in the previous section.

2.2.5. Benchmarking the Change in Mobile Termination Costs over Time

71. The Commission assumes that the cost of mobile termination falls by 10% per year from its benchmark of 7.2 cpm in 2009 to 3.8 cpm in 2015, a 47% reduction over six years. The 10% annual reduction is based on benchmarking against mobile termination cost forecasts from Sweden, as well as cost estimates for two different years from Denmark. We note that the Commission's results are quite sensitive to this assumption – if the mobile termination cost remains constant at 7.2 cpm then the net benefits of regulation reduce to \$49 - \$62m for consumer welfare and \$20m - \$21m for total welfare.
72. We are concerned that the Commission's benchmarking of cost reductions has not used other information that is available about changes in mobile termination costs over time. In Australia, WIK estimated a mobile termination cost in 2007 at AU 6.6 cpm and 6.1

cpm for 25% market share and 31% market share respectively.¹⁵ In early 2009 the model was updated with 2008 data and produced estimates of AU 6.2 cpm and 5.9 cpm.¹⁶ This suggests cost reductions of between 3.3% and 6.1% over one year, or an average of 4.7%.

73. For Israel, mobile termination cost estimates by Analysys are given for 2005 – 2009 in the document referenced by the Commission in its comments on the MTAS undertakings.¹⁷ The cost estimates (excluding the externality surcharge) change at a compound annual rate of -1.5% per annum.
74. For Malaysia, the mobile termination costs for 2006 – 2008 presented in the document referenced by the Commission in its comments on the MTAS undertakings are the LRIC cost model estimates for each year, not a glide-path towards a cost modelled rate.¹⁸ These cost estimates change by a compound annual rate of about 1% per year. We were unable to find information on how cost-modelled termination rates have changed over time in the other countries (France, the Netherlands, Norway and the UK) in the Commission’s benchmarking set. Table 6 summarises our results.

Table 6 Benchmarking changes in mobile termination costs over time.

Country	Annual % Change
Australia	-4.7
Denmark	-12.9
Israel	-1.5
Malaysia	1.0
Sweden	-10.3
Median	-4.7

75. Using all available benchmarks produces a median cost reduction of 4.7% per annum. Table 7 shows the implied mobile termination cost estimates in each year starting from both the Commission’s benchmark of 7.2 cpm in 2009 and our amended benchmarks of 10.9 cpm (the 75th percentile of modelled costs), 12.4 cpm (the median of regulated rates) and 14.3 cpm (the 75th percentile of regulated rates).

Table 7 Mobile termination benchmarks with a 4.7% annual reduction (cents per minute).

Benchmark	2009	2010	2011	2012	2013	2014	2015
Commission	7.2	6.9	6.5	6.2	5.9	5.7	5.4
Amended 1	10.9	10.4	9.9	9.4	9.0	8.6	8.2
Amended 2	12.4	11.8	11.2	10.7	10.2	9.7	9.3
Amended 3	14.3	13.6	13.0	12.4	11.8	11.2	10.7

¹⁵ See *MTAS Pricing Principles Determination 1 July 2007 to 31 December 2008*, ACCC, November 2007.

¹⁶ See *Domestic Mobile Terminating Access Service Pricing Principles Determination and indicative prices for the period 1 January 2009 to 31 December 2011*, ACCC, March 2009.

¹⁷ See Exhibit 0.2 in http://www.moc.gov.il/new/documents/about/analysis_m.pdf

¹⁸ Table 6.2 of <http://www.skmm.gov.my/registers/cma/report/pdf/PIReportAccessPricing-MCMC-Final.pdf>

3. The Retail Fixed-to-Mobile Market

76. In this section we discuss the Commission's analysis of the effects of regulation in the retail FTM market. In the Commission's model, all the benefits of regulation are created in this market, as lower MTRs feed through into lower FTM retail prices.

3.1. FTM Welfare Modelling

77. The Commission's model calibrates an FTM demand curve using data on price and quantity, and an assumption about the demand elasticity. Both linear and constant-elasticity demand functions are considered. A pass-through assumption is used to translate annual changes in the MTR to annual changes in the FTM retail price under the counterfactual and factual scenarios. The difference in price between the factual and counterfactual is then used to calculate static welfare effects in the FTM market, as illustrated in figures 19 and 20 of the Draft Report.
78. Most of our concerns regarding the FTM welfare modelling relate to the treatment of pass-through, which we discuss in detail in the next section. However, we have identified some other errors and issues in the FTM welfare model.
79. First, as discussed above, the Commission has incorrectly assumed that the MTR in 2010 under the factual is the same as the counterfactual and therefore that there are no net welfare effects of regulation in that year. In fact, the 2010 MTR will likely be higher under the factual compared to the counterfactual. This also means that the FTM retail price will be higher under the factual than the counterfactual in 2010. The Commission's welfare model is based on the assumption that the factual FTM price is less than or equal to the counterfactual price in every year and the welfare calculations for 2010 are therefore incorrect. We have corrected these calculations in our modified version of the model, and the Appendix to this report details the changes we made.
80. Second, there are some inconsistencies in the treatment of FTM demand. The quantity in the counterfactual is calculated using a constant-elasticity assumption, even in the 'linear' version of the model. The demand parameters (e.g. the intercept and slope for the linear demand) are re-calibrated each year based on the factual price and quantity in the previous year and then this demand curve is used to determine the factual quantity. Thus the counterfactual and factual quantities in each year are determined on a different basis, and the demand curves used in the model shift and change slope over time for no apparent reason.
81. Finally, the Commission excluded common costs from its estimate of the total per-minute cost of FTM calls because (§727):

... in estimating the allocative efficiency impact of regulation, the relevant cost ($LRIC_{Retail}^*$) should exclude common costs, as the change being considered is at the margin.

The Commission therefore reduced the estimated total FTM cost per minute by 10%.

82. We disagree with this treatment of common costs as it confuses common costs with fixed costs. In a mobile network, as we discussed above, many of the common costs (those associated with the coverage network) are fixed with respect to the volume of traffic. A fixed network does not have the same issue – connections to the network are only established when there is some traffic to be handled. It is therefore likely that most of a fixed network's costs will vary with the volume of traffic in the long run.

3.2. FTM Pass-through

83. The Commission's results are highly sensitive to the FTM pass-through assumptions. For example, if the factual pass-through remains at 75% instead of increasing to 100%, the net consumer welfare benefits from regulation reduce by between 55% and 67%, and the net total welfare benefits reduce by between 36% and 44%. Given the sensitivity of the results to these assumptions, it is important that FTM pass-through is modelled accurately.
84. Pass-through is also the main mechanism by which regulation will deliver benefits to end-users. Given the pass-through conditions in Vodafone's undertakings, it is crucial that we can be confident about the level of pass-through in the factual scenario, if regulation is to be recommended over the undertakings.

3.2.1. Inconsistencies in the Commission's Assumptions

85. Before examining the Commission's assumptions about the value chosen for the rate of FTM pass-through, there are two inconsistencies in the Commission's FTM pass-through assumptions.
86. First, the treatments of pass-through in the counterfactual and factual are inconsistent. Under the factual, lower MTRs are assumed to increase competition in the FTM market and therefore increase pass-through. Under the counterfactual, the pass-through for FTM calls terminated on Vodafone's mobile network is determined by its undertakings, but the pass-through for calls terminated on Telecom's mobile network is not. Since the MTR also reduces under the counterfactual, if the Commission is correct that lower MTRs lead to higher pass-through, then the rate of pass-through for calls to Telecom's mobile network must also increase under the counterfactual scenario, in order to be consistent with the assumptions made about the factual scenario. However, as discussed below, we do not believe that MTR reductions will lead to an increase in pass-through under either the factual or the counterfactual.
87. Second, under the factual the Commission assumes FTM pass-through begins increasing from 2008, but regulation does not occur until 2011. Again our analysis below shows that regulation will not lead to increased pass-through, but even under the Commission's belief that it does, the increase cannot be assumed to begin until 2011.

3.2.2. FTM Pass-through Analysis

88. Turning to the Commission's assumptions about the rate of FTM pass-through, the Commission's model uses the assumptions about pass-through to calculate how changes in the MTR translate to changes in the average FTM retail price under both the

counterfactual and factual. If p_t is the FTM retail price and m_t is the MTR in year t , the Commission's basic FTM pass-through model is:

$$p_t - p_{t-1} = \beta_t(m_t - m_{t-1}) \quad (1)$$

where β_t is the rate of pass-through in year t , so that pass-through may vary over time. Thus the change in the FTM price between two years is assumed to be some fraction of the change in the MTR over the same time.

89. The Commission uses (1) to model pass-through under the counterfactual, and assumes that $\beta_t = \bar{\beta}$ in all years, i.e. the rate of pass-through is constant. The constant pass-through $\bar{\beta}$ is calculated as a weighted average of pass-through for FTM calls terminated on Telecom's and Vodafone's mobile networks. The pass-through for calls terminated on Vodafone's mobile network is assumed to be 100%, in line with the pass-through conditions in Vodafone's undertakings. The pass-through for calls to Telecom's mobile network is assumed to be 75%, based on the Commission's analysis of the historical relationship between the average FTM price and the MTR.
90. Under the factual, the Commission assumes that β_t increases over time, from 75% in 2008 to 100% in 2015. The starting point of 75% is again based on the Commission's analysis of the historical data. Pass-through increases over time in the factual because the Commission believes that lower MTRs will increase the intensity of competition in the FTM market, and, everything else equal, more intense competition is associated with higher pass-through.
91. In addition, under the factual, the Commission modifies the relationship in (1) and assumes that as pass-through increases over time, historic reductions in the MTR are further passed through into reductions in the FTM price. This is done in different ways for different years. In 2010, the pass-through for that year (81%) is added to the change in pass-through from 2009 (3%) to obtain a total rate of pass-through (84%) which is applied to the change in the MTR between 2009 and 2010. In 2011 and 2012, the pass-through for that year is multiplied by the change in the MTR for that year and then to this is added the change in the pass-through for that year versus the previous year multiplied by the change in the MTR between 2010 and 2009. In 2013 – 2015, the pass-through for that year is multiplied by the change in the MTR for that year and then to this is added the change in the pass-through for that year versus the previous year multiplied by the sum of the changes in the MTR between 2012 and 2011 and between 2010 and 2009.
92. The Commission's modelling of pass-through under the factual appears to be designed to reflect its belief that MTR regulation will increase competition in the FTM market and that the higher rate of pass-through over time should be applied to historic MTR reductions as well as current reductions. However, we are confused by the Commission's particular approach to implementing this assumption in their model. In particular we cannot understand the justification for the peculiar modelling strategy described in the previous paragraph. These assumptions also mean that the actual rate of pass-through in each year under the factual is higher than that implied by the pass-through parameter for that year. For example, in 2015 the MTR reduces by 0.50 cpm

while the factual FTM price reduces by 0.56 cpm, implying a rate of pass-through of 112%. It is important to bear this fact in mind when trying to calibrate this pass-through model from the historical FTM market data.

93. In our view, equation (1) is a reasonable way of modelling how changes in the MTR are reflected in changes in the FTM price. However, care must be taken when estimating the rate of pass-through from historic data and when making assumptions about how changes in the MTR affect the rate of pass-through.
94. In the Draft Report, the Commission presents Figure 15, which appears to show a strong relationship between the MTR and the FTM retail price between 1997 and 2008. Both the MTR and the FTM retail price have been falling over time, apparently in unison. However, we cannot infer from the Commission's Figure 15 the extent to which reductions in the MTR have *caused* reductions in the FTM price.
95. As noted in the Draft Report (¶661), a number of other changes including carrier pre-selection and the availability of regulated resale access have lead to increased competition in the FTM market, putting downward pressure on prices. Operating costs for fixed networks are also likely to have fallen during this time. These factors are not accounted for in the Commission's Figure 15, and since the MTR and FTM price have both been trending downwards over time, a simple regression of the FTM price on the MTR will overestimate the extent to which MTR reductions have caused reductions in the FTM price. For example, in 2003 the MTR did not change, but the FTM price continued to fall.
96. In the Draft Report, the historic rate of pass-through in the FTM market is estimated to be 75% (¶664). This is estimated by dividing the total change in the FTM price between 2007 and 1997 by the total change in the MTR over the same period. Thus the Commission estimates

$$\beta = \frac{p_{2007} - p_{1997}}{m_{2007} - m_{1997}}$$

or

$$p_{2007} - p_{1997} = \beta(m_{2007} - m_{1997})$$

97. Estimating pass-through in this way therefore assumes that all of the change in the FTM price between 2007 and 1997 can be explained by the change in the MTR over the same period. This is clearly not a valid assumption because other factors have also been putting downward pressure on FTM retail prices, and so this approach will over-estimate the true pass-through that is attributable to reductions in the MTR. In reality, the change in the FTM price over this period is given by

$$p_{2007} - p_{1997} = \beta(m_{2007} - m_{1997}) - \alpha$$

where α reflects the factors other than the MTR that have caused the FTM price to fall over this period. The Commission's approach omits α and since there are no offsetting

effects that would have increased the FTM retail price, the Commission’s calculation will overestimate the rate of pass-through.

98. To correct this problem, we must allow for other factors in addition to the MTR to affect the FTM price over time. The most straightforward way to do this is to modify equation (1) so that the change in the FTM price depends on an exogenous factor as well as the change in the MTR:

$$p_t - p_{t-1} = \alpha + \beta_t(m_t - m_{t-1}) \quad (2)$$

The parameter α reflects the other pro-competitive changes that have occurred in the FTM market, as described above. We expect that $\alpha < 0$.

99. Using the data from Table 40 in the Draft Report, we estimated three different versions of equation (2).¹⁹ The first version assumes $\beta_t = \beta$ for all t , i.e. that pass-through is constant over time. The second version assumes $\beta_t = \delta + \gamma t$, i.e. that pass-through is changing with time. The third version assumes $\beta_t = \delta + \gamma m_t$, i.e. that pass-through changes when the MTR changes.

100. In particular, we estimated the following three equations using the data for 1997 to 2007:

$$p_t - p_{t-1} = \alpha + \beta(m_t - m_{t-1}) \quad (2a)$$

$$p_t - p_{t-1} = \alpha + \delta(m_t - m_{t-1}) + \gamma(m_t - m_{t-1})t \quad (2b)$$

$$p_t - p_{t-1} = \alpha + \delta(m_t - m_{t-1}) + \gamma(m_t - m_{t-1})m_t \quad (2c)$$

101. Table 8 shows the estimated coefficients of these equations and their p -values.²⁰ In all three models, as expected the exogenous change in the FTM price is negative and statistically significant (at least at the 10% level). The estimated value of α does not change significantly across the three different specifications. Once exogenous changes in price are allowed for, there is no statistically significant effect of changes in the MTR on changes in the FTM price. There is also no evidence that the rate of pass-through is increasing either over time or as the MTR changes.²¹

¹⁹ As the Commission does, we omitted the data for 2008 to exclude the effects of the MTR deeds. Our results do not change much if 2008 is included.

²⁰ All R^2 values in this table and the subsequent tables are calculated as the square of the correlation coefficient between the fitted values and the data, to allow R^2 values to be compared between models with and without a constant term.

²¹ The increasing trend of pass-through that the Commission observes in Figure 16 of the Draft Report is also not statistically significant, with a p -value of 0.31.

Table 8 Estimation results from FTM pass-through models (*p*-values in brackets).

	Constant	$m_t - m_{t-1}$	$(m_t - m_{t-1})t$	$(m_t - m_{t-1})m_t$	R²
Model 2a	-0.015 (0.043)	0.242 (0.188)			0.206
Model 2b	-0.014 (0.051)	0.047 (0.837)	0.039 (0.228)		0.365
Model 2c	-0.015 (0.055)	0.620 (0.209)		-1.110 (0.392)	0.290

102. From a theoretical point of view, we would expect that reductions in the MTR would be passed through to lower FTM prices at least to some extent. However, the theoretical link between the MTR and the *rate* of pass-through is less clear. With this in mind, and given the regression results reported in Table 8, our view is that Model 2a gives the best estimate of pass-through in the FTM market among these three models. The estimated coefficients of this model say that, after controlling for exogenous changes in the FTM price, the rate of pass-through of annual changes in the MTR to the FTM price is approximately 24%.
103. However, it is possible that the coefficient α as estimated above captures some of the change in the FTM price that should be attributed to changes in the MTR. To allow for this possibility, we re-estimated the three models assuming that $\alpha = 0$. This assumes no exogenous changes in the FTM price, and is therefore likely to overestimate the effect of the MTR on the FTM price. This will give an upper bound estimate of pass-through. Table 9 shows the results of estimation without a constant.

Table 9 Estimation results from FTM pass-through models excluding exogenous price changes (*p*-values in brackets).

	$m_t - m_{t-1}$	$(m_t - m_{t-1})t$	$(m_t - m_{t-1})m_t$	R²
Model 2a	0.565 (0.000)			0.206
Model 2b	0.312 (0.221)	0.046 (0.244)		0.336
Model 2c	0.999 (0.089)		-1.305 (0.412)	0.272

104. With a constant rate of pass-through (Model 2a), pass-through is estimated at about 57%, and the effect of changes in the MTR on the FTM price is highly statistically significant. Models 2b and 2c again show there is no evidence that pass-through is changing either over time or as the MTR changes. In Model 2c the coefficient on the change in the MTR is significant at the 10% level, but coefficient on the interaction between the level of the MTR and the change in the MTR is not. Omitting the latter variable simply gives Model 2a. In our view, among these models, Model 2a is the best model for estimating pass-through, although as noted above the estimate of 57% is likely to be an over-estimate.
105. We can also test the whether the Commission's modelling of incremental pass-through over time in the factual scenario is appropriate. If that hypothesis is correct then lagged changes in the MTR should feed into reductions in the FTM price. To test this we re-

estimated Model 2a including the lagged value of the change in the MTR, both with and without a constant term. In particular we estimated the equation

$$p_t - p_{t-1} = \alpha + \beta(m_t - m_{t-1}) + \theta(m_{t-1} - m_{t-2}) \quad (2a')$$

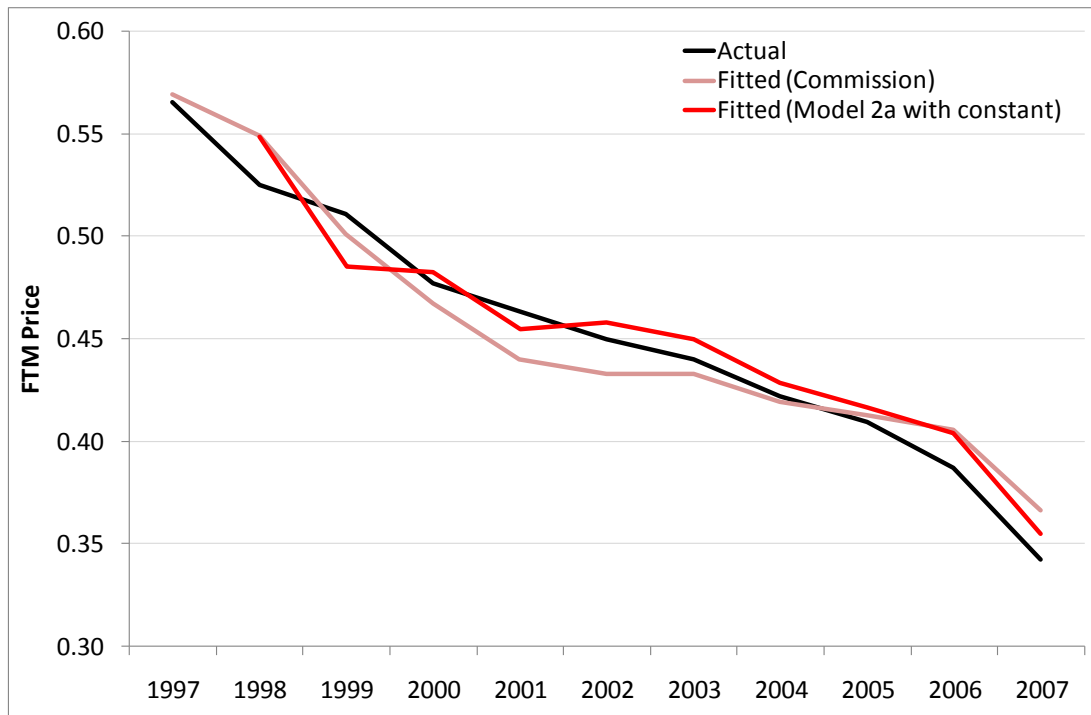
106. Table 10 shows the results of this estimation, again excluding the data for 2008. The estimated coefficients α and β are very similar to the estimated coefficients when the lagged MTR change was not included. However, there is no evidence that lagged changes in the MTR are passed through into the FTM price. We conclude that the Commission’s assumption of incremental pass-through under the factual is not justified by the evidence that we observe in the retail FTM market.

Table 10 Estimation results from FTM pass-through models including lagged MTR changes (p -values in brackets).

	Constant	$m_t - m_{t-1}$	$m_{t-1} - m_{t-2}$	R²
Model 2a' with constant	-0.014 (0.081)	0.266 (0.173)	-0.071 (0.721)	0.290
Model 2a' with no constant		0.436 (0.050)	0.109 (0.610)	0.239

107. We should point out that while the R² values reported in Table 8 and Table 9 above are lower than the R² that the Commission obtains in Figure 15 of the Draft Report, these values cannot be directly compared because the Commission’s dependent variable is the level of the FTM price, while our dependent variable is the annual change in the FTM price. Given that the Commission ultimately uses the pass-through parameter in the cost-benefit model in an equation like equation (1), it is more appropriate to use the data to estimate models of the same form, as we have done.
108. To compare the fit of our models with that of the model in Figure 15 of the Draft Report, it is necessary to convert the changes in the FTM price predicted by our models to the level of the FTM price, by adding the estimated change to the level of the price for the previous year. Figure 1 shows the fitted values of the FTM price produced by Model 2a with constant (the fitted values with no constant are very similar) and the fitted values of the model in Figure 15 of the Draft Report. The R² of our fitted values is 0.96 and of the Commission’s fitted values is 0.94. Both models therefore explain the FTM price time-series equally well, but our approach will produce a better estimate of the true pass-through of changes in MTRs to FTM prices for use in the cost-benefit model.

Figure 1 Comparison of goodness of fit of FTM pass-through models.

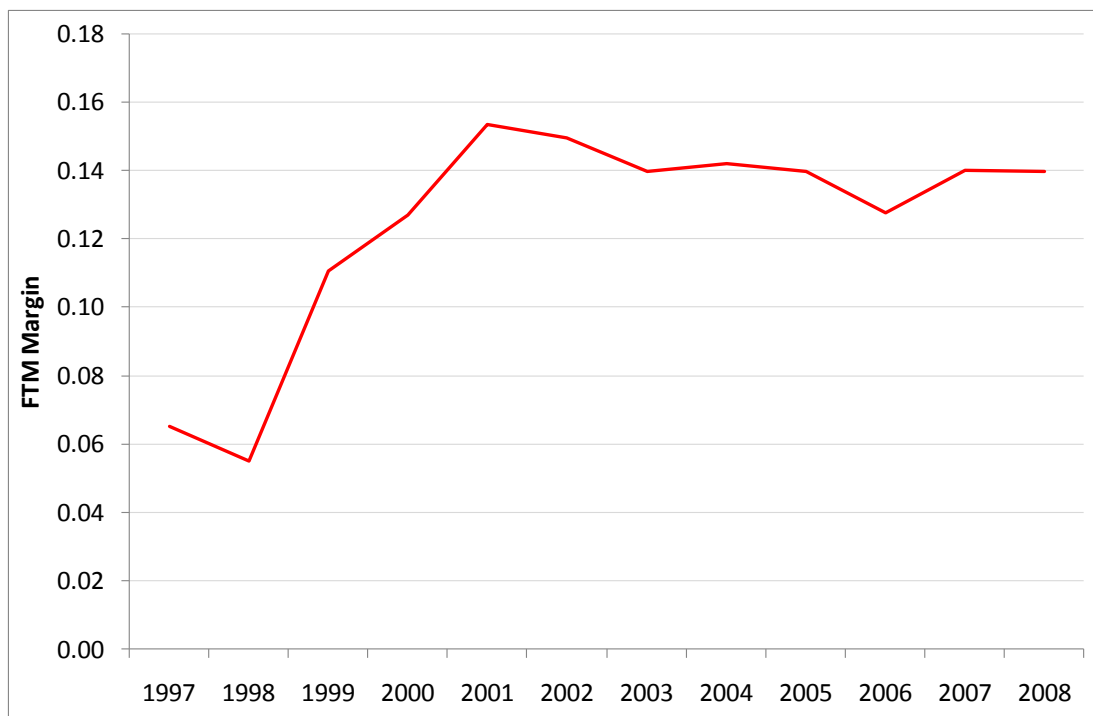


3.2.3. Competition and Margins in the FTM Market

109. In terms of the effect of MTR reductions on the intensity of competition in the FTM market and therefore the rate of pass-through, it is useful to recall that economic theory predicts that when the intensity of competition increases, the difference between price and cost decreases. The price-cost margin is commonly used by regulators and competition authorities as a measure of market power, with a smaller margin reflecting a more competitive market. For example, in a simple Cournot model, price converges to marginal cost as the number of firms increases. In a Hotelling model of product differentiation, price also converges to marginal cost as the firms become less differentiated. Therefore, if reductions in the MTR increase the intensity of competition in the FTM market, we should expect to see FTM pass-through increasing *and* FTM price-cost margins reducing.
110. As we showed above, there is no evidence that reductions in the MTR have led to an increase in the rate of pass-through in the FTM market. Furthermore, margins have not been decreasing. Figure 2 shows the average per-minute margin in the FTM market, calculated by subtracting the MTR from the FTM retail price using the data in Table 40 of the Draft Report. While the MTR is not the only cost of providing FTM calls, the other per-minute costs such as fixed origination will be constant or falling over time, so the change in the margin between the FTM price and the MTR will be less than or equal to the change in the margin between the FTM price and the total per-minute cost of FTM calls. As Figure 2 shows, the FTM margin more than doubled between 1997 and 2001, during which time the MTR decreased by 38%. Between 2001 and 2008 the margin decreased slightly (by about 9%) while the MTR decreased by a further 46%.

111. Over the entire period from 1997 to 2008 the MTR decreased by about 33 cents per minute, while the FTM margin increased by more than 7 cents per minute. This is the opposite of what we would expect to see if reductions in the MTR do increase the intensity of competition in the retail FTM market. Under the Commission’s factual scenario, the MTR will decrease by 8.6 cents per minute in 2011 and by a total of 10.6 cents per minute by 2015 (relative to 2010). This is significantly less than the 33 cent per minute decrease observed over the historical period, during which time the FTM margin increased. We also note that Telecom’s residential FTM margin over the MTR increased from 43 cpm in 2004 to 48 cpm in 2008, during which time the MTR fell by over 11 cpm.²² It is therefore very difficult to reconcile this evidence with the Commission’s assumption that a relatively small reduction in the MTR (by historical standards) will lead to a significant increase in the intensity of competition in the FTM market.

Figure 2 Margin between the FTM retail price and the MTR (\$ per minute).



112. The Commission’s conclusion that average retail prices for FTM calls are substantially above the cost of supplying these services due to above-cost MTRs (§xvii) is therefore quite incorrect. MTRs have fallen substantially while FTM margins have not. If there is any lack of competition in the FTM market, it does not appear to be caused by the level of the MTR.
113. We also note that mobile termination is becoming an increasingly small fraction of the cost faced by fixed-line operators of supplying an FTM call. In terms of promoting competition in the FTM market, the significance of a relatively small reduction in the MTR is questionable. MTRs have already fallen from 50 cpm to 15 cpm and all of the evidence above suggests there has been no resulting increase in competition in the FTM

²² Calculated from Table 22 in the Draft Report.

market. It is not clear how a further 8 cpm reduction in the MTR is going to promote competition when a 35 cpm reduction has failed to do so.

3.2.4. The Importance of FTM Pass-through

114. It is worth reiterating the importance of pass-through in the FTM market for there to be any possibility that regulation creates net economic benefits. This is particularly true given the pass-through obligations in Vodafone's undertakings.
115. Using all the Commission's other assumptions, if the rate of pass-through is 60% under the factual and for calls to Telecom's mobile network in the counterfactual, then there are no net benefits to consumers from regulation. Instead, all the benefits of regulation will accrue to fixed-line firms.
116. Our analysis above shows that even pass-through of 60% under the factual is likely to be optimistic. In order to recommend regulation on the basis that it will generate benefits for end-users, the Commission must be very sure that its assumptions about pass-through under the factual will turn out to be correct.

3.2.5. FTM Pass-through Summary

117. We showed that the Commission's method of estimating pass-through from the historical data will over estimate the true change in the FTM price that is attributable to a change in the MTR. The estimate of 75% that is used for pass-through for calls to Telecom in the counterfactual and as a starting-point for pass-through in the factual is therefore too high. We estimated pass-through at 24% when we allowed for constant exogenous changes in FTM prices, although this may be an underestimate, and at 57% when we did not allow for constant exogenous changes in FTM prices, although this may be an overestimate. We found no evidence that pass-through has increased over time or when the MTR has decreased, and no evidence of incremental pass-through. FTM margins have also not decreased when the MTR decreased, indicating that large MTR reductions over the past ten years have not led to greater competition in the FTM market.
118. Averaging our two estimates, in our view a reasonable estimate of annual FTM pass-through that is attributable to changes in the MTR is 41%, and this will not increase under the counterfactual or the factual. While our estimate is less than the often-quoted benchmark of 50% pass-through for a monopoly, we note that the 50% figure is derived under the assumption of linear demand, and monopoly pass-through can be higher or lower than 50% depending on the curvature of demand. We also note that our estimate is greater than what has been observed in Australia in recent years.²³

²³ See *Domestic Mobile Terminating Access Service Pricing Principles Determination and indicative prices for the period 1 January 2009 to 31 December 2011*, ACCC, March 2009, page 22 – 24.

4. The Retail Mobile Market

119. In the Commission's cost-benefit model, regulation causes economic detriments in the retail mobile market via the waterbed effect. In the Draft Report the Commission also provides a more qualitative analysis of the effects of regulation on competition and outcomes in the retail mobile market. We discuss each of these issues in turn.

4.1. The Waterbed Effect

120. The waterbed effect arises because mobile operators change their retail mobile prices in response to regulation. If termination rates are regulated downwards, this effect leads to welfare losses in the retail mobile market.
121. The waterbed effect is a general phenomenon and is not specific to mobile termination. It can occur whenever one price of a multiproduct firm is regulated while its other prices remain unregulated.²⁴ The basic condition for a waterbed effect to occur is that the marginal revenues and/or marginal costs of the regulated and unregulated products are connected in some way. Alternatively, a waterbed effect can occur if marginal revenues and costs are independent but there are fixed costs and the firm is subject to a zero-profit constraint. For mobile networks, the waterbed effect operates through changes in marginal revenues.²⁵

4.1.1. The Waterbed Effect from FTM Termination Regulation

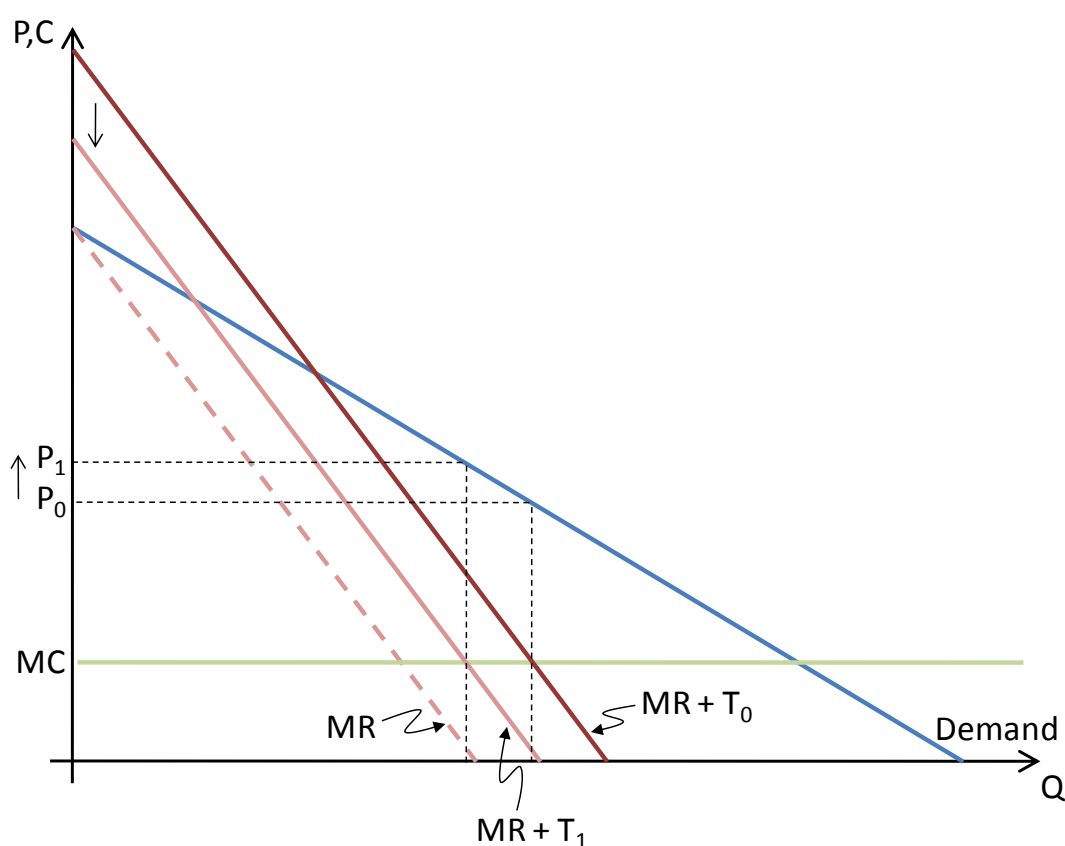
122. In the case of a change in the FTM termination rate, the effect is easy to understand. Each mobile subscriber attracts some amount of FTM calls, and an additional subscriber therefore brings some additional FTM termination revenue. If the FTM termination rate is cut, the marginal revenue associated with every mobile subscriber falls. Profit-maximising firms respond to a fall in marginal revenue by reducing output, or equivalently, by increasing price. Since the termination rate is regulated, the other unregulated retail mobile prices will rise. The Commission recognised the FTM waterbed effect in its earlier mobile termination investigation, and has again included it in its cost-benefit model in this investigation.
123. In terms of the FTM waterbed effect, it is important not to characterise it as 'revenue recovery' (e.g. ¶843 in the Draft Report). While it may be convenient for the quantitative model to think of the waterbed effect in terms of the amount of lost termination revenue that is 'recovered' via higher retail mobile prices, this can lead to confusion about what causes the effect in the first place. As described above, the waterbed effect occurs due to the profit-maximising behaviour of mobile firms in response to a change in the marginal revenue per mobile subscriber. It does not occur because mobile firms simply decide to recover some of the termination revenues that they have lost. The waterbed effect also does not depend on mobile firms being profit-constrained (e.g. ¶838 in the Draft Report). The best way to think of the waterbed effect is that it reflects a change in the *incentives* faced by mobile operators.

²⁴ For a general discussion see Schiff (2008).

²⁵ There may also be a zero-profit constraint, but this is not necessary for the waterbed effect to occur.

124. Figure 3 illustrates the FTM waterbed effect further. Given the blue demand curve for mobile subscriptions, the associated marginal revenue from subscription is the pink dashed curve. If the average termination revenue per subscriber is T_0 then marginal revenue is shifted up by this amount, to the dark red curve labelled $MR + T_0$. The firm will maximise profit at the quantity where the marginal revenue (including termination revenue) equals marginal cost, or where $MR + T_0 = MC$. This corresponds to the price of P_0 . If termination is regulated so that termination revenue per subscriber falls to T_1 , the marginal revenue also shifts down, and the profit-maximising price becomes P_1 , which is higher than P_0 . This analysis clearly shows how the FTM waterbed effect is a result of the firm's profit-maximising behaviour.

Figure 3 Illustration of the FTM Waterbed Effect.



4.1.2. The Waterbed Effect from MTM Termination Regulation

125. In addition to the FTM waterbed effect, changing the MTM termination rate will also induce a waterbed effect. The basic intuition for this effect is that changing the MTM termination rate affects the intensity of competition between mobile networks when there are on-net discounts.²⁶
126. With on-net discounts, to the extent that consumers make some of their calls randomly to the subscribers of the same network (as opposed to making all their calls to a fixed 'calling circle'), consumers benefit when the size of the network increases. This is

²⁶ See, for example, section 2.2 of Armstrong & Wright (2008).

because when a new subscriber joins a network, there is some probability that the existing subscribers of the same network will want to call the new subscriber, and they will be able to do so at the cheaper on-net rate. Therefore, everything else equal, a larger network is more valuable to its subscribers, although the strength of this effect depends crucially on how much subscribers care about the size of the network as a whole rather than simply which network their friends and family belong to.

127. The implication is that when a network gets a new subscriber, it will get some additional revenue from that subscriber, and because the network is now slightly more valuable to the existing subscribers, it can get some additional revenue from them as well. On-net pricing induces network effects, and these effects strengthen the incentive to acquire new customers. The greater incentive to acquire new customers means that firms compete more intensely in the presence of network effects. Everything else equal, this leads to lower prices, lower profits, and greater consumer surplus.
128. Within this context, the MTM termination rate partially determines the strength of these network effects, to the extent that it affects the differential between on- and off-net prices. If a lower MTM termination rate leads to a smaller differential, the network effects are reduced. By the same logic as above, this reduces the intensity of competition between networks, leading to higher prices overall and lower consumer surplus.
129. Thus a change in the MTM termination rate will also induce a waterbed effect. This effect has been clearly demonstrated in the literature on network competition. In fact it can be shown that, considering MTM termination alone, networks will prefer a below-cost MTM termination rate as this will minimise network effects and reduce the intensity of competition to the greatest extent possible.²⁷

4.1.3. Transfers and Distribution of the Waterbed Effects

130. To summarise, regulating both the FTM and MTM termination rates will lead to waterbed effects through different channels, and this will create welfare losses in the mobile market. The Commission appears to consider the FTM waterbed effect but ignore the MTM effect, meaning that the Commission's estimates of economic detriments in the retail mobile market are too low. We discuss the Commission's modelling further in section 4.1.5 below.
131. We also note that, even under the Commission's estimates, the waterbed effect is large in dollar terms. The Commission estimates total detriments for mobile consumers of between \$161m and \$183m, and total welfare detriments of between \$30m and \$59m. These are substantial amounts, eliminating between 42% and 65% of the Commission's estimates of the gross benefits of regulation. It is therefore important to realise that one of the main effects of regulation is large transfers of welfare, making mobile consumers and mobile firms worse off, while fixed-line firms and consumers are made better off (see below). Even if regulation does promote competition in the mobile market, the detriments estimated by the Commission are substantial, and it is therefore incorrect to claim that mobile termination regulation will necessarily benefit mobile consumers.

²⁷ Ibid.

132. Furthermore, while the Commission estimates an aggregate waterbed effect, these effects will not be equally distributed across all mobile subscribers. The Commission recognises (¶409) that a move to bill-and-keep could have significant adverse effects on the prepay mobile customer segment. This is because prepay customers tend to make relatively few calls, and so termination is an important source of revenue for mobile networks from this market segment. In fact, the same logic is true for any regulated reduction in the MTR, not just a move to bill-and-keep.
133. It follows that any reduction in the MTR disproportionately weakens the incentive to compete for prepay customers who make relatively few calls. These are customers who are also relatively price sensitive, and therefore most likely to be adversely affected by price increases. Any waterbed effect will be felt most strongly by mobile customers in the prepay segment, and given the Commission's concern for the effects of bill-and-keep on these customers, it is surprising that the same concern is not expressed regarding the waterbed effect. While it would be difficult to disaggregate the waterbed effect by customer segment without a detailed model of demand by different segments, this is nevertheless an important qualitative factor that the Commission should consider in its decision-making.

4.1.4. What Determines the Size of the Waterbed Effect?

134. In order to discuss the factors that determine the size of the waterbed effect, we first need to know how to measure the size of the effect. In the literature, the size of the waterbed effect is often discussed in terms of the effect of regulation on the profits of the regulated firms. A 'full' waterbed effect involves a complete offsetting of the regulated loss in profit. A 'zero' waterbed effect means the firms' profits fall by exactly the amount of profit lost due to regulation.
135. However, it is important not to confuse the method of measuring the waterbed effect with the mechanism that causes the effect. As explained above, in mobile markets the waterbed effect is not caused by the desire or need for mobile networks to maintain a particular level of profit. Rather, it arises from their profit-maximising response to the changes in incentives to compete for subscribers as a result of regulation. The effect is caused by incentives, not necessarily by a constraint.
136. The Commission correctly recognises that the intensity of competition among firms can influence the size of the waterbed effect. In the mobile context it is easier to understand this effect by thinking about a termination rate increase rather than a decrease. If the FTM MTR increases, for example, mobile firms gain some FTM termination revenue. Competition between them will force them to pass this on to mobile subscribers in the form of lower prices. The greater the intensity of competition, the greater the pass-through. Reversing this logic shows that the increase in retail mobile prices following a regulated decrease in the MTR will be larger the greater the intensity of competition in the mobile market.
137. In the mobile market, the strength of the waterbed effect also depends on the level of penetration. However, we disagree with the Commission (¶848-849) that the strength of the waterbed effect decreases as the penetration rate increases. In fact, it can be shown that the opposite is true – the waterbed effect is strongest when the market is saturated.

Intuitively, with a saturated market, the only way that firms can get new customers is by getting them to switch from a rival. If the market is not yet saturated, there are some customers who do not subscribe to any firm, and attracting these customers may be 'easier' than attracting a customer to switch from a rival, particularly if the firms are horizontally differentiated. In this case, competition between firms is less intense when there is partial penetration compared to full penetration.

138. As explained above, the intensity of competition affects the size of the waterbed effect. With full penetration, competition is most intense, increasing the size of the waterbed effect relative to partial penetration. This was shown by Armstrong and Wright (2009).²⁸ Their model is based on imperfect competition between two mobile operators. When there is full penetration, there is a full waterbed effect from changing the FTM MTR, and the firms' profits do not change when the MTR changes. With partial penetration the waterbed effect is weaker, and the size of the waterbed effect increases as penetration increases, due to the change in intensity of competition between firms.
139. The Commission also argues that if mobile subscription is relatively inelastic, then the waterbed effect will be small (¶850-851). While this is true for the total welfare measure of the waterbed effect, it is not true for the consumer welfare measure. Consumers will still face higher prices and consumer surplus will decrease as a result. Indeed, the change in consumer surplus is greatest when demand is completely inelastic, for any given price increase. Furthermore, with inelastic demand, mobile firms can raise prices without worrying about a reduction in demand, meaning that the change in mobile prices will be greater than when demand is elastic. Overall, the consumer welfare reduction due to the waterbed effect will be greater when demand is relatively inelastic.²⁹
140. The Commission attempts to assess the size of the waterbed effect using data on revenues and prices in the mobile market between 2006 and 2008 (¶855-858). We think that this is very difficult for a number of reasons. The time period is short, and covers a time when the New Zealand mobile market has been undergoing many changes, including reaching saturation and the transition to 3G. Operators may have offered handset subsidies for the purpose of giving consumers an incentive to switch to 3G, and this may distort the apparent waterbed effect that is observed during this period. In addition, as we explained above, as the market reaches saturation the intensity of competition between firms will increase, putting downward pressure on prices regardless of the level of the MTR.
141. The Commission's analysis of the mobile market data is also ad-hoc, is not based on any sort of model, and uses casual observation rather than econometric techniques. Given the complexities of the mobile market, it is inconceivable that this analysis could reveal any meaningful information about the size of the waterbed effect. In terms of estimating the size of the waterbed effect, Genakos and Valletti (2008) and Andersson and Hansen

²⁸ See section 2.4 of their paper and Table 6 in particular.

²⁹ We also doubt the veracity of the Commission's evidence about the elasticity of mobile subscription demand (footnote 399). Faced with a scalpel-wielding surgeon, we suspect many people will change their mind about losing a toe rather than their mobile phone.

(2009) present evidence in favour of a relatively strong effect, although the latter only consider MTM termination. A recent empirical study by CEG for Ofcom also showed a link between mobile penetration and the level of the MTR.³⁰

142. Theory also suggests that the effect should be relatively strong, with Armstrong and Wright (2009 – table 6) showing results between 50% and 100% depending on the level of mobile penetration. This and the fact that the Commission has ignored the MTM waterbed effect lead us to believe that the Commission’s assumption of a 50% waterbed effect is too small.³¹ Given the results presented in the literature, our view is that a 75% waterbed effect is a more reasonable assumption.

4.1.5. Modelling the Waterbed Effect

143. The Commission models the waterbed effect by first calculating the increase in mobile ARPU necessary to offset a given percentage of the reduction in mobile termination revenue in each year. This does not represent the way that the waterbed effect works, but it is a reasonable way to characterise the effect for the purpose of the cost-benefit model.
144. Assuming an elasticity of demand for mobile subscription, in the Commission’s model the increase in ARPU is translated into a reduction in mobile subscribers in the factual relative to the counterfactual. The calculated reduction in mobile subscribers is partially offset by the so-called ‘FTM effect’. This is because lower FTM prices under regulation increase the volume of FTM calls. If mobile subscribers care about receiving these calls, they will be less likely to give up their subscription due to the waterbed effect. However in our view this effect will not completely offset the waterbed effect, and there will be a loss of mobile subscribers in the factual compared to the counterfactual.
145. The increase in ARPU and reduction in mobile subscriber numbers cause direct consumer and producer welfare losses in the mobile market. In addition, since there are now fewer mobile subscribers in total, there are extra welfare losses because the remaining mobile subscribers have fewer people to make MTM calls to and fixed-line consumers have fewer people to make FTM calls to.

The Commission’s Waterbed Model Contains Errors

146. The calculation of the change in ARPU due to the waterbed effect in the Commission’s spreadsheet model contains a significant error. The Commission’s model ignores the elasticity of mobile subscription demand when calculating the required ARPU increase. The effect is that the actual termination revenue recovery is much less than the percentage assumed, and the size of the waterbed effect is underestimated as a result.

³⁰ Competition Economists LLP, “Wholesale Termination Regime, Termination Charge Levels and Mobile Industry Performance: A study undertaken for Ofcom”, 20 April 2009, available at <http://www.ofcom.org.uk/consult/condocs/mobilecallterm/annex6.pdf>.

³¹ In addition, the actual waterbed effect in the Commission’s model is significantly smaller than 50% due to an error in calculating the effect, as we demonstrate below.

147. Table 11 illustrates this problem using the results from the Commission’s linear version of the waterbed model for 2011. In that year, regulation causes a reduction in FTM termination revenue of \$73.94m. This is calculated as:

$$\text{Lost termination revenue} = \text{Counterfactual MTR} \times \text{Counterfactual FTM Quantity} \\ - \text{Factual MTR} \times \text{Factual FTM Quantity}$$

where the quantities are obtained from the linear version of the FTM market model.

148. The Commission assumes that 50% of this loss will be recovered via the waterbed effect. However, the necessary change in ARPU is calculated by simply dividing the amount of revenue to be recovered by the number of mobile subscribers in the counterfactual. This ignores the fact that mobile subscription will reduce in the factual when the mobile subscription price rises, and therefore a greater increase in ARPU is required to achieve the assumed amount of revenue recovery. The actual change in retail mobile revenues is:

$$\text{Change in mobile revenue} = \text{Factual ARPU} \times \text{Factual Mobile Subscribers} \\ - \text{Counterfactual ARPU} \times \text{Counterfactual Mobile Subscribers}$$

where the factual number of mobile subscribers is calculated after allowing for the ‘FTM effect’.

149. To correctly model the waterbed effect, the factual ARPU in each year must be calculated so that the change in mobile revenue equals the fraction of lost termination revenue that is assumed to be recovered (e.g. 50% under the Commission’s assumptions). The Commission’s model fails to do this and therefore underestimates the waterbed effect.

Table 11 Results from the Commission's linear waterbed model for 2011.

	Counterfactual	Factual
FTM Market		
MTR (cpm)	13.35	5.80
FTM quantity (m mins)	1,087.19	1,227.27
FTM termination revenue (\$m)	145.12	71.18
Lost termination revenue (\$m)		73.94
Mobile Market		
ARPU	453.39	462.38
Mobile subscribers (m)	4.56	4.53
Retail mobile revenue (\$m)	2,068.91	2,095.27
Gained mobile revenue (\$m)		26.36
Lost termination revenues recovered		36%

- 150. As shown in Table 11, once we account for mobile subscription elasticity (including the offsetting ‘FTM effect’), only 36% of the lost termination revenues in 2011 are actually recovered via the waterbed effect, which is significantly less than the 50% assumed to be recovered.
- 151. We have calculated the correct values of the mobile ARPU under the factual that recover half of the lost termination profits. Table 12 shows the factual ARPUs required in each year under the two different demand models, using the Commission’s assumptions for all other parameters of the model.

Table 12 Factual mobile ARPUs (\$).

	2010	2011	2012	2013	2014	2015
Linear Demand						
Commission	452.13	462.38	463.29	464.08	464.69	465.35
Corrected	452.14	466.05	466.65	467.10	467.47	468.14
Constant Elasticity Demand						
Commission	452.13	462.38	463.29	464.08	464.69	465.35
Corrected	452.14	465.56	466.12	466.55	466.90	467.50

- 152. Correcting the waterbed calculations in this way, while leaving all other assumptions unchanged from the Commission’s model, reduces the consumer benefits of regulation by \$56m - \$60m and the total welfare benefits by \$12m - \$16m. Failing to take account of mobile subscription elasticity in the calculation of the waterbed effect therefore results in significantly over-estimating the net benefits of regulation.
- 153. We have corrected these calculations in our modified version of the Commission’s model. Due to the complexities of the calculation of ARPU under the factual (including allowing for the ‘FTM effect’), the formula for the appropriate ARPU is not straightforward. Instead, we use the Goal Seek function in Excel to numerically determine the factual ARPU in each year corresponding to the correct amount of revenue recovery, taking into account the elasticity of mobile subscriptions and the FTM effect. Our modified spreadsheet includes a ‘Calculate’ button on the Key Assumptions tab which must be pressed after changing any of the model’s parameters, in order to recalculate the factual ARPUs and the waterbed effect.
- 154. Increasing the size of the waterbed effect to 75% and correcting the error in the calculation of the factual ARPUs as described here while retaining all the Commission’s other assumptions virtually eliminates the case for regulation. The net consumer welfare benefits are -\$60.4m to -\$81.5m and the total welfare benefits are \$5.9m to \$18.0m.
- 155. In addition, the waterbed welfare calculations in the Commission’s spreadsheet contain the same error as the FTM welfare calculations whereby the MTR in the factual is assumed to be less than or equal to the MTR in the counterfactual in each year. This produces incorrect welfare calculations for 2010. We have corrected these errors in our modified version of the spreadsheet, as outlined in the Appendix to this report.

The Commission's Assumptions about Mobile Pass-through are Inconsistent

156. The Commission assumes the same rate of mobile pass-through under the counterfactual and factual, and this rate is constant over time. The Commission also argues that reductions in the MTR will increase competition in the mobile market (e.g. ¶¶790). In order to be consistent, the Commission must therefore also assume that (i) the rate of mobile pass-through is higher under the factual than the counterfactual, and (ii) the rate of mobile pass-through under both scenarios increases over time.
157. However, in our view, regulation of MTRs will not significantly increase competition in the mobile market, for reasons that we explain in section 4.2 below. Thus in our modified version of the cost-benefit model we have not assumed that mobile pass-through changes as a result of changes in the MTR. Nevertheless, the Commission must make such an assumption if its cost-benefit model is to be consistent with its conclusions about the effects of regulation on competition in the mobile market.

4.2. Effects on Competition in the Retail Mobile Market

158. The Commission does not include effects of regulation on competition in the mobile market in its cost-benefit model (aside from the waterbed effect). However, it does say that it expects MTR regulation to promote competition in the mobile market, both increasing the intensity of competition between existing operators, and by improving the competitive position of 2degrees and other potential entrants (¶¶765-833). We have a number of concerns with the Commission's analysis that we discuss here.

4.2.1. Relationship between MTRs and Retail Mobile Prices

159. First, the Commission observes that MTRs and MTM retail prices have both been falling in recent years (¶¶766-770). We agree with the Commission (¶¶771) that this does not demonstrate that the reduction in mobile prices was caused by reductions in MTRs. As we noted earlier, the New Zealand mobile market has been undergoing significant changes in the recent years, including reaching saturation and the transition to 3G, which will have an effect on competition in the mobile market and obscure the effect (if any) of MTRs on retail mobile prices.
160. The Commission notes the popularity of flat-rate on-net plans (¶¶771) and suggests that if MTRs were lower, such offers might be extended to include calls to off-net numbers. This conclusion overlooks the fact that such plans are priced taking into account the value of all members of the 'calling circle'. Offering a 'bestmate'-type plan including off-net calls will always be less attractive to a mobile network regardless of the MTR, because the network cannot obtain any value from customers who do not belong to its network. We therefore do not agree with the Commission's conclusion that lower a MTR is likely to lead to flat-rate pricing for off-net calls.

4.2.2. Market Shares and Traffic Imbalances

161. The Commission presents evidence of an imbalance of traffic between Vodafone and Telecom and shows that this imbalance has reduced at the same time as Telecom's market share has increased (¶¶773). The Commission interprets this as saying that the level of traffic imbalance may not be independent of market share. It then concludes that

a small new entrant may have a significant net outflow of traffic when it has a small market share, which would be a financial burden (¶774).

162. In general it is not market share per se but the mix of customers each network has that determines net traffic flows between networks. If all customers are identical then it is easy to demonstrate that traffic flows will be balanced regardless of market share. However if network A's customers make more calls on average than network B's then there will be a net traffic flow from A to B for any given market shares.
163. In the New Zealand market, the flow of traffic between Telecom and Vodafone reflects the mix of customers on each network. While Telecom's market share has increased between 2006 and 2008, it is impossible to separate this from changes in Telecom's mix of customers at the same time. If Telecom expanded by gaining customers who make fewer calls than the average of its existing customers for given prices then the traffic imbalance will decrease. This is a function of the change in customer mix, not the increase in Telecom's market share. If Telecom gained customers who on average are identical to its existing customers then traffic would remain balanced but its market share would increase.
164. From the data that the Commission presents, it is therefore impossible to reach the conclusion that the traffic imbalance is associated with market share. We also note that any analysis that focuses only on termination revenues and payments is a partial and incomplete analysis of a mobile network's business. In particular it ignores the revenues that the networks receive from selling subscriptions, calls and other services to their customers.
165. For example, if network A's customers make relatively more calls on average than network B, then network A will make a net termination payment to B. However, the type of customers that network A has are relatively more valuable, and it will earn more in revenues from subscriptions and other services from these customers. Therefore, the fact that A has to make a termination payment to B does not harm A's profitability. The termination payment and the retail revenues that a network earns reflect its business strategy and the type of customers that it has attracted. Conversely, network B receives net termination revenues, and this reflects the fact that its customers are less valuable and it earns less other revenues from them, so termination helps to make these customers profitable.

4.2.3. Effects of Changing the MTR on Mobile Market Competition

166. With the above facts in mind, it is clear that one of the main effects of changing the MTR will be to change the incentives that mobile networks have to compete for different types of customer. A lower MTR will make customers who make relatively many calls more attractive, and competition for them will intensify, while competition for customers who make relatively few calls will weaken. We note that customers who make many calls are relatively valuable, and competition for them will already be more intense than competition for customers who make few calls. Therefore the effect of regulation will be to intensify competition over customers for whom competition is already relatively intense, and to weaken competition over customers for whom competition is already relatively weak. On balance it is not clear that this will be

beneficial for mobile consumers, and it appears that the Commission has not considered these effects in its analysis.

167. As we explained in section 4.1, on-net discounts are a way that mobile networks compete, and competition between networks is more intense in the presence of these discounts. Furthermore, the incentive to offer on-net discounts will exist regardless of the level of the MTR. This incentive comes not from a desire to stifle competition, but as an outcome of competition itself. To see this, imagine two networks and neither offers on-net discounts. If either network offers such a discount, it can likely attract some subscribers from the other network. This incentive is the same as the incentive that causes firms to cut prices under ordinary competition. The outcome is that both networks offer on-net discounts, even though this increases the intensity of competition between them. On-net discounts can therefore be viewed as a result of competition, not as a way that networks try to reduce competition between themselves, and changing the MTR will not change the basic incentive to offer such a discount.
168. In terms of its analysis of MTR regulation on entry, the Commission focuses on interconnection costs (e.g. ¶789), but appears to ignore interconnection revenues. As we explained above, interconnection costs and revenues depend on the customer mix, as do retail revenues and costs. To merely focus on interconnection costs gives a distorted view of the effects of regulation on a potential entrant. We also note that the Commission appears to ignore the fact that reducing the FTM termination rate will reduce FTM termination revenues of all mobile operators, including entrants, to the extent that this is not offset by the waterbed effect. It is therefore difficult to see how FTM termination regulation can promote entry or competition in the mobile market.
169. By way of quantitative analysis of the effects of regulation on competition in the mobile market, the Commission estimates the consumer surplus and total surplus associated with a 5% reduction in retail mobile prices. However, the Commission has not demonstrated that any such benefits will be caused by regulation, rather than just entry.
170. As we noted, 2degrees has already committed to enter the market, and additional facilities-based entry in the near future seems unlikely given the size of the New Zealand market. Given this state of affairs, the question then is whether MTR regulation will lead to lower overall prices in the mobile market. We discussed above how a lower MTM MTR reduces the intensity of competition between mobile networks. Furthermore, a lower FTM MTR reduces revenues of all mobile networks including new entrants. It is therefore not clear that regulation will be associated with an increase in competition in the mobile market.
171. Finally, the Commission calculates that New Zealand's mobile penetration rate exceeds 100% and notes that this may be due to consumers having multiple handsets to take advantage of on-net pricing (¶801-804). This would seem to impose unnecessary costs on consumers. However, it is our understanding that penetration is calculated based on the number of active SIM cards. Every 3G mobile data device contains a SIM card, even if it is not a phone. Therefore, concerns about greater than 100% penetration may be largely unfounded. This accords with a recent statement by the CEO of 2degrees, who

predicted that uptake of mobile data devices would drive penetration to 500%.³² We therefore question the materiality of the costs actually incurred by consumers having multiple handsets.

³² See http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10585195.

5. Values of Other Parameters

172. Some other parameters in the Commission's analysis are based on out of date information. Specifically, mobile ARPU, mobile minutes and mobile voice revenue were obtained from Telecom's 2004 annual report and have not been updated. The Commission has information from Telecom and Vodafone that would allow it to update these parameters with more recent data.
173. To avoid introducing restricted information in our modified version of the model, we have relied on Telecom's published financial and performance information to estimate these parameters. Mobile voice revenue, mobile call minutes, ARPU and the number of subscribers for the 2008 financial year are all available in recent versions of Telecom's performance reports.³³
174. According to Telecom's results, 2008 mobile voice revenue was \$493m, corresponding to 1,405m voice minutes, or about 35 cpm, in contrast with 43 cpm assumed in the Commission's model. Telecom also had 2,077,000 subscribers during that year, compared with 1,352,000 in the model.
175. The Commission also assumes mobile ARPU of \$450 per year. Telecom reports ARPU of \$28.93 per month excluding interconnection revenue or \$36.73 including interconnection revenue. Since the ARPU is used as a proxy for the overall 'price' that mobile consumers face, the appropriate figure to use is the ARPU excluding interconnection revenue, or about \$350 per year.

³³ See for example Appendix 1 of the "Management Commentary" on Telecom's 2009 Q3 results, available at <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NTAwMHxDaGlzZEIjEPS0xfFR5cGU9Mw==&t=1>.

6. Revised Cost-Benefit Results

176. As described in this report, we have made a number of changes to the Commission’s cost-benefit model, to correct errors that we found and to reflect what we believe are more reasonable assumptions about the important parameters, based on the available evidence and our analysis.
177. The Appendix to this report lists all the changes that we made to the model. Here we summarise the net welfare effects that we obtain after applying all of these changes to the Commission’s model. We present results for each of the four MTR benchmarking scenarios shown in Table 7.
178. In the first scenario, we used the Commission’s MTR benchmark for 2009 (7.2 cpm). While we do not believe this is a reasonable benchmark, it is instructive to see the cost-benefit results under this scenario when the model is modified in the ways we have described.

Table 13 Modified cost-benefit results using the Commission's MTR benchmark (NPV, \$m).

	Consumer Surplus	Total Surplus
Linear	-242.8	-45.1
CED	-274.0	-78.8

179. In the second scenario, the 2009 MTR is benchmarked at the upper quartile of the cost estimates (10.9 cpm).

Table 14 Modified cost-benefit results using the upper quartile of cost estimates (NPV, \$m).

	Consumer Surplus	Total Surplus
Linear	-145.6	-32.3
CED	-162.0	-50.1

180. In the third scenario, the 2009 MTR is benchmarked at the median of the current regulated rates (12.4 cpm).

Table 15 Modified cost-benefit results using the median of current regulated rates (NPV, \$m).

	Consumer Surplus	Total Surplus
Linear	-109.0	-27.1
CED	-118.7	-37.5

181. In the final scenario, the 2009 MTR is benchmarked at the upper quartile of the current regulated rates (14.3 cpm).

Table 16 Modified cost-benefit results using the upper quartile of current regulated rates (NPV, \$m).

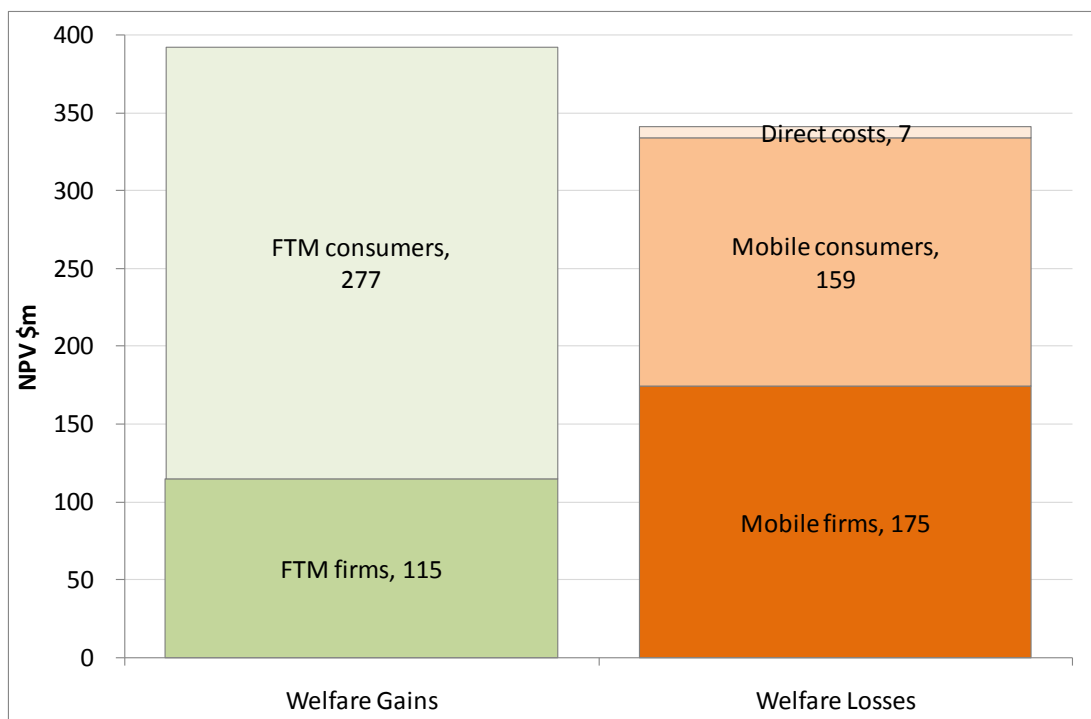
	Consumer Surplus	Total Surplus
Linear	-63.9	-20.2
CED	-64.2	-20.6

182. These results clearly show that there is no justification for regulation once the errors in the Commission’s model are corrected and the key parameters are updated to more reasonable values.
183. Indeed, under these assumptions, the Commission’s factual scenario results in the worst outcome for consumers and economic welfare. This is because if pass-through in the factual is not as high as the Commission assumes, then the counterfactual is superior even if the MTR is higher in the counterfactual, due to the pass-through obligations in the Vodafone undertakings. Once again this highlights the importance of the Commission’s FTM pass-through assumptions to be correct if regulation is to deliver any benefits to end-users. A greater regulated reduction in the MTR also results in a larger waterbed effect, which increases the detriments of regulation.

7. Welfare Transfers

184. In any cost-benefit analysis, a very important issue is the standard used to assess the results. In the Draft Report, the Commission does not state exactly what criteria it uses, but its emphasis on the consumer welfare numbers over the total welfare numbers gives the impression that regulation should be recommended if the net effect on consumer welfare is positive while total welfare does not decrease.
185. From an economic standpoint, it is quite unambiguous that the only criterion that will always lead to economically sensible conclusions is the total welfare standard. On the other hand, the purpose of the Act (s18) refers only to end-users as the ultimate beneficiaries of regulation.
186. We note that one of the main effects of the proposed regulation is large welfare transfers, including between consumer groups. Figure 4 illustrates the welfare gains and losses that occur in the Commission's cost-benefit analysis (in the linear version of the model).

Figure 4 Welfare gains and losses implicit in the Commission's cost-benefit analysis (NPV\$m; linear model).

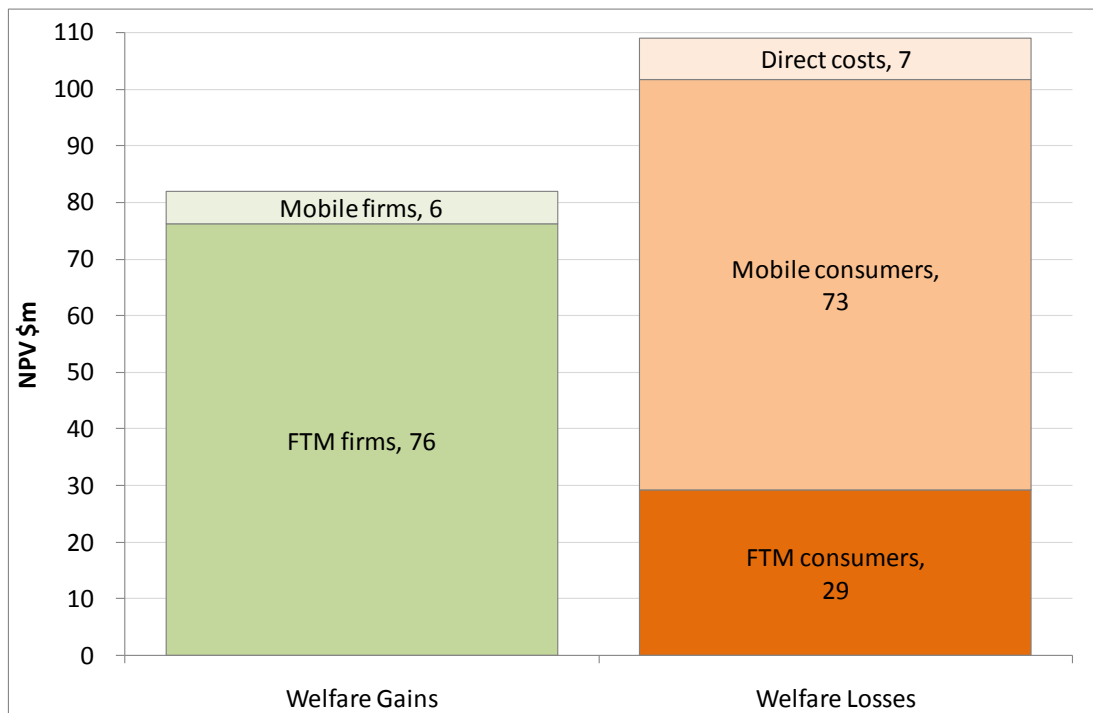


187. The end result is that, under the Commission's assumptions, about \$334m of economic welfare is transferred away from mobile consumers and firms, into the hands of FTM consumers and firms. These large transfers create about \$51m of net economic benefits.
188. In our opinion, the Telecommunications Act was not designed to serve as a tool for significant redistributions of economic welfare between telecommunications markets, and in particular it did not envisage regulation that transfers a large amount of welfare

between *consumer* groups. Evaluating such a regulation requires making interpersonal comparisons of welfare, which is very difficult or impossible to do.

189. While many consumers will use both FTM and mobile services, the intensity with which different consumers use these services will differ. Under the Commission’s analysis, consumers who use mobile services relatively intensely will be made worse off, while those who use FTM services relatively intensely will be made better off.
190. It is not clear whether a policymaker would choose to make the large transfers illustrated above in exchange for the relatively small net gains. This is particularly true when we consider that the aggregate losses suffered by mobile consumers will not be uniformly distributed across all such consumers. Instead, low users (such as prepay customers) may be disproportionately affected. It is important for the Commission to bear in mind the redistributive effects of regulation as well as the net effects.
191. In comparison, Figure 5 shows the transfers implicit in the model when we correct the errors and modify the parameters in the ways described in this report, using the median of regulated prices as the MTR benchmark. We note that in this case the only beneficiaries of regulation are firms, and all end users are made worse off. This is because we believe that FTM pass-through will not be as high as the Commission assumes, so that while MTRs are lower in the factual than the counterfactual, FTM retail prices will be higher in the factual compared to what will be achieved by the pass-through requirements in Vodafone’s undertakings.

Figure 5 Welfare gains and losses implicit in our modified cost-benefit analysis using the median of regulated prices as the MTR benchmark. (NPV\$m; linear model).



Appendix: Modifications to the MTAS Quantitative Model

192. This Appendix briefly describes the modifications we have made to the Commission's spreadsheet model following our analysis of the parameters and assumptions. The cells that we have changed are highlighted in purple in our modified version of the spreadsheet. The headings below correspond to the worksheets in the spreadsheet that we have modified.

Key assumptions

E6 Changed factual MTR to 15 cpm to reflect the fact that the undertakings will not apply in 2010 under regulation.

F6:J6 Changed factual MTR to reflect our estimate of the MTR cost in 2009 and the change in MTR costs over time (see Table 7).

C9:J9 Changed pass-through for FTM calls to Telecom in the counterfactual to our estimate of 41% in all years.

C12:J12 Changed pass-through for all FTM calls in the factual to our estimate of 41% in all years.

E24:E29 Included FTM costs for 2010 based our benchmarks to enable welfare calculations for 2010 to be made.

E28:J28 Removed deduction for FTM common costs from FTM cost calculation.

D34:J34 Changed mobile pass-through to 75% in all years to reflect our view of the size of the waterbed effect.

C41 Changed mobile ARPU to \$350 reflecting Telecom's 2008 results.

FTM workings

C4:J4 Modified calculation of allocative efficiency gain to allow for the FTM price in the factual to be higher than in the counterfactual.

C5:J5 Modified calculation of excess returns transferred to allow for the FTM price in the factual to be higher than in the counterfactual.

C13:J13 Modified calculation of transfer component to allow for the FTM price in the factual to be higher than in the counterfactual.

Waterbed linear

A39:M39 Added calculation of the loss in FTM termination profits that should be 'recovered' via the waterbed effect.

A40:M40 Added calculation of the change in total mobile revenues due to the waterbed effect.

H44:M44 Values of the mobile ARPU under the factual are no longer calculated by formula. They are solved numerically so that the change in mobile revenues due to the waterbed effect equals the change in mobile termination revenues assumed to be recovered by the waterbed effect. This is achieved using the macro that runs when the 'Calculate' button on the Key Assumptions tab is pressed.

G57:M57 Modified calculation of allocative change in mobile subscriber consumer surplus to allow the mobile subscription price in the factual to be lower than the counterfactual.

G58:M58 Modified calculation of transfer change in mobile subscriber consumer surplus to allow the mobile subscription price in the factual to be lower than the counterfactual.

G61:M61 Modified calculation of change in mobile producer surplus to allow the mobile subscription price in the factual to be lower than the counterfactual.

F103:F105 Updated mobile revenue, minutes and subscriber data using Telecom information for FY2008.

Waterbed CED

G30:L30 Values of the mobile ARPU under the factual are no longer calculated by formula. They are solved numerically so that the change in mobile revenues due to the waterbed effect equals the change in mobile termination revenues assumed to be recovered by the waterbed effect. This is achieved using the macro that runs when the 'Calculate' button on the Key Assumptions tab is pressed.

A35:L35 Added calculation of the loss in FTM termination profits that should be 'recovered' via the waterbed effect.

A36:L36 Added calculation of the change in total mobile revenues due to the waterbed effect.

F58:L58 Modified calculation of transfer change in mobile subscriber consumer surplus to allow the mobile subscription price in the factual to be lower than the counterfactual.

F61:L61 Modified calculation of change in mobile producer surplus to allow the mobile subscription price in the factual to be lower than the counterfactual.

Full results (TS)

C13:H13 Modified calculation of change in producer surplus to allow for the FTM price in the factual to be higher than in the counterfactual.

B45: H45 Modified calculation of change in producer surplus to allow for the FTM price in the factual to be higher than in the counterfactual.

References

Andersson, K. & B. Hansen (2009). Network competition: Empirical evidence on mobile termination rates and profitability. Mimeo, available from

<http://home.bi.no/a0510011/Papers/Andersson%20and%20Hansen%20MTR%20and%20Pi%20april%202009.pdf>

Armstrong, M. & J. Wright (2009). Mobile call termination, *Economic Journal*, 119: 270-307. Available from <http://profile.nus.edu.sg/fass/ecs/kdw/ArmstrongWright.pdf>.

Genakos, C. & T. Valletti (2008). Testing the 'waterbed' effect in mobile telephony. *CEIS Working Paper* No. 110, available from

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1114856.

Schiff, A. (2008). The "waterbed" effect and price regulation. *Review of Network Economics*, 7: 392-414. Available from

http://www.rnejournal.com/artman2/uploads/1/schiff_RNE_sept08.pdf