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Interconnection Benchmarking in Namibia

By Christoph Stork

Abstract

Regulators across Europe and Africa agree that termination rates should be based on the forward-looking long-run incremental cost (LRIC) of termination of an efficient operator. Termination rates at cost of termination will remove economic distortions witnessed in Europe and Africa today and prepare the markets for a smooth transition to IP-based Next Generation Networks. The paper reviews the latest developments and trends for interconnection rates and shows how interconnection benchmarking can be used to set termination rates using the case of Namibia. Implementing LRIC is challenging, expensive, time-consuming, and the required information is often not available in developing countries. The benchmarking methodology benchmarks termination rates, termination costs and regulatory best practice. The paper also demonstrates how annual reports and traffic volume can be used to as common sense check to compliment the benchmarking approach.

<i>Introduction</i>	2
<i>Namibia's Telecommunication Sector</i>	2
<i>Benchmarking</i>	8
<i>Benchmarking Regulatory Best Practice</i>	9
<i>EU Debate</i>	9
<i>Two-sided market argument</i>	13
<i>Waterbed Effect Argument</i>	16
<i>Benchmarking Termination Rates</i>	19
<i>Selected African Countries</i>	19
<i>European Union</i>	22
<i>Benchmarking Cost of Termination</i>	25
<i>Tanzania</i>	26
<i>Austria</i>	27
<i>Sweden</i>	28
<i>Australia</i>	28
<i>France</i>	29
<i>Namibia</i>	29
<i>Namibian Benchmark Model</i>	30
<i>Conclusion</i>	32
<i>References</i>	33

Introduction

Following a dispute about interconnection charges between Namibian telecommunication operators, a consultative workshop on interconnection models was held on the 13 October 2008 in Windhoek, chaired by the Minister for ICTs, Joel Kaapanda.

This workshop had been the key to resolving the interconnection dispute successfully within a nine month period. Participants at the workshop agreed that international benchmarking is the preferred approach to determine interconnection rates prescribed by the regulator when carriers fail to agree on terms of interconnection.

Research ICT Africa was commissioned by the NCC to conduct the benchmarking study in January 2009 and gave its recommendation in June 2009.

The NCC ruled in terms of clause 20.1c of MTC's (Government Gazette No 3815 / March 2007) and Leo (Government Gazette No 3676 / August 2006) licences which requires cost based termination rates for interconnections between operators, prescribing the compromise model that Telecom Namibia, Leo and MTC agreed on and which leads to a drop of termination rates to the cost of an efficient operator in Namibia by January 2011:

- The termination rate ceiling as from 1st July 2009 for mobile to mobile, mobile to fixed and fixed to mobile calls was set to N\$0.60 per minute, charged in per second intervals.
- Operators terminating international calls for an operator with an international voice licence will receive N\$0.60 per minute, charged in per second intervals, for the termination of calls.
- Operators with an international voice gateway will be restricted to the transit charge of N\$0.60 per minute, charged in per second intervals, plus the international settlement fee payable to the foreign operator for terminating that call. The international settlement fees will be calculated each month based on the average for the last month for each destination.

The termination ceiling will be reduced further every 6 months until the estimated cost of an efficient operator of N\$0.30 per minute, charged in per second intervals, has been reached.

This next sections review Namibia Telecommunications sector and then review the international benchmarking process that led to the resolution of the interconnection conflict.

Namibia's Telecommunication Sector

The Namibian Communications Commission (NCC), established in 1992, reports to the Ministry of Information and Communication Technology, and is solely funded by the government. The NCC is expected to become a fully-fledged independent regulator for the entire ICT sector early in 2010. The telecommunications bill, was enacted in November 2009. The act extends the responsibilities of the regulator with respect to establishing an interconnection regime, including a dispute settlement framework for the sector. It makes the regulator financially independent of government, allowing it to collect licence fees to fund its own operation and the universal service fund. New ICT policies dealing with broadcasting, telecommunication, IT, licensing, and ICTs in general were drafted in early 2009. Regarding interconnection, the new telecommunication policy states:¹

- Individual licensees must allow any other licensee to interconnect its services and network with that of the individual licensee unless such a request is technically or financially unfeasible. Interconnection charges must be such that they ensure a fair, transparent and pro-competitive access regime.
- The party providing interconnection and/or facility leasing must provide services that are sufficiently unbundled.
- The Regulatory Authority may prescribe benchmark charges for interconnection. These charges should be determined in accordance with international benchmarks on interconnection. A carrier must charge the benchmark fees prescribed unless it can prove to the Regulator that its forward-looking incremental costs will exceed the prescribed benchmark fees.

¹ Telecommunications Policy for the Republic of Namibia 2008, Final draft, 18 September 2008.

- Interconnection creates open network access. Any commercial network should be fully accessible to any other operator in a non-discriminatory manner, whilst protecting privacy of subscribers and databases.

Telecom Namibia is the only fixed-line operator in Namibia and is owned by Namibia Post and Telecom Holdings (NPTH), which in turn is owned by the State. NPTH is also a majority shareholder of Mobile Telecommunications Ltd. (MTC), which was awarded a mobile telecommunication licence in 1996. In July 2006, 34% of MTC was bought by Portugal Telecom. MTC still has about 87% market share and subscriber numbers are increasing. A second mobile licence was awarded to Leo in 2006. Leo² launched its services in April 2007.

Telecel Globe, a subsidiary of Orascom Telecom, bought 100% of Leo in January 2009. Telecom Namibia launched a mobile service in late-2006/early-2007 called Switch, based on CDMA. Switch was restricted to fixed-wireless until May 2009 due to political pressure.³ MTC and Leo use GSM to provide mobile telephony, while Telecom Namibia uses CDMA. Telecom Namibia has a statutory licence but not a statutory monopoly. It remains a *de facto* monopoly until an additional fixed-line licence is awarded, thus breaking Telecom Namibia's monopoly.

Table 1: End of Financial Year Figures: September 2008 for Telecom Namibia and MTC and end of June 2008 figures for Leo (Source: Annual reports and information provided to NCC)

	MTC	Leo	Telecom Namibia
Total Subscribers	1,008,658	114,177	31,705
Total Market share	87.4%	9.9%	2.8%
Total call volume in '000	775,819	31,934	537,141
Direct revenue per minute in N\$	1.63	1.20	0.00
Direct cost per minute in N\$	0.34	1.13	0.51
Opex per minute in N\$	0.97	10.14	1.05
Total expenditure per minute in N\$	1.02	11.22	1.41
Total revenue per minute in N\$	1.65	2.43	
Minutes per subscriber in '000	0.77	0.28	N/A
Revenue per subscriber in '000 N\$	1.27	0.68	N/A
Termination revenue as share of total revenue	11.2%	9.8%	6.0%

² CellOne was rebranded into Leo in September 2009

³ Leo and MTC had argued that Switch would be illegal and lobbied the Government to stop Telecom Namibia from providing mobile services. However this is not the case, and Telecom Namibia "voluntarily" restricted its service to fixed-wireless due to political pressure (Stork & Deen-Swarray, 2007).

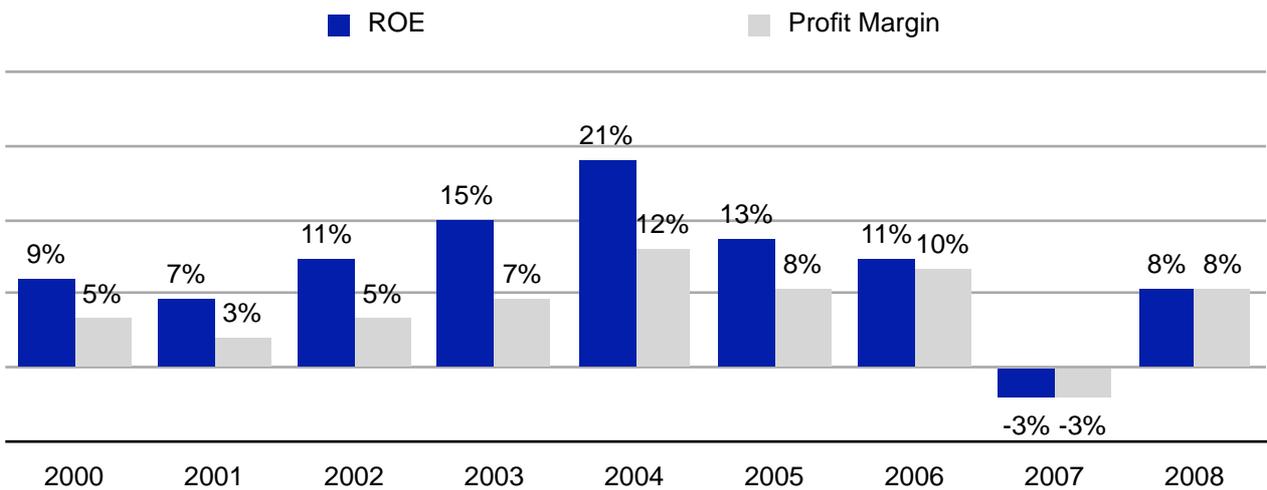


Figure 1: Return on equity and profit margin of Telecom Namibia

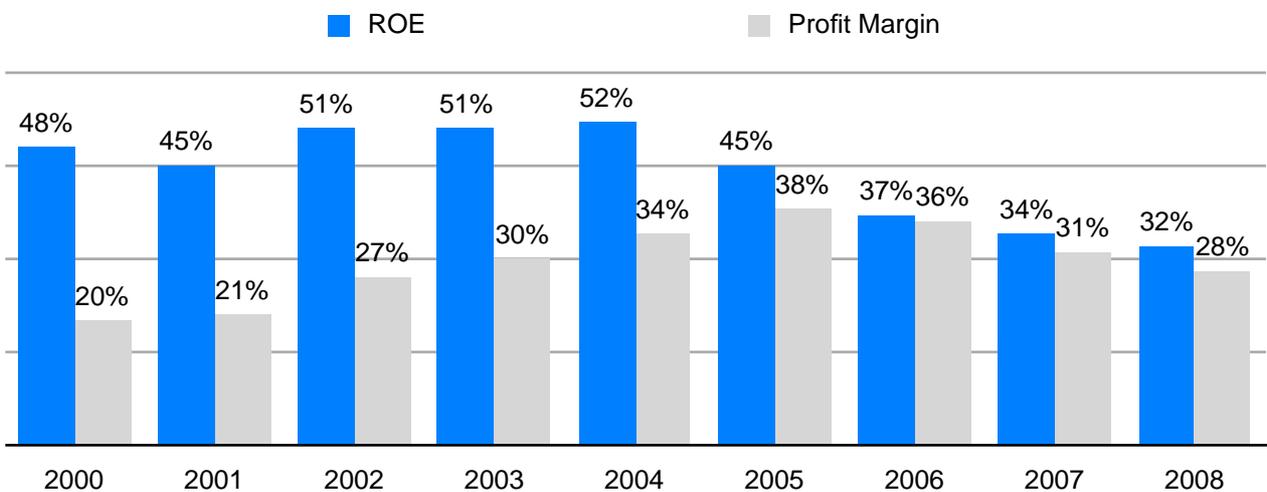


Figure 2: Return on equity and profit margin of MTC

Telecom Namibia’s return on equity and profit margin dropped to -3% in 2007. This can be attributed mainly to the roll-out of the CDMA service, SWITCH, and associated costs. Both return on equity and profit margin were positive again in 2008 at 8%. MTC’s return on equity was very high at around 50% until 2005/6, when the arrival of competition in the mobile telephony sector led to a drop to a still-high 37% in 2006, 34% in 2007 and 32% in 2008. The same trend can be observed for profit margins, which peaked in 2005 and have since then begun to decline. Leo’s return on equity and profit margin are substantially negative and Leo will need a capital injection to avoid negative equity in 2009 if losses remain as high as they have been in 2008. However, such financial figures can be expected from a new entrant in the telecommunication market. New entrants usually need several years before they break even. For example, South Africa’s CellC turned a profit in 2008 for the first time, after becoming operational in 2003.

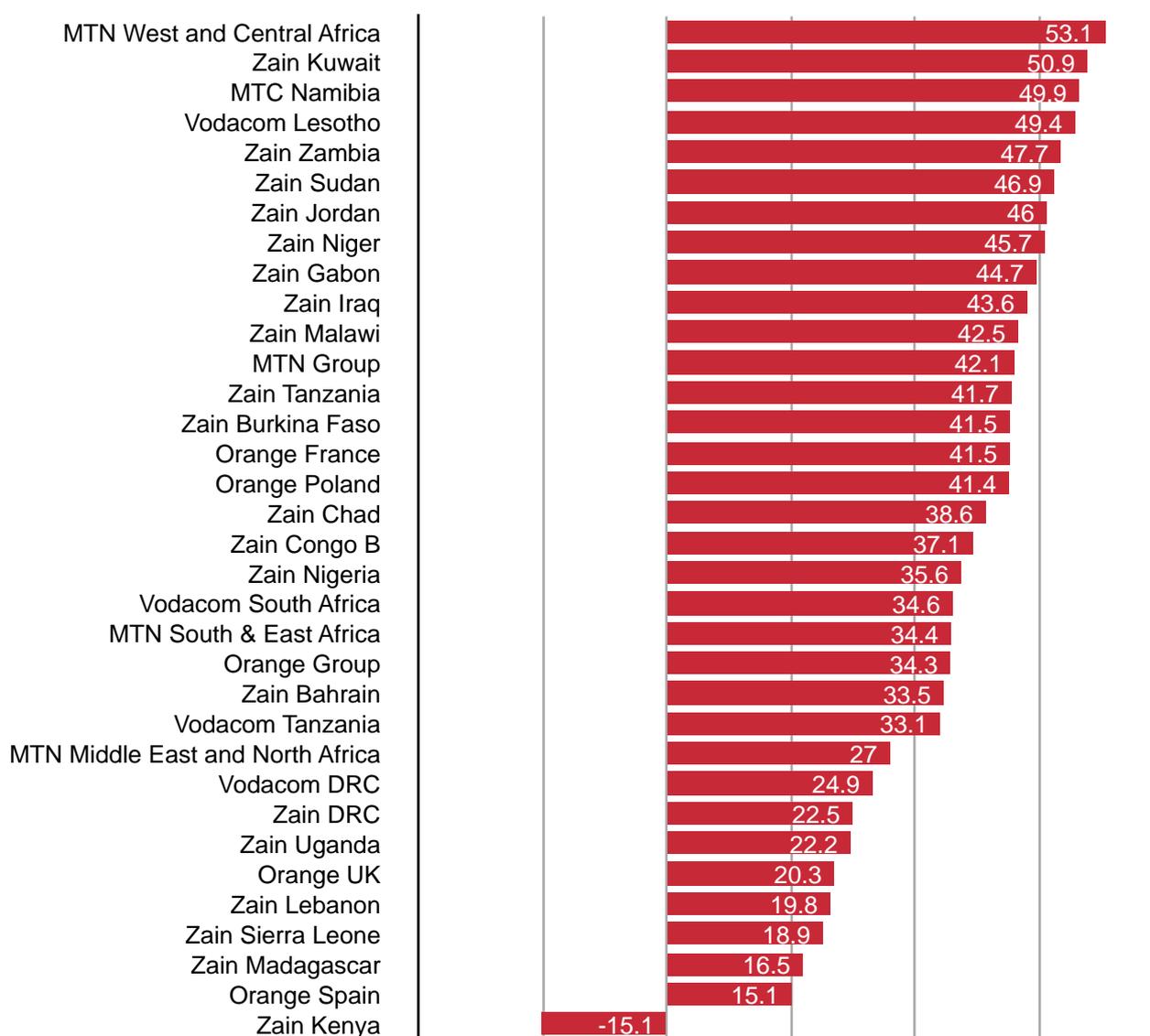
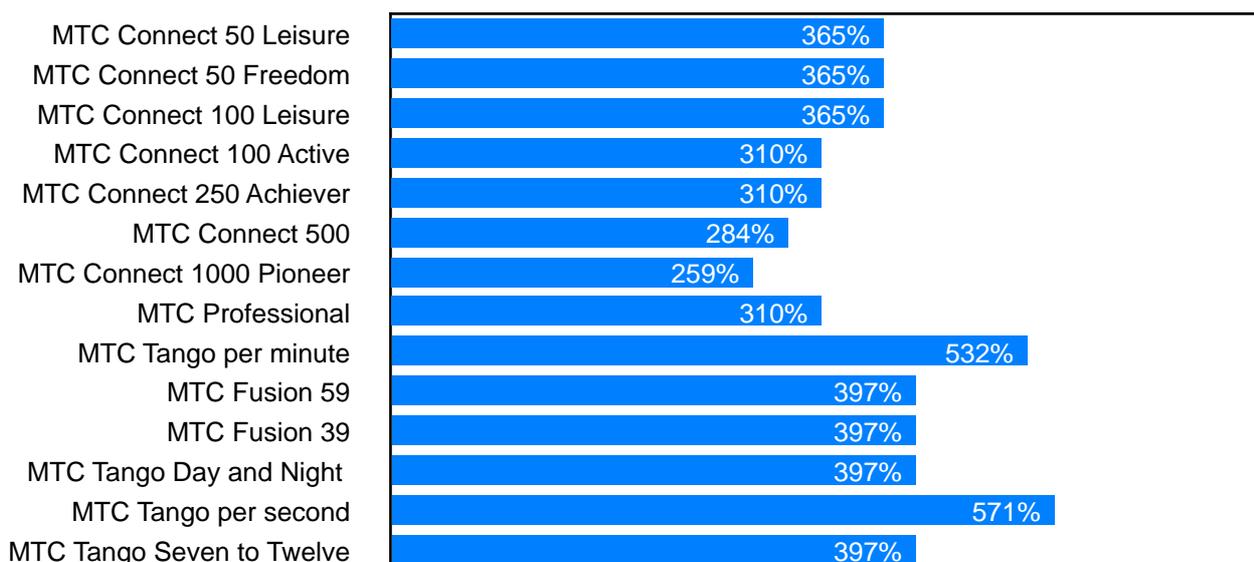


Figure 3: Selected EBITDA margins for 2008 in % (Source: Financial Statements of Operators)

MTC's EBITDA margin for the financial year ending in 2008 was 49.9%, which is very high internationally, and high even for Africa. The table above shows selected EBITDA margins. A high EBITDA margin for a company operating in a competitive market is an admirable achievement. For an incumbent operator with 87% market share however, it generally reflects the exercise of market power.

Mobile termination was set by operators to N\$1.06 prior to the NCC ruling. Fixed termination rates were different for Leo and MTC; the fixed terminate rate for MTC was N\$0.63, while Leo paid N\$0.68. MTC received less for terminating international calls for Telecom Namibia (N\$0.59) compared to Leo (N\$0.62). Both Leo and MTC are required by their licence to enter into interconnection arrangements which are non-discriminatory. Telecom Namibia has no such obligation and can set rates for Leo and MTC differently, as it has.

■ Peak Fixed Retail Price as multiple of FTR



MTC's fixed retail rates are up to 530% and 570% of the fixed termination rate for its most popular products: Tango and Tango per second. This indicates a strategy to starve the fixed-line network (Telecom Namibia) by providing a strong disincentive for its customers to call fixed numbers. The high fixed retail rates cause traffic imbalances and net interconnection payments for Telecom Namibia. Leo's retail rates are more reasonable multiples of the FTR.

Figure 5: MTC's retail prices for fixed line calls at peak time expressed as multiple of fixed termination rate (FTR)

■ Peak Fixed Retail Price as multiple of FTR

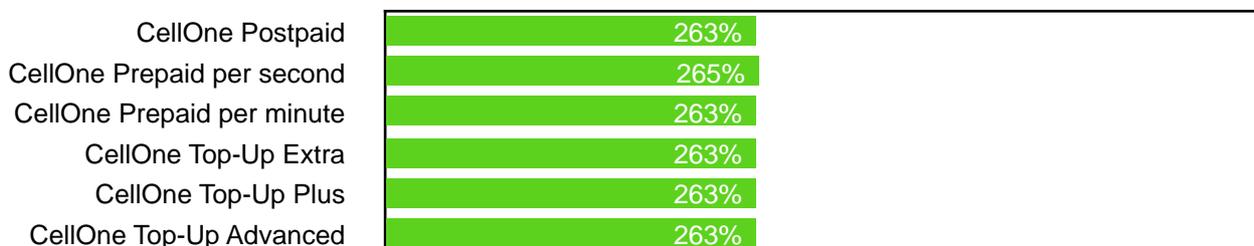


Figure 6: Leo's retail prices for fixed line calls at peak time expressed as multiple of fixed termination rate (FTR)

In explaining the need to regulate price termination to boost competition, a recent EU press release states: "Higher mobile termination rates make it harder for fixed and small mobile operators to compete with large mobile operators."⁴ A new entrant needs to be able to compete in its off-net rates with the incumbents on-net rates to be attractive to a switcher. This is because a customer moving from the incumbent's to the new entrant's network will change from making mostly on-net calls to making mostly off-net calls.

The average off-net retail rate as a multiple of the mobile termination rate was equally much higher for MTC compared to Leo. This too pointed to MTC's strategy of using its market position and high off-net and fixed-line prices to keep traffic on its network.

⁴ EU Press release, 7 May 2009, Telecoms: Commission acts on termination rates to boost competition, IP/09/710, http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=4919&utm_campaign=isp&utm_medium=rss&utm_source=newsroom&utm_content=tpa-5

By keeping its retail prices very high, MTC caused traffic imbalances and net interconnection inflows. Leo and Telecom Namibia were currently net interconnection payers to MTC due to these traffic imbalances.

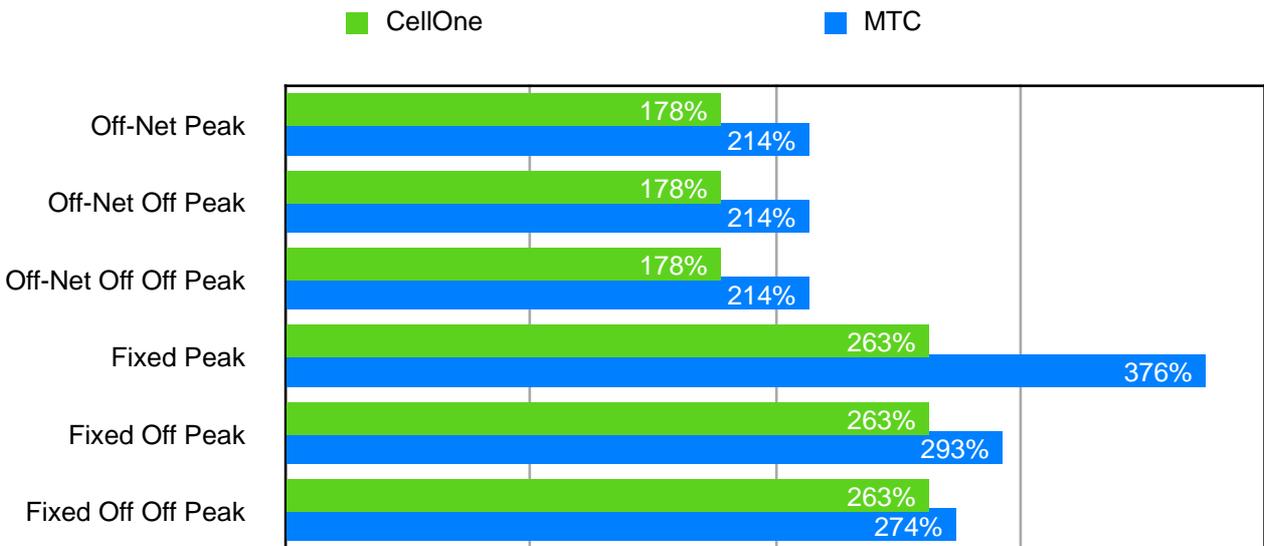


Figure 7: Average retail prices for fixed line calls and off-net calls expressed as a multiple of fixed termination rate (FTR) and mobile termination rate (MTR)

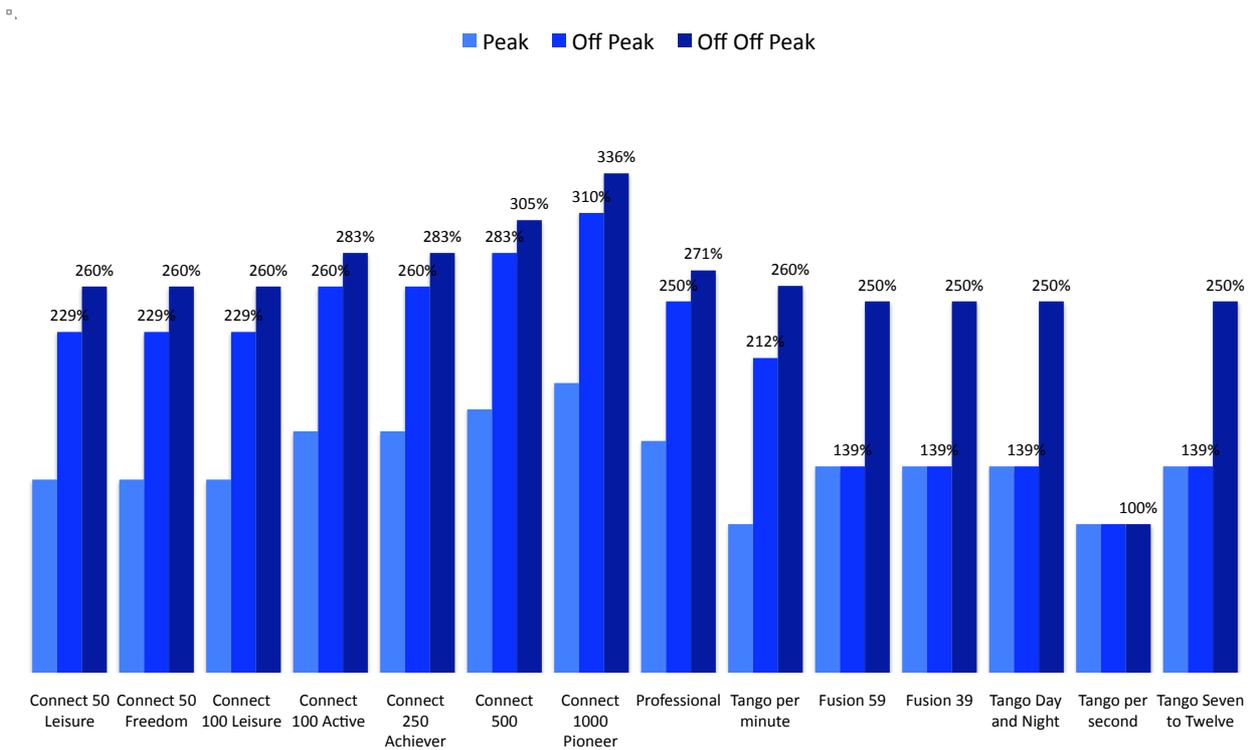


Figure 8: MTC's off-net retail prices as a multiple of on-net retail prices

MTC also used the high mobile termination rates in connection with its market power to prevent Leo and Switch from gaining market share, by offering lower on-net retail rates for off-peak and off-off-peak than the MTR, as can be seen in Figure 9.

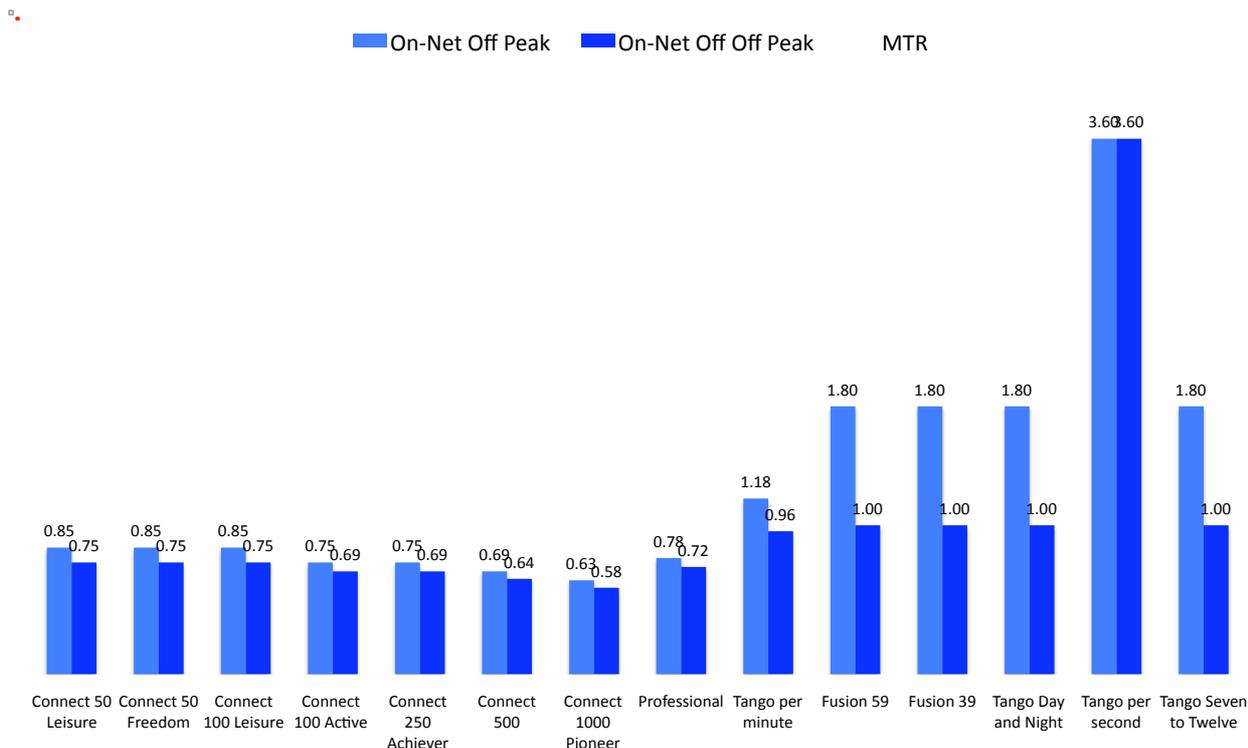


Figure 9: MTC off-peak and off-off-peak on-net rates compared to MTR of N\$1.06

In conclusion, the evidence indicated that MTC was using its market dominance, in combination with high termination rates, high off-net and fixed line retail rates, and below MTR on-net retail rates to:

- Cause traffic imbalances and net interconnection revenue;
- Prevent Leo and Switch from gaining market share; and
- Starve Telecom Namibia’s fixed-line network.

The Leo and MTC licences prohibit anti-competitive practices and abuse of dominant position. How far away the termination rates were from cost of termination can be seen from Table 1. Total expenditure of MTC for the financial year ending September 2008 divided by call volume for the same period was less than the MTR during that period.

Benchmarking

Benchmarking termination rates is the process of establishing interconnection rates based on rates in other jurisdictions. Undertaking full forward-looking cost modelling is challenging, expensive, time-consuming, and often the required information for that is not available in developing countries. The ICT Regulation Toolkit states that “where benchmarked rates allow competition to develop satisfactorily, rates based on benchmarking may be used for extended periods.” Benchmarking involves⁵

- Selecting a sample of countries or operators (possibly at similar stages of socio-economic and industry development);
- Gathering price data for the services under consideration in each of the sample countries;
- Adjusting benchmarked rates to account for country specific differences.

Benchmarks may need to be adjusted to account for differences in country characteristics. “The goal of the adjustments is to try **to model interconnection costs** without having enough detailed information on local cost inputs to carry out a full forward-looking cost analysis.”⁶ Adjustments need to be made for

⁵ ICT Regulation Toolkit, <http://www.ictregulationtoolkit.org/en/index.html>

⁶ ICT Regulation Toolkit, <http://www.ictregulationtoolkit.org/en/index.html>

population density, local area size, extent of urbanisation, traffic patterns and call durations, input prices, scale economies, exchange rates and taxes. However, whatever country or operator seems similar enough, there are always enough factors which are different to expose the selection to criticism. In terms of population density Australia and Namibia are very similar, in terms average household income, labour and site cost, and traffic pattern the two country are very different.

Therefore, not only do interconnection rates need to be compared, but the costs of interconnection and regulatory practices need to be benchmarked as well. Termination rates, even when cost oriented, differ to varying extents from country to country. Therefore, benchmarking termination cost will lead to a better guide for determining interconnection rates of efficient operators for a country. The cost of termination incorporates all the country specific characteristics. Comparing cost of efficient operators between countries is the first step, getting some kind of cost data from the country to be benchmarked is the second step.

Benchmarking Regulatory Best Practice

A consensus exists around the world that call termination is a monopoly. Operators each have a monopoly on call termination on their networks.⁷ Termination rates need hence to be regulated. Regulating prices of monopolies requires usually setting prices at cost. However, that would provide little incentive to use efficient technologies since any cost could be claimed back through retail prices. Regulators across Europe and Africa agree that termination rates should therefore be based the cost of an efficient operator.

A debate about what costs should be included in the calculation of the cost of termination has been lead for many years, with net interconnection payment receivers arguing for high and net payer for low termination rates. The same company may argue for high termination rates in a country where it holds a dominant position and for low termination in another country where it is a new entrant. International consulting companies too loose little sleep over changing their conclusions depending on who the client is. Similarly, points are being made regarding symmetry of termination rates.

EU Debate

The European Commission issued a draft recommendation on the regulatory treatment of fixed and mobile termination rates in the European Union in October 2008 (EU, 2008). This sparked a termination rate discussion in the EU. The final recommendation on 7 May 2009 incorporated comments by operators and regulators across Europe and recommended the following to European regulators (EU, 2009):

- *Cost of Efficient Operator*: National Regulatory Authorities (NRAs) should set termination rates at the cost of an efficient operator, implying symmetric termination rates.
- *LRIC*: Cost of termination should be calculated on the basis of forward-looking long-run incremental costs (LRIC), only taking into account costs that are caused by the provision of wholesale call termination (wholesale call termination being the increment).
- *Top-Down Addition*: NRAs may use a top-down approach based on audited cost data to improve the bottom-up LRIC.
- *Next Generation Network (NGN)*: The core part of both mobile and fixed networks should be based on NGN, and the access part for mobile networks should be a combination of 2G and 3G.
- *Definition of incremental costs*: Costs that can be avoided if a specific service is no longer provided (wholesale voice termination service provided to third parties).
- *Definition of traffic related costs*: Fixed and variable costs which increase with increased levels of traffic.
- *Asymmetric termination rates*: "In case it can be demonstrated that a new mobile entrant operating below the minimum efficient scale incurs higher per-unit incremental costs than the modelled operator, after having determined that there are impediments on the retail market to market entry and expansion, the NRAs may allow these higher costs to be recouped during a transitional period via regulated termination rates. Any such period should not exceed four years after market entry." (EU, 2009)

⁷ See eg Genakos and Valletti (2009), ERG (2007b),

NRAs are required to implement cost-efficient symmetric termination rates by 31 December 2012. Altogether, the recommendation is likely to lead to termination rates between 1 and 2 Euro cents by the end of 2012 across the whole of the EU. Predictably, the recommendation has been applauded by new entrants and small operators, supported by national regulatory authorities and objected to by mobile incumbent operators with significant market power.

In response to these recommendations Frontier Economics (2009) composed a report for several of Europe's mobile incumbents, concluding that the EU draft recommendation would lead to MTRs which are below the efficient cost of termination for three reasons:

- It ignores the cost of coverage as it is considered non-incremental to the provision of wholesale termination services;
- It excludes common costs;
- It confuses the costs of a hypothetical operator with the costs of an efficient operator.

These arguments are flawed for several reasons.

- First, common costs that are associated with the efficient provision of efficient termination services are included. Only common costs that are not required for providing termination services are excluded.
- Second, total termination revenue typically comprise a relatively small share of total revenues, around 10-20%.⁸ Operators do not build networks and provide coverage to terminate calls, but to provide services to their customers and gain new customers. Providing termination services is a service to existing customers since being able to call other networks and being able to receive calls from other networks is of benefit to their own subscribers. Lower termination rates therefore increase the utility of the network to its subscribers. Higher termination rates mean that each subscriber subsidises his or her on-net calls with his or her off-net calls made or received.
- Third, Frontier Economics (2009) argues that the LRIC costs proposed by the EU are not those of an efficient operator but rather a hypothetical operator with costs that will be lower than an efficient operator. Whether or not this may be the case depends on the implementation of the LRIC model and the data available from operators.

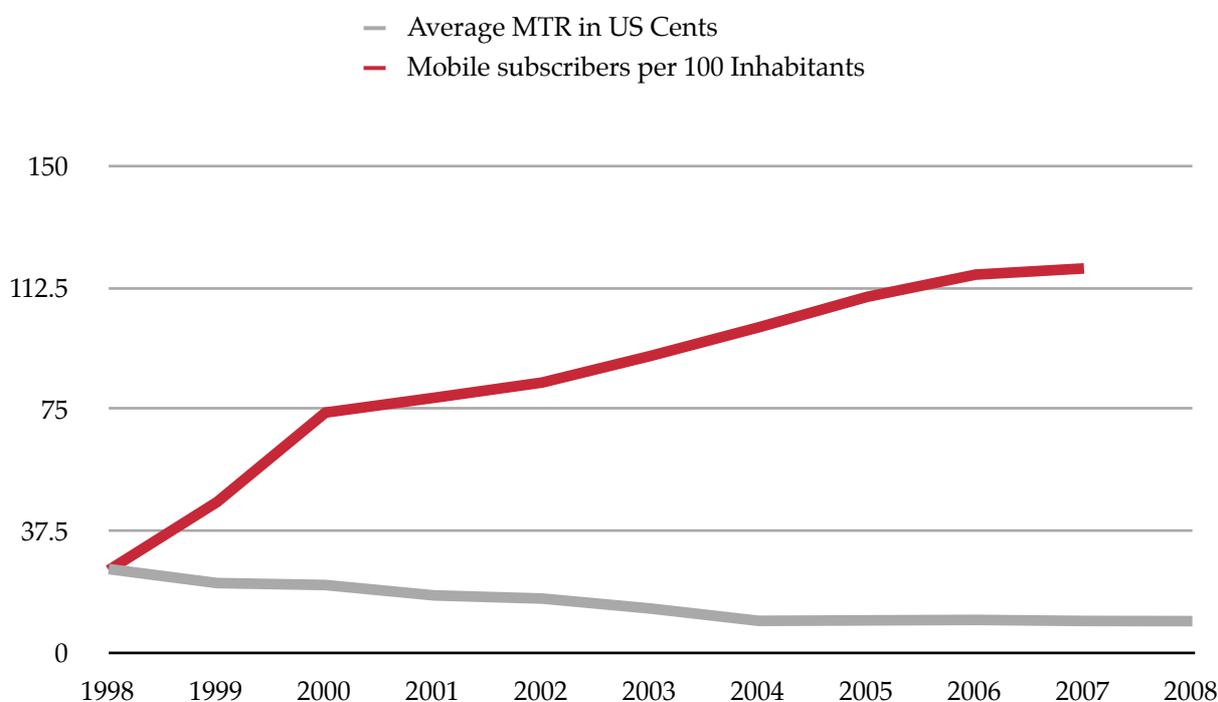


Figure 1: UK MTR vs subscriber per 100 inhabitants (source: OVUM and ITU)

⁸ For the financial year ending in 2008: MTC Namibia 11.2%, Leo Namibia, 9.8%, Telecom Namibia, 6% (NCC, 2009), Vodacom South Africa, 2009: 18.2% (Vodacom, 2009)

An earlier Frontier Economics report for incumbent mobile operators, July 2008, investigates the likely consequence of drastically reduced MTRs below efficient cost termination rates. It concludes that consumers would not be better off and that the level of subscription would drop due to higher retail prices: "The lower level of subscription is the result of higher retail prices, as the cost of incoming calls are not covered by termination revenues." However no one proposes to set termination prices below the efficient termination cost, and the historical evidence clearly contradicts Frontier's claim. MTRs have come down in Europe for the last 10 years and countries have not experienced lower subscriptions, nor reduced call volumes, nor increased retail rates. Even countries that used zero termination rates (for example France) did not witness a decline in subscriber numbers or lower usage.

In fact, the opposite has been the case, lower mobile termination rates were accompanied by growing subscriber numbers and traffic. Figure 1 demonstrates this for the UK for mobile subscribers per 100 inhabitants and MTRs in US cents.

It is possible that active SIM cards could drop due to a lowering of mobile termination rates if that reduces the need to own two SIM cards due to excessive off-net calling prices. However, that would only reduce active SIM cards but not the actual number of users. Incumbent operators have been eager to report on SIM cards and not on subscriber numbers for this reason. The drop in subscriber numbers that South African operators, in particular predict, are usually based upon active SIM card reductions and not real user numbers.

Table 1 shows that retail prices have not increased following termination rate reductions but decreased. All 21 countries had lower retail prices in 2008 compared to 2006 and all 21 countries saw termination rate reduction during the same period. Table 1 underestimates retail price reduction though, since the OECD price basket methodology only captures the prices of dominant operators. Only operators that have 50% market share or more are included. If no single operator has 50% market share then the biggest operators are chosen that together reach 50%. Dominant operators have, however, the least incentive to reduce costs. New entrants that need to gain market share are more likely to pass the cost savings from lower termination rates on to their subscribers in form of lower off-net call prices.

Table 1: Changes in low mobile usage baskets prices compared to changes in MTR (Source: OECD, 2007; OECD, 2009; ERG, 2006; ERG, 2008a)

	OECD Mobile low user basket, August 2006, VAT included US\$ PPP	OECD Mobile low-usage basket, August 2008, VAT included US\$ PPP	ERG 2006 Mobile Termination rates in Euro	ERG 2008 Mobile Termination rates in Euro	2008 price expressed as 2006 price	2008 MTR expressed as 2006 MTR
Austria	193.43	148.26	0.1121	0.06	77%	54%
Belgium	175.51	146.92	0.1397	0.087	84%	62%
Denmark	68.82	50.31	0.1134	0.085	73%	75%
Finland	99.89	60.31	0.079	0.053	60%	67%
France	239.68	216.49	0.098	0.069	90%	70%
Germany	123.55	104.55	0.1139	0.082	85%	72%
Greece	302.47	202.46	0.1248	0.1	67%	80%
Hungary	230.48	217.08	0.1071	0.086	94%	80%
Iceland	142.61	117.61	0.1212	0.079	82%	65%
Ireland	202.95	149.95	0.1054	0.099	74%	94%
Italy	233.39	195.23	0.122	0.108	84%	88%
Luxembourg	112.84	107.59	0.14	0.09	95%	64%
Netherlands	119.63	105.02	0.114	0.094	88%	82%
Norway	111.2	86.72	0.0885	0.084	78%	95%

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	OECD Mobile low user basket, August 2006, VAT included US\$ PPP	OECD Mobile low-usage basket, August 2008, VAT included US\$ PPP	ERG 2006 Mobile Termination rates in Euro	ERG 2008 Mobile Termination rates in Euro	2008 price expressed as 2006 price	2008 MTR expressed as 2006 MTR
Poland	209.79	147.94	0.1352	0.107	71%	79%
Portugal	178.44	153.8	0.1171	0.11	86%	94%
Slovak Republic	255.4	241.62	0.1046	0.068	95%	65%
Spain	258.02	250.8	0.1131	0.071	97%	63%
Sweden	87.92	77.69	0.0783	0.046	88%	58%
Switzerland	145.11	111.03	0.1515	0.114	77%	75%
UK	170.53	160.4	0.087	0.077	94%	89%

Only when dominant operators begin to lose subscribers to the new entrant in large numbers are they likely to reduce prices. This pass through or the lack of it, is also used as an argument against lowering termination rates to the cost of an efficient operator (Sandbach, 2007b). The argument is: why lower termination rates if the cost saving is not passed on to the consumer anyway? The answer to that is twofold. First, termination rates at the cost of an efficient operator remove the subsidy from one operator to another. Secondly, if cost savings are not passed on then further regulatory remedies might be required to increase competition within the sector.

Two-sided market argument

Mobile call termination is frequently interpreted as one side of a two-sided market and the waterbed-effect is a predicted outcome of a two-sided market. The two-sided argument is used by those operators benefiting from high termination rates and rejected by those who are net sender and payers. Both sides of this argument are used by multinational operators where they experience different positions of dominance in different markets so that may defend high termination rate in one country and ask for cost based termination rates in another. Operators might even change their arguments if changes in user profiles or other circumstances lead to a reversal of net-termination flows.

However, any of the two sided market models fails to predict market outcomes correctly and waterbed effects cannot be empirically observed following termination rate cuts. Evans (2007) states that two fundamental principles apply for price setting in two sided markets:

- Interdependent prices: Price are determined interdependently, i.e. changing the price for the one side will change the price of the other side.
- No Cost causation: No direct link between incremental cost for a good or service and the price.

Neither can theoretically nor empirically be shown. The next sections will make this point from various angles.

Various definitions are being used for call termination being a two-sided market, each with severe weaknesses (see table 2). The Sandbach (2007a) and Evans (2007) definitions ignores the fact that an operator has only limited influence over the price other operators can charge for calls to their own network. If network A and B agreed to a termination rate x , then B could charge any amount $x+a$ to its subscribers. B could in theory price calls to A so high that A receives very little termination revenue from B. A would hence not be able to subsidise retail prices for its subscribers through termination revenues. Setting termination rates would only restrict off-net prices of competitors downwards not upwards. Price elasticity for calls from other networks is a function of the off-net prices of other networks, which may or may not be influenced by termination rates. Traffic between networks depends on several factors, many of them that an operator cannot control, such as user profiles, market share and the off-net prices of the other operators.

Table 2: Two-sided market definitions

Author	1st Side	2nd Side	Comment
Sandbach (2007a) Evans (2007)	Providing telecommunication services to own subscribers: Prices = on-net, off-net, to fixed-line	Providing connectivity to own subscribers base for users of other networks: Prices = MTR	Operator has little control over calls received from other networks due to off-net prices of other networks and user profiles of own and other network users.
CentrePiece (2007)	Subscriptions: access price = handset + Sim	Outgoing Services: price = retail prices	Definition ignores that access price is once-off and usage price change frequently
Hausman & Wright (2006)	Mobile subscribers	Fixed-line callers	Operator has little influence over retail prices of fixed-line operator. MTR only defines downward barrier.

However, assuming that A could cause a net flow in interconnection fees from B and use that to subsidise retail prices for its subscribers, what then happens to the subscribers of B? Could the mobile telecommunication market be two-sided for one operator and one sided for another? Could the two-sidedness change over time? Both can clearly be rejected.

Hausman & Wright (2006) define the one side of the market as mobile and the second side as fixed-line subscribers. In a Calling Party Pays environment (Africa and Europe) the subscriber does not pay for receiving calls. The operator cannot set prices for the second side of the market. The operator has little influence over the price of the fixed-line operator.

The CentrePiece (2007) defines access as one side and usage as the second side of a two-sided market, ignoring that access is a once-off price and usage a price that changes frequently, which excludes interdependability.

Let's assume for a moment that there are two markets according to the Sandbach (2007a) and Evans (2007) definition:

- Market A Mobile off-net termination
- Market B Mobile origination and on-net termination

The first argument why that might be a two-sided market is that high termination rates subsidise access for poor users. Since termination rates have decreased all over the world yet subscriber numbers have increased, the opposite effect to the one predicted by two-market theory has actually been the case (Figure 1).

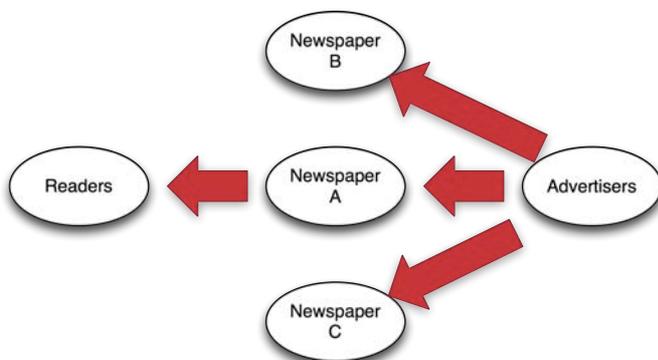
The second argument is about prices, higher prices for the one side of the market allows lowering the prices for the other side. Here too the opposite has been the case. Lower termination rates were not followed by increases but decreases in retail prices (Table 1).

Call termination is a complex matter with competitive consequences for the performance for the sector. However, the saying "sell a lot cheaply or a little dearly" ...still holds generally. Lower MTRs will lead to lower off-net prices of new entrants and smaller mobile operators, which will reduce their off net prices to compete with the on-net prices of dominant operators to gain market share. That will lead to more termination traffic for the dominant mobile operators. Dominant mobile operators would prefer to sell less dearly since it entails the hidden benefit of protection from competition. High MTRs require high off-net retail rates for small operators, which makes it expensive to move from a larger to a smaller operator since this will tilt the relationship between on-net and off-net calls.

Valletti (2006) gave the example of newspapers that can sell their newspapers cheaper to gain a larger readership and then sell the advertising space more dearly. However, the advertising market is competitive and the price is being driven by demand and supply. The larger the readership the more will a newspaper be able to charge advertisers.



That is not true for call termination, where the prices are fixed though contracts. There are no equilibrium termination prices since they are determined by contracts between operators and only change if regulators intervene or every operator benefits from changing them. Each interconnection agreement can be seen as a pareto efficient equilibrium. Operator A cannot be better off without operator B being worse off, no matter how economically inefficient the interconnection arrangement. A operator cannot simply increase the MTR because its subscriber base grew.



Also advertisers cannot only choose between a various daily newspapers but also weekly ones and monthly magazines or even chose to advertise on TV or radio instead. Some newspapers can further

charge high advertising fees despite small readership due to the average income of the readers like The New Yorker for example.

Mobile termination is a monopoly and callers cannot choose on what network a call needs to be terminated when calling a particular person.

Continuing with the Sandbach (2007a) definition, let us assume a situation with two mobile operators. Mobile operator A has a market share of 80% and operator B of 20%. Reducing MTRs to the cost of an efficient operator could have the following outcome:

- Operator B: Reduces its off-net prices to make it more attractive for subscribers of A to move to B, while maintaining its profit margin by passing on the reduction in MTR to its subscribers. This will also generate more outgoing calls to A subject to the price elasticities of B’s subscribers.
- Operator A: Can pass on the cost saving in termination rates or keep off-net prices constant. In the latter case the profit from each outgoing minute increases. Outgoing traffic will increase should the operator drop its off-net rates, subject to the price elasticity of A’s subscribers.

A has the choice to make more money on each minute of outgoing calls and to sell the same as before or maintain its profit margin for outgoing calls and sell greater volumes. The disincentive to leave the larger and join the smaller network is reduced through lower termination rates and lower off-net rates of operator B. Why should A now increase its on-net rates? It would provide even more incentive for its subscribers to move to B. Which option A chooses, whether it will be more profitable to pass on the cost saving in termination to its subscribers or to benefit from higher profit margins for outgoing calls will depend on many market factors and strategic considerations. A key factor will be the attractiveness of B for subscribers of A. Should A lose customers to B in large numbers it could opt to reduce its off-net rates as well or even its on-net rates. Should B still be unattractive for subscribers of A (lack of number portability, lack of coverage etc.) then A would most likely not change any of its prices. In that case the higher profit margin from outgoing calls should compensate for the lower termination rate.

Table 3: Operator’a A choice if B drops off-net prices

		Operator B (20% market share)
		Reduce off- net prices
Operator A (80% market share)	Passes MTR reduction on to subscribers = lower off-net prices	More traffic from B (more minutes at cost) More traffic to B (more minutes, same profit margin)
	Keep off-net prices unchanged	More traffic from B (more minutes at cost) Same traffic to B (same minutes, higher profit margin)

However, this example represents only the simplest case. Any decision reacting to a drop in MTR would depend on market share of operators, customer composition, regulatory environment and many other factors. The complexity increases exponentially when adding fixed-line operators and more mobile operators. Pro-competitive regulatory interventions like local loop unbundling, national roaming, infrastructure sharing, number portability will equally increase the complexity exponentially.

This can be demonstrated with a outcome matrix for two mobile operators. In this example the decision each operator has to take is to either increase or decrease or keep prices constant for off-net and on-net calls following a MTR cut. In this highly simplified scenario are already 81 outcomes (see table 4). Adding a third mobile operator would lead to 729 outcomes. Adding fixed-line operators and hence another set of prices, several products for each operator for which prices are set individually and allowing price increments in percentage steps pushes the number of possible outcomes up exponentially.

Strategists within operators are likely to deal with that complexity with gut feeling and play it by the ear, adjusting as the consequences are being observed.

The two-sided market debate, other then predicting market outcomes incorrectly, does not help to deal with such complexities. A game theoretical approach is likely to predict the obvious: Cost-based termination rates increase the competition between operators and hence lead to lower retail prices, more subscribers and more investment - particularly in cost saving and or service enhancing technologies.

It is also possible that cost-based terminations rates do not increase competition between operators and that retail prices remain entirely unaffected. Such an outcome could be the case in a country with two mobile operators of equal market size and exchange of traffic, for example. Increasing retail prices would only be conceivable for an operator that is a net receiver of termination payment that is already operating at a loss. Such an operator could increase retail prices to limit further losses. This would, however, be likely to seal the operators fate.

Table 4: Outcome matrix for two operators following a MTR cut when decisions are limited to raise, cut or keep on-net and off-net retail prices

			Operator A								
			On-net	up	up	up	constant	constant	constant	down	down
	On-net	Off-net	up	constant	down	up	constant	down	up	constant	down
	Operator B	up	up								
up		constant									
up		down									
constant		up									
constant		constant									
constant		down									
down		up									
down		constant									
down	down										

Waterbed Effect Argument

A result of a two-sided market and an argument that is often put forward to maintain the status quo is the waterbed effect.^{9 10} The waterbed effect describes a situation where if mobile termination rates go down, some other prices need to go up, usually usage and access prices. However, this ignores the fact that operators can increase or decrease prices depending on what maximises their profit. Which strategies maximises profits depend on many factors such as market share of operators, strategy, price elasticity to name just a few. It is far too simplistic to assume that the reduction in regulated prices will automatically mean increasing prices in other areas.

Concern has been raised that forcing prices down in regulated segments might lead to higher prices in unregulated segments of the market. This is unlikely because the unregulated segments are likely to be unregulated because they are competitive. In any case, fear of excessive pricing in one segment is not enough reason to allow excessive pricing in another.

Table 5: Predicted vs actual outcomes of termination rate reductions

Author	Access & Usage Prices	Subscriber Numbers
Predicted outcome	go up	go down
Actual outcome	go down	go up

Genakos & Valletti's (2009 and 2007) evidence regarding increasing retail prices following MTR reductions is contrary to the evidence (see Figure 1 and Table 1). Neither access nor usage prices increased in response to MTR reductions in the EU. In fact the opposite is the case. Increased competition brings down access and usage prices as MTRs approach the cost of an efficient operator. The findings of Genakos & Valletti (2009 and 2007) are more likely due to weaknesses in the data used. The data shortcomings are discussed in another section.

⁹ See for example Centre Piece (2007): "pressing down prices in one part of firms' operation causes another set of prices to rise." "Of course, the reverse is also true: if regulation reduces termination charges and hence revenues, operators will have to raise their prices to subscribers."

¹⁰ Sandbach (2007c) states that a optimal MTR would at least need to be twice the termination cost due to the waterbed effect.

High MTRs protect against competition

Dominant mobile operators can use high MTRs to defend their markets share against new entrants. High MTRs must mean high off-net rates for the new entrant, making it expensive for a subscriber to change service provider from the larger to the smaller network.

The dominant mobile operator can also starve the smaller mobile and the fixed-line operator by combining high MTRs with high off-net and fixed-line retail charges, causing net interconnection outflows from the new entrant and the fixed-line operator.

The Genakos & Valletti (2009 and 2007) papers, demonstrate that EBITDA margins may be affected by lower termination rates which is to be expected since lower termination rates increase competition and lead to lower not higher retail prices. EBITDA margins of operators that were shielded by high termination rates from competition are naturally bound to decline under competitive pressure.

MTR and retail prices are not interdependent

Telecommunication operators sell a variety of products, retail and wholesale. MTRs are not interdependent with retail prices for several reasons:

- Termination rates are not prices that are being set to maximise profits but are contractual arrangements that are unlikely to change unless regulators intervene or it is in the interest of all parties involved to change them. An operator cannot increase MTR because of higher market share, for example, something that would be suggested from the newspaper example cited above.
- MTR reductions can be passed on to subscribers, which leads to a decrease in off-net prices, not an increase. Should it not be passed on then the operator makes more money for each outgoing minute compensating for the loss in the termination revenue through the MTR reduction. These are concrete choices an operator can make depending on which it thinks will be maximising profits.
- The mobile termination rate is just one price. There is the possibility of a second price if there is differentiation between peak and off-peak termination rates. Products of mobile operators are complex and operators have many products, different off-net, on-net, peak, off-peak, SMS, MMS and data prices for each product. Operators will maximise their profits and pricing strategies are complex and driven by user profiles, market niches and not by revenue replacement. Reducing prices might actually lead to more revenue and increasing prices to fewer subscribers following mobile termination rate cuts.
- Operators can only set their own retail prices but not those of other operators. Yet, the others' off-net prices will influence how many calls are being received.
- Termination rates are mostly symmetrical between mobile operators and if they are asymmetrical due to regulatory intervention, then the smaller network can charge more. Symmetrical termination rates contradict the two-sided market argument as the larger network gets the same nominal value as the smaller network.

High MTRs are subsidies within the sector

A frequently encountered argument is that access and retail prices are subsidised by high termination rates. Reducing termination rates will lead to higher prices and fewer subscribers.

As Genakos & Valletti (2009) point out, the financial benefit from high termination rates constitutes a subsidy from the fixed-line network to the mobile network or from one mobile network to another mobile network. Which network is a net receiver of termination revenue depends mainly on market size, customer composition, retail prices of all operators involved and the level of fixed and mobile terminations rates.

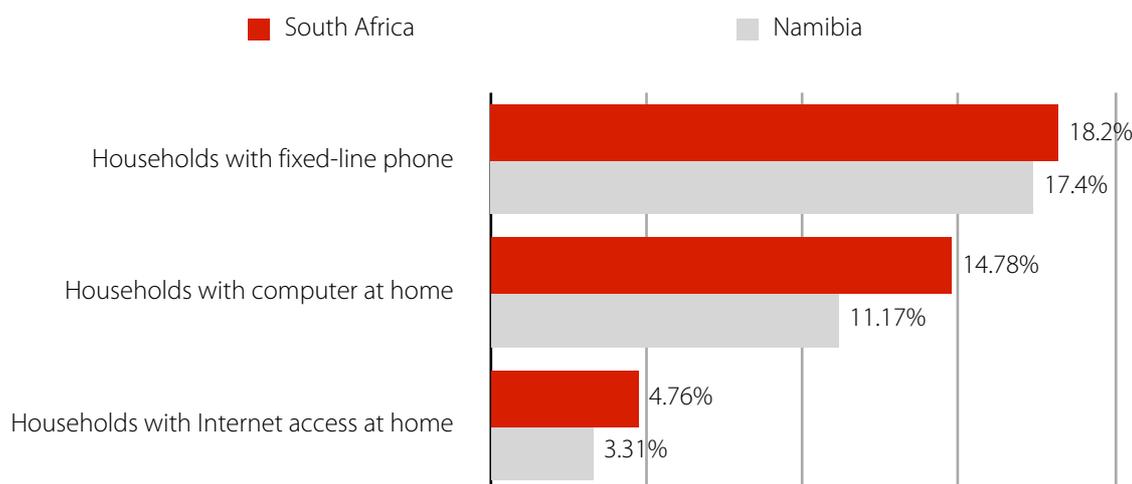


Figure 2: Fixed-line, Computer and Internet penetration in South Africa and Namibia

High mobile termination rates mean not only that fixed-line subscriber subsidise mobile subscribers but also that mobile subscribers from one network subsidise the mobile subscribers from another network. Worse, new entrants who still have to build extensive networks, subsidise usually incumbent mobile operators, which have amortised network infrastructure and achieved high economies of scale.

Subsidising subscribers at the expense of other subscribers makes no sense. Any investment related argument with regard to the waterbed effect makes equally no sense. The subsidisation that results from high termination rates is within the sector. Why should one operator be given a subsidy to role out network infrastructure at the expense of other operators?

Allowing highly profitable mobile operators to be subsidised by fixed-line subscribers contributed to the decline of fixed-line phone penetration in South Africa and Namibia. High MTR also mean that it is expensive to call mobile phones from fixed-lines, another reason for fixed-mobile substitution.

Fixed-line networks are of importance for Africa particularly in relation to providing much need affordable broadband and should not simply be sacrificed for mobile profitability .

Termination is a service to own subscribers

Providing termination services, is also a service to operators' own customers since being able to call other networks and being able to receive calls from other networks is a benefit to own subscribers. This implies that a high MTR is reducing the value the operator provides to its own subscribers by making calls to other networks as well receiving calls from other networks more expensive.

Cross country studies are unsuitable to study regulatory impact

The waterbed effect is a theoretical concept and has not been documented empirically. Neither has there been any convincing evidence that call termination is one side of a two-sided market.. The empirical studies analysing a panel of countries used to justify this argument produces highly questionable results for many reasons:

- Mobile penetration rates and mobile retail prices in a country depend on many factors such as number of fixed and mobile operators, sequence of market entry, technologies deployed, market share of operators, user profiles of subscribers of operators, disposable income, business model used by operators, penetration of substitute technologies like fixed line and cable TV, past regulatory interventions and sequence of it, regulatory strategies, communication laws and policies and many other social and economic factors. Constructing data sets with enough data points to account for such diversity is impossible. This is acknowledged by the CEG (2009) study.
- Most studies investigating the impact of MTR reduction on retail prices use of the OECD price baskets methodology, which only capture the retail prices of the dominant operators (together 50% market share). Examples for such studies are CEG (2009) and Genakos & Valletti (2009). Including smaller operators would indicate price changes following regulatory interventions better. Dominant operator

are likely to change retail prices at a slower pace if at all. New entrants that need to gain market share are more likely to pass through termination rate savings to their subscribers, in particular since this brings their off-net prices closer to the on-net prices of dominant operators.

An example of a study that deliver questionable results based on cross country comparisons is the CEG (2009) study, commissioned by Ofcom. First, it intends to contribute to the "debate about the relative performance of the Calling Party Network Pays (CPNP) and Bill and Keep (B&K) charging regimes in delivering better outcomes to consumers particularly with regard to retail prices, usage and the take-up of mobile services." Yet CPNP and B&K are not mutually exclusive. France has a CPNP regime and until 2003 B&K as well. The comparison should have been between CPNP and RPNP. On the data side, the final data set only has 3% of the data points from a B&K country - the USA out of 146 observations. This is not enough to draw any conclusion about the differences between the two billing systems. Studying India as a case study which changed from RPNP to CPNP would have revealed much better results.

Less econometrically sophisticated but more plausible would be to look into specific cases. Did Vodafone UK increase its retail prices after any MTR reduction in the UK? And how did the smaller operator or the net-interconnect-payer react?

Benchmarking Termination Rates

This section benchmarks termination rates from African countries that have cost-oriented termination rates already, as well as European termination rates. Asian termination rates (for example in India), which are usually only a fraction of those charged in Europe, have not been considered.

Selected African Countries

Five African countries were selected as case studies for this benchmarking exercise. The selection criteria were mainly that benchmarked countries needed to have conducted cost studies for setting termination rates. All five countries used consultants to conduct LRIC studies.

Uganda: Uganda is in the midst of finalising a LRIC study conducted by Price Waterhouse Coopers in terms of statutory instruments supplement No. 10 (Uganda Gazette No14 XCVIII 11 March 2005) referred to as The Telecommunications (Interconnection) Regulations, 2005. There was a second round of public consultations in March 2009. Generally, all operators have service-neutral licences, though Uganda Telecom and MTN were originally granted fixed and mobile licences. MTN is now the largest mobile operator, followed by Zain (formerly Celtel, which was the first mobile licence in 1997). Other operators include HITS Telecom, Warid Telecom and Reliance. The latter received a licence in 2008 to become Uganda's sixth mobile operator. Current rates are symmetrical between fixed and mobile and UCC anticipates that these will come down further with the current review. Voice termination, in Ugandan Shillings (UGX), is 181 (N \$0.86). There is a set discount rate of UGX30 on 5 million minutes. SMS termination rates are set at UGX30 (N\$0.14). These prescribed termination rates are ceilings but have to be applied in a non-discriminatory way. UTM recently lodged a lower rate for the new entrant, Warid. Domestic and international termination rates are currently asymmetrical but asymmetry is likely to be removed in forthcoming determination currently under review.

Tanzania: Two interconnection determinations have been made. The second determination, Review of Telecommunications Network Interconnection rates, was issued in 2007 on the basis of a consulting report by Analysys (UK) following a panel of inquiry (public hearings). At the time, six network operators were offering services, of which Vodacom had 47.8% market share, Celtel 29.1%, MIC (TIGO) 12.8%, Zantel 7.2%, TTCL 3%, and Benson Informatics Ltd 0.1%. Outgoing calls are not subject to regulation because call termination agreed commercially with operators in foreign countries over which Tanzania does not have jurisdiction, though incoming international calls that transit through a gateway in Tanzania and terminate on networks over which it does have jurisdiction are subject to regulation. Tanzania prescribes the same ceilings for fixed and mobile termination rates. Tanzania's reasons were twofold. First, only 1.3% of the outgoing off-net mobile traffic goes to fixed lines. Secondly, most retail mobile tariffs do not distinguish between fixed and mobile. As a result there is a single voice termination glide path determined in US\$ but paid in Tanzanian Shillings (TZS). No SMS or other data rate set. The current determination prescribes a glide path that reduces termination charges over a four year period to US\$0.07.

Table 6: Mobile and fixed termination ceilings for Tanzania (Source: TRCA)

	2008	2009	2010	2011
US \$	7.83	7.65	7.49	7.16
N\$	0.64	0.63	0.61	0.59

Kenya: Operators include Telecom Kenya, Orange, Zain, Econet Wireless and Safaricom. Orange offers fixed and mobile services. Safaricom is the biggest player in the market followed by Zain (formerly Celtel) and Econet Wireless. There are also two local loop operators. In 2006-2007 Analysys (UK) was commissioned to conduct an assessment of interconnection rates for Kenya using LRIC. Implementation in 2007 on the basis of a determination by the Communications Commission of Kenya proposed to reduce the mobile-to-mobile rate, then of Kenyan Shillings (KES) 10. The intention was to reduce it in the first year to KES 8, but one operator was already offering a retail rate of around KES 8, so in the first year they started with the second year target. The mobile termination ceiling prices for commercial agreements can be negotiated "in a non-discriminatory manner". There are no agreed discount rates. Fixed termination rates are dependent on single or double tandem. Fixed to mobile and mobile to fixed is treated as single tandem and set at KES 1.65. Double Tandem Termination is set at KES 4.35.

Table 7: Mobile and fixed termination ceilings for Kenya (Source: CCK)

		2007	2008	2009
MTR	KES	6.28	5.27	4.42
	N\$	0.74	0.63	0.52
Fixed to mobile and mobile to fixed: Single Tandem	KES			1.65
	N\$			0.20

Mozambique: In Mozambique interconnection rates were symmetrical based on international benchmarks for the period 2003 to 2007. In 2007, INCM contracted Mr. Matthias Halfmann, an interconnection expert who worked together with INCM and TDM, MCell and Vodacom Mozambique to develop a cost model based on long-run incremental cost (LRIC). The interconnection regulation in Mozambique requires that interconnection rates shall be determined using a LRIC cost model. Based on the data collection from each of the operators involved in the interconnection of the networks, Mr Halfmann developed a LRIC cost model and calculated the asymmetrical interconnection rates to be implemented for 2008 and 2009. The interconnection regulation in Mozambique foresees that the interconnection rates shall be revised every two years to reflect changes in the market. As a result, a cost model was developed and a gradual (glide path) implementation of asymmetrical rates was agreed upon by operators.

Table 8: Mobile and fixed termination ceilings for Mozambique (Source: INCM)

		2008	2009
TDM	MT	0.9	0.95
	N\$	0.30	0.32
MCell	MT	2.59	2.42
	N\$	0.87	0.81
Vodacom	MT	2.98	3.10
	N\$	1.00	1.04

Botswana: Botswana Telecommunication Corporation is the *de facto* monopoly fixed-line provider in Botswana. This was part of the rationale for it not initially receiving a mobile licence when Mascom and Orange were granted mobile licences. It has subsequently been granted a mobile licence (beMobile). Botswana contracted McCarthy Tetrault and Analysys UK in 2004/5 to develop a cost model and pricing framework for the telecommunication sector. The recommendations were price ceilings for mobile and fixed termination rates. It is currently conducting a market study with the assistance of Analysys UK, which we will include in a review of termination rates.

Table 9: Mobile and fixed termination ceilings for Botswana in 2009 (Source: BTA)

	Peak	Off-Peak	Average
Average (unweighted) MTR in Pula	0.63	0.55	0.59
N\$	0.76	0.67	0.71
Average (unweighted) FTR in Pula	0.17	0.17	0.17
N\$	0.21	0.21	0.21

Table 10: Termination rates and cost models for selected African countries, first quarter 2009

		Botswana	Mozambique	Tanzania	Kenya	Uganda
Cost Model		LRIC	LRIC	LRIC	LRIC	FDC
Consultants		Analysys/ McCarthy Tertault	Matthias Halfmann	Analysys	Analysys	PWC
Year of last review		2005	2007	2007	2007	2005, currently ongoing
Local currency		Pula	MT	US cents	Kenya Shilling	Uganda Shilling
2009 MTR	Local currency	0.59	2.42 (MCel)	7.65	4.42	181
	N\$/ZAR	0.71	0.81	0.63	0.52	0.86
2009 FTR	Local currency	0.17	0.95	7.65	1.65	181
	N\$/ZAR	0.20	0.32	0.63	0.20	0.86
Can negotiate lower rates?		Yes, ceiling	No, fixed	Yes, ceiling	Yes, ceiling	Yes, ceiling
Further reductions planned?			Yes	Yes		MTR below N\$0.3 expected with current review
MTR – FTR Symmetry		No	No	Yes	No	Yes
Asymmetric MTR		No	Yes	No	No	Yes (Warid)
Termination rates are ceilings that have to be applied in a non-discriminatory way?		Yes	No	Yes	Yes	Yes
Source		BTA	INCM	TRCA	KCC	UCC

The table above compares mobile termination rates and the way there were derived for Botswana, Mozambique, Tanzania, Kenya and Uganda in local currency as well as in N\$. Uganda and Mozambique

have the highest MTRs and both countries are in a review process at the moment (as is Botswana). Both countries also use asymmetric mobile termination rates to facilitate market entry. Tanzania and Uganda have converged MTRs and FTRs. Draft calculations for Uganda's review suggest termination prices will be reduced to UD\$0.03 (source: UCC).

European Union

The European Regulators Group (ERG) compiles mobile termination rates (MTR) for EU countries based on an average of mobile termination charges for each operator in a country, weighted by subscriber numbers. Generally, MTRs are set above cost. The distance to cost varies considerably from country to country within the EU, even though MTRs in Europe are cost oriented. The table below lists the MTRs for 2008. The countries with the lowest mobile termination rates were Cyprus, Sweden, Finland, Austria and Slovenia.

Table 11 Mobile Termination rates in 2008 in EUROS (Source: ERG, 2008a)

Country	Population density 2006	Mobile termination rates		
		Peak	Off-peak	Total
Cyprus	83.50	0.020	0.020	0.020
Sweden	22.10	0.046	0.046	0.046
Finland	17.30	0.053	0.053	0.053
Austria	99.50	0.060	0.060	0.060
Slovenia	99.60	0.064	0.064	0.064
Romania	93.90	0.068	0.068	0.068
France	99.90	0.069	0.069	0.069
Spain	87.20	0.088	0.055	0.071
United Kingdom	250.00	0.077	0.077	0.077
Lithuania	54.20	0.104	0.052	0.078
Iceland	3.00	0.079	0.079	0.079
Germany	230.70	0.082	0.082	0.082
Norway	15.30	0.084	0.084	0.084
Denmark	126.20	0.085	0.085	0.085
Hungary	108.30	0.086	0.086	0.086
Belgium	347.80	0.087	0.087	0.087
Estonia	30.90	0.088	0.088	0.088
Latvia	36.70	0.088	0.088	0.088
Luxembourg	182.80	0.096	0.083	0.090
Netherlands	483.80	0.094	0.094	0.094
Malta	1,287.80	0.096	0.096	0.096
Ireland	62.30	0.127	0.072	0.099

Country	Population density 2006	Mobile termination rates		
		Peak	Off-peak	Total
Greece	85.20	0.100	0.100	0.100
Poland	122.00	0.107	0.106	0.107
Italy	199.70	0.108	0.108	0.108
Croatia	78.50	0.111	0.105	0.108
Portugal	114.90	0.110	0.110	0.110
Slovakia	110.00	0.113	0.113	0.113
Switzerland	187.10	0.114	0.114	0.114
Czech Republic	132.90	0.126	0.126	0.126
Bulgaria	69.40	0.159	0.142	0.151

ERG suggests that regulators complement the bottom-up LRIC model with best practice benchmarking based on weighted average MTRs of the five lowest countries.¹¹ That benchmark would have been in 2008 the average MTR of Cyprus, Sweden, Finland, Slovenia and Austria, weighted by subscribers.

The general trend of bringing termination rates gradually down to cost continues. Several new developments have taken place since ERG published its last MTR snapshot. The UK, France, Austria and Finland reduced their termination rates and published new glide-paths.

UK: Ofcom released the “Mobile Call Termination – Amendment to SMP Service Conditions” on 2 April 2009. The UK Competition Commission had determined that the charges for connecting to O2, Orange, T-Mobile and Vodafone networks should be reduced to 4.0 pence (in 2006/7 prices) per minute by 2010/11. The Competition Commission also determined that the charge for connecting to the H3G network should be reduced to 4.4 ppm (in 2006/7 prices) by 2010/11.¹² Ofcom implemented the directive from the Competition Commission through its amendment.

Austria: The Telekom Control Commission (TKK) determined that mobile termination rates have to be cut to 2 Euro cents per minute by 1 July 2011. The first cuts will be made retroactively with calls terminated between 1 July and 31 December 2008 being charged at 5.7 Euro cents per minute. For the period 1 January 2009 to 30 June 2009 the rate will drop to 4.5 Euro cents per minute. The rates will then decrease incrementally every six months until 1 July 2011. TKK says that the wholesale reductions will be passed on to the consumer and that fixed-line operators will benefit as well. The MTR reductions are in line with the recommendations of the EU and aim to reduce economic distortions currently caused by too high MTRs.¹³

Finland: The Finnish Communications Regulatory Authority (FICORA) has announced that the three major mobile operators have agreed on new mobile interconnection charges, introducing symmetric prices in December 2009 at 4.9 Euro cents. The MTR will fall to 4.4 Euro cents per minute in December 2010. FICORA has stated that it expects to see further rate cuts in 2011.¹⁴

France: The French regulator ARCEP determined that MTRs for Orange and SFR should be reduced to 3 Euro cents by July 2010 and to 4 Euro cents for Bouygues Telecom. ARCEP estimates termination cost will reach 1 or 2 Euro cents in the next couple of years based on a LRIC model. The EU Commission endorsed the regulatory measures. “ARCEP’s overall approach is to reduce termination rates towards the long-run

¹¹ Source: Interview with Annegret Groebel, Managing Director BNetzA, i/ERG Chair 2009

¹² http://www.ofcom.org.uk/consult/condocs/mobile_call_term/CTMAmendment2009final.pdf

¹³ <http://www.rtr.at/de/pr/PI21042009TK>

¹⁴ http://www.ficora.fi/en/index/viestintavirasto/lehdistotiedotteet/2009/P_13.html

incremental cost (LRIC) of an efficient operator resulting in symmetric rates which will eventually be in line with the Commission's forthcoming Recommendation on termination rates. ARCEP set the target efficient cost-based mobile termination rate between €0.01 and €0.02 per minute, to be eventually reached by all mobile operators."¹⁵

Table 12: ARCEP latest decision on MTR in Euro Cents and N\$ (Source: ARCEP and ECB)

		Jan 2008 – Jun 2009	Jul 2009 – Jun 2010	Jul 2010 – Dec 2010
Orange	Euro cents	6.5	4.5	3
	N\$	0.78	0.54	0.36
SFR	Euro cents	6.5	4.5	3
	N\$	0.78	0.54	0.36
Bouygues Telecom	Euro cents	8.5	6	4
	N\$	1.03	0.72	0.48

Ireland: Ireland's three largest mobile phone operators – Vodafone, O2 and Meteor – have agreed to reduce mobile termination rates (MTRs) by 47% over three years to 5 EURO cents. H3GI has indicated to ComReg its intention to reduce its MTRs to follow suit by 1 January 2013 in a stepped approach, to a symmetrical maximum rate per minute of 5 EURO cents.¹⁶ ComReg anticipates that the mobile operators will pass on their wholesale savings to end-users.¹⁷

India: The Telecom Regulatory Authority of India (TRAI, 2009) reduced termination charges on 9 March 2009 for all types of domestic calls (fixed to fixed, fixed to mobile, mobile to fixed and mobile to mobile) from 30 paise to 20 paise per minute. (Euro cents 0.47 to 0.31; from N\$0.057 to N\$0.038)

¹⁵ <http://www.itu.int/ITU-D/ict/newslog/Viviane+Reding+Welcomes+French+Plans+To+Lower+Mobile+Termination+Rates.aspx>

¹⁶ http://www.comreg.ie/publications/comreg_secures_reductions_in_termination_charges_from_mobile_operator_3.583.103357.p.html

¹⁷ www.WirelessFederation.com/news/

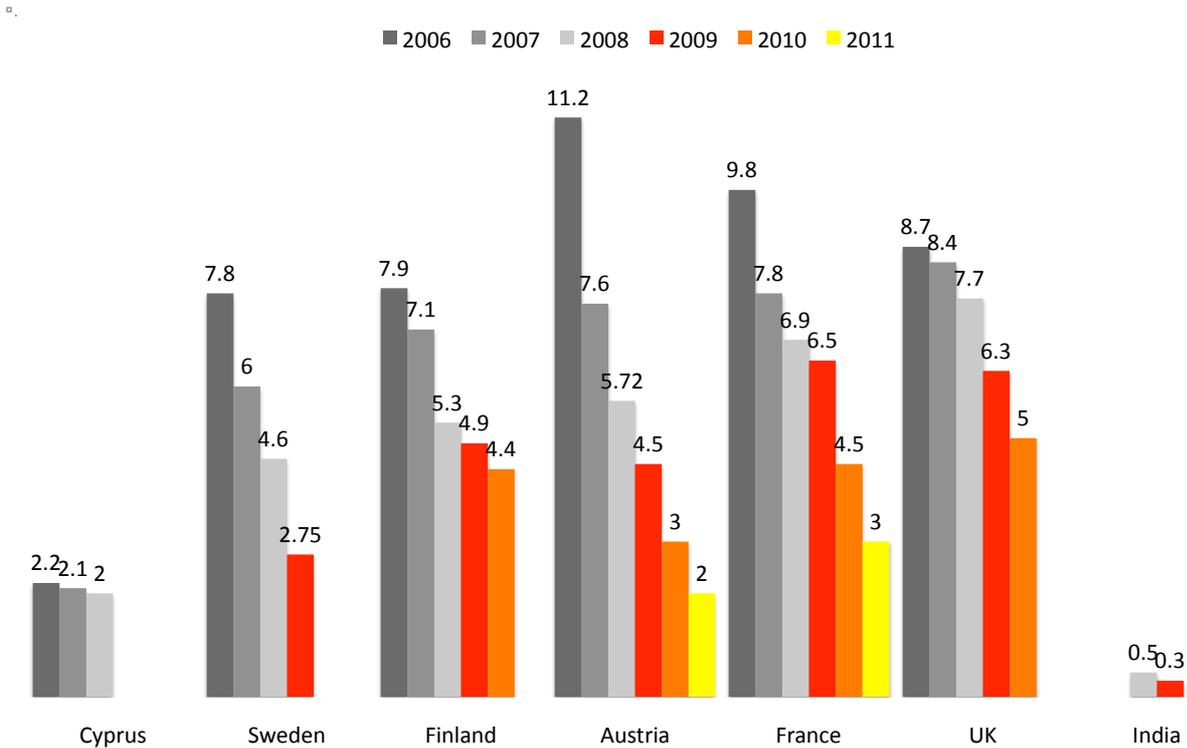


Figure 11: MTR Trends in Euro cents (Source: ERG, Ofcom, ARCEP, RTR, FICORA)

International comparison indicates that Namibia’s mobile termination rates are very high. Generally, MTRs are still far away from cost of termination in Europe and elsewhere. The international trend for mobile termination rates is towards the cost of an efficient operator. Austria and France see this at between 1 and 2 Euro cents (N\$0.12 to 0.24). Namibia’s termination rates should equally aim towards that. The mobile licence of MTC and Leo required the MTRs to be cost-based, transparent and sufficiently unbundled.

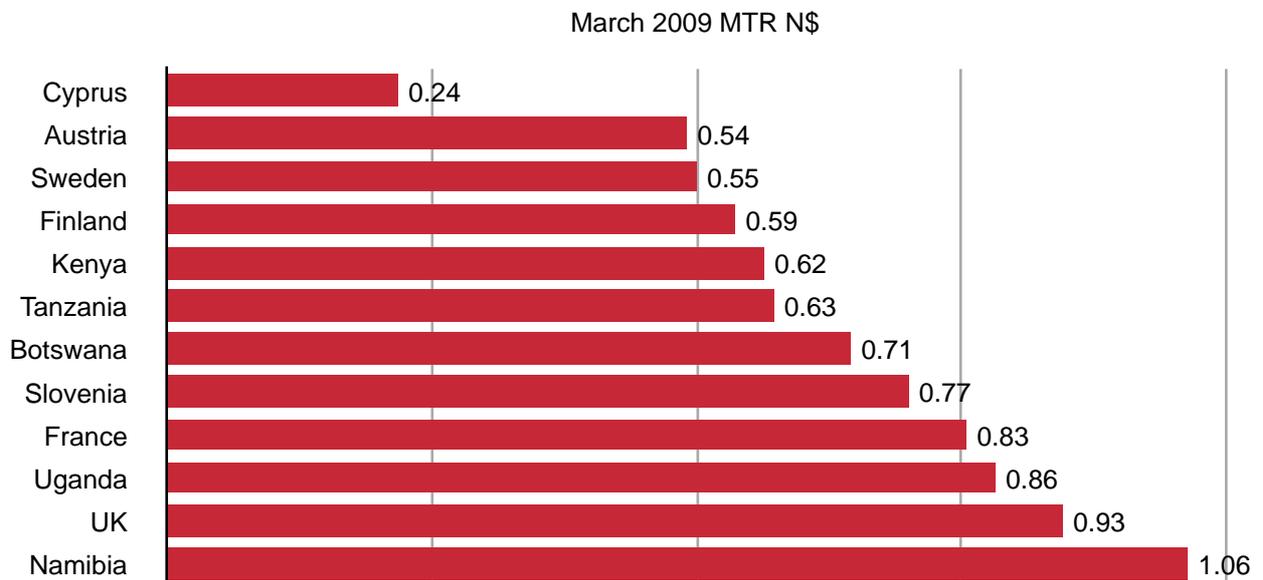


Figure 12: Mobile termination rates in N\$ compared (annual average exchange rate for 2008)

Benchmarking Cost of Termination

To derive cost-based benchmarks for termination rates for Namibia it would not be enough to look at termination rates in other jurisdictions. The previous chapter demonstrated how heterogeneous mobile termination rates are across Europe. The trend is towards termination rates that are equal to the cost of an

efficient operator, but most European countries will only get there in 2011 or later. Another aspect is taking into account country-specific cost factors. Namibia is sparsely populated and MTC has always argued that the cost of termination is higher because of that. Looking at termination rates in Europe tells us very little about the link between population density and termination rates, let alone cost of termination.

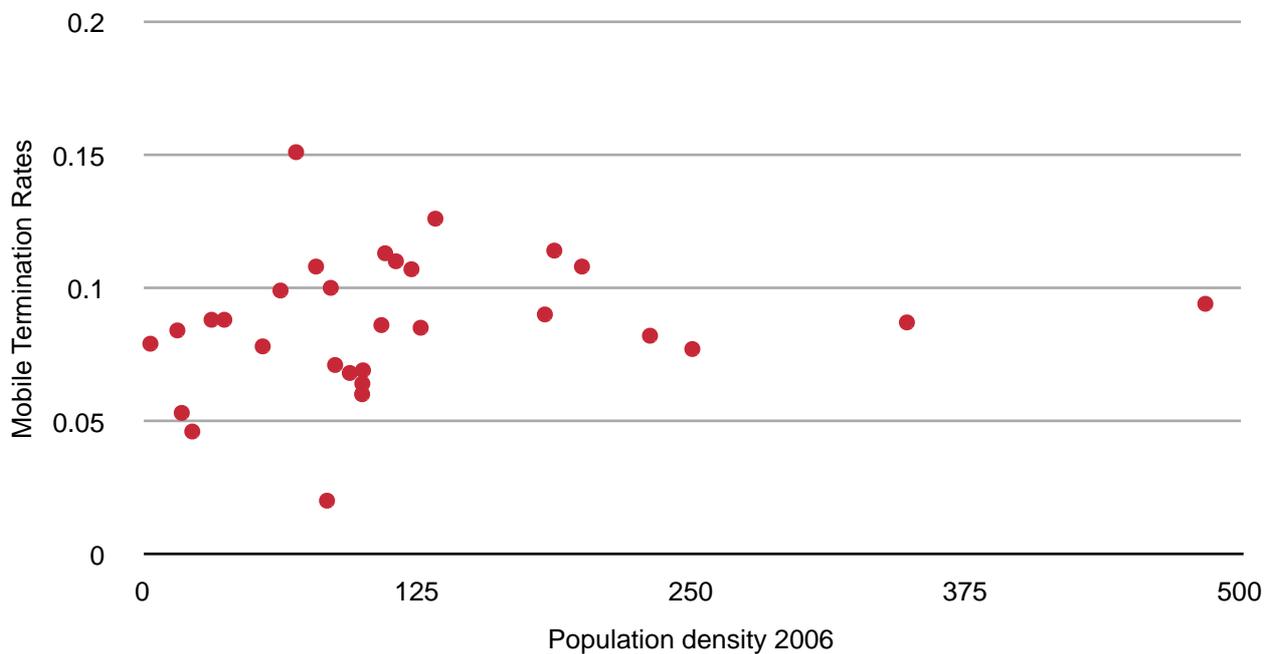


Figure 13: Population density plotted against mobile termination rates (Source: ERG)

The figure above shows that there is no correlation between population density and MTRs in Europe. Countries like Sweden and Finland, which have among the lowest population densities, are also among the five countries with the lowest MTR.

Population density is not necessarily correlated with termination costs in most countries, for a variety of reasons. Some costs are lower in rural areas, e.g. wages, smaller volumes of traffic but larger cell sizes and less costly traffic management. Users in concentrated areas are mobile and want service when they travel to rural areas. Systems are constructed to provide for cross border links and international traffic. Costs may be higher in many African countries than in Europe because of equipment prices, which are often subject to import duties/taxes, but other costs may be lower such as labour and site costs.

Constructing cost-based termination rates therefore requires costs to be benchmarked. Cost data is very difficult to come by and most regulators and operators consider it highly confidential. Cost data from Austria, Sweden, Tanzania, Australia and France were made available by regulatory authorities to the NCC for the purpose of this study.

Tanzania

Analysys UK conducted two LRIC cost studies for Tanzania in 2004 and 2007. Following a panel of inquiry the Tanzania Communications Regulatory Authority issued the Interconnection Determination No.2 with the following key points (TCRA, 2007):

- The value of Weighted Average Cost of Capital (WACC) is 22% in the final model.
- The interconnection rates are in USD, but settlement will be made in Tanzania Shillings (TZS) based on a weighted average exchange rate as provided by the Bank of Tanzania for the previous 12 months to 15 December.
- The Converged Licensing Framework (CLF) issued by TCRA in February 2005 is technology neutral and service neutral. The result is that there will only be one single termination rate for all types of networks irrespective of service and technology used.

- Alignment of fixed and mobile termination rates, based on the facts that on average only 1.3% of the outgoing off-net mobile traffic goes to fixed lines, that most retail mobile tariffs make no distinction between outgoing calls to fixed lines and other mobiles, and that the CLF is service neutral, making no distinction between fixed and mobile.
- Outgoing international calls are not subject to regulation because an international gateway operator must pay an international carrier to terminate a call in a foreign country.
- Incoming international calls transit through an international gateway within Tanzania and terminate on a national network, irrespective of their origin, falling within the scope of the regulation and this determination (i.e. they have to comply with the termination rate ceiling).

The cost of termination for a new entrant in a converged environment is given in the table below in real USD and nominal USD prices. The cost includes LRIC plus an equi-proportionate mark-up for common costs and overheads.¹⁸

Table 13: Cost of termination and MTR/FTR glide path of termination rate ceiling (Source: TRCA).

		01 Jan 08	01 Jan 09	01 Jan 10	01 Jan 11	01 Jan 12
LRIC + equi-proportionate Mark-Up (EPMU)	Real 2007 US cents	7.15	6.88	6.63	6.51	6.39
	Nominal US cents	7.30	7.18	7.08	7.12	7.16
	N\$	0.60	0.59	0.58	0.58	0.59
Glide Path for MTR &FTR & international incoming	Nominal US cents	7.83	7.65	7.49	7.32	7.16
	N\$	0.64	0.63	0.61	0.60	0.59

Austria

The Telekom-Control-Kommission of Austria commissioned a study which was finalised in December 2008. Based on a top-down approach, the study calculated the actual cost of termination from audited financial data. The regulator's stated best practice is to take the costs of the lowest cost (i.e. most efficient) operator as the basis for its price controls. These are highlighted in the table below for each year. Operator 1 was the most efficient operator for 2005 and 2006 and Operator 3 for 2007, 2008 and 2009.

Table 14: Cost of mobile termination in Euro cents and N\$, conversion based on annual exchange rate for 2008 from the ECB (Source: RTR, 2008)

		2005	2006	2007	2008	2009
Operator 1	Euro Cents	6.67	5.69	4.40	3.40	3.08
	N\$	0.80	0.69	0.53	0.41	0.37
Operator 2	Euro Cents	12.83	6.41	6.49	3.39	2.70
	N\$	1.55	0.77	0.78	0.41	0.33
Operator 3	Euro Cents	12.88	10.21	4.03	2.42	1.87
	N\$	1.55	1.23	0.49	0.29	0.23
Operator 4	Euro Cents	16.06	12.45	8.32	4.52	2.71
	N\$	1.94	1.50	1.00	0.55	0.33

¹⁸ Common Costs and overheads that are not traffic related should not be included in the cost of termination, according to the draft recommendation of the EU. Tanzania's termination rates are therefore higher compared to what could be expected if the EU definition were applied.

		2005	2006	2007	2008	2009
Operator 5	Euro Cents		11.64	8.41	8.74	
	N\$		1.40	1.01	1.05	

Sweden

Sweden's National Post and Telecom Agency (PTC) commissioned Analysys UK to conduct an upgrade to its hybrid LRIC model in 2008 (PTS, 2008). Both the fixed and mobile termination rates are regulated in Sweden, based on LRIC. As a general principle, symmetry applies for all operators regarding termination, mobile and fixed respectively. The current mobile termination rate is SEK 0.43 per minute. This level is under review and the initial indication is that there will be a significant drop by July 2009 to SEK 0.275 per minute. However, this cost result is currently subject to consultation with the industry, hence the final level, to be applicable by July 2009, will be finalised mid/late June 2009.

Table 15: Cost of mobile termination in SEK (Source: www.pts.se, www.ecb.int)

		2008-09	2009-10	2010-11	2011-12	2012-13
Based on costs of highest operator	SEK	0.358	0.275	0.227	0.201	0.183
	N\$	0.449	0.345	0.285	0.252	0.230
Based on costs of lowest operator	SEK	0.213	0.204	0.175	0.144	0.125
	N\$	0.267	0.256	0.219	0.181	0.157

The current fixed termination rate depends on the segments used. The most recent cost result can be seen in the table below. The cost of mobile termination is expected to be SEK 0.183 SEK (N\$ 0.23) for the highest cost and SEK 0.125 (N\$ 0.157) for the lowest by 2012/3.

Table 16: Cost of fixed termination for 2009 in SEK-conversion in EUROS and N\$ based on annual exchange rates (FX) of the European Central Bank (Source: www.pts.se, www.ecb.int)

Fixed Termination	SEK	N\$
Local Segment	0.035	0.043
Metro Segment	0.037	0.047
Single Segment	0.037	0.046
Double Segment	0.043	0.053
Single Transit	0.013	0.016
Double Transit	0.016	0.020

Australia

WIK Consult GMBH developed a mobile termination cost model for Australia on behalf of the Australian Competition and Consumer Commission (ACCC). The model is based on either 96% or 92% population coverage and a weighted average cost of capital (WACC) of either 11.68% or 15%. The WIK (2007) study used Total Service Long Run Incremental Cost (TSLRIC). The table below provides cost estimates for various market share scenarios. Two interesting points to be observed are:

- Cost of termination is higher than cost of origination; and
- Cost of termination declines as market share increases.

Table 17: Cost per minute (CPM) of service: Australian cents and N\$, conversion using annual exchange rates for 2008 from the ECB (Source: WIK, 2007)

Market Share	17%		25%				31%		44%			
Coverage	96%		96%		92%		96%		96%			
WACC	11.68%		11.68%		11.68%		15%		11.68%		11.68%	
	A\$ cents	N\$										
Voice on-net	13.4	0.93	10.7	0.74	10.2	0.71	11.5	0.80	9.6	0.66	8.9	0.62
Voice termination	7.3	0.51	5.9	0.41	5.6	0.39	6.2	0.43	5.3	0.37	5	0.35
Voice origination	6.4	0.44	5.2	0.36	4.9	0.34	5.5	0.38	4.6	0.32	4.2	0.29
Termination share of on-net	54.48%		55.14%		54.90%		53.91%		55.21%		56.18%	

France

The French regulator ARCEP estimates the cost of mobile termination of an efficient operator to be between €0.01 and €0.02 per minute.¹⁹ This translates into N\$0.12 to N\$0.24 using the average exchange rate for 2008.

Namibia

The table below presents a rough estimate of cost of termination in Namibia. Telecom Namibia and Leo provided the requested information to the NCC. MTC refused to provide cost data other than which is contained in its annual report. For Leo and MTC the direct costs and depreciation as indicated in the latest financial statement are divided by the total call volume. An estimate of the cost termination is 50% of that figure.

Table 18: Estimates of the cost of termination in Namibia based on annual reports and cost and traffic data submitted by operators to the NCC

	Telecom Namibia	Leo	MTC
Direct cost in N\$ '000 as per information provided to NCC	155,456		
Direct cost and depreciation in N\$ '000 as per annual report		77,962	371,219
Total minutes	537,141	31,914	775,819
Direct cost and depreciation per minute in N\$	0.29	2.44	0.48
Estimated termination cost (50% of direct cost and depreciation per minute)	0.14	1.22	0.24

MTC is, following the definitions used in the EU, the most efficient mobile operator in Namibia. Leo's cost of termination is very high due to low traffic on its network. Its termination cost would not be a suitable ceiling for the cost of an efficient operator.

¹⁹ <http://www.itu.int/ITU-D/ict/newslog/Viviane+Reding+Welcomes+French+Plans+To+Lower+Mobile+Termination+Rates.aspx>

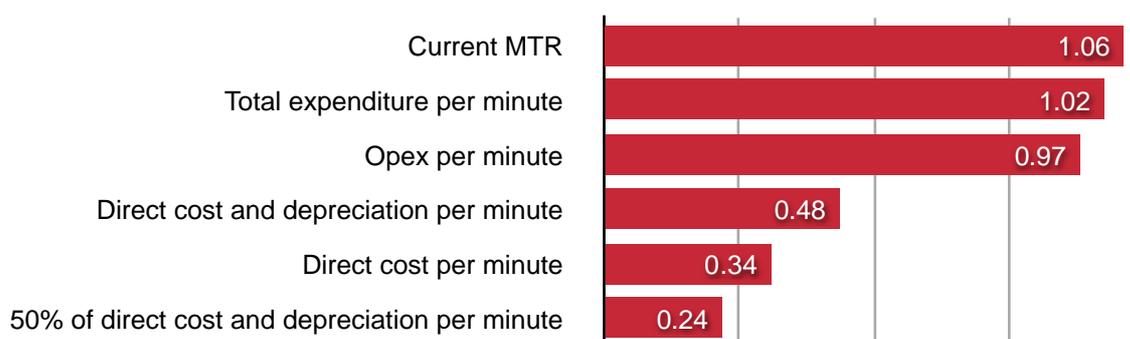


Figure 14: MTC's cost per minute (Source: MTC annual report 2008 and information submitted to NCC)

How far away current termination rates are from cost of termination can be seen from the figure above. MTC's total expenditure for the financial year ending September 2008 divided by call volume is less than the current MTR.

The average cost of termination seems to be in the region of N\$0.20 to N\$0.35. Australia has nearly identical population density to Namibia and used a model with 96% population coverage but only 44% market share. MTC has 87% market share and 95% population coverage. The figures for Australia should therefore be comparable with Namibia. Higher labour and site costs in Australia should be offset by higher minutes use per user compared to Namibia.

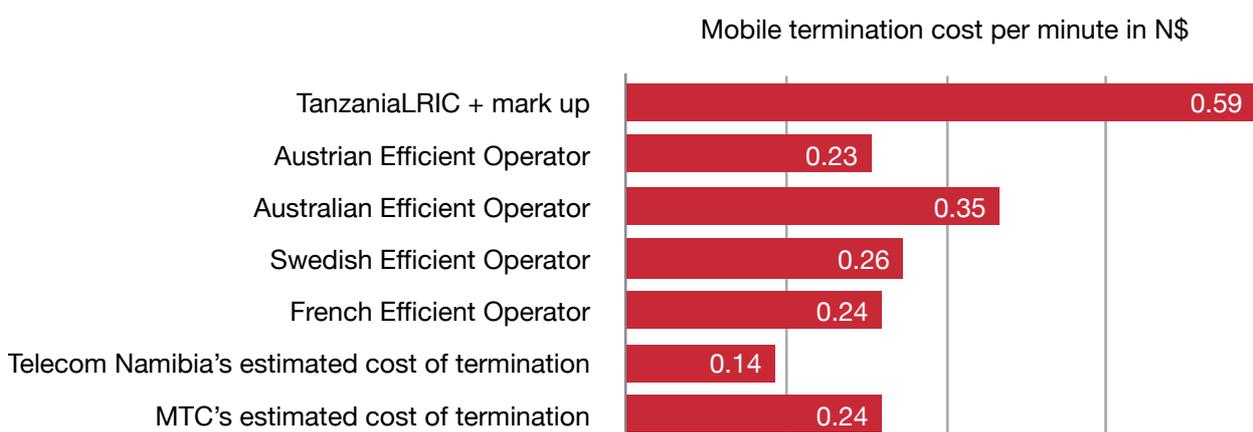


Figure 15: Cost of termination in N\$

In the absence of more detailed cost data from MTC, which it refused to provide, it would be reasonable to assume that its cost of termination would not be higher than N\$0.30, based on a LRIC model following the EU draft recommendation.

Namibian Benchmark Model

The principles for the Namibian Benchmark Model, in line with international best practice and international trends, are that:

- Termination rates should be close to the cost of an efficient operator;
- Cost of termination is determined based on benchmarking the cost of termination in jurisdictions that implemented accounting separation or other means to establish the cost of termination;
- Termination rates should be technologically and service neutral in line with Namibia's ICT policies and the anticipated new telecommunications bill and licences;
- Termination rates should facilitate emergence of IP-based NGNs; and
- Recommendation should be implemented in terms of the current licence conditions and acts.

The initial recommendation emerging from this was that the new termination target rate should be N\$0.30 based on the cost of termination of the most efficient operator, which is MTC. Facilitating fixed-mobile

convergence and migration to IP-based next generation networks, this target rate should be applicable for any voice termination regardless of technology used. Four models were proposed and discussed with operators.

- Model 1: Immediate drop to N\$0.30 starting 1 July 2009
- Model 2: Symmetric glide path to N\$0.30 that started 1 July 2006
- Model 3: Symmetric glide path to N\$0.30 starting 1 July 2009
- Model 4: Asymmetric glide path to N\$0.30 starting 1 July 2009

The proposed termination glide path for each model is a ceiling. Operators would be free to negotiate lower termination rates given compliance with their licences, which require non-discriminatory treatment.

Models 1 and 2 would have been a compromise from the side of Leo and Telecom Namibia. For Leo these models needed to be complemented by other regulatory interventions. MTC did not comment on any of the proposed models and instead suggested their own model, which was rejected by the other operators.

Table 28: Summary of operator comments

	Leo	Telecom Namibia	MTC
Model 1: Immediate drop to N\$0.30 starting 1 July 2009	2nd choice: if accompanied by other regulatory interventions	2nd choice: Removing distortionary factors immediately but request higher transit charge for outgoing international calls	No comment
Model 2: Symmetric glide path to N\$0.30 that started 1 July 2006	2nd choice: if accompanied by other regulatory interventions	1st choice: Compensates for market distortions of past years	No comment
Model 3: Symmetric glide path to N\$0.30 starting 1 July 2009	Rejected: sees no reason to wait to remove market distorting factors	Rejected: only gradually removes market distortions and disadvantages TN and consumers unjustifiably for two years longer	No comment
Model 4: Asymmetric glide path to N\$0.30 starting 1 July 2009	1st choice: because of current traffic imbalance	Rejected: only gradually removes market distortions and disadvantages TN and consumers unjustifiably for two years longer	No comment
MTC model: reduction to N\$0.60 until 2011	Rejected: same as for Model 3	Rejected: same as for Model 3	Drop in EBITDA margin to 37% because of having to compete on a level playing field

MTC and Leo were both uncomfortable with setting the termination rate at the cost of an efficient operator, and both mentioned they might prefer a LRIC study in the longer run. Telecom Namibia wished to have higher termination rates for outgoing international calls due to costs of the international gateway. A compromise model was suggested with advantages for all operators:

- Immediate drop of termination rates to N\$0.60 to catch up with the region and international developments;
- Immediate converged termination rates;
- Glide path to the estimated cost of an efficient operator; and
- Immediate fixed-mobile convergence of termination rates.

The advantages were:

- MTC and Leo have time to conduct LRIC studies and contest the results of the cost estimate of this study if they wish to do so;
- Telecom Namibia would benefit from similar fixed termination rates as the current ones for 6 months while mobile termination rates are lower; and
- The NCC can monitor market development and assess further regulatory interventions to safeguard fair competition.

Table 1: Compromise Model

	Current	1 July 2009	1 January 2010	1 July 2010	1 January 2011
MTR	1.06	0.60	0.50	0.40	0.30
FTR	0.63	0.60	0.50	0.40	0.30
Originating internationally, terminating locally via Telecom Namibia	0.59	0.60	0.50	0.40	0.30
Originating in Namibia and terminating internationally	Government Gazette	0.60 + international settlement rate	0.50 + international settlement rate	0.40 + international settlement rate	0.30 + international settlement rate

Telecom Namibia and Leo were willing to accept this model as a compromise to achieve an industry consensus. MTC only agreed to this model after the final report had been delivered to the NCC. The NCC ruling was based on this compromise model.

Applying the new termination rates to the financial data from 2008 indicated that MTC's EBITDA margin would only marginally be affected. This quick calculation did, however, not take competitive pressure into account emanating from reduced termination rates.

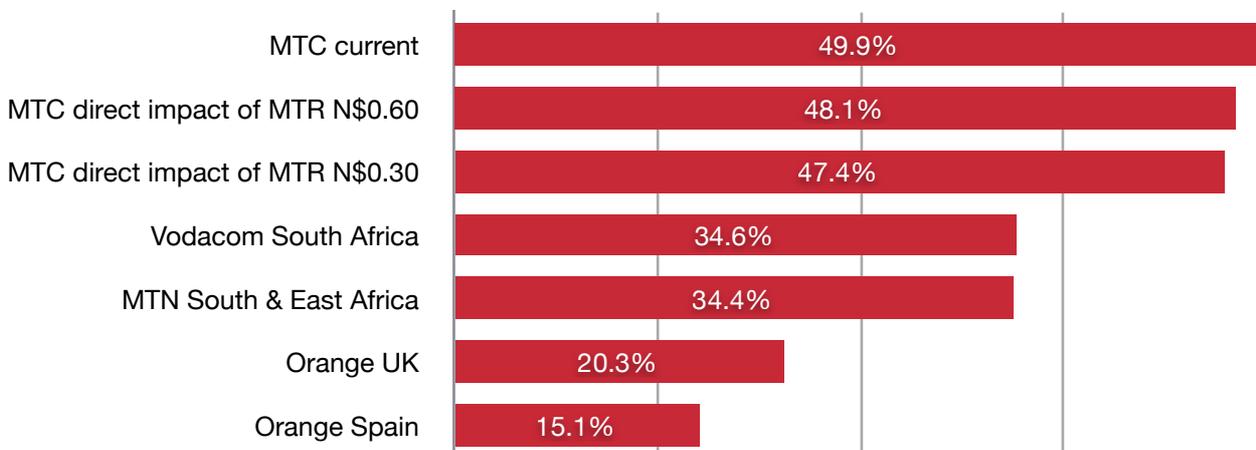


Figure 16: Apply new termination rates to MTC's 2008 financial results in N\$

Conclusion

Namibia managed to resolve an Interconnection dispute within nine months despite an desperately understaffed regulator with only very limited powers. Benchmarking helped to get quick results. Detailed cost studies are unlikely to have delivered very different results.

The benchmarking approach can be used for regulatory purposes over a longer period of time if it leads to the desired outcomes. Detailed cost studies might have to be conducted otherwise.

The swift resolution of the dispute would not have been possible without a visionary minister, a resolute board of the NCC and regulators from other African countries and Europe that supplied cost figures.

This stresses the importance of regional bodies as a basis for co-operation and information sharing. Similar to the ERG in Europe an African Regulatory group could provide guide to regulators and compile cost data that can be used for benchmarking purposes.

References

- Armstrong, M. (2002): 'The Theory of Access Pricing and Interconnection', in Martin Cave, Sumit Majumdar and Ingo Vogelsang (eds), Handbook of Telecommunications Economics, North- Holland.
- Armstrong, M. and Wright, J. (2007): 'Mobile Call Termination', mimeo, University College London.
- Cave, M., Bomsel, O., Le Blanc, G. and Neumann, KH. (2003): How mobile Termination Charges Shape the Dynamics of the Telecom Sector, Paris, Warwick, Bad Honnef.
- CEG (2009): Wholesale Termination Regime, Termination Charge Levels and Mobile Industry Performance, A study undertaken for Ofcom.
- CentrePiece (2007): Regulating the mobile phone industry: Beware of the Waterbed Effect, CentrePiece Autumn 2007, <http://cep.lse.ac.uk/pubs/download/cp238.pdf>
- EARPTO (2008): Guidelines on Interconnection and access for telecommunications networks and services within the East African Community, East African Regulatory, Postal and Telecommunications Organisations, April 2008.
- ERG (2006): ERG (06) 59, MTR update snapshot, <http://www.erg.eu.int>
- ERG (2007): Final report on IP Interconnection, <http://www.erg.eu.int>
- ERG (2008a): ERG (08) 41, final MTR Snapshot 081020, <http://www.erg.eu.int>
- ERG (2008b): Regulatory Accounting in Practice 2008, <http://www.erg.eu.int>
- ERG (2008c): ERG (08) 45, ERG's Common Position on symmetry of fixed call termination rates and symmetry of mobile call termination rates, February 2008, <http://www.erg.eu.int>.
- ERG (2008d): IRG/ERG Response to Public Consultation on Termination Rates, ERG (08) 31 rev1, September 2008, <http://www.erg.eu.int>
- ERG (2009): Report on Fixed-Mobile Convergence: Implications on Competition and Regulatory Aspects, March 2009.
- EU (2008): Draft Commission Recommendation of [...] on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, October 2008.
- EU (2009): Commission Recommendation of 7.5.2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 7 May 2009, C(2009) 3359 final.
- Evans, D. (2007): Do mobile operators have a dominant position in a market for the wholesale termination of calls from fixed to mobile?, The Economics of Mobile Prices, Vodaphone Policy Paper Series, Number 7, November 2007.
- Frontier Economics (2008): Assessing the impact of lowering mobile termination rates: A report for Deutsche Telekom, Orange, Telekom Italia, Telefonica and Vodafone, July 2008.
- Frontier Economics (2009): Comments on the EC's Impact Assessment of the Draft Recommendation for the treatment of fixed and mobile termination rates: A report for Deutsche Telekom, Orange, Telekom Italia, Telefonica and Vodafone, February 2009.
- Genakos, C. & Valletti, T. (2007): Testing the "Waterbed" Effect in Mobile Telephony, The Economics of Mobile Prices, Vodaphone Policy Paper Series, Number 7, November 2007.
- Genakos, C. & Valletti, T. (2009): Testing the "Waterbed" Effect in Mobile Telephony, [http://www.sel.cam.ac.uk/Genakos/Genakos&Valletti-Waterbed%20effect%20v_2\(core\).pdf](http://www.sel.cam.ac.uk/Genakos/Genakos&Valletti-Waterbed%20effect%20v_2(core).pdf)
- Government SA (2004): The regulation in respect to the chart of accounts and cost allocation manual for mobile cellular telecommunications services of 2004, Gazette 26520, Telecommunications Act 103 of 1996.
- Hausemann, J. and Wright, J. (2006): Two Sided Markets with Substitution: Mobile Termination Revisited, <http://econ-www.mit.edu/files/1038>
- ITU (2006): Interconnection in an NGN Environment, ITU, April 15, 2006.

- Marcus, J. (2008): IP-based NGNs and Interconnection: The Debate in Europe, Communication & Strategy, DigiWorld Economic Journal, No 72, 4th Quarter 2008, www.idate.org
- NCC (2009): Namibian Interconnection Benchmarking Study, <http://ncc.org.na>.
- OECD (2007): Information and Communications Technologies - OECD Communications Outlook 2007, OECD publishing, ISBN 978-92-64-00681-2.
- OECD (2009): Information and Communications Technologies - OECD Communications Outlook 2009, OECD publishing, ISBN 978-92-64-05983-2.
- PTS (2008): Model documentation for the National Post and Telecom Agency (PTS), Documentation for the upgraded hybrid mobile LRIC model 2 June 2008, Ref: 6216-232.
- Rochet, J. and Tirole, J. (2006): 'Two-sided Markets: A Progress Report', RAND Journal of Economics 35: 645-67.
- RTR (2008): Wirtschaftliches Gutachten für die Telekom Control Kommission im Verfahren M1/08, Wien December 2008.
- Sandbach, J. (2007a): Mobile price structures: two sides of the market, The Economics of Mobile Prices, Vodafone Policy Paper Series, Number 7, November 2007.
- Sandbach, J. (2007b): Pass-through, The Economics of Mobile Prices, Vodafone Policy Paper Series, Number 7, November 2007.
- Sandbach, J. (2007c): Welfare effect, The Economics of Mobile Prices, Vodafone Policy Paper Series, Number 7, November 2007.
- Stork, C. (2008): Draft Telecommunications Bill 2008: lessons from South Africa, NEPRU Policy Brief, Issue 21, ISSN 1860-659X.
- Stork, C. and Deen-Swaray, M. (2007): Switch to Competition, NEPRU Policy Brief, Issue 18, ISSN 1860-659X.
- Stork, C. and Esselaar, S. (2006): Telecommunication Sector Reform for Development, NEPRU Policy Brief, Issue 17, ISSN 1860-659X.
- TCRA (2007): Tanzania Communications Regulatory Authority, Determination on Review of telecommunications network interconnection rates in the United Republic of Tanzania, issued in 2007, interconnection determination No. 2 issued in 2007.
- TRAI (2009): Telecom Regulatory Authority of India Information note to the Press, Press Release No. 25/2009.
- Unknown Author (2007): Regulating the mobile phone industry: Beware of the Waterbed Effect, CentrePiece Autumn 2007, <http://cep.lse.ac.uk/pubs/download/cp238.pdf>
- Valletti, T. (2006): Mobile Call Termination: a Tale of two-sided Markets, Communications & Strategies, No 61.
- Valletti, T. and Houpis, G. (2005), 'Mobile Termination: What is the "Right" Charge?', Journal of Regulatory Economics 28: 235-58.
- WIK (2007): Mobile Termination Cost Model for Australia, Report for the Australian Competition and Consumer Commission, WIK Consult GMBH, Bad Honnef, January 2007.
- WIK (2008): Future of IP Interconnection: Technical, Economic and Public Policy Aspects, March 2008, prepared for the EU.
- Wright, J. (2002): 'Access Pricing under Competition: An Application to Cellular Networks', Journal of Industrial Economics 50: 289-316.