Comparison of fixed and mobile cost structures

Contents

1 Introduction and Executive Summary

1.1 Introduction

This report was commissioned by the GSM Association (GSMA) and undertaken by PricewaterhouseCoopers (PwC) to examine the differences in fixed and mobile cost structures.

Our report focuses on the areas which we believe contribute to long-run differences between the cost structures of fixed and mobile networks and the impact these differences have on the average unit cost[1] of voice traffic. We have considered both qualitative and quantitative analysis on the key differences between the two types of network as well as the intuitive and theoretical reasons why differences in cost structure might be expected, including:

- Treatment of access network costs
- Scarcity of spectrum
- Useful lives of assets
- Age of networks
- Scope and scale economies
- Ability to reduce costs through cost sharing

The paper looks at both the differences in the nature and structure of costs and the implications the differences have on regulated cost-based charges for fixed and mobile call termination.

We hope this paper will contribute to a constructive debate around the factors that should be considered when NRAs and operators are comparing cost structures for different types of network operator.

1.2 Executive summary

In recent times a number of commentators have questioned whether the scale of differences observed between fixed and mobile termination rates and the level of differences are cost reflective. Some commentators have gone so far as to suggest that the costs of fixed and mobile termination should be approximately the same. Given the fundamental differences between fixed and mobile networks we see no *a priori* reason to suppose that costs should be similar. In the light of the public debate and regulatory scrutiny, this paper examines the reasons why the cost of a minute of mobile telephony differs from, and is higher than, the cost of a minute of fixed telephony.

Having analysed the factors set out above, we conclude that there are significant differences between the cost structures of mobile and fixed operators. The biggest single difference is the access network and how its costs are driven and hence should be recovered. The access network in a fixed network (predominantly the copper loops) is almost entirely driven by the number of subscribers, and increases in traffic, independent of the number of subscribers, require no further investment in the access network. As such, the costs of the access network are appropriately recovered from a subscription service. This is not the case for mobile networks where the access network (base stations and associated equipment) is not dedicated to individual subscribers. An increase in traffic on mobile networks does require further investment in the access network. As such, the costs of the access network are appropriately recovered from traffic services.

In addition to the difference in the economics of the access network, there are also a number of other factors that result in the costs of a mobile network being different to those of a fixed network. It is our opinion that these differences support the view that the cost of a unit of traffic is more expensive on a mobile network than on a fixed network and that such a cost difference is unlikely to disappear in the foreseeable future.

1 When referring to cost In this report, we mean operating costs, depreciation and a return on capital.

2 Background

2.1 Purpose of the Study

PwC has been commissioned by the GSMA to write a report on the differences between fixed and mobile cost structures. We have considered a number of factors which we believe contribute to the significant differences between the cost structures of fixed and mobile network operators. In the following section we set out the impact of these differences.

2.2 Approach

We have used the following sources of information in compiling this report:

1. Publicly available cost models;
2. Publicly available information on the websites of national regulatory authorities (NRAs) and network operators;
3. Information from research reports and data services.

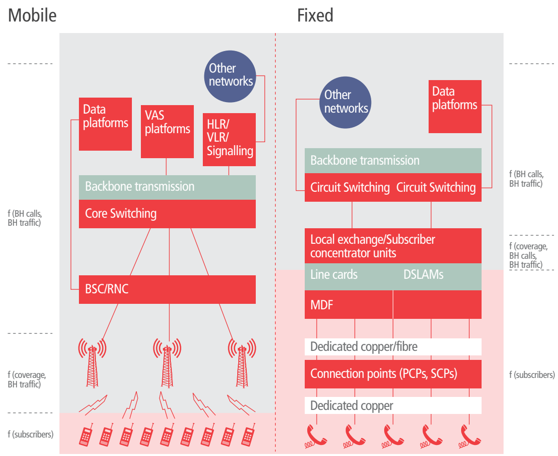
We have considered the factors we feel contribute to a different cost structure between fixed and mobile networks. We start by considering the impact of each of the factors individually and then analyse the impact of a combination of factors using worked examples.

2.3 Regulatory context

There has been an initial consultation by the European Regulators Group (ERG) on creating a common position on Mobile Termination Rates (MTRs). A survey of NRAs is currently being conducted. One of the questions within this survey is whether NRAs consider that fixed and mobile termination rates should ultimately converge. As demonstrated in this paper there are a number of reasons why the cost structures of fixed and mobile operators are likely to be different. This suggests that the convergence of fixed and mobile termination rates in any particular country should not be assumed and in fact is only likely to be appropriate from a costing perspective[2] through coincidence or the convergence of modelling inputs that are currently substantially different.

2.4 Comparison of networks

When considering the different cost structures of fixed and mobile operators, it is helpful to consider how the network architectures differ. Shown below are simplified diagrammatic representations of typical fixed and mobile networks.



(Note – elements recovered from subscribers are shown in pink and elements recovered from traffic are shaded in grey).

The diagram above compares mobile and fixed networks at a high level. Both MNOs and FNOs incur costs to meet the demand for subscription, busy hour calls, busy hour traffic and the need to provide the required level of network coverage. Whilst all the complexities of the two networks cannot be captured in a diagram, there are some notable differences which stand out, including;

- The absence of material subscriber-driven network elements (excluding mobile devices) in mobile networks,
- An increase in traffic in the fixed network will only result in an increase in core-switching and transmission costs, not in the access network,
- An increase in traffic in mobile networks will result in an increase in all network elements including the radio access network,
- Coverage-related costs in fixed networks are typically recovered from traffic services, as is the case with mobile networks, and
- Signalling and location activities (HLR/VLR) are more material in mobile networks

The remainder of this paper sets out the differences between fixed and mobile cost structures in more detail.

2 We are not considering symmetrical fixed and mobile termination rates from a competition or market stimulation perspective.

3 Factors affecting differences between fixed and mobile cost structures

This section sets out the most important factors that contribute to the differences in the cost structures of fixed and mobile network operators.

3.1 Treatment of access network costs

The biggest single difference between the cost structures of fixed and mobile operators is the treatment of the access network. The access network (and its cost) in a fixed network (predominantly the copper loops) is entirely driven by the number of subscribers and increases in traffic *per se* require no further investment in the access network. This is because each subscriber has a dedicated (copper) line which is capable of handling 24 erlangs of traffic per day. Thus the dimensioning and costs of this line, and the whole customer access network, are effectively invariant to the amount of traffic throughput. (As discussed above and further below, this is not the case for the core switching and transmission functions of a PSTN.) As such, the costs of the access network are causally related to the number of subscribers and independent of the volume of traffic. Such costs are appropriately recovered from subscription revenues.

This is not the case for mobile networks where the access network (base stations and associated equipment) is not dedicated to individual subscribers. Rather, these network elements are dimensioned so that they are capable of serving the traffic arising from outgoing and incoming calls. Therefore, an increase in traffic does require further investment in the access network. As such, the costs of the access network are causally related to the volume of traffic and are appropriately recovered from traffic services.

Regulators have typically decided (based on detailed costing studies) that all the costs of a mobile network are incremental to traffic services. The nature of the mobile radio access network is not directly analogous to the copper network of a fixed operator. The access network in a mobile network is competed between different users – when one user is using radio capacity, it cannot be used by any other user. As such, the efficient mechanism for recovering the cost of radio capacity is in relation to the traffic services that it supports. However, the access network in a fixed network comprises dedicated copper. The copper pair of one user cannot be used by any other user. Therefore, the efficient mechanism for recovering the cost of the copper access network is in the form of a rental fee from subscribers.

It could be argued that some of the mobile base stations that are in their original deployment are not variable with respect to traffic. In fixed networks, coverage related network elements, e.g. local exchange equipment and subscriber concentrator units, have been recovered from traffic services. Therefore, as a matter of consistency, the costs of coverage base stations should also be recovered from traffic services. This is the current stance of many NRAs who have typically concluded that these costs are only a small proportion of the total network costs and have opted to allow operators recover all network costs from traffic services[3].

In our opinion, the treatment of the access network is the biggest single difference between the cost structures of fixed and mobile operators. The majority of fixed network costs are not recovered from traffic services, whereas mobile network costs are only recovered from traffic services. In section 4 we look at the cost structure of BT vis-à-vis the UK mobile operators and demonstrate the impact this difference has in terms of cost structures and cost recovery.

3.2 Market Structure

The mobile telephony market structure is different to the fixed telephony market due to the historical evolution of the market as well as the economics of network build.

In most European countries, there will typically be a single dominant fixed line incumbent operator which was formerly state owned. In some countries the government still has a stake in the company[4]. There is also frequently a cable operator or collection of cable operators who provide fixed telephony services[5]. Typically there will also be alternative operators with limited infrastructure who might only offer services to businesses or within specific parts of the country. The alternative operators will often rely on the wholesale services of the incumbent operator e.g. Local Loop Unbundling (LLU), the provision of which is underpinned by a regulatory obligation. At the date of the last Communications Market Review[6], 25% of BT's 5,600 local exchanges were unbundled, covering 72% of UK households. In general, it could be said that the fixed market typically has two network providers of nationwide services – one incumbent telecoms operator and one cable operator (or collection of operators) and numerous service providers either relying on the incumbent operator's network entirely or with some limited infrastructure of their own.

3 If NRAs did not allow operators to recover all the network costs from voice services, operators might not be able to continue to offer pre-pay services, which would not be desirable from a public policy perspective.

4 Such as France or Greece.

5 Often there will be more than one cable operator in a country, but their geographical footprint will have no or limited overlap.

6 Ofcom, Communications Market Review, August 2007.

The typical mobile market is structured differently. In nearly every mobile market in the world there is more than one mobile network operator with national coverage. In Europe there are at least two mobile network operators in every country with most countries having three to five mobile network operators. The actual number of network operators is largely determined by the regulatory authority that is responsible for licensing and spectrum. However, whereas the fixed market is characterised by many service providers competing at a retail level, the mobile network operators continue to dominate the retail market as well. There have been some successful mobile virtual network operators (MVNOs) e.g. Virgin Mobile, who use the MNOs' infrastructure with some limited core infrastructure of their own. However, the mobile market is generally characterised by a few vertically integrated network operators competing with each other for the end-to-end provision of mobile services.

These characterisations of the fixed and mobile markets are supported by a recent study that found that the average number of MNOs per country is 3.69, compared to 2.30 FNOs per country[7]. These figures do not assess the coverage offered by the operators and some operators included may not have full national coverage.

Having established that the mobile market is typically served by more operators than the fixed market, the implication this has for the relative costs of mobile and fixed services is clear.

In any industry where there are fixed costs of service provision, the more operators there are, the higher the total cost base of the industry. It is widely held that there are significant fixed costs associated with both fixed and mobile networks, and therefore, the presence of more mobile networks in the market means, *ceterus paribus*, that the cost of providing mobile service in that market will be higher.

It should be noted that the presence of more mobile network operators than fixed network operators leads to increased network competition among MNOs. This provides strong efficiency incentives. It is likely that the extent of such efficiency incentives will be less in the fixed sector. When comparing MNOs with FNOs, this will counter-balance some of the economies of scale from which FNOs benefit. However, this point is less relevant where there is effective regulation on FNOs.

Going forward, it is possible that mobile network operators will seek to generate further cost savings in the form of network sharing, effectively reducing the number of mobile network operators. The effect of scale economies more generally is considered further in section 3.6.

3.3 Scarcity of spectrum

Spectrum is a scarce resource, the use of which is regulated through the allocation of specific frequency bands to individual operators. Spectrum suited to the provision of GSM services, the 900MHz and 1800MHz bands, was allocated to operators in the 1980s[8] and 1990s and the licence payments were frequently a mix of up-front fees and ongoing annual payments. GSM licence fees, either through operating costs or amortisation costs, were typically a small but not immaterial proportion of an operator's annual cost base. For some later entrants, the GSM licence fees were more material as the value of mobile services was more established.

In recent years a number of countries have allocated 3G spectrum through an auction process. Due to the scarcity of spectrum, it was imperative for the existing mobile operators to acquire some spectrum in these auctions in order to be able to offer 3G (UMTS) services and to maintain their existing 2G subscriber base. In the early years of the millennium, the prices paid at some of these auctions were high and in some cases exceeded the total cost (in present value terms) that was expected to be invested in the 3G network itself during the life of the licence, thus more than doubling the total cost base of the network operators.

Additionally, the terms of the UMTS licences frequently contained an obligation to cover a certain percentage of the population within a specified time period. The cost and duration of the licences in countries for which auctions were held is shown in the table overleaf along with the implied cost per year (assuming HCA depreciation) and the coverage obligations in each country.

7 Source: Primetrica. Sample size for MNOs is 169 countries; sample size for FNOs is 158 countries. Data from 2006 and 2007.

8 In the UK, Vodafone and O2 (trading as Cellnet) received their licences in 1982 and Orange and T-Mobile (then One2One) in 1989.

Country	Auctions v comparative bids	Price of UMTS licences (€ billions)	Duration (years)	Annual HCA depreciation (€ billions)	Coverage requirement
Austria	Auctions	0.8	20	0.04	25% pop in 3yrs 50% pop in 5yrs
Belgium	Auctions	0.6	20	0.03	30% pop in 3yrs 40% pop in 4yrs 50% pop in 5yrs 85% pop in 6yrs
Denmark	Auctions	0.5	20	0.03	30% pop in 3yrs 80% pop in 7yrs
Germany	Auctions	50.1	20	2.51	25% pop in 3yrs 50% pop in 5yrs
Greece	Auctions	0.5	20	0.03	25% pop in 1.5yrs 50% pop in 4.5yrs
Italy	Auctions	12.2	15	0.81	Regional capitals 2.5yrs Provincial capitals 5yrs
Netherlands	Auctions	2.7	15	0.18	Main cities, roads and airport in 6.5yrs
UK	Auctions	36.1	20	613	80% pop in 7yrs

FNOs do not face similar spectral constraints and associated costs. Apart from the direct costs of purchasing spectrum, there is a further cost associated with spectrum. The migration from one type of spectrum to another necessitates an upgrading and reinvestment in the network. This is demonstrated by the relatively short life associated with the various mobile technology generations. In contrast, copper networks have been in deployment for many years (as discussed further in section 3.5).

3.4 Useful lives of assets

Fixed network assets have longer useful lives on average than mobile network assets. For example, the copper wire in the access network is frequently assigned a 20 year useful economic life for depreciation and accounting separation purposes; however, in reality, the useful life may be considerably longer. Duct and trenches have even longer useful lives – in the region of 40 years. These assets are buried underground so have less exposure to weather and vandalism. In contrast, mobile base station equipment is unlikely to have a useful life of more then ten years, although the site infrastructure and buildings will have a longer useful life.

To illustrate this point further, we present below the average useful life of each of the major network cost categories taken from publicly available Regulatory Accounts and Cost Models[9].

Fixed network

Asset Class	UEL
Buildings	40
Trench/Duct	40
Cable	20
Exchange equipment	10
Others (cars, computers etc)	5

Mobile network

Asset Class	UEL
Buildings	40
Base stations	10
Transmission	10
Switching	10
Others (cars, computers etc)	5

These show that the key differences in useful lives are in the access network, with the Trench/Duct and Cable categories having significantly longer lives than base stations.

From the publicly available cost models, we have also calculated the average useful life of assets for fixed and mobile operators weighted by Gross Replacement Cost. This indicates that the average UEL is likely to be higher for fixed than for mobile, although we note there is limited data for FNOs.

Mobile Network Operator

	Max UEL	Min UEL	Average UEL weighted by GRC
Australia	15	5	7.85
UK	20	6	12.22
Sweden	25	5	11.66

Fixed Network Operator

	Max UEL	Min UEL	Average UEL weighted by GRC
Ireland	40	4	Not available
UK	40	3	Not available
Sweden	40	10	30.75
Denmark	40	5	21.73
New Zealand	34	4	Not available

For a given initial investment, the network with the longer average useful economic life, i.e. the fixed network, will have a lower annual cost.

9 Sources: Fixed – BT Annual report, Eircom regulatory financial statements, Sweden cost model, Denmark Hybrid LRAIC model, New Zealand Commerce Commission Principles Paper. Mobile – Sweden cost model, UK cost model, Australia mobile model

3.5 Age of networks and depreciation methodology

Commercial fixed line telephony services have been offered in developed countries since the early 1900s. The predecessor of BT, the Electric Telegraph Company, started business in 1846[10]. Whilst a large portion of the network will have been upgraded over time, some long lived assets such as trenches and ducts would have existed prior to the launch of mobile services in the 1980s.

Since the inception of analogue mobile services, there have been several new generations of technology (see Figure 1 below) e.g. the first GSM service launching in Finland in 1991. Each of these has required substantial capital investment.

Figure 1 – average age of mobile networks by technology generation[11]

Generation	Average age
1G	16.81
2G	8.29
2.5G	4.14
3G	2.37
3.5G	1.24
Overall average	5.63

The average age of the mobile networks currently in use is therefore low relative to fixed networks. There are two implications of assets being newer in terms of cost recovery:

1. When accounting based depreciation is used for cost recovery (e.g. Current Cost Accounting of Historic Cost Accounting), newer assets will require more cost recovery than older assets. This is because part of the annual cost recovery of an asset is the return on capital. This is calculated as WACC x Net Book Value or Net Replacement Cost. The return on capital therefore declines as the assets age resulting in newer assets requiring greater cost recovery than older ones[12].
2. It is likely that fixed networks will have a significant proportion of assets that are fully depreciated, and where allowable cost is derived from the unadjusted accounting records, there will be no annual cost recovery associated with these assets.

Another issue associated with the age of networks is the depreciation methodology used to depreciate the network assets. The simplest form of depreciation is straight-line historic cost depreciation. This is most relevant in a world with stable demand where only maintenance capex is being undertaken, as has been the case for many fixed operators in recent years. For mobile operators demand is growing and has grown rapidly over the past few years.

In the mobile cost model produced by Analysys Consulting for Ofcom, economic depreciation is used. This recovers investment costs over the total demand for the assets, hence a large amount of the cost recovery will have been deferred from the early years of mobile services until later years when demand is significantly higher. Thus using economic deprecation creates a difference between the cost recovery of fixed and mobile networks in relation to traffic services.

3.6 Scale and Scope economies

As noted in section 3.2, the presence of fewer nationwide fixed network operators will result in greater economies of scale for those fixed operators. Network industries typically have a mix of fixed and variable costs. The greater the number of network operators, the greater the fixed costs that have to be recovered[13]. The presence of fewer nationwide fixed operators means less fixed costs that have to be recovered from the users of fixed telephony services.

FNOs will also benefit from economies of scope as they are able to offer multiple services over the same infrastructure. A typical fixed operator will provide all or most of the following services:

- Wholesale and retail voice telephony services
- Wholesale and retail broadband services
- Leased lines
- VPN/Data services
- IPTV

The following breakdown of revenue from Eircom's regulated accounts for the 15 months ended June 2007 show that only 40% of retail revenue relates to calls:

Breakdown of Eircom Retail Turnover	£m	%
Access (line rental, VPN, DSL)	614	40%
Call revenue	618	40%
Leased lines	121	8%
Other	176	12%
TOTAL	1,529	

10 Source: BT Website – http://www.btplc.com/Thegroup/BTsHistory/index.htm

11 Source: Primetrica, calculated based on launch date of mobile services. Sample size is 169 countries.

12 This paper does not discuss the relative merits of different depreciation methodologies.

Breakdown of Eircom Retail Turnover	£m	%
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Call revenue	618	40%
Leased lines	121	8%
Other	176	12%
TOTAL	1,529	

In contrast, mobile operators typically only provide voice and mobile data services. Vodafone Group's accounts for the year ended March 2007 shows that 80% of the revenue from Vodafone's European operations related to voice revenue.

Breakdown of Vodafone European Turnover	£m	%
Voice revenue	17,357	80%
Messaging revenue	2,925	14%
Data revenue	1,300	6%
TOTAL	21,582	

(Excludes revenue from Vodafone's fixed operations)

Fixed operators are therefore likely to benefit from greater economies of scope as a result of:

- Multiple services utilising the same assets, e.g. voice and broadband both utilising the copper access network, and
- Fixed and common costs being distributed among more services so the contribution to overheads from each service is reduced.

3.7 Network sharing versus cost sharing

Fixed network operators can share some of the cost of extending or repairing their access networks with other companies such as utilities. These companies can share the cost of digging up roads and preparing trenches/ducts with electricity or gas companies[14]. This is explicitly recognised in many cost models, for example that produced by the World Bank[15]. As trenching and ducting are a large part of the access network cost, cost savings in this area can be considerable when considering a new-build network. The opportunities for cost sharing in established fixed networks are more limited.

Cost sharing for mobile operators is also possible. Typically cost sharing for mobile operators is focused on the radio access network (RAN). The realisation of these cost savings is dependent on how the process is approached and the compatibility of the geographic coverage of the operators concerned.

The level of network sharing will be impacted by regulatory restrictions and general competition law preventing collusion. This is an area where an equilibrium has not yet been reached and which may affect the number of mobile networks in operation and hence the number of mobile network operators.

It is not possible currently to assess whether there is greater potential for cost sharing in mobile or fixed networks. However, the presence of cost sharing opportunities is another reason why mobile and fixed cost structures are different. Detailed costing exercises should take into account the most up-to-date information on cost-sharing in order to assess the per unit cost of traffic, rather than assuming equality between fixed and mobile networks.

3.8 Next Generation Networks

Some fixed network operators are currently investing in Next Generation Networks based on internet protocol (IP). Operators will require large up front investment but this will result in a wider range of services available and lower per subscriber cost for the services provided. Part of the investment will be to provide more data services (e.g. high speed broadband) and part to reduce the unit cost of providing telephone calls. The investments in NGN would not be made if there was not an expectation that they would be profitable.

A major benefit expected from NGN core networks is the removal of the many overlay networks that have supported the range of services provided by fixed operators. This is another area that NRAs will need to be mindful of going forward in assessing the relative costs of fixed and mobile networks.

13 The issue of fixed cost recovery is outside the scope of this paper. It is our view that regulated prices should include a mark-up for the recovery of fixed and common costs. This is discussed further in the paper titled "The setting of mobile termination rates: Best practice in cost modelling", which is available at www.gsmworld.com/costmodelling

14 An example of trench sharing is described here – http://www.patentstorm.us/patents/5839242-description.html

15 A Model for Calculating Interconnection Costs, World Bank, 2004, pg 40

4 UK Case study

In this section we look at a comparison between the costs of BT, the biggest UK fixed network operator and the estimated combined costs of the UK mobile network operators. We have used the UK as an example because of the detailed information provided in BT's regulatory accounts although we would expect similar results from any country in the developed world.

Looking at BT's Current Cost Financial Statements, 2007, it can be seen that only four of the Wholesale Markets are providing similar services to that provided by mobile network operators[16], the total HCA operating cost of which is £486m. This is only 32% of the core network HCA operating cost and 10% of total network operating cost. The remainder of the cost relates to services not provided by mobile network operators, such as leased lines, broadband conveyance and technical areas such as interconnect circuits.

In comparison, Vodafone's total UK network running cost was £1,353m in 2007[17]. Based on this we have estimated the total network running cost for MNOs in the UK as £5,413m, more than ten times the cost of BT providing the analogous fixed services.

In addition, MNOs use the incumbent's network for transit purposes, which is another source of income for the fixed line incumbent. This means that comparing the number of retail fixed minutes to retail mobile minutes is not strictly a like-for-like comparison, given that a proportion of retail mobile minutes also use elements of the fixed network, and hence contribute to the cost recovery of the fixed network.

The range of services offered by BT gives it greater opportunities to recover fixed operating and investment costs. For example, one should consider the revenue profile of FNOs and MNOs. Fixed network operators receive a substantial proportion of their income from monthly charges such as line rental. Taking BT as an example, total access revenue for the year ended March 2007 was £4.7bn. This is a fixed income stream which is independent of customer usage. There is no equivalent income stream for mobile operators. Although customers on post-pay contracts do pay a monthly charge, this is effectively covering the cost of the 'free' minutes and handset subsidies which are associated with post-pay packages.

In the table below we compare the number of subscribers, minutes of use and annual costs for BT and the UK MNOs. Looking at the data below it can be seen that the combined total number of minutes for the MNOs is very similar to that of BT. These figures are likely to be an underestimate because the MNO figures do not include H3G and the BT figures will not include transit minutes. The annual cost figures will include the effect of differing asset lives, age of networks and economies of scale.

We can also see that the total annual cost (cost of sales plus other expenses plus depreciation) is similar for BT and the combined total of all MNOs. This total annual cost will include outpayments to other operators and retail costs such as marketing. We have then excluded these outpayment and retail costs by making some high level assumptions on the MNO data and using BT current cost financial statements in order to reach an annual network cost. Despite the total annual cost being higher for BT than for the total MNOs, the annual network related cost is lower for BT.

BT provides a wide range of services over its network, many of which are not offered by MNOs. Examples include exchange lines, wholesale leased lines, technical interconnect circuits and broadband conveyance. Comparing BT's cost of providing equivalent services to MNOs against the total MNO network cost, one can see that the total network cost of providing MNO equivalent services is only slightly higher than an average MNO. Bearing in mind that the average MNO has only three-fifths of the subscribers and one quarter of the minutes of BT, this implies that the per unit cost of providing mobile equivalent services is higher for MNOs than for BT.

	BT	Total MNO	Vodafone
Number of minutes (m)	87,852	87,677	24,520
Number of subscribers (m)	25.7	72.9	18.4
Total annual UK cost (£m)	17,915	18,452	4,613
Annual network related cost	7,740	5,413	1,353
Annual network related cost for voice traffic services (£m)	486	5,413	1,353

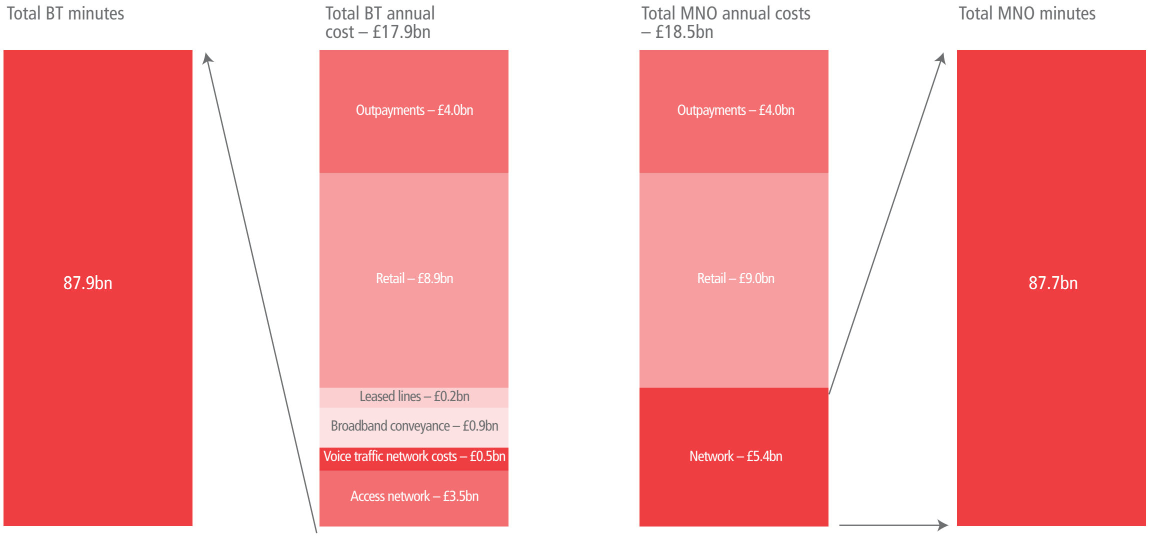
16 Call origination on fixed public narrowband networks, Local-tandem conveyance and transit on fixed public narrowband networks, Single transit on fixed public narrowband networks and Fixed call termination. BT Current Cost Financial Statements, page 14

17 Vodafone Annual Report 2007, page 36

A breakdown of the total annual cost is given in the table below. We have estimated the total annual MNO cost by multiplying Vodafone's cost by four. We feel this is a conservative estimate as there are five MNOs in the UK market, although the last entrant, H3G, has a lower market share.

£bn	BT	Total MNO estimate	Vodafone
Total annual UK cost	17.92	18.45	4.61
of which			
Retail	8.94	9.04	2.26
Outpayments from retail	1.23	4.00	1.00
Network	7.74	5.41	1.35
of which			
Outpayments from core	2.72		
Access network	3.50		
Broadband convenyance	0.85		
Leased lines	0.18		
Voice traffic services	0.49	5.41	1.35

The cost breakdown is illustrated in the diagram below, which highlights the fact that overall BT and all of the MNOs have a similar annual cost and a similar number of minutes. However when the cost is broken down into the services this relates to, it can be seen that only a small proportion of BT's total annual cost relates to MNO equivalent services.



Sources: BT annual report and regulatory accounts. Total MNO cost estimated from Vodafone annual report

5 Conclusion

5.1 Several factors suggest differing cost structures

There is significant evidence that mobile network operator cost structures are different from those of fixed network operators due to a number of factors. This is consistent with our *a priori* view that, from a costing perspective, the cost of a minute of voice traffic on a mobile network is not comparable to the cost of a minute on a fixed network.

5.2 Markets are still evolving

In addition to the currently observed differences, there are likely to be significant changes to both the mobile and fixed industries in the coming years. There are a number of unknowns e.g. in relation to migrations to new technologies, consolidation of operators and the opportunities to implement cost reduction initiatives.

Just as symmetry between mobile and fixed traffic costs cannot be assumed now, it also cannot be assumed to occur at any point in the future. Therefore, for as long as customers are charged for telephony on a unit basis, and for as long as NRAs believe that regulatory intervention is necessary, there will be a need for robust cost analysis to inform the efficient level of regulated prices.

Ultimately a call on a mobile network is very different from a call on a fixed network. The mobility that a mobile network provides has implications both for the level of costs and how those costs are efficiently recovered. The additional costs associated with mobile telephony are unlikely to unwind in the coming years. However the phenomenal success of mobile telephony demonstrates that customers are willing to pay extra for the costs associated with mobility. These are real cost differences which no amount of spuriouss comparisons with the costs of fixed telephony can eliminate.

6 List of sources

Regulatory and Statutory Accounts

Fixed

Eircom – Current Cost and Long Run Incremental Cost Statements for period ended 30 June 2007

BT – BT Annual Report 2007, BT Current Cost Financial Statements 2007

Mobile

Vodafone Annual Report 2007

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Sweden – PTS Consolidation Model v1.3 PUBLIC. xls, available from *http://www.pts.se/Sidor/sida.asp?SectionId=1980*

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