Working Party on Telecommunication and Information Services Policies

INTERNATIONAL REFILING OF MOBILE TRAFFIC (TROMBONING)
FOREWORD

This paper, prepared by Professor Martin Cave (Brunel University, United Kingdom), was discussed by the Working Party on Telecommunication and Information Services Policies at its session in December 2000. The Working Party agreed to recommend the declassification of the document to the Committee for Information, Computer and Communications Policy. The Committee agreed to its declassification in February 2001 subject to further written comments from Delegates. These comments have been taken into account in the present final version.

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SECTION 1 – WHAT IS MOBILE TROMBONING?

The simple way of delivering a national call to a mobile customer is for the operator providing service to the calling party (either a fixed or another mobile operator) to transfer the call to the receiving party’s operator for termination on its network. The transferring operator levies a retail charge on its customer and makes a payment to the receiving party’s operator in accordance with its interconnection agreement with that operator. As distinct from call termination charges on fixed networks, which are typically subject to explicit control by the National Regulatory Agency both for incumbents and for fixed line entrants, termination charges by mobile operators in most OECD countries have hitherto been subject to lighter regulation. The mobile call termination rate in question is thus likely to be subject to negotiation and not necessarily to be cost-based; in many places it appears to be substantially above cost.

An important reason for above cost termination is that, where a calling party pays system exists, mobile operators have market power in the termination of a call. The customer placing a call has no choice if they want to complete the call but to terminate the call on the network chosen by the mobile subscriber that they are calling. In the case of receiving party pays (RPP), the mobile subscriber is charged by his/her operator for the termination of the incoming call. This becomes an element in the receiving party’s retail tariff and thus one of the criteria likely to be used by subscribers in choosing their mobile operator. As a result, in countries such as the United States where RPP predominates, the incentives for mobile tromboning do not apply in the same way. Accordingly, US operators have generally not participated in the measures to counter mobile tromboning discussed below, in particular the segmentation of fixed and mobile accounting rates.

Now consider an alternative route for the transmission of the call. Instead of delivering the call directly to the mobile operator, the calling party’s operator sends it abroad, using an international circuit. If the operator owns or leases the international circuit, then the cost would be the marginal cost of carriage, which may be very low, especially if there is spare capacity. Arriving at the international switch in the other country, the call is then sent back to its country of origin as an international call. The operator receiving that international call will be remunerated at the settlement rate agreed between the two parties. The receiving operator will then hand it over to the receiving party’s mobile operator for termination, paying the appropriate negotiated termination charge. This arrangement is illustrated in Figure 1.
Two points clearly emerge from this description. The first is that mobile tromboning is transparently inefficient in resource utilisation, since it involves two entirely redundant legs – the outgoing and incoming international segments – in the delivery of the call. (As noted below, however, this does not preclude it from being welfare improving overall, if it encourages the removal of a greater allocative inefficiency.) Second, and relatedly, mobile tromboning will only be undertaken if the calling party’s operator – or another operator to which the calling party’s operator hands over the call – sees an arbitrage opportunity which causes it to be cheaper for that operator to trombone the call than to deliver it directly. From an examination of Figure 1, for this to be successful it is necessary that one or the other of the following conditions be satisfied:

- Case 1 (where the overseas switch to which the call is delivered is owned by the sending operator):

  the domestic mobile termination rate exceeds the marginal cost of exporting the call, the marginal cost of the international half circuit for re-importing it and the settlement rate, or

- Case 2 (where the exporting operator delivers it to another operator for re-importation):

  the domestic mobile termination rate exceeds the marginal cost of exporting the call plus the price charged by the operator in the overseas country for sending it back (including the settlement rate when it is reimported).
These are the necessary conditions relevant in each case. But they are not sufficient, because all the operators involved in the tromboning process have to be willing to provide the service required of them. If they are not, then the arrangement will not work. The most obvious candidate for refusing to participate in the tromboning process is the international operator receiving the tromboned call. If that operator were rewarded with a settlement rate less than the sum of its own costs and the mobile call termination rate which it had to pay to the receiving party’s mobile operator, then it would have an incentive to refuse to accept it. In evaluating this conduct, however, it is legitimate to take into account the fact that settlement rates are – notionally at least – based on the costs of terminating a variety of calls associated with different costs, including a ‘reasonable’ proportion of calls to mobiles.

An operator choosing to trombone a call to a mobile number is simply seeking to minimise its costs. The introduction of ‘unnecessary’ international legs is often observed in Internet traffic, a high proportion of which is conveyed on routes which include network access points or Internet exchanges in the United States, even in circumstances where alternative shorter routes are available. This phenomenon is sometimes regarded as being linked to competition problems in the Internet backbone, but correctly should be regarded as a natural and efficient illustration of least-cost routing. Where the prices charged by competing networks to convey traffic are competitive and cost-reflective, there is no reason to question the appropriateness of any chosen route. In the case of mobile tromboning, however, the decision whether to trombone or not depends – as discussed below – on the relative levels of two prices, neither of which may be fully open to competitive pressures. The first is the settlement rate – a cost incurred by the operator tromboning traffic when it is re-imported into the country of origin. The second is the mobile termination rate for domestic calls, incurred by the operator if the non-tromboning route is chosen. If either or both of these prices depart from costs, there is a risk that inefficient routing decisions may be made.

The discussion above has been based on the tromboning of a mobile voice call. However, it applies equally well to the delivery of any call covered by an incoming international settlement rate, where that settlement rate is less than the domestic call termination rate. The same process might therefore apply to other calls, associated with high termination rates, such as calls to personal numbers.

Having introduced mobile tromboning, the paper now examines the costs and prices of the elements in the tromboning process, in order better to elucidate the conditions under which it will be both profitable and practicable.
SECTION 2 – THE BUILDING BLOCKS OF MOBILE TROMBONING

The activities involved in the direct and tromboning routes are listed in Table 1.

Table 1. Activities involved in calls to mobiles, with illustrative cost estimates per minute*

<table>
<thead>
<tr>
<th>Normal Termination</th>
<th>Tromboning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conveyance to point of interconnect with mobile</td>
<td>3. Conveyance to outgoing international switch:</td>
</tr>
<tr>
<td>operator: EUR 0.02-0.03.</td>
<td>EUR 0.02-0.03.</td>
</tr>
<tr>
<td>2. Mobile termination: EUR 0.13-0.20.</td>
<td>4. Export of call: originating EUR 0.02-0.03</td>
</tr>
<tr>
<td></td>
<td>5. Cost of half-circuit for incoming leg: EUR 0.01-0.02.</td>
</tr>
<tr>
<td></td>
<td>6. Cost of incoming half circuit: EUR 0.01-0.02.</td>
</tr>
<tr>
<td></td>
<td>7. Conveyance to point of interconnect with mobile</td>
</tr>
<tr>
<td></td>
<td>operator: EUR 0.02-0.03.</td>
</tr>
<tr>
<td></td>
<td>8. Mobile termination: EUR 0.13-0.20.</td>
</tr>
</tbody>
</table>

*Note that these are costs of production on an average incremental cost basis, not charges. As the source for the mobile termination rates (see Table 2) recognises the costs for mobile termination are sensitive to growth in subscriber numbers and traffic volumes and are therefore difficult to predict. The cost estimates are illustrative only, as the argument does not depend on their precise value.

Source: Author.

The relevant activities are:

– The termination of domestic calls on the relevant mobile network.
– The export of the tromboned call.
– The re-import of the tromboned call.
– Termination on the mobile network of an international call.

Also affected potentially are the retail prices of international calls to mobiles.

a) The costs and prices of mobile termination of domestic calls

In most OECD countries, mobile termination rates have not been subject to direct price setting by the regulatory authority, until recently. Instead, they were subject to negotiation between the mobile operator and other operators with which it was exchanging traffic. This situation is now changing, as shown below. It should also be borne in mind that in some countries, the retail price of fixed to mobile calls is set by the fixed operator (subject to prevailing retail price regulation), while in others it is set by the mobile operator which reimburses the fixed operator for call origination. To complicate matters further, at least one country – France – is currently moving from the latter to the former system.
The last three years have seen growing regulatory concern about mobile termination charges. In the United Kingdom, mobile call termination rates charged by the two largest operators, BT Cellnet and Vodafone, are subject to direct regulatory intervention. In 1998 OFTEL, having failed to persuade Cellnet and Vodafone to reduce termination charges, submitted the matter to the UK Monopolies and Mergers Commission, which found that the charges were excessive and that it was in the public interest that they be immediately reduced by 25% to 11.7 pence per minute and be subject to a three-year price cap under which rates were to decline in real terms by 9% per year. These rates did not, however, apply to the two newer operators, Orange and One2One, which later reduced their charges but by a lesser amount. Other European regulators, in France, Norway and Sweden for example, are also concerned about the level of mobile termination charges. In Austria, as the regulator thought that mobile termination charges were unreasonable, prices for call termination in mobile networks were set on a per minute basis.

Even in the absence of explicit price setting by the regulator, certain mobile operators in the European Union which are found to exercise significant market power, are subject to obligations under the Interconnection Directive. This means that there is a prohibition on discrimination, which has the effect of making the differential charges for terminating domestic and international calls, described below, of doubtful legality. For example, in Belgium the dominant mobile operator, Proximus, was recently declared as having significant market power thus requiring that its termination rates would be cost oriented. In Austria the national regulatory authority for telecommunications determined the mobile interconnection rate of Mobilkom AG, an operator designated as having significant market power in the interconnection market, so that the second (max.mobil) and third (Connect Austria) mobile operators have to apply the same interconnection fees as Mobilkom. Only the fourth operator, tele.ring, was allowed to charge higher interconnection rates due to its recent entry into the mobile market (it started business in June 2000).

In cases where mobile operators are not subject to regulation under telecommunications regulation, they are still subject to ordinary competition law. Thus in 1999, the Competition Directorate of the European Commission embarked upon an investigation of the termination rates charged by certain mobile operators, following a complaint by WorldCom. In late 2000, the investigation had focussed upon charges levied by three mobile operators only.

In Australia, the ACCC (Australian Competition and Consumer Commission) is currently considering whether it should regulate mobile origination and termination rates, following a complaint by a fixed network competitor about the level of termination charges.

The actual level of termination charges is shrouded in a certain amount of secrecy, since interconnection agreements are normally commercially confidential. However, in the course of its complaint against certain European mobile operators, WorldCom cites rates applicable in November 1999. These are shown in the first column of Table 2.
Table 2. Call termination rates in November 1999 (€cents per minute)

<table>
<thead>
<tr>
<th>Operator</th>
<th>Termination Charges</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium 900</td>
<td>20</td>
<td>13.4</td>
</tr>
<tr>
<td>Germany 900</td>
<td>26</td>
<td>12.9</td>
</tr>
<tr>
<td>Spain 900</td>
<td>22</td>
<td>12.5</td>
</tr>
<tr>
<td>France 900</td>
<td>22</td>
<td>12.7</td>
</tr>
<tr>
<td>Italy 900</td>
<td>25</td>
<td>11.9</td>
</tr>
<tr>
<td>Netherlands 900</td>
<td>20</td>
<td>13.1</td>
</tr>
<tr>
<td>Finland 900</td>
<td>23</td>
<td>13.1</td>
</tr>
<tr>
<td>Sweden 900</td>
<td>24</td>
<td>16.8</td>
</tr>
<tr>
<td>UK 900</td>
<td>18</td>
<td>12.5</td>
</tr>
<tr>
<td>Austria 900</td>
<td>15.99</td>
<td>13.8</td>
</tr>
<tr>
<td>Germany 1800</td>
<td>40</td>
<td>20.1</td>
</tr>
<tr>
<td>Netherlands 1800</td>
<td>20</td>
<td>21.4</td>
</tr>
<tr>
<td>UK 1800</td>
<td>23</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Note: The column "Termination Charges" shows data from a Mobile Communications Report of actual charges. The column "Cost Estimate" shows Analysys estimation using a LRIC model including an equal proportionate mark-up. Termination charges without mark-up range from 5.3 to 9.3 Euro cents per minute.


Since that date, rates in Germany, Italy, Holland and Sweden have fallen by between 19 and 41% and in France a reduction in prices for fixed to mobile calls of about 20% has taken place.

It is also relevant to consider the costs of mobile call termination, because they give some indication of the kind of level which might be achieved either through a competitive process or through cost-based pricing achieved through intervention by regulatory or competition authorities.

Table 2 also shows the costs of mobile call termination for the operators, as estimated by Analysys. The Analysys procedure was to construct a bottom-up engineering model of 900 and 1800 operators, dependent upon the geographical features of the country concerned. The model uses forward looking costs, since as a result of rapid technical progress in the industry, this approach is likely to produce different estimates than those based upon historic costs. Costs are annualised using a discount rate of 14%. The cost estimates in the table are derived on the basis that coverage costs (i.e. the provision of a basic network) are distributed predominantly over traffic costs. This has the effect of substantially increasing the estimate of call termination costs, as compared with an alternative model in which coverage costs are allocated on a per customer basis.

The results, which Analysys acknowledges only to be broad estimates for any country, suggest the presence of substantial if declining margins in the European Union on mobile call termination. They suggest a cost price of about EUR 0.13 for 900 networks and EUR 0.20 for 1800 networks, although some regulators have doubts that the cost for terminating on 1800 networks are much higher than for 900. However, as the Analysys report acknowledges, the data must be treated with care and are sensitive to growth in subscriber numbers and traffic volumes. As noted below, many existing call termination rates paid by fixed-link operators to mobile operators for terminating international calls fall below the current prices charged for termination mobile calls.
b) The costs and prices of delivering a tromboned call to the international switch in the other country

The service in question here is the export of a call from the fixed operator’s switch to the international switch of the overseas operator. This will involve conveying the call along domestic and international segments. An estimate of cost of the domestic segment is given by cost-based interconnection rates - about EUR 0.02-0.03 per minute\(^3\). It is also widely acknowledged that technological advance has reduced the cost of international conveyance to something of the same order even where inter-continental conveyance is involved.

This means that the average incremental cost of the domestic and international outward leg of the tromboning journey is of the order of EUR 0.04-0.06. Especially where there is spare capacity on an operator’s circuits, the marginal cost will be much lower. Where the tromboning operator has to purchase the service, it is likely that competition will drive the price down to cost price.

c) The price and cost of re-importing the tromboned call

When the same operator is returning the tromboned call it has exported in the first place, that operator will incur the costs of the international half circuit, as well as paying a settlement rate to the operator to which it is handed over on its return. Those international half-circuit costs will be of the order (on an average incremental cost basis) of EUR 0.01-0.02 per minute.

The level of the settlement rate will, however, be the outcome of negotiation between the two corresponding operators. As is well known, settlement rates vary substantially from country to country, in a manner which is quite independent of costs. In particular, a country with a balance of incoming calls normally has an incentive to keep rates above costs. Only on routes where there is effective competition among international operators at both ends is it likely that settlement rates will be pushed down to costs – the cost of the receiving operator’s international half-circuit and the cost of domestic termination.

Most public discussion of settlement rates has largely ignored the rapid growth of mobile telephony, and hence the increasing proportion of international calls which, even in the absence of tromboning, would be terminated on mobile numbers. A uniform rate has been used until recently, notionally intended to cover the average costs of terminating calls on both fixed and mobile networks. To the extent that settlement rates have been symmetrical in both directions, this appears to reflect an assumption that the proportions of calls terminated on fixed and mobile networks are roughly the same in both directions. But since many negotiations over settlement rates are largely divorced from consideration of costs, it is not surprising that the cost differential between fixed and mobile termination has not played a major part in them.

Only a few regulators require the publication of settlement rates. Table 3 contains settlement rates most recently published by OFTEL for UK operators and by the FCC for US operators. The FCC in the United States has approved International Simple Resale (ISR) on more than 30 routes, including all of the routes listed in Table 3. ISR rates are generally lower than the published settlement rates on a route and sometimes include different rate structures, including different rates for mobile traffic.
Table 3. Selected settlement rates (one-half the accounting rate) with UK and US operators (€cents per minute)

<table>
<thead>
<tr>
<th>Country</th>
<th>UK (January 2000)</th>
<th>US (October 2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Denmark</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>France</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Germany</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Italy</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Japan</td>
<td>54</td>
<td>16</td>
</tr>
<tr>
<td>New Zealand</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Sweden</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>UK</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>US</td>
<td>7</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: FCC and OFTEL.

Table 2 showed that a broad estimate of the cost of terminating a call on a mobile network is EUR 0.13 to 0.20. Added to this are the combined costs of the international half-circuit and of conveying the call from the international switch to the mobile network (approx. EUR 0.03-0.05). This makes a total cost of EUR 0.16-0.25. The revenue available to set against this cost is the settlement rate. Table 3 shows that the settlement rate fails to cover these costs in the case of a call to a mobile number. As noted above, the settlement rate is notionally intended to reflect the costs of terminating a balance of international calls to fixed and mobile networks. If, as a result of tromboning, the balance moves sharply in favour of mobile termination, there will be shortfall of revenue. If uniform or unchanged settlement rates are used, then either the incoming international operator or the mobile operator will have to bear a loss.

d) Mobile termination rates for incoming international calls

In practice, fixed operators receiving international calls for termination on mobile networks have dealt with this problem by negotiating special rates with mobile operators for their termination. In some cases, these rates appear to be (and have to be, if the fixed operator is not going to make a loss, having already incurred costs of EUR 0.02-0.03) not only less than (i.e. as little as 10% or 20% of) domestic mobile termination charges, but also less than the cost of mobile termination. This has caused problems from a regulatory standpoint as *prima facie* it breaches the obligation of non-discrimination imposed upon mobile operators with significant market power in the European Union. As a consequence, several European regulators, including the ART in France, have concluded that the rates should be brought into line. It is, however, a demonstration that, in negotiations between the incoming international operator and the mobile operator over the division of the settlement rate, the balance of advantage has lain with the incoming international operator, which in the last resort can simply refuses to hand on incoming calls.

There is, however, an alternative means of resolving the problem. It is simply to de-average the settlement rate, creating separate rates for calls terminating on fixed networks and those terminating on a mobile network. However, before such bifurcated settlement rates are applied there should be certainty that termination rates for both fixed and mobile services are cost-based, otherwise there is a danger of introducing serious distortion in pricing. The fact that consumers calling a number in another country may not be aware that the number is a mobile number and subject to higher calling charges also raises serious consumer issues. The next section discusses how this has developed in some countries and how it may also be reflected in different retail charges for international calls to fixed and to mobile numbers.
Summary

Figure 2 brings together the points made under a – d above. The left-hand stack shows the cost to the operator of delivering the call to the mobile operator, together with the charge paid for mobile termination of a domestic call. If that charge exceeds the height of the stack on the right-hand side of the figure, then the operator will have an incentive to trombone. The stack on the right consists of the cost to the operator of exporting the call to the overseas international switch – this will include the costs of some domestic (CC), as well as of international conveyance (EC); the cost borne by the operator in providing the international half-circuit to re-export the call (HC); and the settlement rate (SR). The last has to be set against the cost incurred by the international operator in importing the call as well as the charge paid to the mobile operator for call termination.

Figure 2. Call costs without and with tromboning

A number of implications follow immediately from Figure 2:

- If a domestic operator has an incentive to trombone, it must be because the domestic mobile termination rate exceeds the sum of the settlement rate and the (inefficiently incurred) costs of exporting and re-importing the call\(^7\). There is thus no way in which the international operator receiving the call can pay the standard mobile termination charge without incurring losses.

- Other things equal, closer approximation of the domestic mobile termination charge to cost will reduce the incentive to trombone.

- Other things being equal, a reduction in the settlement rate will increase the incentive to trombone.
Other things being equal, an increase in the settlement rate in general, or in particular for calls terminated on a mobile, will reduce the incentive to trombone.

These theoretical observations have important policy implications.

The discussion so far has focussed entirely on price, yet tromboning may also affect call quality, by introducing a minute delay or minutely increasing the probability that the call will fail. Operators which trombone calls record that they monitor call quality carefully, to ensure that there is no overall deterioration in quality. If there is a risk that tromboning will reduce quality, the practice is abated.
SECTION 3 – THE GROWTH AND (PARTIAL) DECLINE OF MOBILE TROMBONING

As the penetration of mobile phones increased throughout the second half of the 1990s – to the extent that many countries now have more mobile than fixed lines – the importance of the price of calls to a mobile in determining a customer’s choice of operator grew. According to some operators, the price of a call to a mobile replaced the price of a call to the United States as one of the key determinants of many business customers’ choice of operator. This created a particularly strong incentive to reduce the price of calls to mobiles through tromboning.

For tromboning to occur, it is only necessary for an operator with calls to deliver to mobile phones to find one route which satisfies the required relationship between the settlement rate and the domestic mobile termination rate. Where there are several options, the operator would choose the cheapest. For many countries, the United States has represented the natural choice of country through which traffic is tromboned. High capacity cables to and from the United States keep costs down, and US operators have struggled for many years to lower settlement rates with corresponding operators – with considerable success in recent years. Moreover, the predominance within the United States of RPP for mobile calls has meant that US operators are not vulnerable to the tromboning of domestic calls to US mobiles. There are other areas where low settlement rates and high mobile termination rates encourage tromboning. Thus a significant amount of domestic mobile traffic is tromboned internationally among the Nordic countries. There are reports of tromboning occurring also in the Asia/Pacific region.

It is possible to offer some rough scaling of the extent of tromboning by comparing the share of calls to mobiles in international calls with the share of calls to mobiles in calls overall. In the United Kingdom, for example, in 1998/9 when tromboning is said to have been at its height, 92% of calls were terminated on a fixed network and 8% on a mobile network. 7% of calls terminating on fixed networks came from overseas. Yet it is reported that on some international routes where significant tromboning was taking place, up to 80% or 90% of incoming calls were destined for a mobile operator. Assuming that the proportion of (genuine) international calls to mobiles is the same as that of international calls to fixed, this suggests a massive scale of tromboning. The activity thus involved a significant re-distribution of income between the tromboning operator and its customers on the one hand and the receiving international operator and the terminating mobile network on the other.

However, starting in about 1997, certain major international operators receiving large volumes of tromboned traffic, notably BT, decided on a strategy of resistance. This involved the use of a ‘quantity rationing’ response and/or a ‘price’ response.

The former took the simple form of placing a cap on the proportion of incoming traffic it was prepared to accept for termination on a mobile network. This might be, for example, 5% or 10%. If its international correspondent sought to send a greater proportion, the operator would refuse to accept the excess. Assuming this policy were generally applied, then mobile tromboning would be impracticable, even if the incentive to do so were still strong.
Where the incoming operator carrying out the rationing is dominant, questions can be raised about whether this conduct is abusive. These concerns are strengthened where the operator is vertically integrated with a mobile operator. There have been numerous debates about whether mobile termination is a separate market in the case of each mobile operator, or whether there is a single national market. Even if the latter view is adopted, it is possible that action taken by a dominant operator in rationing the proportion of incoming international calls going to mobile numbers has the effect of benefiting its affiliated mobile operator, in a way which abuses that dominance. This aspect of the situation has not featured in observations by regulatory or competition authorities on the tromboning phenomenon.

The alternative ‘price’ response is to seek to negotiate a separate and higher settlement rate for the termination of international calls on a mobile network. Since 1998, BT and other operators subject to tromboning have negotiated a significant number of settlement rates specifically for mobile call termination. In the case of most operators, these remain confidential. However, France Telecom, which first entered into an agreement with British Telecom, has negotiated special mobile settlement rates with 50 operators. These are mainly with operators in Europe, but also with some North American and Asian operators. Cullen International reports France Telecom as seeking to agree on an extra charge of EUR 0.23 over and above the existing accounting rate for calls terminating on mobile networks.

Data on settlement rates for calls to an international mobile are not published separately by OFTEL and the FCC. In the case of BT, however, it is possible to draw some inferences about their level by a comparison of the company’s wholesale price lists for outgoing calls to overseas operators. The company publishes a price list showing prices to be paid to BT by another UK operator for the conveyance by BT of international outgoing calls, handed over from the operator’s system at a BT International Switching Centre. In the August 2000 price list, there was a special rate in the case of 19 companies for providing the service for calls to a mobile in the partner country. It is reasonable to suppose that the difference between the rates reflects differences in international settlement rates. The relevant prices for daytime calls to fixed and mobile numbers are shown in Table 4, together with the difference between them. The average differential in BT’s outgoing calls charges to Europe is 9 pence or EUR 0.16. This is with the difference between mobile termination charges in Europe, which average EUR 0.25 (see Table 2), of the same order as (but less than) fixed link termination charges of EUR 0.02 – EUR 0.05. As noted above, settlement rates can vary, for example where ISR is allowed.
### Table 4. BT Charges for Conveyance of International Outgoing Calls (pence per minute)

<table>
<thead>
<tr>
<th>Destination</th>
<th>Fixed</th>
<th>Mobile</th>
<th>Fixed/Mobile Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>14.57</td>
<td>18.52</td>
<td>3.95</td>
</tr>
<tr>
<td>Belgium</td>
<td>4.78</td>
<td>16.35</td>
<td>11.57</td>
</tr>
<tr>
<td>Denmark</td>
<td>4.87</td>
<td>18.05</td>
<td>13.18</td>
</tr>
<tr>
<td>Finland</td>
<td>7.94</td>
<td>18.46</td>
<td>10.52</td>
</tr>
<tr>
<td>France</td>
<td>3.02</td>
<td>17.78</td>
<td>14.76</td>
</tr>
<tr>
<td>Germany</td>
<td>5.14</td>
<td>10.58</td>
<td>5.44</td>
</tr>
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<td>Greece</td>
<td>11.41</td>
<td>11.79</td>
<td>0.38</td>
</tr>
<tr>
<td>Israel</td>
<td>11.50</td>
<td>18.16</td>
<td>6.66</td>
</tr>
<tr>
<td>Italy</td>
<td>9.24</td>
<td>26.71</td>
<td>17.47</td>
</tr>
<tr>
<td>Japan</td>
<td>16.54</td>
<td>22.08</td>
<td>5.54</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>13.99</td>
<td>18.37</td>
<td>4.38</td>
</tr>
<tr>
<td>Malaysia</td>
<td>9.78</td>
<td>25.96</td>
<td>9.78</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4.13</td>
<td>16.96</td>
<td>12.83</td>
</tr>
<tr>
<td>New Zealand</td>
<td>10.98</td>
<td>20.40</td>
<td>9.42</td>
</tr>
<tr>
<td>Norway</td>
<td>6.26</td>
<td>10.34</td>
<td>4.08</td>
</tr>
<tr>
<td>Portugal</td>
<td>9.17</td>
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<td>6.67</td>
</tr>
<tr>
<td>Spain</td>
<td>6.16</td>
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</tr>
<tr>
<td>Sweden</td>
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<td>12.17</td>
<td>2.34</td>
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<tr>
<td>Switzerland</td>
<td>4.92</td>
<td>19.75</td>
<td>14.83</td>
</tr>
</tbody>
</table>

Source: BT.

In principle, we would expect the de-averaging of the settlement rate into fixed and mobile termination components to lead to an increased mobile rate and a decreased fixed rate. However, it is not possible to establish whether the latter has occurred as well as the former. There is also a question of whether the conventional symmetry of the settlement rate would be retained, in circumstances where there may be substantial differences in the price of mobile termination at either end. There is some conflict of testimony on this point with some operators saying that the mobile settlement rate is the same at both ends of the relationship, others saying that it differs.

An important knock-on effect of the differentiation of settlement rates in accordance with the network terminating the call has been differentiation by some operators in retail prices. Since August 2000, BT has charged a different retail price for a call to an overseas fixed line than to an overseas mobile line. These rates were notified by BT in the proper manner and were not opposed by OFTEL. It is likely, however, that most of BT’s customers are not aware of the higher charges, and there is no means of alerting them on a call by call basis. KPN in the Netherlands has followed suit in differentiating retail prices, causing concern on the part of OPTA, the Dutch regulator, about the resulting disadvantage to Dutch customers.

Governments and operators need to be cautious in introducing bifurcated settlement rates. An independent assessment of the cost of terminating a call on a mobile network and the extent to which that cost may exceed the cost of terminating a call on a fixed network is necessary before such a decision is taken.
SECTION 4 – EVALUATION

Interviews with executives from telecommunications companies suggest that mobile tromboning has had a comparatively short half-life in some countries, even though it survives in others. Its heyday in Western Europe was between 1997 and 1999. More recently, as a result of countermeasures taken by the operators affected, the phenomenon has declined there. These countermeasures have been introduced particularly by countries where the ground for mobile tromboning is most fertile – countries characterised by relatively low settlement rates and high mobile termination rates.

As noted above, counter-measures involving price, in the form of a differentiated settlement rate for calls to mobile networks, have been introduced in several countries satisfying the conditions described above. The principal exception has been the United States, where the commercial framework – receiving party pays – and lower general mobile termination rates have removed the incentive for many US operators to participate in the counter-measures. However, in Europe, mobile tromboning via the United States has been countered by means of quantity rationing – the simple refusal to accept an excessive proportion of incoming calls to mobiles in international traffic.

It is noteworthy that regulators have taken different attitudes towards mobile tromboning. Some have encouraged it. Others appear to have regarded it as a form of inefficient arbitrage which is unlikely to offer long-term benefit to consumers. The latter have permitted or have favoured the introduction of more cost-reflective pricing, even in circumstances where it has had the effect of raising the retail price of certain international calls. Among OECD countries only Finland does not (in principle) allow tromboning.

Above-cost termination rates for mobile calls which, in turn, result in tromboning, impose a real resource cost on the economy. If mobile termination rates were themselves fully cost-reflective, then mobile tromboning would have no redeeming features. To the extent that they are not, however, the resource costs of inefficient routing are compensated for by lower and more cost-reflective retail prices for consumers in those countries where mobile termination rates are high.
Figure 3. The effects of tromboning

AC₁ = marginal/average cost without tromboning
AC₂ = marginal/average cost with tromboning
P₁ = retail price without tromboning
P₂ = retail price with tromboning

Suppose AC₁ = 100, AC₂ = 103.33, P₁ = 200, P₂ = 160
Q₁ = 100, Q₂ = 120.

Then area E = 3.33 x 120 = 400, and
area F = \( \frac{1}{2} \times 40 \times 20 = 400 \).

Source: Author.

Figure 3 sheds light on this trade-off. Mobile tromboning raises costs on some calls to mobiles but lowers retail prices for all. Suppose that the increase in costs from tromboning, averaged over all calls to mobiles, raises costs from AC₁ to AC₂. Retail prices fall from P₁ to P₂. The costs of tromboning are area E. The benefit is the increase in consumer surplus F, which itself depends upon the price elasticity of the demand curve D. Clearly the net effect depends upon cost and price changes, the pattern of demand and the proportion of calls tromboned. To fix ideas, suppose one sixth of calls to mobiles are tromboned, that tromboning increases costs by 20%, and reduces retail prices by 20% (from twice cost). Suppose the price elasticity of demand is –1. In this case additional consumer benefits almost exactly equal extra tromboning costs. If average tromboning costs were proportionately higher, or the decline in price smaller, the net effect would be adverse. The same consequence would follow if demand were less elastic. Equally, higher tromboning costs, combined with a greater proportion of calls tromboned, would tilt the balance against tromboning, as would a smaller fall in retail prices and a lower price elasticity of demand.
Unfortunately, the data necessary to make this evaluation in practice are not available. The cost data above suggest that mobile tromboning increases the cost of a tromboned call by something of the order of one third. The price elasticity of demand is unlikely to be substantially greater than 1, and may be below it. It is, however, extremely difficult to establish either the proportion of calls to mobiles which are tromboned and/or the impact of tromboning on retail prices. It is perhaps not surprising that different regulatory authorities have taken a different view of the same phenomenon. Some have focussed upon the productive inefficiencies. Others have focussed upon the leverage which the existence of tromboning has exerted on mobile termination rates.
NOTES

1 Something akin to RPP arises through international roaming, where the receiving party pays for the international component of the call received. However, the issues involved are different with roaming, where international conveyancing is a necessary rather than an avoidable part of call delivery.

2 As becomes clear below, these formulations make the simplifying assumption that the costs of delivering the call to the international switch and to the point of interconnection with the mobile operator are the same.

3 Data provided by Cullen International.

4 Thus the ‘pure’ average incremental cost of call termination, without mark-up and with coverage costs allocated on a per-customer basis, is of the order of EUR 0.05 – EUR 0.10.

5 See, for example, the EU ‘benchmark’ interconnection rates.

6 In many countries the historic fixed operator also controls a major mobile operator, so the loss is borne jointly.

7 This makes the plausible assumption that CC and DC are the same.

8 Article 3.4 of the International Telecommunications Regulation requires that; ‘Subject to national law, any user, by having access to the international network established by the administration, has the right to send traffic’. This has not been invoked to resist such a cap.

9 See note to figure 3.