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TECHNICAL ISSUES ON ROAMING
Transparency, Technical Aspects and Data Overview related to the Proposed Regulation on Roaming

Briefing Note

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EXECUTIVE SUMMARY

The object of the present briefing is to analyse some of the fundamental aspects of the legal proposal by the European Commission on the subject of roaming, COM (2006)382 on 12 July 2006, which proposed to modify the regulation of mobile communications, resulting in important reductions of roaming tariffs within the Community. The briefing examines the efficiency and concrete applicability of the measures introduced by the Regulation Proposal, which created the "Mechanism of the Domestic European Market" and the envisaged requirements of transparency and information on roaming costs charged by mobile network operators (MNOs).

The briefing consists of four sections, analysing the following issues: Transparency, Technical Infrastructure, Overview of Existing Data, and Feasibility of Technical Implementation.

TRANSPARENCY

Recent studies indicate that more than 40% of European users do not have a clear idea of the cost of calls abroad. Excessive roaming costs are the main reason why Europeans use their phones less often when travelling abroad, and almost 60% of Europeans would use their phones more frequently if international roaming fees were less expensive.

To keep customers better informed of international roaming prices, Article 7 of the Regulation Proposal envisages measures such as providing roaming customers with free voice call and short message services (SMS) to provide retail tariff information, as well as periodically informing them of applicable roaming charges and pricing variations.

This section includes an analysis and comparison of the various methods to achieve greater tariff transparency, in particular, the "Free pull" (envisaged by Article 7), "Advanced push", and "Hybrid push/pull" systems (see Table 1).

With the Free pull system (option 3 of Table 1), MNOs offer a free SMS/voice call service to their customers, and constantly update them about (substantial) changes in roaming charges. Because MNOs would be responsible for all costs, they may increase charges, thus resulting in informed customers cross-subsidising uninformed customers who require the service. In addition, differentiation in offered services might decrease and less mature markets may be more negatively affected. However, the Advanced push system (option 4, in which users receive a welcome SMS with information on the recommended network partner, then choose their preferred network and receive an SMS with tariff plans) would be too costly for MNOs and quite difficult to implement, while the Hybrid push/pull (option 5, in which users receive a welcome SMS which offers the option to send an SMS to gather information on available prices); seems more economically sustainable for MNOS, as users pay to send an SMS, and it may be more user friendly. The analysis suggests that a service providing greater tariff transparency should not necessarily be offered to customers for free.

TECHNICAL INFRASTRUCTURE

This section describes the technical infrastructure of roaming and analyses whether the system creates increased costs. International roaming involves the following activities for equipment, systems and operations: call data records (CDRs); interconnection and transit infrastructure costs; payments for call termination for visited MNO, home network costs; and costs of negotiation between roaming partners.

This analysis estimates that international roaming costs are between 10% and 20% higher than a national-only system, a figure supported by a separate estimate that suggests added costs of about €0.02–0.03/call. However, current roaming charges are more than 100% higher than the national roaming costs.

To implement tariff restriction according to the Proposal, it would be necessary to update the billing systems, the roaming agreements, and the business processes for settings rates.

In theory this would take three months to complete, but considering possible mandates and legal challenges, the process would most likely take one to two years.

The assessment foresees the following impacts on investments as a consequence of the proposed regulation: a decrease in unit cost to customers; a marginal increase in operator costs, outweighed by increasing returns; increased revenues with no network or operational expansion; and increases in new entrants and new technologies.

The overall result would be increased social and business benefits, with lower costs of doing business across Europe. Existing operators would have increased revenues and traffic, and innovation and new entrants would be strongly encouraged.

OVERVIEW OF EXISTING ROAMING DATA

This section notes the discrepancy between information provided by operators and information requested by the Commission to create a complete and accurate summary of the market data.

Data integrity issues mainly concern market size, pricing and industry costs. The market size of the mobile market may have changed substantially from 2005, with fluctuations in roaming tariffs and changes in consumer demand patterns. Pricing information is provided through call centres, newspapers, magazine, journals, electronic pricing guides and the Internet; however there may still be issues of accuracy. The industry has worked on this issue by utilising a voluntary Code of Conduct for European operators to enhance the clarity of international retail roaming price information for consumers. In order to assess profit margins, the Commission services requested specific data from the Global System for Mobile Communications (GSM) Europe Association and from sixteen EU operators, selected to provide a representative sample of network size, roaming traffic volume; and membership of alliance networks. The GSMA's claimed rates of nominal inter-operator tariffs (IOTs) may be understated due to nominal IOT discounting, which occurs between alliance members. Most operators claim that competition in the wholesale market is working and is helping to bring down prices; however, retail prices may not always drop when wholesale prices decrease. The Commission calculates that the average retail charge for a roamed call is more than five times higher than the actual cost of providing wholesale service, and on received roaming calls, operators make retail margins of 300 to 400 %. Operators attest that their packages offer good value for money and the total cost of these services to consumers has been decreasing; however, there is no clear evidence that any of these services are run at a loss, or that roaming prices are justified to compensate for the price of cheaper services.

FEASIBILITY OF TECHNICAL IMPLEMENTATION

Article 5 of the Proposal of Regulation states that the retail price limits envisaged will take effect after six months ("*The obligations in Article 4 shall take effect six months after the entry into force of this Regulation"*).

After an analysis of the measures envisaged by the Regulation, the briefing note concludes that the implementation of the transparency measures would be difficult to carry out within the expected amount of time. The adoption of this measure, in fact, would need to constantly update information on available retail prices of visited network service providers and would need to simplify tariff schemes and user profiles to keep down costs. Furthermore, this measure would not be easily implemented because the costs of implementation are significant and will be borne entirely by MNOs. The impossibility of recovering the cost of setting up the service may lead either to an increase in domestic charges or to a reduction in investments.

Regarding the implementation of the tariff-reducing measures, price-capped roaming regimes could be effected reasonably quickly – in three months or so. The time required is that to update the billing systems, the roaming agreements, the business processes for setting rates and possibly the interconnect systems and any checks on TAP files or possibly raw CDR data, as well as the customer-care processes. Billing systems can be updated by reprogramming if they are of the previous generation, or by operator resetting and perhaps reconfiguration of rating tables if they are of the current generation. However, as capping will require mandates through legislation, with potential legal challenges to be processed, a horizon of at least one to two years is realistic.

INTRODUCTION

The problem of high international roaming tariffs dates from mid-1999, when the European Commission decided to carry out a sector inquiry into national roaming and make international comparisons of some mobile communications operators to assess whether there were infringements of Article 82 of the Treaty, concluding with the adoption of the 2002 regulatory package for electronic communications, which introduced a system of regulatory obligations on firms that held a dominant position in the market. The current framework for electronic communications provides an analysis procedure for the relevant markets on behalf of the national regulator authorities, resulting in the emergence of individual relevant markets susceptible to *ex ante* regulation and, if the conditions occur, the impositions of regulatory obligations *ex ante* on firms in the sector of electronic communications which operate in the relevant market. It was in such a context that international roaming, after having been singled out as potentially susceptible to regulations *ex ante*, was included in the relevant markets of service in the sector of telecommunications regulated by the Recommendation of the Commission of 11 February 2003.

The introduction of international roaming in the relevant markets subject to regulation *ex ante* therefore allows the national regulation authorities, as stated in Article 16 of Directive 2002/22CE, to impose regulatory obligations on access and on institutions for price checks on the firms after having evaluated such a market as effectively competitive. The national competition permits the competent authority to sanction anti-competitive behaviour by individual firms.

Recent studies and investigations from the European Commission nevertheless highlight, the existence of unjustifiably high international roaming rates, and the ineffectiveness of the current regulatory framework which monitors anti-competitive behaviour in the firms.

Despite repeated warnings and numerous initiatives by the EU Institutions, the prices of international roaming rates still remain unjustifiably high: the packages offered by mobile telephone operators in response to the input of the EU present excessively high costs which do not reflect the actual costs of the operators of such services, and therefore constitute a deterrent to the use of mobile telephones by foreign consumers.

The Regulation Proposal of the European Parliament and the Council (COM) (2006) presented by the Commission aims to provide a legal and standard basis for achieving important reductions in roaming tariffs within the Community and greater transparency of detailed costs.

For the suggested instruments to achieve these objectives, the Commission proposes the institution of the “Mechanism of the European domestic market”. This measure consists of setting limits on common rates for mobile phone calls affected by a host network in the Community and destinations in other public telephone networks located within the Community. In addition to the instruments used to reduce charges, the proposal foresees specific finalised measures to guarantee the transparency of costs, requiring mobile telephone operators to give information on costs to their customers when they sign up for the service and to provide regular updates, including cases of significant variations in actual costs.

1. TRANSPARENCY

In this section, transparency issues are briefly addressed from the viewpoint of users and mobile network operators (MNOs). In discussing transparency issues, we initially adopt a "Greenfield" approach – i.e., we assume that there is no price regulation at the retail and wholesale level. When commenting on the likely impact of the proposed regulation on users and MNOs, we take into account the potential cumulative effects of transparency measures and price regulation.

1.1 Transparency for the end user

The lack of consumer awareness of costs and available pricing schemes when travelling abroad has been confirmed by several empirical studies, and most recently by a Eurobarometer survey published in November 2006, according to which more than 40% of European users do not have a clear idea of the cost of calls abroad, "excessive communication costs are by far (81%) the main reason why Europeans use their phones less often when travelling abroad", and almost 60% of Europeans "would be ready to use their phones more frequently when travelling abroad if prices were more attractive".[1]

Against this backdrop, Article 7 of the proposed regulation envisages some transparency measures, such as providing roaming customers with a free short message service (SMS) (so-called "pull mode") and call-based retail tariff information, as well as clearly informing them periodically of applicable roaming charges and any changes to these. This adds to a number of measures that have already been implemented at EU and national levels, such as the creation of a pan-European website by the European Commission in cooperation with the Global System for Mobile Communications (GSM) Europe Association,[2] and the development of national websites by national regulatory authorities (NRAs). Below, we briefly list possible measures for increasing retail tariff transparency, and provide an assessment of their likely effects on mobile network operators (MNOs), end users and competition in mobile markets.

Methods of achieving greater tariff transparency

Greater transparency for the end user can be achieved through several (complementary) measures. Options that have been considered so far include:

- the provision of *information in paper form*;
- the *creation of ad hoc websites* at national or pan-European level;[3]
- the provision of international roaming charges by means of a *116 number* for harmonised European services;
- self-regulatory options that rely on *initiatives by individual MNOs or industry associations*, aimed at simplifying tariff schemes to the benefit of final users;[4] and
- information on tariffs made available through Wireless Application Protocol (*WAP*) / General Packet Radio Service (*GPRS*) *browsing*.

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[1] See Special Eurobarometer n. 269, available at http://ec.europa.eu/public_opinion/archives/ebs/ebs_269_en.pdf, pp. 14 and 17.

[2] See http://europa.eu.int/information_society/activities/roaming/index_en.htm and http://www.roaming.gsmeurope.org

3 Currently available websites include the European Commission's website launched in October 2005, dedicated national websites started by NRAs in 2006 and the GSM Europe a website launched in July 2006. Larger MNOs also offer recommendations and price information to their subscribers and pre-paid users on their websites. Websites are generally useful, as they provide users with a one-stop-shop for information and comparisons of international roaming tariffs, and consumers can consult them anywhere where web access is available. However national websites are easier to manage and consult than pan-European ones, and are also more informative; pan-European websites only provide an overview of charges, not information on specific charges and user profiles.

[4] Examples include the adoption of average/zonal prices (Freemove, Vodafone Eurocall/Passport plans, etc.). A number of European MNOs have already started offering services that allow end users to gather sufficient information to select the cheapest foreign network when roaming abroad. ERG reports that an Italian MNO adopts a hybrid ("push–pull") system by sending an SMS to its customers explaining how to obtain information on charges in the visited country: the subsequent request ("pull") is charged at the normal rate of an SMS in Italy but with no charge for receiving the information. A Lithuanian MNO uses a similar system, but in addition to the SMS initiated by the user to get the prices (charged at standard IR rates), the user is charged by the home MNO a price of 0.45 LTL (0.13 Euro). In the UK, one MNO provides a "pull" service for country-specific information, including tariffs (using a short code). The service is free if requested in the UK, and charged at normal rates outside. Most notably, an Irish MNO is reportedly trialling a "push" SMS for customers who roam abroad, which – besides providing tariff information – also identifies whether the customer is using the cheapest network and, if not, recommends which network to use and the associated cost. The main disadvantage of this option is the difficulty of monitoring compliance with transparency obligations by MNOs. On the other hand, such an option – especially if caps are maintained both at retail and wholesale level in the final regulation – would encourage MNOs to develop different service bundles for different users – i.e., to adopt an efficient versioning of their service bundles to tailor them to end-user preferences.

These options, however, were found to be not fully effective, difficult to monitor, or too costly to implement.[5] Two additional options, both based on the SMS (short message service) tool, are considered to be potentially more effective.

- Information can be provided through a *"push" SMS*, i.e. an SMS initiated by the customer's home MNO showing tariffs for inbound and outbound calls on the selected visited network. Roamers would receive a "welcome SMS" from their home MNO, which alerts them to additional charges for roaming, contains information on charges for basic voice calls on the selected roaming network, and suggests where additional, more comprehensive information can be retrieved. The technical implementation appears quite challenging for a number of reasons. First, an operator-initiated welcome SMS only provides information on the specific network which the customer has logged on to: users would then have to face the hassle of logging on to several (and possibly all available) networks in order to find the best deal. Second, as tariffs vary considerably between operators, and depending on the origin, destination, time of day, type of customer contract and services offered, an SMS will hardly provide all the needed information within the limited number of characters available (160). Most often, information would be limited to service availability – a rather unsatisfactory solution.

  For pre-paid customers, the provision of real-time tariff information is more costly to implement, although increasingly feasible from a technical viewpoint. GSM-enabled technologies for advice of charge (AOC) are not useful as they can only send one price at a time, and only after the call has finished. Advanced intelligent network (IN) technologies (such as "customised applications for mobile enhanced logic", CAMEL) are more user friendly than previous call-back technologies and enable direct communication between a home MNO and a visited MNO, in turn allowing operators to offer complex discount schemes, based on a variety of factors applied in real time when the user is roaming abroad. With CAMEL, the call is monitored and controlled by a node in the home network, which communicates with the visited network. When one of the parties hangs up and ends the call, the proper amount is debited from the pre-paid account.[6] However, deploying CAMEL is quite costly, and inevitably requires home MNOs to charge users wishing to use the service.[7] The cost of integrating CAMEL functionality in the network of one MNO and upgrading the billing and IT system was conservatively estimated at €100 million in 2001.[8] Such cost includes expensive network and software upgrades, the addition of new service control points (SCPs), and testing and implementation by all the cooperating networks. For example, the cost of new SCPs is estimated at €5 to €8 per subscriber for a customer base of at least 3 million, depending on the range of functions to be implemented.[9] Finally, CAMEL must be supported by both the home and the visited MNOs, and may unacceptably delay the call set-up, in turn negatively affecting customer experience. For such reasons, some MNOs, concerned about returns on investment, have not implemented the technology yet, and those that have implemented it have not considered the proposed price regulation when calculating prospective returns.

- Information can be provided through a *"pull" SMS*. Under this scenario, customers send a (*user initiated*) SMS to a number reserved by their home operator with a standard code (for example, "INT PRICE") when abroad. In reply, the user receives one (or more) SMS with information on the charges relevant for his/her type of subscription. In principle, this solution might prove effective, especially since the information provided can be tailor-made and take into account the user's tariff plan: this, to a limited extent, reduces the need to send an enormous amount of information via SMS. However, the technical development of a reasonably informative system would entail development costs. As a matter of fact, welcome SMSs are currently mostly sent by visited MNOs, not by home MNOs. Implementing a pull system would require that home MNOs reserve a number that customers can call when roaming abroad – such a service would of course come at a cost for home MNOs. For this reason, the European Regulatory Group (ERG) IRTT Project Team recently accepted that the SMS MNOs could charge for use of a pull mechanism. The ERG group only recommended that the price of this SMS information service should be such as not to discourage its use and should, in turn, be communicated clearly to users[10].

[5] See the report of the European Regulatory Group (ERG) Project Team on International Roaming Tariff Transparency (IRTT), ERG(05)43 rev 1, October 2005.
[6] If one of the parties' balance reaches zero, the call is automatically disconnected, normally after a warning tone is played.
[7] CAMEL solves the usability problem associated with previous unstructured supplementary services data (USSD) call-back technologies, which required users to key in a string of characters following the USSD standard to instruct a service node located in their home network to call them back and then connect the called number.
[8] See, e.g., GSM Europe Information Paper, *Real Time Information: The Feasibility of Implementation*, October 2001.
[9] Giroux (2003). However, €2–3 per subscriber may be sufficient to CAMEL-enable existing legacy equipment without adding many new SCPs.
[10] ERG(05)43 rev1, October 2005, p. 20.

In Table 1, we compare five different options for implementation of a push or a pull system. These include the option envisaged in Article 7 of the proposed roaming regulation (option 3 in the table).

Table 1 – Comparison of options to increase tariff transparency

	Option	Effectiveness/relevance	Efficiency	Implementation, sustainability
1	***SIMPLE PUSH*** User receives a welcome SMS with information on how to gather data on roaming prices. A link to a website or paper materials distributed at points of interest could be envisaged.	**Low** Users would need to gather information on the web or from paper materials distributed at points of interest. Potential "junk mail effect" and information overload for users. No tailor-made information related to user profile.	**Medium** Easy to implement, as it only requires minor changes to the welcome SMS. Implies the setting-up of a website or the development/distribution of guidance materials. May require a right to store materials at points of interest.	**Low** Technology is readily available. Implementation costs are significant and not likely to be acceptable to MNOs. Difficult to monitor compliance with transparency obligations. *Not user friendly*. Users would need to find their way through complex guidance documents.
2	***SIMPLE PULL*** User decides whether to send an SMS to (or call) a universal number that provides information on roaming charges via SMS.	**Medium** Requires the user's initiative. Implies that users are informed about available numbers to call. 'hassle' effect is limited as users can receive info tailor-made to their profile.	**Medium** Service yet to be implemented. MNOs could charge for sending the info via SMS. Need for cooperation between MNOs/NRAs to set up service.	**Low** Implementation costs are significant and likely to be passed on to users.
3	***FREE "PULL"*** Envisaged by the current proposal in Article 7. Home MNOs offer a free SMS/voice-call service to their customers, and constantly update them about (significant) changes in roaming charges.	**Medium** Requires the user's initiative. Implies that users are informed about available numbers to call. "Hassle" effect is limited as users can receive information tailored to their profile. Information may cover all available networks.	**Medium** Service yet to be implemented. MNOs cannot charge for sending the info via SMS or voice call. Home network needs to cooperate with MNOs/NRAs to set up service and gather information on retail prices. Might encourage zonal pricing/simpler tariff schemes and exclusivity agreements between operators.	**Low** Implementation costs are significant and will be borne entirely by MNOs. Need to keep constantly updated information on available retail prices by visited network service providers. Need to simplify tariff schemes and user profiles to keep down costs.
4	***ADVANCED PUSH*** Users receive a welcome SMS with information on the recommended network partner, then choose their preferred network and receive an SMS with tariff plans for its tariff scheme.	**High** Users receive an alert about existing available networks and the cheapest partners per profile. Tariffs are transparent, as users receive a single SMS tailored to user profile (solves the "junk mail effect"). Possibility of opting-in specific schemes for frequent travellers.	**Low** Need to enhance welcome SMS and update information constantly. Costs would be significant, and vary depending on network features and structure of charges. MNOs cannot charge for welcome SMS. Compatible with steering technologies and IOT volume discounts.	**Medium** Implementation costs are significant and unlikely to be recovered/passed-on to end users. Users unaware of the cost of alternatives. Users need to become familiar with manual network selection. Real-time tariff information technology not available on all networks. For pre-paid customers, only CAMEL is user friendly, as opposed to call-back technologies.
5	***HYBRID PUSH/PULL*** Users receive a welcome SMS which offers the opportunity to send an SMS to gather information on available prices for the user's tariff plan or ways to opt-in to *ad hoc* pricing schemes for travellers (e.g. Vodafone Passport, O2, My Europe, etc.).	**High** Users receive an alert on existing available networks and the cheapest partners per profile. Tariffs are transparent as users receive a single SMS tailored to user profile. Possibility of opting-in to specific schemes for frequent travellers. Requires the user's initiative.	**Medium** Need to enhance welcome SMS and update information constantly. Costs would be lower than option 3, as SMS is sent only if user requests it. MNOs can charge for welcome SMS and subsequent information. Compatible with steering technologies and IOT volume discounts.	**Medium** Implementation costs are significant and likely to be passed-on to end users. Methodology still being trialled. Users become aware of alternative pricing offers and *ad hoc* schemes. Real-time tariff information technology not available on all networks. For pre-paid customers, only CAMEL is user friendly, as opposed to call-back technologies.

Implications for operators and consumers

A fully fledged push system (option 4) would prove too costly for MNOs and quite difficult to implement. Option 5, in contrast, appears at once more economically sustainable for MNOs and more user friendly. If this option were implemented, consumers would be alerted and would have the opportunity to gain access to a value-added service at a charge. However, already informed consumers would not incur any additional costs: only those who need information would initiate an SMS request. This feature avoids both paternalistic measures –providing information to all consumers regardless of their needs – and cross-subsidies between users, with informed users cross-subsidising less informed ones.[11] In order to be effective, such a measure may be integrated with other measures, such as comprehensive information on *ad hoc* leaflets and already available websites set up by MNOs, NRAs and the Commission.

With option 3 (Article 7 of the proposed regulation), uninformed consumers would be better off, as they would profit from a free service that provided them with valuable information. Informed consumers, on the other hand, might cross-subsidise uninformed ones through greater charges. If MNOs were unable to recover development costs through higher prices, consumers would in any event be affected in the medium term due to a reduction of investments by MNOs.[12]

The likely consequences of option 3 for operators and price setting are as follows:

- *Simplification of tariff schemes*: in order to comply with the transparency obligation, MNOs might accelerate the already ongoing process of simplifying roaming pricing schemes, with the adoption of zonal pricing and flat-rate schemes. This would certainly reduce implementation costs.

- *Charging units*: the current proposal to regulate wholesale international roaming charges introduces a cap on per-minute charges inclusive of call set-up costs and opt-in fees. MNOs normally charge their users per second on domestic calls, whereas for international roaming services the charging unit varies considerably. In particular, some operators charge roamers per (indivisible) minute, others choose shorter charging intervals such as 15 or 30 seconds, and others have switched to charging by the second. Some operators also impose a call set-up ("flagfall") charge on international roaming calls, but not on domestic ones. If they cannot recover development costs for transparency measures mandated by the proposed regulation, MNOs might switch back to per minute charging, which allows for increased revenues and decreases billing transparency for final users.

In addition, if the proposed wholesale and retail price regulation is maintained, further effects may also materialise as a result of the "pull" transparency obligations:

- *Consolidation and information exchange*: MNOs may have an incentive to strengthen their alliances and/or consolidate, in order to facilitate the exchange of information on applicable retail prices. Typically, the visited network only knows its own inter-operator tariffs (IOTs), not the home MNO's retail tariff rates, let alone user profiles. The current GSM standard does not provide for the transfer of relevant information between the host and visited networks. The impact on social welfare is ambiguous: on one hand, consolidation and traffic steering can bring low charges; on the other hand, they may "compartmentalise" the market and foreclose non-group MNOs, let alone MVNOs, with negative impacts on dynamic competition and long-term welfare.[13]

- *Standardisation of service bundles*: as the current price cap is related to maximum – not average – prices and charges for receiving calls are eliminated, efficient versioning of service bundles would become more difficult for MNOs. The degree of service differentiation on the market would therefore decrease.[14]

[11] As acknowledged by the ERG IRTT Project Team, "the combination of both a push and a pull mechanism would be able to overcome the problems … stemming from the fact that consumers could be unaware of the existence of end-user initiated SMS."
[12] The Commission's impact assessment acknowledges that, as a result of the current proposal, MNOs may react with a rebalancing of tariffs and/or with a reduction of investments.
[13] See, in this sense, ARCEP (2006).
[14] The proposed regulation may disrupt specific pricing schemes adopted by some MNOs to match their customer preferences. This is the case, for example, with Vodafone Passport, which is based on very attractive retail prices for outgoing calls but also on charges for incoming calls. This would introduce a degree of homogeneity in a market that is now developing highly differentiated service packages.

- *Collusion*: service differentiation and lack of transparency of (discounted) IOTs charged by MNOs have so far convinced most NRAs that joint dominance is impossible in the market for wholesale international roaming. With the double cap and a pull system, more information on current retail prices would be available to all MNOs, and in turn information on wholesale prices would become easier to collect.[15]. In turn, all the conditions for join dominance under the CFI *Airtours* judgment would be restored in the market.[16] Of course, the extent to which joint dominance can lead to higher prices depends heavily on whether the costs of providing the service for MNOs are below the cap. If this were the case, MNOs might have an incentive to collude tacitly in setting prices at the maximum possible level allowed by the regulation.

As a final remark, the impact of option 3 coupled with a double cap regime would vary significantly between MNOs and member states. In particular, less mature markets with higher network costs and MNOs with a small customer base would be more negatively affected than larger MNOs in more mature countries and MNOs forming groups or alliances.

1.2 Transparency: the operators' side

Nominal IOTs are generally very transparent for operators, as they are made available to all operators (on a confidential basis) on the Global System for Mobile Communications Association (GSMA) *Infocentre*. However, in practice IOTs are much less transparent due to volume discounts, traffic re-direction techniques – such as assisted/managed roaming, SIM application toolkits and over-the-air (OTA) programming[17] – and different billing arrangements. In this section, we assess whether a greater transparency of IOTs would lead to more competitive markets.

Perhaps the most common argument for regulating wholesale international roaming charges is the risk of tacit collusion between MNOs to maintain high IOTs. Many alternative explanations have been proposed by economists for such collusion.[18] Authoritative commentators have recalled that, at least until early 2004, the limited availability of traffic steering techniques, the transparency of nominal IOTs and the non-discrimination clause included in the GSM Standard International Roaming Agreement (STIRA) have been major causes for the lack of price competition in the market for wholesale international roaming.[19] Today, however, the situation appears radically different:

- Until a few months ago, any attempt by an MNO to reduce IOTs would probably not have caused an increase in traffic volumes, as visited networks were randomly selected by the roaming customer. Today, with at least 80% of the traffic is non-random but rather selected by the customer, and there is a growing consumer awareness of retail tariffs, MNOs will have a much greater incentive to negotiate better deals with preferred network partners; this would be the only way to offer end users more attractive packages.[20]

- Under the STIRA non-discrimination clause, each operator applies the same terms and conditions in its international roaming agreements, i.e. it supplies its wholesale services at the same price, independently of the counterpart. Given such constraints, it is easy to understand why operators have decided to focus on alliances, traffic re-direction and volume discounts on nominal IOTs: discounted IOTs are in fact not subject to the non-discrimination clause.

Against this background, increasing transparency of IOTs actually paid by home networks to visited networks would not lead to a more competitive environment. Interestingly, the lack of transparency in discounted IOTs and the impossibility of retaliating have convinced many NRAs that no joint dominance or other collusive behaviour could be sustainable.[21] In addition, IOTs are becoming much less important, as a growing proportion of traffic is internalised within groups or cross-border alliances.

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[15] Article 4 of the current proposed regulation introduces a retail cap equal to 130% of wholesale tariffs.
[16] Case T342/99.
[17] Today, steering techniques reportedly allow MNOs to steer more than 80% of their traffic abroad. See, e.g., ARCEP (2006) p. 22, and the Commission's impact assessment, COM(2006)382 final, p. 24.
[18] See, e.g. Valletti (2004); Stumpf (2004), Tsyganok (2005) and Lupi and Manenti (2006).
[19] See Valletti (2004).
[20] See, for a formal demonstration, Salsas and Koboldt (2002).
[21] See AGCOM (2006), FICORA (2005), ComReg (2006), PTS (2006) and NPT (2006). *Contra*, see ARCEP (2006).

Such alliances have profited from increasingly sophisticated steering techniques to offer lower prices to their end users.[22]

A trend towards increased price competition in the setting of wholesale international roaming tariffs is likely to be observed in the future, but this will depend more on technological developments than on the proposed regulation.

1.3 Concluding remarks

The transparency measures contained in the Proposal on international roaming charges would exert an unclear impact on consumers and operators. Given the significant development costs for most MNOs – especially in countries where pre-paid customers prevail – the free provision of tariff information may lead informed roamers to subsidise uninformed ones. If the costs of setting up the service cannot be recovered, this may lead either to an increase in domestic charges or to a reduction in investments. Overall, the regulation may also lead to cross-border industry consolidation and alliances, and a loss of valuable service differentiation. On the operators' side, there seems to be no need to increase the transparency of IOTs. This may, if anything, stimulate collusive bargaining if costs are below the caps selected by the Commission.

Overall, if retail and wholesale caps are maintained in the final proposal, any requirement to impose costly transparency measures free of charge should be carefully considered under the proportionality principle: if price caps are meant as "safety nets" for consumers, then the opportunity to gather additional tariff information should not necessarily be offered for free. Likewise, with burdensome transparency measures in place, the need to impose retail price regulation becomes less evident.

[22] Notable examples are Vodafone Passport and the recent announcements by the members of the Freemove Alliance. As reported by the European Commission, some large EU operators are already charging wholesale tariffs close to €0.45.

2. TECHNICAL ISSUES ON INFRASTRUCTURE

In this section we analyse the theme of the technical infrastructure, answering a series of questions.

2.1 Does technical infrastructure cause higher roaming costs?

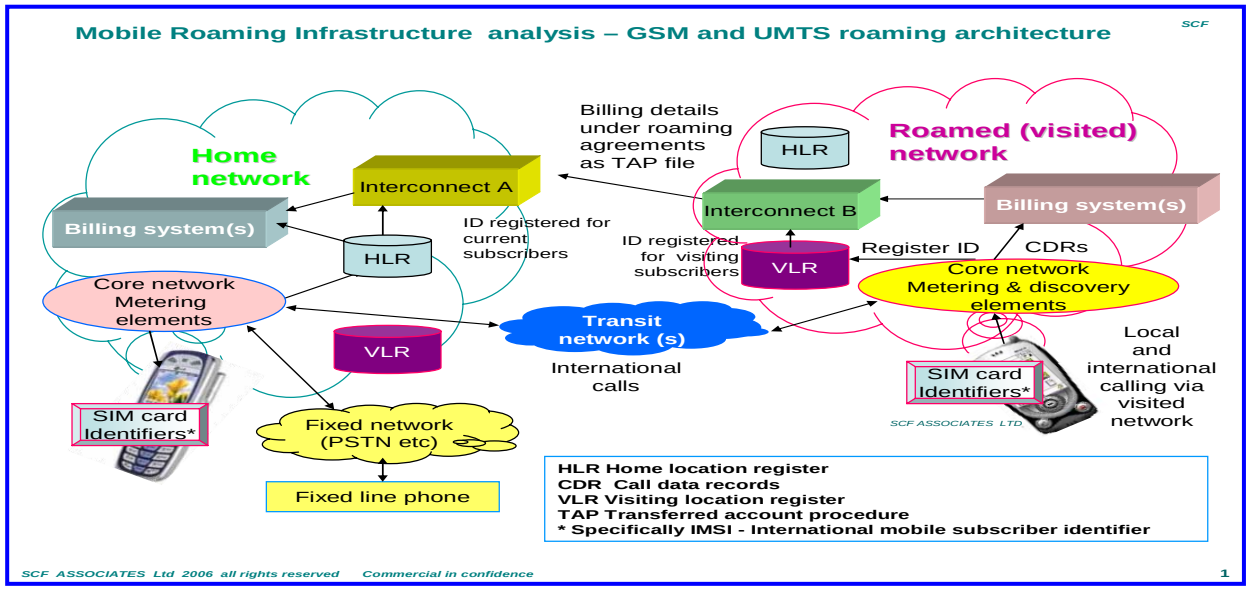
MNOs argue that high international roaming prices mainly result from the increased costs of technical infrastructure and its operation. To assess this claim we must answer several questions:

- Is the handling and billing of an international call more expensive than a national call and, if so, by how much?
- What technical infrastructure elements are required for international roaming?
- What are the actual levels of extra costs for roaming and the likely future costs of developments?
- What does a comparison of international prices with the corresponding levels of national pricing show?

However, data to answer these questions are not publicly available since they are considered commercially confidential. If national regulatory authorities possess such data, they will not disclose them. Consequently, one can only assess the operators' claims by going back to first principles, examining the process and its components, and estimating any additional capital and operational expenditure (CapEx and OpEx).[23]

2.2 The roaming business process

International and national roaming is determined by the European GSM interconnect process. The operational basis is set out in a roaming agreement between two network operators. When a subscriber enters a foreign country, the mobile handset accesses the visited network. A request for service is detected by the network and the handset is recognised as not being registered with the local home location register (HLR). The originating home network is then identified, using the international mobile subscriber identifier (IMSI) number in its SIM card, and contact is made with the home network to request service information on the roaming handset (specifically, authorisation to roam and credit status), and all roaming call details are returned to the home operator, as shown below:



[23] To get data on the cost of roaming, some interviews with key players were undertaken. Generally, there is enormous reluctance in the telecoms industry to give real information about the key questions. Also the regulators are bound by various confidentiality requirements, even if they have data. Thus any cost analysis had to be made independently, supported by trade press, as applicable.

2.3 The additional cost items for roaming in the technical infrastructure

International roaming involves the following activities for equipment, systems and operations:[24]

- Collection and transport of call data records (CDRs) with costs of retail billing for roaming subscribers; this may include specific real-time systems (e.g. for pre-paid customers) such as CAMEL.
- Interconnection and transit infrastructure costs for international calls, with payments to transit carriers.
- Payments for call termination for visited MNO, at wholesale prices, with discrepancy resolution.
- Associated additional home network and business systems costs, including customer-care operations.
- Costs of negotiation and upkeep of roaming agreements with a large number of roaming partners, although many may be implemented via the incumbent fixed-line operator and save costs.

2.4 Should technical infrastructure cause higher roaming costs?

The cost items for roaming listed above would not necessarily result in significantly higher infrastructure costs. Rather, the issue is whether international roaming calls have a different and higher cost than national "offnet" calls – i.e. those terminated on another network nationally, either fixed or mobile. It is reasonable to expect increased network and support systems for international roaming capacity, but it is questionable whether there is a large difference in cost for this type of expansion over that required for a *national* increase in traffic minutes. First indications are that any increase would be a fraction rather than a multiple of current national real costs. We now examine this further.

2.5 What is the nature and actual level of extra costs for roaming and likely future costs?

The nature of these extra costs is for network and billing systems to cover international call transport, with wholesale invoicing and retail billing. Approximate high-end figures for additional CapEx and OpEx for a medium-sized operator (10 million subscribers) are shown below.

Cost item (maximum cost case for all calls)	**Order of CapEx (€)**	**Order of Annual OpEx (€)**
Additional network capacity	5m (or 1m/yr, 5yrs)	10m
Electronic Data Interchange system for TAP files	2m	2m
CAMEL for home network	15m	3m
Rating engine enhancement	5m	5m
Interconnect billing system	7m	10m
Extra customer care	5m	10m
Wholesale termination charges	2m	25m (0.08€/min,150m x2min calls)
Wholesale international transit charges	1m	20m (0.05€/min,150m x2min calls)
International wholesale accounting for TAP files, invoices etc	1m	3m
Increased fraud risk as detection delay with periodic invoicing		10m

Note: Assumes 5% of 10m subscribers roam, with 1 call/day, i.e. approximately 150m calls/year of 2 minutes (OECD average); all calls involve an international transport element, not just local visited roaming, which would cost far less; the MNO has interconnects and roaming agreements with visited MNOs directly and not just via the incumbent fixed-line operator which carries the calls internationally (such bulk agreements can be at a lower cost than with the visited MNO and also reduce or remove associated management costs).

[24] Some MNOs assert that other, non-network, costs are also essential elements – such as sales, marketing, discounts and incentives, handset costs, customer care, administration extra cost of capital for network assets (eg. Vodafone in its submission to the 2002 UK Competition Commission report). However, we would argue that such costs should not be included since their attribution to roaming is vague and in any case their actual contribution to international roaming costs is likely to be small.

The possible effects of scale on small versus large MNOs, and on MNOs operating in sparsely versus densely populated areas, are summarised in the table below.

Large MNO	Small MNO
More likely to use heavy-duty billing and customer-care tools (e.g. CAMEL for real time pre-paid) but additional capacity is paid back in extra volume of business.	Likely to use lightweight (web-based) systems which are low cost for real time pre-paid. Also more likely to try to offload as much of processing (and perhaps the complete billing cycle) to a partner – either the roaming partner MNO or a third-party billing specialist, whichever offers the lowest cost for roaming and the processing of TAP files.
Densely populated area	**Sparsely populated area**
Requires more infrastructure at the billing and activation provisioning level as a dense urban and cosmopolitan area will have more roaming visitors. However this is compensated for by the increased revenues	As roaming detection and metering would usually occur above the RAN (radio access network), sparse density would tend to require lower and slower server processing power for requests for service activation and for handling CDRs, so the overall additional costs of roaming should not become disproportionate. Again, third-party billing solutions may also be attractive.

2.6 By how much would technical infrastructure cause higher roaming costs?

The proportion of calls that are international roaming calls is typically 1–5% of traffic (Joseph, 2006). However, to ensure that we do not underestimate costs, we have assumed below that 10% of calls handled by the MNO are in the international roaming category. The impacts of international roaming on CapEx and OpEx are of three main types, all varying widely with the volume of calls, resulting in the increased costs shown in the table below.

Cost type, both OpEx and CapEx	% cost increment over no international roaming
Type 1. Increased capacity for international roaming	10% CapEx and OpEx
Type 2. More expensive systems for int'l calls	5–10% CapEx and OpEx
Type 3. Different and specialised operations and systems	5–10% CapEx and OpEx (e.g. for CAMEL)
TOTAL	20–30% both CapEx and OpEx

Overall, we estimate the potential increased costs for international roaming at between 10% and 20% above a national-only system. Moreover, additional costs for international SMS would be expected to be smaller proportionately as the infrastructure extensions are less.[25] [26]

[25] Using the figures in the table in Section 2.5, we could also give a flat-rate cost with some €98m OpEx and €12.6m Capex per year payback, spread over 150m average calls, or some €0.73 per average call of 2minutes, or 0.37 Euro/min – but this assumes an international element on all calls, a maximised OpEx and a relatively low call volume. A median realistic figure could be far lower. Comparison with mobile calls via third-party rediallers who buy wholesale and resell retail gives far lower rates. For instance, using International Callchecker on 02 January 2007, a UK call to a mobile in France cost from €0.10 to €0.14/minute (http://callchecker.moneysavingexpert.com/intcallchecker/index.php).

[26] It is conceivable, however, that these costs would be offset by increased revenues and other efficiencies: a) possible additional revenues resulting from higher calling patterns of roamers, if pricing were adjusted; b) increased efficiencies of the national networks and systems utilisation with increased volume; c) impacts of software economics on operations – the cost of billing can be set as constant per subscriber and per call; in fact it follows an increasing returns curve of lower cost per unit produced (Forge, 2006).

2.7 An alternative estimate from a software supplier perspective

These "ball park" figures can be supported by examining a further approach, that of the telecoms billing software industry.[27] This alternative estimate reveals about €0.02–0.03/call of added cost.[28]

2.8 Comparison of international costs with their corresponding level of national costs

Comparing today's international roaming prices in the table below with national calls, we can see that to roam in Germany from France involves high RPP (receiving party pays) charges for the pre-paid customer, of some €0.65/minute as well as a 122% mark-up on the costs to place calls to France, with a 185% mark-up for pre-paid customers.

Cost of a four-minute peak mobile voice call for a French Orange customer roaming in Germany

	Customer price for 4-minute call	
Roaming in Germany (on T-Mobile)[a]	***Pre-paid (€)***	***Post-paid (€)***
Calling home	4.00 (€1/min)	4.00 (1€/min)
Being called from home	2.60 (€0.65/min))	2.72 (€0.68/min)
National call[b] for comparison	1.80 (€0.45/min)	1.40 (€0.35/min)

Sources: [a]Tariffs: Roaming Around Europe, http://ec.europa.eu/information_society/activities/roaming/tariffs/index_en.htm
[b]http://mobile.orange.fr/0/visiteur/PV?PS=GEHPACCRTS&TOP=O

From our brief analysis, current roaming charges are high in comparison with costs. Our analysis suggests a reasonable mark-up of about 30% over national call costs, while current roaming charge mark-ups are more than 100% of the national call costs. The current high mark-up gives scope for competitive price cutting.[29]

2.9 Are there alternative technical solutions to address geographical difficulties/anomalies?

Alternative technical solutions include:

- Using Internet-based systems for management and billing of packet-based mobile services such as GPRS. In similar fashion to the alternatives to the expensive IMS (IP multimedia subsystem) for 3G and fixed mobile convergence, Web-based technology can be used to provide a cheaper version of CAMEL functionality. There is also the possibility over the next five years that new types of operator will enter the roaming market, using Skype-style voiceover IP technology for the international segment for international mobile calls. This requires that the service providers are allowed to connect by the MNOs at each end and to compete freely.
- The SIM application toolkit – allowing preferential selection to be preset to the lowest-cost IOT in each country – which encourages visited network operators to offer discounts in return for preferred roaming status (Stumpf, 2001). This beats the current averaged retail roaming prices (which offer a single rate for roaming).

[27] Basing a comparison on a telecoms billing software company is valid for the following reasons. Up to 50% of infrastructure investment and annual turnover of a mobile network can be in billing – the cost of providing and maintaining the billing systems (Swan, 2003). Overall costs depend principally on: number of subscribers, network infrastructure type (circuit v packet switched, fixed wireline mobile), range and types of services, business processes, billing integration to OSS/BSS, etc. Staff form the major portion of operational costs, for up to several hundred people, which, with other process costs, makes billing-related OpEx a significant part of total OpEx. Running the billing systems includes tailoring them for special customer requirements, customer contact and care, cross-checking the input data (CDRs) and fraud management; all are labour intensive. Post-processing the bills (printing and posting bills to subscribers) is additional.

[28] A rough calculation can be made for a mid-size MNO (10 million subscribers) based on average values of software and processing of around €10m per year for CapEx over 5 years for billing, mediation and interconnect systems, plus some €20m per year in OpEx for staff, etc. Alternative cost measures for billing software are sometimes calculated on a price per subscriber, which varies by complexity of the billing application. For a full-service MNO or fixed telco billing system, US$5–10/subscriber is usual, so a 10-million subscriber billing system might cost US$50–100m equivalent to €7.5–15 m per year over 5 years. At 50% of infrastructure investment, total infrastructure cost range is €15–30m per year. An increase of 10% for international roaming would put the extra infrastructure cost at € 1.5–3m per year. Spread over a 5% roaming population (i.e. 0.5 million roaming subscribers) who make, say, one call per day, this would increase roaming charges for infrastructure and operations say by the top-end figure of €3m. Spreading this over some 150 million calls/year gives approximately €0.02/call of added cost. Adding further costs of CAMEL, at some €20m spread over 5 years, would add €0.03 to each call.

[29] This is in line with INTUG (International Users Group) findings following its investigation of international roaming (Antocicco, 2006) – for a medium length call of two minutes in Rome against the same call in a foreign city, Budapest: cost in Rome: €0.27; cost in Budapest: €1.12 via same operator – an increase of 315%; cost in Budapest: €4.00 via different operator: increase of 1381%.

- For pre-paid roaming, the ability to "top-up" abroad is an additional necessary feature but is usually lacking. This problem could be solved by bilateral agreements on top-up schemes between roaming partners and /or a European clearing house, operated by the industry or by commercial third parties, with location-enabled services such as "where is my nearest top-up kiosk/shop".
- There is also the option of moving to Bill and Keep as in an ISP peering solution, as proposed by Littlechild;[30] although some might not consider this a technical solution, it does simplify billing.

2.10 Probable time horizon for the spread and/or implementation of such alternatives

Price-capped roaming regimes could be effected reasonably quickly – in three months or so. The time required is that to update the billing systems, the roaming agreements, the business processes for setting rates, and possibly the interconnect systems and any checks on TAP files or possibly raw CDR data, as well as the customer-care processes. Billing systems can be updated by reprogramming if they are of the previous generation, or by operator resetting and perhaps reconfiguration of rating tables if they are of the current generation. The actual time required (including testing) varies from a few hours in the latter case to perhaps days or weeks in the former. Modifying the roaming agreements and business processes, with retraining, should take around a month to six weeks, for both billing and CRM/customer care in parallel, with sales and marketing communications also in parallel. This is a typical timescale for a new mobile service product to be rolled out to market. However, as capping will require mandates through legislation, with potential legal challenges to be processed, a horizon of one to two years at least is realistic.

There is also another possible retarding factor in that the larger GSM operators, and in particular those with a pan-European footprint, will ask for lower charges only in exchange for preferred roaming status. Such a move could discriminate against mobile operators in downstream retail markets that do not have a pan-European footprint and so lack bargaining power. This issue will require EU-wide regulatory measures by the EC through NRAs. However there should not be a hindrance to price competition. The anti-discrimination rules contained in licences, competition law or the GSM international roaming framework should not be applied in a way that impairs the continual downward adjustment of wholesale roaming charges through competition. Moreover, market forces, if allowed to operate by the NRAs, may also tend to work against preferential situations for the largest MNOs.[31]

2.11 Likely changes in investments as a consequence of the proposed regulation

In assessing likely changes in investments we should first note that we lack a common European mobile roaming zone. International roaming falls outside the jurisdiction of national regulatory authorities and, so far, the rules governing the single European market have not been applied. Note that when operators club together to form a single and dominant significant market power, then the objectives of operator and citizen diverge widely. Consequently, wholesale controls alone are unlikely to be effective. The solution is regulation of wholesale *and* retail pricing as soon as possible. As infrastructure costs for national and international activities are not very different – with the latter perhaps 20% higher – roaming should soon become available across Europe with similar tariff levels to home-country prices, being based on fixed network to mobile network termination rates. The effects on customer call behaviour and therefore revenues and investments could be seen in the short to medium term (one to three years).

Also, as soon as is practical, MNO mark-ups will have to be capped as the operators will tend to exploit customer ignorance. They will tend to form implicit cartels that set similar prices, claiming these are the "market-rate". Our assessment is that roaming regulation impacts on the mobile business would be most positive for investment uptake:

[30] Littlechild, S.C. (2006); earlier version available at http://www3.imperial.ac.uk/pls/portallive/docs/1/43006.DOC.

[31] Here we note that arbitrage by roaming brokers, new entrants and wider geographical markets on the retail roaming level would tend to work against preferential situations for the largest MNOs.

- A decrease in unit cost to customers, promoting more cross-Europe traffic with a significant increase in calls, as prices are lower, stimulating investment where needed.[32] This would have continuous and long-term effects in stimulating new rounds of investment.
- A marginal increase in operator costs to handle increased international loads, which will be far outweighed by the increasing returns from the improved overall operator efficiencies as network utilisation rises, with higher revenues. This would be a short-term requirement requiring immediate investment, but with long-term effects and short to medium-term payback.
- Increased revenues will also occur without any network or operational expansion as shares of roaming calls entirely within a visited country are paid back to the home network operator. This effect could appear in the short tem but would tend to promote investments in the long term.
- A major increase in calling volume following a reduction in MNO margins on roaming calls will stimulate investment for new entrants and for new technologies able to challenge the incumbent cellular MNOs with new lower fixed costs. These would be following the lead of "challenger" MNOs such as Sprint in the USA that introduced widespread WiMax technology. This might occur in the medium to long term, although there could be far faster reaction from the market if the new adopters such as Sprint flourish and prosper, especially if the large fixed-line operators (e.g. BT) see this as a deciding factor for their major business cases, for national WiFi or WiMax coverage, which may centre on low-cost IP calls for cosmopolitan hotspots.

The overall result would be increased social and business benefits, with lower costs of doing business across Europe. Existing operators would have increased revenues and traffic, and as the size of the pie expands, innovation and new entrants would be strongly encouraged

2.12 Conclusions

From our brief analysis, we see that current roaming charges are very hard to justify from a cost-based point of view. The range of charges that could be added in marketing, sales and other elements is endless, but the true cost is perhaps only obscured by these. We cannot see how operators can justify the charges for roaming that are up to several times the national roaming price. A more appropriate mark-up for roaming might well be some fraction of the national price for termination by another MNO or fixed-line operator, perhaps of the order of 20% to 30% extra at the most. Our overall conclusion is that the MNOs do not make true roaming costs public. Only regulation or strong new competition in roamed services, from new entrants, types of services and technologies, are likely to change this.

In view of the basic costing and price differences, we suggest that an analytic audit using cost-based accounting for a blended offering across several types of MNO would be in the interest of the EU citizen, to arrive at the true costs. It should be carried out within a minimal timeframe (an order of months) and in parallel with any other directives on roaming pricing, rather than delaying them.

[32] There is certainly evidence of a latent demand; a Eurobarometer survey finds 59% would use their mobile phones more when travelling abroad, if prices were lower while 15% of travellers switch off their mobiles when on holiday abroad or do not take them.

3. OVERVIEW OF EXISTING ROAMING DATA

The limited degree of integrity and completeness of the market data has created debate regarding the analysis conducted in the Commission's impact assessment. The Commission has voiced its view that the operators are not providing comprehensive information for a full assessment of the roaming market. On the other hand, operators insist that they have given the appropriate data.

Data integrity issues mainly concern market size, pricing and industry costs:

3.1 Inferences on market size data

The estimate of consumer welfare indicated in the Commission's impact assessment may be relevant for previous years but may not reflect a precise scenario for the years to come. The actual size of the roaming market remains a moving target as demand, supply, costs and prices are in constant flux. The market size of the mobile market is likely to have changed substantially from 2005, with fluctuations in roaming tariffs and changes in consumer demand patterns.

Due to such factors, data analysis in impact assessment of regulation is not the sole basis of evaluation. Broader impacts and qualitative effects are of equal relevance. Nonetheless concerns have arisen regarding the data used for the actual size of the retail and wholesale markets and the calculated benefits of EU regulation.

Market data

The EU regulatory model aggregates retail revenues from roaming services, which according to the GSMA can be estimated to have reached €8.5 billion in 2005. The figure is made up of €3.5 billion for the wholesale market and €5 billion for the retail market. The total roaming market is 5.7% of the total mobile industry revenues, which is estimated at around €150 billion.

Consumer welfare estimates

Using this estimate of the roaming market, the retail and wholesale regulation policy option delivers the greatest benefits. The resultant consumer surplus would be between €5.23 and €5.96 billion. During the consultative process, the GSMA said that the relevant market size for the calculation of regulatory impact on the consumer should be the retail market portion of €5 billion per year. Adopting this figure alone would reduce the incremental change in consumer welfare of the Commission's proposal, relative to the no regulation option by almost half. The figure also leads the estimated total welfare to drop from €619 million to €317 million.

3.2 Pricing data integrity

The complexity of pricing structures for the different mobile network operators compounds the problem of collecting reliable data on prices. Determining the roaming prices could depend on permutations of as many as fifteen available mobile tariffs, two or more promotion plans, time-sensitive pricing structures, and different wholesale pricing agreements for the twenty-seven EU member states.

Average price per minute

There is debate on the use of the average price per minute for roaming, because of deviations from the average prices of pre-paid and post-paid tariffs for different operators and different countries. The Commission's impact assessment dated July 2006 quotes €1.15 per minute as the average roaming price. The EU model takes an estimate of aggregate EU per minute wholesale and retail prices, which is based on data provided for the purposes of the impact assessment by various MNOs and NRAs.

On the GSMA world website the average roaming price in Europe is quoted at €0.83 per minute. The figure is calculated by dividing €5 billion of retail revenues by 6 billion minutes of roaming traffic.

The Commission's impact assessment states that the typical retail charges for a post-paid customer range from around €0.80 per minute to around €1.30 per minute on average, while charges for pre-paid roaming are around 25% higher.

The disparity in price ranges from the average mark is to be highlighted. The high level of roaming prices is evident from the differences in prices that apply for apparently similar calls that are not represented by the figure of the average price per minute. A UK customer can expect to pay between €0.86 per minute for a one-minute call from France to over €1.75 for the same call from Slovenia. Even greater deviations from average are found in the case of a customer from Malta roaming in Latvia, who would pay over €2.20 per minute.

3.3 Information on roaming tariffs

Network operators provide detailed pricing information through their call centres, and by publishing their price lists in newspapers, magazines and journals in each country. Some operators have launched electronic pricing guides, which will automatically appear when customers access the Internet via their mobile phones.

Information on roaming prices is publicly available on the Internet via the EU Information Society's portal for roaming, the GSMA Europe website, and the sites of the respective countries' mobile network operators.

Undertaking a price match through prices obtained from the different websites is difficult, because of variations in snapshot dates, billing units and the degree of information they offer on customised tariffs. The EU site updates roaming prices every six months and quotes peak time rates. The GSMA Europe site provides comprehensive pricing information by country, operator and tariffs, giving the most advantageous roaming price for a two-minute call from a mobile to a fixed line. Both the EU and the GSMA sites publish a disclaimer that their information should be used only as a tool for comparison purposes and that consumers should verify actual prices with operators.

When checking prices with operators, there may still be issues of accuracy between the billed figure and the updated information on websites and from call centres. The industry has worked on this issue by monitoring the adherence of operators to a voluntary Code of Conduct for European operators for the purpose of enhancing the clarity of international retail roaming price information for consumers.

3.4 Cost data

In order to assess profit margins the Commission services requested specific data from the GSMA and from sixteen EU operators, selected to provide a representative sample of network size, roaming traffic volume and membership of alliance networks. Other data sources for the impact assessment included NRAs, commercial research and Commission's internal resources.

The GSMA has provided the Commission with copies of nominal IOTs, which are the rates operators would get if they did not have the buying power to negotiate discounts. Tariffs are available to operators on a confidential basis from GSMA.

Nominal IOT discounting

Profit margin calculations based on nominal IOTs would be understated, as they would be distorted by discounts negotiated between operators across borders. Nominal IOT prices do not represent the effective prices paid by operators, as volume discounts need to be subtracted. Operators belonging to alliances benefit from larger discounts.

Bilateral and multilateral agreements typically have arrangements for offsetting roaming minutes as another form of wholesale discounting. Alliance members increasingly direct traffic towards other members of the alliance to benefit from their reciprocal wholesale pricing agreements and support a positive upward spiral of profit margins.

Price elasticity

Although interested parties are looking at the same data, different conclusions are reached by regulators and operators. Most operators claim that competition in the wholesale market is working and is helping to bring down prices.

However, retail prices may not always drop when wholesale prices decrease. Market forces are insufficient for price drops to be automatic. Market studies show that the overall demand in the market for international roaming services is inelastic, at both the retail and the wholesale level. As much as 60% of group profits for the larger operators come from business customers, which are less price-sensitive to the cost of international roaming calls.

Measuring the response of retail prices to wholesale price fluctuations is not an easy task as changes in wholesale prices are decided through bilateral and multilateral agreements between operators.

Margins

The Commission calculates that at €1.15 per minute, the average retail charge for a roamed call is more than five times higher than the actual cost of providing wholesale service, and in some cases up to ten times higher. The GSMA has estimated that the annual gross contribution from roaming services in 2005 within the EU was €4.5 billion, but this is of course not a profit figure. It does not take into account mobile operators' fixed costs, such as network infrastructure, sales and marketing, distribution and license fees, or the cost of originating or terminating a roaming call on the operator's own network.

The Commission's documentation lists additional operational cost for supporting a roaming call at less than €0.20 in most cases. On received roaming calls, operators make retail margins of 300–400%.

Operators defend the high margins on the basis that international roaming is part of a package of interrelated services to consumers. They attest that their packages offer good value for money and the total cost of these services to consumers has been falling for a sustained period. However there is no clear evidence that any of these services are run at a loss, or that high roaming prices are justified to compensate for the price of cheaper services.Mobile operators have requested the Commission to take into consideration detailed operational issues in the costing exercise, including administrative costs of roaming contracts, marketing, coverage of low population areas, billing and fraud management, and the operation of roaming signalling links.

On the other hand, in order to be effective, wholesale regulation must facilitate the objective of lowering retail prices in a straightforward and effective manner. While a comprehensive costing exercise for all operators and regulators may be useful to determine the right level of roaming prices, that level would be a moving target and would require constant recalculation as the market continues to evolve in terms of roaming usage and operational costs.

3.5 Conclusions on roaming data

The breadth of international data on roaming prices, costing and market sizes has made data analysis a complex task. The statistics and results obtained have provided a foothold for financial, economic and legal debate, and it has given the stakeholders opportunities to attempt to play for time to delay the Commission's plans for regulation. The information available via quantitative and qualitative methods is sufficient for the Commission to move ahead with an effective assessment of the market scenario.

4. FEASIBILITY OF TECHNICAL IMPLEMENTATION

In this section we make an assessment of the technical feasibility of the implementation of the proposed measures by operators in a six-month transition period, as foreseen by Article 5 of the proposal. The assessment has to consider both the proposed measures – the specific transparency measures and the "European Home Market Approach" – in terms of technical and financial issues.

4.1 The implementation of the specific transparency measures

As we indicated in Section 1.1 (subsection on Methods of achieving greater tariff transparency), there are additional options, all based on the SMS tool, to achieve greater tariff transparency: a**)** Simple "push"; b) Simple "pull"; c) "Free pull"; d) "Advanced push"; e) "Hybrid push/pull".

The measure envisaged by the current proposal in Article 7 is the option under "Free pull", by which home MNOs offer a free SMS/voice call service to their customers and constantly update them of any (significant) changes in roaming charges.

With option 3 (Article 7 of the proposed regulation), uninformed consumers would be better off, as they would profit from a free service that provides them with valuable information. Informed consumers, on the other hand, might cross-subsidise uninformed ones through greater charges. If MNOs could not recover development costs through higher prices, consumers would in any event be affected in the medium term due to a reduction of investments by MNOs.

The impact of option 3 coupled with a double cap regime would vary significantly among different MNOs and member states. In particular, less mature markets with higher network costs and MNOs with a small customer base would be more negatively affected than larger MNOs in more mature countries and MNOs forming groups or alliances.

As described in Table 1, this option would not be easily implemented in the foreseen six-month transition period because the costs of implementation are significant and will be borne entirely by MNOs.

The adoption of this measure, in fact, would require visited network service providers to keep constantly updated information on available retail prices; tariff schemes and user profiles would have to be simplified in order to keep down costs. In particular, less mature markets with higher network costs and MNOs with a small customer base would be more negatively affected than larger MNOs in more mature countries and MNOs forming groups or alliances.

From a financial point of view, the implementation of the transparency measures contained in the proposal on international roaming charges would increase the costs for most MNOs, especially in countries where pre-paid customers prevail. The free provision of tariff information may lead informed roamers to subsidise uninformed ones. If the cost of setting up the service could not be recovered, this might lead either to an increase in domestic charges or to a reduction in investments. Overall, the regulation may also result in cross-border industry consolidation and alliances, and a loss of valuable service differentiation. On the operators' side, there seems to be no need to increase the transparency of IOTs. This may, if anything, stimulate collusive bargaining if costs are below the caps selected by the Commission.

Overall, if retail and wholesale caps are maintained in the final proposal, any requirement to impose costly transparency measures free of charge should be carefully considered under the proportionality principle: if price caps are meant as "safety nets" for consumers, then the option of gathering additional tariff information should not necessarily be offered for free. Likewise, with burdensome transparency measures in place, the need to impose retail price regulation becomes less evident.

4. 2 The implementation of the "European Home Market Approach" measure

The proposal provides for the establishment, on the basis of the "European Home Market Approach", of common, Europe-wide price limits on the charges that mobile network operators may levy for the wholesale provision of mobile roaming services for mobile voice telephony calls made from a visited network in the European Union and terminating on a public telephone network also located within it.

The price limits take account of the differences in the underlying costs of providing international roaming services for calls made to a destination within a visited country, on the one hand, and calls made back home or to a third country within the EU, on the other. The proposal therefore calls for a lower wholesale price maximum for the former category of calls (set at twice the EU average mobile termination rate for mobile network operators designated as having significant market power) and a higher limit for the latter category (set at three times the EU average mobile termination rate for such operators). In order to ensure that there is no price squeeze in the provision of mobile roaming services at retail level, the proposal also provides for safeguard price limits at the retail level for the same categories of roaming calls, set at 130% of the applicable wholesale limit. In accordance with the European Home Market Approach, and in order to ensure that charges payable by roaming customers for receiving calls while roaming abroad in the EU more closely reflect the underlying costs incurred by their home mobile provider in providing this service, the proposal also provides that those charges should not exceed a maximum limit. The price limits provided with regard to the retail charges for the making of regulated roaming calls will take effect as a matter of law six months after the entry into force of the proposed measure.

Article 4 of the proposal sets the maximum prices that can be charged at retail level by the home mobile provider for a regulated roaming call. This is 130% of the applicable maximum wholesale charge for that call (excluding VAT). Article 5 provides that the retail price limits in Article 4 will take effect after six months ("*The obligations in Article 4 shall take effect six months after the entry into force of this Regulation*").

One of the advantages of the European Home Market Approach over the regulatory approaches (e.g. Visited Country approach or Home Pricing approach) is its relatively easy monitoring and implementation.

Capping at wholesale and retail level represents a relatively less intrusive regulatory approach, since it does not restrict competition below levels of pan-European prices. Operators do not have to follow the maximum price levels set by regulation and can still offer better deals to their customers (as it is currently the case in some countries or for some consumer segments).

Overall costs depend principally on: number of subscribers, network infrastructure type (circuit v packet switched, fixed wireline mobile), range and types of services, business processes and billing integration to OSS/BSS among other factors. Staff form the major portion of operational costs, for up to several hundred people, which with other process costs makes billing-related costs a significant part of total OpEx. Running the billing systems includes tailoring them for special customer requirements, customer contact and care, cross-checking the input data (CDRs) and fraud management; all are labour intensive. Post-processing the bills (printing and posting bills to subscribers) is an additional cost.

Allowing a transitional period of six months before the retail provisions on making calls come into effect would allow operators time to redefine pricing structures for active roaming calls.[33] As we indicated in Section 2.9, price-capped roaming regimes could be effected reasonably quickly – in three months or so. The time required is that to update the billing systems, the roaming agreements, the business processes for setting rates, and possibly the interconnect systems and any checks on TAP files or possibly raw CDR data, as well as the customer-care processes. Billing systems can be updated by reprogramming if they are of the previous generation, or by operator resetting and perhaps reconfiguration of rating tables if they are of the current generation. The actual time required (including testing) varies from a few hours in the latter case and perhaps days to weeks in the former. Modifying the roaming agreements and business process change with retraining would probably take a month to six weeks, for both billing and CRM/customer care in parallel, with sales and marketing communications also in parallel. This is a typical timescale for rolling out a new mobile service product to market. However, as capping will require mandates through legislation, with potential legal challenges to be processed, a horizon of at least one or two years is realistic. There is also another possible retarding factor in that the larger GSM operators, and in particular those with a pan-European footprint, will ask for lower charges only in exchange for preferred roaming status.

[33] (COM) (2006) Impact Assessment of 12.2.2006, p.50

Such a move could discriminate against mobile operators in downstream retail markets that do not have a pan-European footprint and so lack bargaining power. This issue will require EU-wide regulatory measures by the EC through NRAs. However there should not be any hindrance to price competition. The anti-discrimination rules contained in licences, competition law or the GSM international roaming framework should not be applied in a way that impairs the continual downward adjustment of wholesale roaming charges through competition. Moreover, market forces, if allowed to operate by the NRAs, may also tend to work against preferential situations for the largest MNOs. [34]

[34] Here we note that arbitrage by roaming brokers, new entrants and wider geographical markets on the retail roaming level would tend to work against preferential situations for the largest MNOs.

ANNEX I

DEFINITIONS

International roaming

This means the use of a mobile telephone or other device by a roaming customer to make or receive calls while outside the member state in which the customer's home network is located, by means of arrangements between the operator of the home network and the operator of the visited network.

European Home Market Approach

This is the common mechanism for ensuring that users of public mobile telephone networks when travelling within the EU do not pay excessive prices for international roaming services when making or receiving calls. It thereby provides a high level of consumer protection while safeguarding competition between mobile operators. The Home Approach lays down rules on the charges that may be levied by mobile operators for the provision of international roaming services for voice calls originating and terminating within the EU. It applies both to charges levied between network operators at wholesale level and to charges levied by the home provider at retail level.

Home provider

This refers to the undertaking that provides the roaming customer with terrestrial public mobile telephony services at retail level.

Home network

This means the terrestrial public mobile network located within a member state and used by the home provider for the provision of terrestrial public mobile telephony services to the roaming customer.

Regulated roaming call

This is a mobile voice telephony call made by a roaming customer, originating on a visited network and terminating on a public telephone network within the EU

Roaming customer

A roaming customer is a customer of a provider of terrestrial public mobile telephony services (supplied by means of a terrestrial public mobile network situated in the EU) who uses a mobile telephone or other device to make or receive calls on a visited network by means of arrangements between the operator of the home network and the operator of the visited network

Visited network

A visited network is a terrestrial public mobile telephony network situated in a member state other than that of the home network and permitting a roaming customer to make or receive calls by reason of arrangements with the operator of the home network.

ANNEX II

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ANNEX III

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Advice of charge
CAMEL	Customized application of mobile enhanced logic
CapEx	Additional capital
CDRs	Call data records
ERG	European Regulatory Group
GPRS	General packet radio service
GSM	Global system for mobile communications
GSMA	GSM Association
HLR	Local home location register
ICT	Information and communications technologies
IMS	IP multimedia subsystem
IMSI	International mobile subscriber identifier
IN	Intelligent network
IOTs	Inter-operator tariffs
INTUG	International Users Group
IRTT	International roaming tariff transparency
MNOs	Mobile network operators
NRA	National regulatory authority
OpEx	Operational expenditure
OTA	Over-the-air programming
RPP	Receiving Party Pays
SCP	Service control point
SIM	Subscriber identity module
SMS	Short message service
STIRA	Standard International Roaming Agreement
UMTS	Universal Mobile Telecommunications System
USSD	Unstructured supplementary services data
WAP	Wireless Application Protocol

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