

# Telecommunication services in the CPI - a quantity approach<sup>1</sup>

Paper presented at the Sixth Meeting of the International Working Group on Price Indices,  
Canberra, Australia, 2-6 April 2001.

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## Abstract

The growth of the market for telecommunications services raises the issue of weight shares of these services in the CPI. This important issue is dealt with in this paper. The discussion of telecommunication services in the CPI have mostly been centred to price measurement issues and less about the weight compilation.

Gathering information about expenditures for telecommunication services can be cumbersome. The fact that some telephone companies give their clients very detailed bills opens new possibilities for collecting very detailed information about consumption of these services in a Household Budget Survey. This has been utilised in the Icelandic HBS 2000 with satisfying results. These bills were in most cases acquired, with the participants consents, directly from Iceland Telecom and this method has proved to be very effective.

This detailed HBS information along with information from Iceland Telecom about traffic (minutes and number of calls) are the base for the revision of the CPI weights for telecommunication services in March 2001.

The weight share of two new mobile services has increased considerably. The use of prepaid telephone cards have increased. Nearly 30% of the mobile users subscribed to this service at the end of the year 2000. The amount of SMS messages sent has also grown rapidly.

The COICOP classification used was revised to take into consideration new developments in telecommunication services. The weight were revised mainly using HBS data and in some cases data from the telephone companies. It is likely that in the future the HBS data will be the source in most cases for the information needed. The method used for the price measurement is based mainly on rates and unit values.

After the March 2001 weight revision the share of telephone services in the Icelandic CPI is around 3.8%.

## The market structure in Iceland and the growth of international telecommunication services

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<sup>1</sup> I would like to thank my colleges: Guðrún R. Jónsdóttir, Hallgrímur Snorrason, Rut Jónsdóttir and Jón Þór Eyjólfsson at Iceland Telecom for their help in the preparation of this paper. I would also like to thank the participants of the Ottawa Group meeting in Canberra, Australia 2-6 April 2001 for their helpful comments. This paper is mainly based on data about the telephone services from the Icelandic Household Budget Survey that is a continuous survey from 2000. Also used are very detailed but confidential information from Iceland Telecom referring to the year 2000 that shows the number of traffic in minutes and number of calls. Use is also made of confidential detailed revenue data from all the telephone companies.

The growth of the market for telecommunications services raises the issue of weight shares of these services in the CPI. This issue is the main theme that this paper deals with. The question asked is how these shares can be measured accurately. From 1998 Statistics Iceland has revised the weights of telecommunication yearly. The new weights have until now been based on detailed quantity information supplied by Iceland Telecom. The competition on the Icelandic telemarket has increased but Iceland Telecom is still the biggest company operating with a total market share of 86%<sup>2</sup>.

In addition to Iceland Telecom, a former government utility, there is another competitor, Tal<sup>3</sup>. The competition that was fierce in the beginning seems to have settled down as the mobile penetration has increased. In the fixed line market for individuals Iceland Telecom is dominating, with one other firm<sup>4</sup> operating with a very small market share. Following table shows cellular mobile subscribers by the Icelandic mobile companies, at the end of each year, and as a percentage of inhabitants. According to EMC<sup>5</sup> this is the highest penetration of mobile phones.

	<u>1998</u>	<u>1999</u>	<u>2000</u>
Iceland Telecom	93,275	129,085	160,468
Tal	11,350	32,937	54,428
Total	104,625	162,022	214,896
Inhabitants	275,264	278,717	282,845
Share	38.0%	58.1%	76.0%

This growth of the telecommunication sector is international. The expenditures of individuals and firms on telecommunication services has expanded greatly in the last 10 years and the diversity of services increased which is the root to the measurement problems for these services in the CPI.

According to the International Telecommunication Union (ITU), the increase in the telecommunication revenue in the period 1990-2000 was twofold whereas the equipment sector nearly tripled. The biggest growth was in mobile services. The number of mobile cellular subscribers rose from 11 million in 1990 to 650 million in year 2000<sup>6</sup>.

Parallel with this development there is an ongoing trend in deregulation of the market for these services and the development has been described as changing the "sector from utility market to a commodity like market"<sup>7</sup>.

In the future there will probably be development of third generation system, Universal Mobile Telecommunication Systems (UMTS) and it has been predicted that in a ten years time there will be about two billion users of UMTS<sup>8</sup>. If that will be the case there is a considerable work to be done for CPI compilers in the coming decade. This development, even if it is in the direction of bundled services is all within the framework of present mobile services framework and is as such not a new service. The pricing for this service will probably be a combination of fixed charge for each query as is the case now and variable charge for data transfer<sup>9</sup>.

Increased size of the telecommunication sector and deregulating of markets has increased competition and led to considerable lowering of prices for these services. Both these factors (prices and quantity) have to be accounted for in the price measurement process. The biggest effort in

<sup>2</sup> Síminn (2001) p. 35.

<sup>3</sup> As of 15 March 2001 the company Íslandssími offers mobile services in Iceland.

<sup>4</sup> The firm is Íslandssími and it is mainly offering services to companies.

<sup>5</sup> EMC press release, 14 November 2000.

<sup>6</sup> ITU (2000). The telecommunication revenue in billions of USD (in current prices and exchange rates) increased from 396 in 1990 to estimated 840 in the year 2000. Similarly equipment sold in the world increased from 112 billion USD in 1990 to estimated 320 in 2000.

<sup>7</sup> OECD (2001b), p 7.

<sup>8</sup> UMTS-forum (2000)

<sup>9</sup> Síminn (2001) p. 27.

statistical offices has been centred to measure changes in prices and a less effort has been directed to the question of weight shares.

### **Itemised bills from the HBS and quantity data from Iceland Telecom**

The Icelandic Household Budget Survey is a continuous survey from the year 2000. The survey circle is three years with a sample size of approximately 1200 households each year. In the year 2000, the final sample consisted of 1141 household, 657 households participated which gives a response rate of 57.6%. A special effort was done in that survey to collect information about the telephone services.

This effort is based on the fact that the bills which Iceland Telecom gives to its subscribers are very detailed, listing different expenditures of services as well as the quantities bought such as number of calls and the minutes used. These bills can be extensive and to make the response burden lighter for the participants they were asked to allow Statistics Iceland to obtain the bill directly from the company and in that way make the collecting of information both easier and safer<sup>10</sup>.

This has been successful and now about sixty percent of the bills are gathered in this way. These bills are a new more detailed and reliable source for analysing expenditures shares and types of services purchased.

In the Icelandic HBS the bills for the telephone services are collected in the quarterly interview where the household is asked about specific expenditures. One of the questions asked is about expenditures on telephone services. The detailed breakdown of the bill made this part of the survey complicated<sup>11</sup>. To lighten the response burden for the participants the possibility was offered to obtain that information directly from the telephone company. To be able to utilise this, the participant had to sign a declaration allowing Statistics Iceland to collect that information directly<sup>12</sup>. About 60% of the bills were collected this way.

The itemisation of the bill is very detailed so there is a possibility of obtaining more detailed weights than before<sup>13</sup>. The itemisation shows for each service, aggregated number of calls and minutes for each service. The only limitation is that a separation is not made between calls at peak rate and off peak rate<sup>14</sup>. Other telephone companies in Iceland offer less itemised bills than Iceland Telecom or no itemisation at all.

It is getting more common in the OECD countries that firms provide itemised bills. Figures show that two thirds of the OECD countries "now have the potential for all users to receive itemised bills"<sup>15</sup>. Consumers require detailed bills for telecommunication services so they can monitor spending. OECD regards "customer billing is the largest individual source of user inquiries and complaints"<sup>16</sup> and a survey conducted in the year 2000 found out that 41% of customers complaints came from "receiving inaccurate information"<sup>17</sup> from companies. Main reason for the increase in itemised billing is a EU law that postulates that itemised bills at basic level "shall be available at no extra cost to the users"<sup>18</sup>. Because of this itemised bills should be available in more countries than was possible before.

Iceland Telecom is charging as of September 2001 a amount for printing out the bills. The company offers at the same time the possibility for customers to get the bills electronically against a small discount. Statistics Iceland will continue to collect this information both for those who get

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<sup>10</sup> The data from the HBS survey does not have the same requirement of confidentiality as the data from Iceland Telecom.

<sup>11</sup> The full questionnaire on the telephone services in the HBS is found in annex 1.

<sup>12</sup> The declaration can be seen in annex 2.

<sup>13</sup> The classification used in the HBS and the CPI is found in annex 3.

<sup>14</sup> This information is however available in the quantity information collected directly from Iceland Telecom.

<sup>15</sup> OECD (2001a) p. 214

<sup>16</sup> OECD (1999a) p. 198

<sup>17</sup> OECD (2001a) p. 214

<sup>18</sup> OECD (2001a) p. 214

their bill by email or by mail. The itemisation of the bill was not changed so the detailed bill still available and is an exact and reliable source.

The other data source used for estimating the weights is the quantity data from Iceland Telecom. The data refers to the year 2000 as does the HBS data. It originates from their billing system except the quantity data for the prepaid telephone cards that come from a different system. The data refers to the traffic measured in minutes and the number of calls and the average length of the call for each type of rate offered by the company is therefore available. Separation between business use and individual use is done by taking into account the difference in identity numbers between individual and firms.

Individual systems comprises, the mobile system and the fixed line system. The traffic data is divided into two parts, traffic from the mobile system and the fixed line system. Within each system the breakdown is following the system that the calls are made to. From each system the calls go into mobile, fixed line or outgoing, at peak time or at off peak time<sup>19</sup>.

Comparison between the HBS data and the calculation based on the traffic information from Iceland Telecom renders similar results, which confirms that this approach gives reliable results even for a small household budget survey.

In the March 2001 revision of the Icelandic CPI the HBS information was used for adjusting the weights of telecommunication services and the share of telephone services in the CPI is 3.8%<sup>20</sup>.

### **Prepaid telephone cards**

The fastest growing service in mobiles are the prepaid cards. "The move towards electronic recharge services is the biggest area of development in the pre-paid environment today"<sup>21</sup> and OECD says that "the major innovation in the pricing of mobile services has undoubtedly been the introduction of pre-paid cards"<sup>22</sup>. The advantages of prepaid cards are numerous. Consumers find it simple to buy the cards getting better overview and control over their expenditures. Many users find the cards more economical even if the rates for the prepaid cards tend to be higher than for the usual mobiles. This is specially well suited for customers that are not heavy users.

The prepaid telephone cards have been the fastest growing mobile service in the last two years in Iceland<sup>23</sup>. One can buy these cards at petrol stations, mini-markets, through the internet etc. At the end of year 2000 subscribers to this service were about 30 % of all the mobile subscribers in Iceland. Other countries have similar experiences<sup>24</sup>.

The prepaid cards are used to a large extent by young people. "Until now the biggest customers group for Freedom Cards have been people younger than 25 years"<sup>25</sup>. Another group of users are firms. The quantity information received from Iceland Telecom shows that firms account for about half of the use. The reason for this is probably the fact that it is very easy to control expenditure by this service.

The length of average call for prepaid cards is about half of the call length of other mobiles and the length of the average call for prepaid cards is similar for individuals and firms.

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<sup>19</sup> The classification used can be seen in annex 4.

<sup>20</sup> This share was 1,0% March 1997, 0,9% March 1998, 1,5% March 1999 and 2,3% March 2000.

<sup>21</sup> EMC press release 18 May 2000.

<sup>22</sup> OECD (2000) p. 56

<sup>23</sup> First card in the world was introduced in 1995. Taken into use by Iceland Telecom at the end of 1998 and by Tal in February 1999.

<sup>24</sup> OECD (2000) p 56. "In Norway , at the end of the first quarter of 1999 the number of Telenor's digital subscribers was 1.4 million. The net increase in that quarter was 139,000, of which 119,000 subscribed to the pre-paid service. In Spain, by June 1999, Telefónica had reached more than 3 million pre-paid users, representing almost 50% of the company's more than 6 million customers. At that stage more than three-quarters of Telefónica's monthly registrations were for pre-paid services."

<sup>25</sup> Síminn (2001). p. 26

Information about the total expenditures on prepaid cards is available in the HBS data. As the cards are prepaid there are no bills issued by the telephone companies. The information about the use is not available from their billing system and has to be queried in a different way.

To check the validity of the information from the HBS, Iceland Telecom compiled detailed quantity results for the cards. The data set refers to the year 2000 and is applied both to individuals and firms. The information from the HBS and the quantity information from Iceland Telecom yield similar results. The expenditure share of prepaid cards measured by both methods is about 30% of total expenditures on the mobile services and confirm that these two data sets compliment each other and give weights that are similar.

The rates for the prepaid cards are depend on the direction of the call, into fixed line, mobile or outgoing. They can not be used outside the country. When calculating the price change for the cards there has to be detailed information available about the use. The information gathered in the HBS shows only the total expenditures. Information about detailed use has to be collected from the firms selling the service.

### **SMS services**

There has been a great growth in the Short Message Service (SMS) which is the ability to "send and receive text messages to and from mobile telephones. The text can comprise of words or numbers or an alphanumeric combination. SMS was created as part of the GSM Phase 1 standard. The first short message is believed to have been sent in December 1992 from a Personal Computer (PC) to a mobile phone on the Vodafone GSM network in the UK. Each short message is up to 160 characters in length when Latin alphabets are used, and 70 characters in length when non-Latin alphabets such as Arabic and Chinese are used."<sup>26</sup>

The increase in these services is enormous and the GSM Association reports "that a record 15 billion SMS (Short Message Service) Text messages were sent over the world's GSM (Global System for Mobile communications) wireless networks during December 2000..... Growth in many European markets continues to soar. In the UK customers generated 756 million text messages in December 2000, representing a growth close to 300 percent on December 1999 figures, whilst Germany achieved a staggering 1.8 billion SMS messages during the month..... The holiday season and New Year celebrations saw a peak in SMS messaging. The average SMS traffic per GSM customer has grown from 0.4 in 1995 to an average 35 messages per GSM customer per month by end December 2000."<sup>27</sup>

The amount of messages sent by Iceland Telecom subscribers passed the one million level per month in the middle of the year 1999. In the middle of the year 2001 the amount emailed per month was around 3.5 million messages<sup>28</sup>. The average share of SMS of the total mobile bill was probably around 3-4% in the year 2000.

SMS services were measured in the HBS survey. The information in the bills shows number of messages sent and the total cost. SMS messages which are sent by subscribers of prepaid telephone cards are not included as there is no bill involved. These messages are included in the price of the prepaid card and not accounted for separately.

### **Using HBS itemised bills and telecommunication quantity data for weighting in the CPI**

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<sup>26</sup> Buckingham (2001) p1.

<sup>27</sup> GSM World press release 12 February 2001.

<sup>28</sup> Síminn (2001). p. 27

<b>COICOP Heading</b>		<b>Source used for weights</b>	<b>Source used for price measurement</b>
08131	Telephone service	HBS	
081311	Fixed line telephone services	HBS for total IT for detail*	
0813111	Fixed line traffic domestic	HBS for total IT for detail	Rates
0813112	Fixed line traffic into mob.	HBS for total IT for detail	Rates
0813113	Fixed line traffic outgoing	HBS for total IT for detail	Unit values
081312	Mobile telephone services	HBS	
0813121	Mobile traffic into fixed line	HBS for total IT for detail	Rates
0813122	Mobile traffic into mobile	HBS for total IT for detail	Rates
0813123	Mobile foreign traffic	HBS	
08131231	Mobile traffic outgoing	HBS for total IT for detail	Unit values
08131232	Mobile traffic received abroad	HBS detail	Unit values
08131233	Mobile traffic roaming abroad	HBS detail	Excluded
0813124	Prepaid telephone cards	HBS total	Rates
0813125	SMS etc.	HBS number	Unit values
081313	Other telephone services	HBS detail	Unit values
0813131	Information numbers	HBS detail	Unit values
0813132	Service numbers	HBS detail	Unit values
0813133	Subscriptions charges	HBS detail	Unit values
0813134	Installation costs	HBS detail	Unit values
0813135	Transfer charges	HBS detail	Unit values
0813136	Other charges	HBS detail	Unit values

\* The detailed information refers to quantity, split into peak/off peak calls, number and length of calls. IT stands for Iceland Telecom.

The classification used for telecommunications had to be revised because of the great variety of new items and services measured in the HBS. The definitions were in accordance with the new data source. The base for the classification is the COICOP standard. The structure of the classification is 3 headings at the 5 digit level, 15 at the 6 digit level, 30 at the 7 digit level and 3 at the 8 digit level. On the whole there are 64 lines in the telecommunication part<sup>29</sup>.

The table pictures the procedure how the overall weight is derived from the HBS.

- The first two columns show the classification headings.
- Next column show the two sources for the weights, the quantity data from Iceland Telecom and the HBS data set.
- The last column show how this information is used for price measurement. The detailed rates are used where there is quantity information available and units prices for other expenditures.

In almost all cases the quantity information is available from the HBS. The exceptions are:

<sup>29</sup> For full detail see appendix 3.

- Division between peak off peak rates
- Detailed quantity information from the prepaid cards showing the distribution of use.
- SMS originating from the prepaid cards.

The conclusion is that HBS information from the detailed bills can be used in almost all cases to create the weights for telecommunication services in the CPI.

Regarding the price measurement there are three methods that are most common for calculating the price change of telecommunication services. These are, the bill method, the rate method and the unit value approach<sup>30</sup>. It seems as many countries use some or other variant of the bill method<sup>31</sup>. There is a need to differentiate between methods used to measure price level and methods used for measuring price change. The OECD basket approach<sup>32</sup> for international comparison of prices and the NERA profile approach<sup>33</sup> for comparing prices of different profiles, are examples of different price level measurement. The profiles or bill methods are examples of methods used for measuring price change. In the Icelandic case the rates are used for available quantity information. Where the quantity information is not available unit values are used and in most cases the units are taken from HBS data.

The bills from the HBS also show how consumers choose their profiles. In all cases the most popular plans chosen by consumers are few. The conclusion is that the HBS information can in most case be laid as ground for the price measurement of the telecommunication services.

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<sup>30</sup> Gorko and Borde (1999).

<sup>31</sup> Gorko and Borde (1999), Montella (2001), Beuerlain (2000), Vassiliou (2001).

<sup>32</sup> Teligen (2000 a and b).

<sup>33</sup> NERA (1999).

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## Annex 1

### Icelandic Household Budget Survey 2000, translation of the questions on telephone services in the quarterly expenditure questionnaire.<sup>34</sup>

#### Telephone services

#### 108. Telephone services

Register **the last telephone bill paid** for each household telephone. Use the empty line for other telephone expenditures f.ex. extra name in the telephone catalogue, number showing etc. **Note those buying services from Landssíminn can authorize Statistics Iceland to get this information directly. In that cases you do not need to fill in the forms but it is necessary to fill in the enclosed form allowing Statistics Iceland to get this information.**

Detailed telephone bill	Home phone	GSM bill telephone 1	GSM bill telephone 2	Other phone _____
Tele company				
Total expenditure	kr	kr	kr	kr
-use	kr	kr	kr	kr
-service charge	kr	kr	kr	kr
-installation	kr	kr	kr	kr
-transfer	kr	kr	kr	kr
-discount	kr	kr	kr	kr
-penal interests	kr	kr	kr	kr
	kr	kr	kr	kr
	kr	kr	kr	kr
	kr	kr	kr	kr

Register the name of the telephone company e.g. Landssíminn, Tal or Íslandssími.

<sup>34</sup> This is an example of the posted quarterly questioner. The questions in the Blaise laptop computer program used by the interviewers when they visit the participants is similar.

**109. Prepaid telephone card bought in the last 30 days**

<i>Card type</i>	<i>GSM tel 1</i>	<i>GSM tel 2</i>	<i>GSM tel 3</i>
GSM " Freedom" (Síminn)	kr	kr	kr
"Tal freedom" (Tal)	kr	kr	kr
Other _____	kr	kr	kr

**110. Other telephone cost e.g. the last bill from the following companies; Halló, Netsímanum, Títan etc.**

*Itemise telephone cost that has not been registered before and note the period that the bill cover.*

<i>Telephone company</i>	<i>Months</i>	<i>Amount</i>
	Months	kr
	Months	kr

**111. Free telephone**

*Has the household free telephone. Mark x in the proper field.*

1  Yes

*Itemise form* \_\_\_\_\_

2  No

**112. Refunded telephone cost**

*Has any part of the telephone cost registered been refunded? Itemise cost and amount?*

\_\_\_\_\_

### 113. Detailed use

Itemise the telephone cost in the same way as in the telephone bills. Use the empty lines for other itemised telephone expenditures other than those listed below.

<i>Type of use</i>	<i>Home phone</i>			<i>GSM tel. 1</i>		
	<i>Amount</i>	<i>Number of calls</i>	<i>Length of calls</i>	<i>Amount</i>	<i>Number of calls</i>	<i>Length of calls</i>
Domestic	kr		: :	kr		: :
Abroad	kr		: :	kr		: :
GSM telephone	kr		: :	kr		: :
Information number	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :

<i>Type of use</i>	<i>GSM tel. 2</i>			<i>Other phone _____</i>		
	<i>Amount</i>	<i>Number of calls</i>	<i>Length of calls</i>	<i>Amount</i>	<i>Number of calls</i>	<i>Length of calls</i>
Domestic	kr		: :	kr		: :
Abroad	kr		: :	kr		: :
GSM telephone	kr		: :	kr		: :
Information number	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :
	kr		: :	kr		: :

## Annex 2

**The Icelandic Household Budget Survey 2000, translation of the declaration given by household that enables Statistics Iceland to collect that information directly from the Telecom Iceland (Síminn)<sup>35</sup>**

### **Information about telephone cost and use in the Household Budget Survey year 2000**

For assessment of the expenditure on telephone services in the Household Budget Survey year 2000, Statistics Iceland needs to collect detailed information from the telephone bills of the participating households. To make this data collection easier, Statistics Iceland ask for a permission from you to get the detailed telephone bills of the household directly from Telecom Iceland. The information needed is exactly the same as can be found on the itemisation enclosed with the monthly bills.

**Family number:**   \_\_ \_\_ - \_\_ \_\_ - \_\_ \_\_ \_\_

Date and place: \_\_\_\_\_

### **Declaration**

We undersigned give here by Statistics Iceland permission to get billing information from Telecom Iceland for the following telephone numbers in \_\_\_\_\_ month in the year 2000.

<b>Type of phone</b>	<b>Phone number</b>	<b>Agreed</b>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

<sup>35</sup> This note is then sent to the company which delivers the bill after that. The bill always refer to a month.

## Annex 3

### The COICOP classification used in the Icelandic Household Budget Survey and for the Consumer Price Index

COICOP group	Heading
0813	Telephone, telegraph and telefax services
08131	Telephone service
081311	Fixed line telephone services
0813111	Fixed line traffic domestic
0813112	Fixed line traffic into mobile
0813113	Fixed line traffic outgoing
081312	Mobile telephone services
0813121	Mobile traffic into fixed line
0813122	Mobile traffic into mobile
0813123	Mobile foreign traffic
08131231	Mobile traffic outgoing
08131232	Mobile traffic received abroad
08131233	Mobile traffic roaming abroad
0813124	Prepaid telephone cards
08131241	GSM freedom card
08131242	Tal freedom card
08131243	Other telephone cards
0813125	SMS etc.
08131251	SMS
08131252	SIMAT (SIM Application Toolkit)
08131253	WAP
08131254	Other
081313	Other telephone services
0813131	Information numbers
0813132	Service numbers
0813133	Subscriptions charges
08131331	GSM subscriptions
08131332	Fixed line subscriptions
08131333	ISDN subscriptions
08131334	ADSL subscriptions
0813134	Installation costs
08131341	GSM installation costs
08131342	Fixed line installation costs
08131343	ISDN installation costs
08131344	ADSL installation costs
0813135	Transfer charges
0813136	Other charges
08131361	Billing
08131362	Itemisation of bills
08131363	Telegraphs
08131364	Extra lines in telephone catalog
08131365	Opening charges
08131366	Number services
081313661	Number showing

081313662	Number hiding
081313663	Number locking
08131367	Message box
08131368	Other fixed or variable charges
0813137	Discounts
08131371	Discounts monthly rates
08131372	Relatives dicount plan
08131373	Discount electronic billing
08131374	Other discounts
08132	Internet service

## Annex 4

**The classification of traffic information from Iceland Telcom used for measuring the quantity of services.**

	Minutes	Number of calls
<b>Mobile system traffic into</b>		
<i>Mobile</i>		
Day rate		
Evening and weekend tariff		
<i>Fixed line</i>		
Day rate		
Evening and weekend tariff		
<i>Outgoing</i>		
Day rate		
Evening and weekend tariff		
<b>Fixed line traffic into</b>		
<i>Mobile</i>		
Day rate		
Evening and weekend tariff		
<i>Fixed line</i>		
Day rate		
Evening and weekend tariff		
<i>Outgoing</i>		
Day rate		
Evening and weekend tariff		