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**THE TELEPHONE USE IN SWEDEN AND
ITS SENSITIVITY TO PRICES**

by

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The telephone use in Sweden and its sensitivity to price

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Abstract.

In a study published by Swedish Telecom (Televerket) twenty years ago, the price elasticity for trunk calls over a distance of 90 Km or more was reported to be -0.6. This result is surprisingly well in line with the main results of this study, despite the differences of methodology and empirical base. The price structure of telecommunication is in one sence fixed for years, and subject to a reform at certain points of time. However, for calls over certain distances such as local calls and trunk calls, there is a short run variation of the price over each day and the week. This short run price variation is used to formulate a demand model and estimate its parameters.

Contents.

1.	Introduction	5
2.	Main results, a summary	5
3.	Telephone prices in Sweden	6
4.	Specification of a demand equation	8
5.	Results	9
5.1	Private households, June 1988 - March 1989	10
5.1.1	All active private households	11
5.1.2	Men and women, 40 years old or less	13
5.1.3	Men, 40 years old or less	15
5.1.4	Women, 40 years old or less	17
5.1.5	Men and women, 41 years old or more	19
5.1.6	Men, 41 years old or more	21
5.1.7	Women, 41 years old or more	23
5.2	Private households, March 1988	25
5.3	Firms and public institutions	27
6.	The price reform of April 1:st 1988	29
7.	Final comments	30
8.	References	31
9.	Appendix 1, The frequency of markings in Sweden.	32
10.	Appendix 2, Matrices of calling time per week	34
11.	Appendix 3, Participating telephone exchanges	41
12.	Appendix 4a, Measured exchanges, March 1988	43
	4b, " " , June 1988	45
	4c, " " , September 1988	47
	4d, " " , December 1988	48
	4e, " " , March 1989	49

1. Introduction.

Following a "tradition" from the late seventies, the Industrial Institute of Economic and Social Research (IUI) and Swedish Telecom (Televerket) have cooperated in order to estimate the price elasticities of telephone use in Sweden (Pousette, 1978). Reasonable estimates of the price elasticities are important information to design an efficient structure of the telephone tariffs. A discussion of efficiency criteria of the two components of the tariff, the price of the subscription and the price(s) of calling time, has recently been presented in an IUI-report, and this paper represents an empirical continuation of this work (Lang & Lundgren, 1990). Price elasticities for calling time only are discussed.

2. Main results, a summary.

The price elasticity of the use of a telephone service, is assumed to be proportional to its price. This prior assumption has been used in several international studies, and is also adopted here. Table I gives a summary of the results from the elasticity computations based on Swedish telecommunication data. The orders of magnitude seem to be well in line with elasticity estimates reported in various international studies, and also with Swedish results reported by Televerket in 1971.

Table I.,
Price elasticities of private households
June 1988 - March 1989, a survey

Group of services	minimum own price elasticity	group price elasticity
Local calls	-0.04	-0.02
Trunk calls ("Riks") >90 km	-0.60	-0.40
Nordic Countries	-1.0	-1.0
Nordic Mobile Telephone	-1.6	-1.3
USA & Canada	-3.1	-2.8

In a recent study by Kling & Van der Ploeg, based on U.S. data, local call elasticities are estimated to (-0.03, -0.28) (Kling & van der Ploeg, 1990). These elasticities are based on another model than the one used below and also on the assumption of a price per call rather than a price per minute. In the Swedish study published twenty years ago, the elasticity for calls over a distance up to 90 Km was reported to be -0.4 and for longer distances -0.6. This study was made by Televerkets Centralförvaltning in 1971 (see Tomas Pousette, 1978). In this study no differentiation between households and firms was made. Further, at that time local calls had a low price per call (one local call = one marking) rather than a fixed price per minute.

One other result in this study is that there is no evidence that the telephone use of firms and public institutions as subscribers is price elastic at all. All estimated parameters of relevance either are insignificant or have a wrong sign.

3. Telephone prices in Sweden.

The price per minute to access the telephone network in Sweden during the weeks under consideration varied as follows. The prices of local calls, calls to the Nordic countries, to the USA & Canada and Nordic Mobile Telephone (NMT) calls, have two levels during various intervals of a week (T01, T02). The prices of trunk calls have four different levels during a week (T11, T12, T13, T14). All other prices have a fixed level (international group II & special services). The lack of price variation means that these categories of the demand can not be incorporated in the estimation procedure.

Table II.			
price SEK/minute; Local Calls			

Distance class	Time during the week		
"TC"	W 08-18	W 18-08	
	& other		
	T01	T02	

100, 101, 102	0.08	0.04	) 1

)1 to March 31 1988,	0.06	0.03	

Table III.				
price, SEK/minute; Trunk calls				

Distance class	Time during the week			
"TC"	W 08-12	W 12-18	W 18-22	W 22-08
	& other			
	T11	T12	T13	T14

103 (d<45 km) reduced	0.22	0.15	0.13	0.12
104 (d<45 km) normal	0.45	0.31	0.26	0.23
105 (45<d<90 km)	0.81	0.58	0.49	0.43
106 (90<d<180 km)	1.25	0.92	0.77	0.66
107 (180<d<270 km)	1.25	0.92	0.77	0.66
108 (d>270 km)	1.25	0.92	0.77	0.66

)2 to March 31, 1988 (	1.53	1.15	0.92	0.77)

price, SEK/minute; Table IV.
International group 1
& Nordic Mobile Telephone

Distance class	Time during the week					
"TC"	All d	All d	Mon-Sat	Mon-Sat	Mon-Fri	Mon-Fri
	08-22	22-08	10-22	22-10	08-18	18-08
				& other		& other
	T01	T02	T01	T02	T01	T02

58 Nordic C (high)	2.23					
62 Nordic C (low)		1.58				
21 USA & Canada (high)			6.90			)1
26 USA & Canada (low)				5.31		)1
109 NMT					3.45	2.30

)1 to March 31, 1988 9.72 7.50

price, SEK/minute; Table V.
International group 2
& special services

Distance class	Time during the week		
"TC"	All days		

78 Boarder NOR, FIN	0.56		
69 Coast zone DEN	1.02		
67 Nordkalotten	1.21		
29 Northern Europe	4.08	(4.45)	)2
27 Middle Europe	4.93	(5.31)	)2
22 Southern Europe	6.27	(6.90)	)2
16 Middle East	10.62		
90 Oth intercontinental	15.33	(19.44)	)2

40 PLUS-services	2.30 SEK when used
41 collect call	0.23 SEK per call (A-subscriber)
31 e.g. 90100	0.23 SEK per call
30 free	0.00 SEK per call

)2 to March 31, 1988

In the specification of a demand equation, we make use of all telephone services where the price per minute takes at least two different levels during a week. This implies that International services group 2 & special services (Table V) are excluded from the model specification and the estimation procedure.

4. Specification of a demand equation.

Let us, following Lang & Lundgren 1990, formulate an aggregate demand equation for telephone use. Consider the average subscribers' demand for calling time, measured in seconds, during a week. This demand is split into four distance classes, where the price per minute has two distinct levels (high & low) during a week (local calls, Nordic countries, USA & Canada and NMT), and six distance classes where the price has four different levels (trunk calls). This makes 32 observations of the z-variable available to the estimation procedure. The other distance classes, where the prices are fixed to one single level during a week, are left outside the estimation procedure.

$$z_{ij} = \alpha_i \exp(\Theta p_{ij}) [\beta_j + \delta \exp(\Theta \sum_{k \neq j} p_{ik})] + \epsilon_{ij}; \quad (1)$$

Let z_{ij} represent the average demand for calling time in distance class i and the price period j . The corresponding price is p_{ij} . The α_i parameter measures the mean level of the demand for calling time of distance class i , and the parameter β_j measures the 'natural' level of demand during the price interval j . The Θ and δ parameters represent the influence of the relative price differentiation within this distance class. In equation (1), all income effects are assumed to be null. Income data are not available and would be of little use in this aggregate formulation of the model.

$$\frac{\partial z_{ij}}{\partial p_{ij}} \cdot \frac{p_{ij}}{z_{ij}} = \Theta p_{ij}; \quad (2)$$

$$\frac{\partial z_{ij}}{\partial p_{ik}} \cdot \frac{p_{ik}}{z_{ij}} = \frac{\delta \cdot \Theta \cdot \exp(\Theta \sum_{q \neq k} p_{iq}) \cdot p_{ik}}{\beta_k + \delta \exp(\Theta \sum_{q \neq k} p_{iq})}; \quad k \neq j \quad (3)$$

When income elasticities are zero, the cross price derivatives should be equal in order to guarantee Slutsky symmetry. This is a particular feature of equation (1). One other feature follows from equation (2). The own-price elasticity of the demand of each distance and time is proportional to its price. The cross price elasticities within a given distance class are given by equation (3). In particular, the demand for calling time in a certain distance class is assumed to be independent of the prices of other distance classes. This assumption implies the third equation of the error specifications (4)

$$E(\epsilon_{ij}) = 0, \quad E(\epsilon_{ij}^2) = \sigma_{ij}^2, \quad E(\epsilon_{ij} \epsilon_{hk}) = 0; \quad \text{if } i \neq h, j \neq k \quad (4)$$

Equation (1) is estimated by weighted non linear least squares, where the weights attached to each observation of a distance class are equal and proportional to the budget share of the expenditures of this class among the ten distance classes considered. The idea is that it must be more important to consider a behaviour that favours a reallocation of the calls from "high price time" to "low price time" if a distance class has a great share of the telephone bill, than if this share is small. In order to obtain efficient and stable estimates of the parameters of particular interest, the Θ and δ parameters, the α_i

parameters that reflect the mean of the demand of a certain distance are computed as means from the sample and entered into the equation (1) as restrictions. The β_j parameters may be interpreted to reflect the 'natural' distribution of a given volume of demand over the price invariant time periods, i.e. the distribution that would occur if the price was constant. Two of the β parameters are normalized and set equal to 1 (their logarithms set to 0), one of the two-period group and one of the four-period group.

5. Results.

For each of the five measured weeks, seven demand matrices (see Appendix 2) are computed for the households. One represents the demand from all private households without any check for age and sex. Three of them represent the demand for calling time from young households, the subscriber being not older than 40. Men and women are accounted for separately and also combined in one group. The same procedure is also applied to households where the subscriber is at least 41 years old. For firms only an unrestricted accumulation of calling time is applied.

For each measured week, the estimated parameters and the associated elasticity measures seem to be internally consistent with reference to the sex differentiation within an age group. Further, women seem to be more price sensitive as compared to men, with exception of the March 1988 result. Otherwise, the estimated measures of price elasticity of young versus old households point in different directions. For the aggregate June 1988 to March 1989 no difference is found.

Table VI.

Private households, a survey of the estimated own-price elasticity of the most expensive trunk calls (working days 0800-1200).

March 1988				June 1988			
	max 40	min 41	unlimit		max 40	min 41	unlimit
M & W	-0.613	-0.585	-0.572	M & W	-0.641	-0.474	-0.509
M	-0.659	-0.607		M	-0.609	-0.443	
W	-0.561	-0.570		W	-0.655	-0.521	
September 1988				December 1988			
	max 40	min 41	unlimit		max 40	min 41	unlimit
M & W	-0.604	-0.459	-0.477	M & W	-0.520	-0.778	-0.681
M	-0.549	-0.395		M	-0.507	-0.798	
W	-0.648	-0.537		W	-0.523	-0.725	
March 1989				June 1988-March 1989			
	max 40	min 41	unlimit		max 40	min 41	unlimit
M & W	-0.695	-0.769	-0.656	M & W	-0.601	-0.610	-0.569
M	-0.626	-0.691		M	-0.581	-0.585	
W	-0.768	-0.888		W	-0.613	-0.641	

M=Men, W=Women, max 40=of age 40 or less, min 41=of age 41 or more
unlimit=all private households without test age or sex (includes more subscribers than those included in M & W max 40 + min 41).

5.1. Private households, June 1988 - March 1989.

The aggregate demand for calling time of June, September and December 1988 plus March 1989 is considered to be the main result of this study and will be reported in detail below. Estimates of all private households of the first measured week in March 1988 will also be reported separately.

There are two reasons for this.

- The price structure was changed on April 1:st 1988
- An average over time reduces "seasonal" effects.

Unfortunately, beside appropriate seasonal effects, the number of telephone exchanges varies from one measured week to another. As an example, the Stockholm area participates with ten exchanges in March and June 1988, with one in September, nine in December and finally with seven in March 1989 (see Appendix 4). The demand per user for various distance categories is tabulated below.

		Table VII. The demand for calling time (seconds)				
		Jun 88	Sep 88	Dec 88	Mar 89	Average
Local calls	T1	2022.7	1991.7	2366.0	2236.3	2144.7
	T2	2502.5	2371.9	2867.4	2691.6	2601.5
Nordic Countries	T1	32.1	29.1	39.3	29.1	32.3
	T2	4.6	2.5	4.4	0.6	3.0
USA, Canada	T1	1.6	1.5	4.9	1.9	2.4
	T2	3.0	1.9	3.9	1.8	2.6
Mobile Telephone	T1	5.3	6.9	8.0	8.8	7.1
	T2	5.2	3.4	6.4	5.9	5.2
Trunk calls, TC 103	T1	3.2	5.0	2.2	3.4	3.5
	T2	7.6	7.4	12.9	12.5	9.9
	T3	8.7	11.8	15.2	19.3	13.5
	T4	11.3	6.6	11.8	13.2	10.8
" " , TC 104	T1	35.7	36.9	32.3	28.1	33.2
	T2	47.0	60.4	57.3	51.4	53.7
	T3	71.3	73.7	52.2	65.4	66.1
	T4	59.2	57.0	70.8	63.5	62.5
" " , TC 105	T1	33.3	40.5	49.0	46.5	41.8
	T2	52.0	65.1	62.5	63.4	60.2
	T3	86.5	98.2	82.2	89.8	89.1
	T4	74.7	83.9	83.1	79.5	80.1
" " , TC 106	T1	26.1	44.9	63.3	76.9	51.5 (*)
	T2	45.0	72.4	132.0	150.0	96.9 (*)
	T3	75.9	111.0	191.5	228.1	147.7 (*)
	T4	76.3	85.4	204.2	198.1	138.1 (*)
" " , TC 107	T1	16.8	22.1	4.5	1.0	11.5 (*)
	T2	35.2	41.9	6.8	3.0	22.7 (*)
	T3	45.7	69.3	11.2	6.8	34.2 (*)
	T4	40.2	71.5	7.5	1.6	30.7 (*)
" " , TC 108	T1	35.6	7.3	0.8	1.4	12.6 (*)
	T2	60.1	17.1	1.0	0.2	21.7 (*)
	T3	91.0	28.1	1.8	2.9	34.0 (*)
	T4	92.6	23.5	3.7	3.2	33.4 (*)

(*) The distance classes 107 & 108 are gradually transferred to 106 (now economically equivalent)

5.1.1 All active private households.

Table VIII.
All active households,
June 88 - March 89

Parameter	Estimate	Std. Err.

B02	0.1639	0.0039
B12	0.2867	0.0818
B13	0.6300	0.0885
B14	0.5144	0.0742
DELTA	-0.0640	0.0051
THETA	-0.4551	0.0561

B01=0.0 & B11=0.0		

Table IX.
Price elasticities

Local calls			Nordic countries						
	T1	T2		T1	T2				
T1	-0.036	0.001	T1	-1.015	0.014				
T2	0.002	-0.018	T2	0.033	-0.719				
USA & Canada			NMT						
	T1	T2		T1	T2				
T1	-3.140	0.006	T1	-1.570	0.012				
T2	0.018	-2.417	T2	0.036	-1.047				
Trunk calls									
d<45 km reduced, TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.100	0.004	0.003	0.003	T1	-0.205	0.007	0.005	0.006
T2	0.004	-0.068	0.002	0.002	T2	0.006	-0.141	0.003	0.004
T3	0.003	0.002	-0.059	0.002	T3	0.005	0.004	-0.123	0.003
T4	0.003	0.002	0.001	-0.050	T4	0.004	0.003	0.002	-0.105
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.369	0.009	0.006	0.007	T1	-0.569	0.010	0.007	0.008
T2	0.008	-0.259	0.004	0.005	T2	0.008	-0.419	0.004	0.005
T3	0.006	0.005	-0.223	0.004	T3	0.006	0.005	-0.350	0.004
T4	0.005	0.004	0.003	-0.196	T4	0.005	0.004	0.003	-0.300

Table X.
All active households,
June 88 - March 89

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2144.7	-0.02	-0.60	T1	32.3	-0.93	-0.02
T2	2601.5	-0.01	0.37	T2	3.0	-0.03	0.05
TOT	4746.3	-0.02	0.97	TOT	35.3	-0.96	0.03
USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2.4	-1.50	-1.18	T1	7.1	-0.90	-0.39
T2	2.6	-1.26	-0.65	T2	5.2	-0.42	0.01
TOT	5.0	-2.75	-1.82	TOT	12.4	-1.32	-0.38
Trunk calls							
d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	3.5	-0.01	0.14	T1	33.2	-0.03	0.19
T2	9.9	-0.02	0.27	T2	53.7	-0.03	0.23
T3	13.5	-0.02	0.32	T3	66.1	-0.04	0.25
T4	10.8	-0.01	0.22	T4	62.5	-0.03	0.20
TOT	37.7	-0.06	0.94	TOT	215.4	-0.12	0.87
45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	41.8	-0.05	0.15	T1	51.5	-0.06	0.08
T2	60.2	-0.05	0.18	T2	96.9	-0.09	0.15
T3	89.1	-0.07	0.23	T3	147.7	-0.12	0.21
T4	80.1	-0.06	0.19	T4	138.1	-0.09	0.18
TOT	271.3	-0.23	0.76	TOT	434.2	-0.36	0.62
180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	11.5	-0.06	0.08	T1	12.6	-0.06	0.09
T2	22.7	-0.09	0.15	T2	21.7	-0.09	0.14
T3	34.2	-0.12	0.21	T3	34.0	-0.11	0.20
T4	30.7	-0.09	0.18	T4	33.4	-0.10	0.19
TOT	99.1	-0.36	0.62	TOT	101.8	-0.36	0.62

5.1.2 Men and women, 40 years old or less.

Table XI.
Households, men & women of age 40 or less
June 1988 - March 1989

Parameter	Estimate	Std. Err.

B02	0.3861	0.0038
B12	0.2988	0.0781
B13	0.7676	0.0935
B14	0.5085	0.0698
DELTA	-0.2149	0.0050
THETA	-0.4805	0.0588

B01=0.0 & B11=0.0		

Table XII.
Price elasticities

Local calls			Nordic countries						
	T1	T2		T1	T2				
T1	-0.038	0.003	T1	-1.071	0.040				
T2	0.010	-0.019	T2	0.120	-0.759				
USA & Canada			NMT						
	T1	T2		T1	T2				
T1	-3.315	0.014	T1	-1.658	0.032				
T2	0.056	-2.551	T2	0.127	-1.105				
Trunk calls									
d<45 km reduced, TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.106	0.016	0.009	0.013	T1	-0.216	0.026	0.016	0.021
T2	0.015	-0.072	0.006	0.008	T2	0.024	-0.149	0.010	0.013
T3	0.013	0.009	-0.062	0.007	T3	0.020	0.014	-0.130	0.011
T4	0.011	0.008	0.004	-0.053	T4	0.017	0.012	0.007	-0.111
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.389	0.033	0.020	0.026	T1	-0.601	0.033	0.020	0.026
T2	0.028	-0.274	0.012	0.016	T2	0.028	-0.442	0.013	0.016
T3	0.023	0.017	-0.235	0.013	T3	0.022	0.016	-0.370	0.013
T4	0.020	0.014	0.009	-0.207	T4	0.018	0.013	0.008	-0.317

Table XIII.
Households, men & women of age 40 or less
June 1988 - March 1989

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1844.9	-0.01	-0.53	T1	27.0	-0.95	-0.07
T2	3012.5	-0.01	0.45	T2	3.3	0.02	0.13
TOT	4857.4	-0.02	0.98	TOT	30.3	-0.93	0.06

USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2.9	-1.17	-0.97	T1	9.0	-0.80	-0.39
T2	5.2	-1.62	-0.89	T2	9.3	-0.50	0.03
TOT	8.1	-2.79	-1.87	TOT	18.2	-1.30	-0.36

Trunk calls

d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1.3	0.01	0.05	T1	27.3	-0.01	0.16
T2	12.2	-0.01	0.30	T2	53.8	-0.03	0.23
T3	19.6	-0.02	0.41	T3	82.4	-0.04	0.31
T4	10.9	-0.01	0.20	T4	59.0	-0.02	0.19
TOT	44.0	-0.04	0.96	TOT	222.5	-0.10	0.90

45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	42.5	-0.03	0.15	T1	47.4	-0.04	0.08
T2	67.0	-0.05	0.18	T2	96.3	-0.08	0.15
T3	109.1	-0.07	0.26	T3	171.2	-0.13	0.23
T4	87.8	-0.05	0.19	T4	137.9	-0.09	0.18
TOT	306.4	-0.20	0.78	TOT	452.7	-0.34	0.64

180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	12.5	-0.04	0.08	T1	13.3	-0.05	0.09
T2	27.1	-0.09	0.15	T2	24.1	-0.08	0.14
T3	46.9	-0.13	0.24	T3	40.6	-0.12	0.22
T4	35.7	-0.09	0.17	T4	35.4	-0.09	0.18
TOT	122.1	-0.34	0.64	TOT	113.3	-0.34	0.63

5.1.3 Men, 40 years old or less.

Table XIV.
Households, men of age 40 or less,
June 88 - March 89

Parameter	Estimate	Std. Err.

B02	0.3622	0.0045
B12	0.2584	0.0754
B13	0.7258	0.0898
B14	0.5371	0.0701
DELTA	-0.1976	0.0053
THETA	-0.4648	0.0579

B01=0.0 & B11=0.0		

Table XV.
Price elasticities

Local calls				Nordic countries					
	T1	T2			T1	T2			
T1	-0.037	0.003		T1	-1.036	0.038			
T2	0.009	-0.019		T2	0.109	-0.734			
USA & Canada				NMT					
	T1	T2			T1	T2			
T1	-3.207	0.014		T1	-1.603	0.030			
T2	0.055	-2.468		T2	0.117	-1.069			
Trunk calls									
d<45 km reduced, TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.102	0.015	0.009	0.011	T1	-0.209	0.025	0.015	0.018
T2	0.013	-0.070	0.006	0.007	T2	0.021	-0.144	0.009	0.012
T3	0.011	0.008	-0.060	0.006	T3	0.018	0.013	-0.125	0.010
T4	0.009	0.007	0.004	-0.051	T4	0.015	0.011	0.007	-0.107
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.376	0.031	0.019	0.023	T1	-0.581	0.031	0.019	0.024
T2	0.026	-0.265	0.012	0.014	T2	0.026	-0.428	0.012	0.015
T3	0.021	0.016	-0.228	0.012	T3	0.020	0.015	-0.358	0.011
T4	0.018	0.014	0.008	-0.200	T4	0.016	0.012	0.008	-0.307

Table XVI.
Households, men of age 40 or less,
June 88 - March 89

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1681.1	-0.01	0.54	T1	24.3	-0.89	-0.04
T2	2646.9	-0.01	0.44	T2	3.7	0.00	0.12
TOT	4328.0	-0.02	0.98	TOT	28.0	-0.90	0.08

USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	5.4	-1.89	-1.45	T1	11.2	-0.85	-0.38
T2	3.8	-0.98	-0.48	T2	9.6	-0.43	0.04
TOT	9.2	-2.87	-1.94	TOT	20.8	-1.28	-0.34

Trunk calls

d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	0.6	0.01	0.04	T1	24.2	-0.01	0.17
T2	7.4	-0.01	0.28	T2	45.9	-0.03	0.23
T3	15.3	-0.03	0.51	T3	70.9	-0.04	0.31
T4	4.4	0.00	0.13	T4	47.7	-0.02	0.19
TOT	27.6	-0.04	0.96	TOT	188.7	-0.10	0.90

45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	49.0	-0.04	0.16	T1	49.9	-0.04	0.09
T2	59.5	-0.04	0.16	T2	97.6	-0.08	0.15
T3	108.1	-0.07	0.25	T3	168.6	-0.12	0.23
T4	101.2	-0.06	0.21	T4	143.9	-0.09	0.18
TOT	317.8	-0.20	0.79	TOT	460.0	-0.33	0.65

180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	13.7	-0.04	0.08	T1	13.9	-0.05	0.10
T2	31.0	-0.09	0.16	T2	26.7	-0.10	0.17
T3	50.4	-0.12	0.23	T3	35.3	-0.11	0.20
T4	39.6	-0.08	0.17	T4	30.7	-0.08	0.17
TOT	134.7	-0.33	0.65	TOT	106.6	-0.34	0.64

5.1.4 Women, 40 years old or less.

Table XVII.
Households, women of age 40 or less,
June 88 - March 89

Parameter	Estimate	Std. Err.

B02	0.4067	0.0039
B12	0.3338	0.0934
B13	0.8055	0.1121
B14	0.4710	0.0802
DELTA	-0.2303	0.0056
THETA	-0.4906	0.0692

B01=0.0 & B11=0.0		

Table XVIII.
Price elasticities

Local calls				Nordic countries					
	T1	T2			T1	T2			
T1	-0.039	0.003		T1	-1.094	0.042			
T2	0.011	-0.020		T2	0.130	-0.775			
USA & Canada				NMT					
	T1	T2			T1	T2			
T1	-3.385	0.014		T1	-1.693	0.033			
T2	0.059	-2.605		T2	0.136	-1.128			
Trunk calls									
d<45 km reduced,TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.108	0.017	0.010	0.014	T1	-0.221	0.028	0.016	0.024
T2	0.016	-0.074	0.007	0.009	T2	0.026	-0.152	0.011	0.015
T3	0.014	0.010	-0.064	0.008	T3	0.022	0.015	-0.132	0.013
T4	0.012	0.008	0.005	-0.054	T4	0.018	0.013	0.008	-0.113
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.397	0.034	0.021	0.029	T1	-0.613	0.034	0.021	0.029
T2	0.030	-0.280	0.013	0.018	T2	0.030	-0.451	0.013	0.018
T3	0.025	0.017	-0.240	0.015	T3	0.023	0.016	-0.378	0.014
T4	0.021	0.015	0.009	-0.211	T4	0.019	0.013	0.008	-0.324

Table XIX.
Households, women of age 40 or less,
June 88 - March 89

=> One per cent price increase of a distance class
the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2027.3	-0.01	0.52	T1	29.9	-0.99	-0.10
T2	3418.8	-0.01	0.45	T2	2.9	0.05	0.14
TOT	5446.1	-0.02	0.98	TOT	32.8	-0.94	0.04
USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	0.0	0.00	0.00	T1	6.5	-0.70	-0.36
T2	6.8	-2.60	-1.62	T2	8.9	-0.59	0.01
TOT	6.8	-2.59	-1.62	TOT	15.4	-1.29	-0.35
Trunk calls							
d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1.9	0.01	0.06	T1	30.8	-0.01	0.16
T2	17.6	-0.01	0.30	T2	62.6	-0.03	0.23
T3	24.4	-0.02	0.37	T3	95.2	-0.04	0.31
T4	18.1	-0.01	0.23	T4	71.6	-0.02	0.20
TOT	62.1	-0.04	0.96	TOT	260.2	-0.09	0.90
45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	35.2	-0.02	0.13	T1	44.5	-0.04	0.08
T2	75.3	-0.06	0.21	T2	94.9	-0.08	0.14
T3	110.3	-0.08	0.27	T3	174.0	-0.14	0.24
T4	72.8	-0.04	0.17	T4	131.3	-0.09	0.17
TOT	293.7	-0.20	0.78	TOT	444.6	-0.35	0.63
180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	11.1	-0.04	0.08	T1	12.5	-0.04	0.08
T2	22.6	-0.08	0.14	T2	21.2	-0.07	0.12
T3	43.0	-0.14	0.24	T3	46.5	-0.14	0.24
T4	31.5	-0.09	0.17	T4	40.5	-0.10	0.19
TOT	108.1	-0.35	0.63	TOT	120.7	-0.34	0.64

5.1.5 Men and women, 41 years old or more

Table XX.
Households, men & women of age 41 or more,
June 1988 - March 1989

Parameter	Estimate	Std. Err.

B02	0.0621	0.0049
B12	0.2709	0.1024
B13	0.6225	0.1106
B14	0.5774	0.0968
DELTA	-0.0029	0.0064
THETA	-0.4880	0.0682

B01=0.0 & B11=0.0		
DEL assumed to be 0.0		

Table XXI.
Price elasticities

Local calls				Nordic countries					
	T1	T2			T1	T2			
T1	-0.039	0.000		T1	-1.088	0.000			
T2	0.000	-0.020		T2	0.000	-0.771			
USA & Canada				NMT					
	T1	T2			T1	T2			
T1	-3.367	0.000		T1	-1.684	0.000			
T2	0.000	-2.591		T2	0.000	-1.122			
Trunk calls									
d<45 km reduced, TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.107	0.000	0.000	0.000	T1	-0.220	0.000	0.000	0.000
T2	0.000	-0.073	0.000	0.000	T2	0.000	-0.151	0.000	0.000
T3	0.000	0.000	-0.063	0.000	T3	0.000	0.000	-0.132	0.000
T4	0.000	0.000	0.000	-0.054	T4	0.000	0.000	0.000	-0.112
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.395	0.000	0.000	0.000	T1	-0.610	0.000	0.000	0.000
T2	0.000	-0.278	0.000	0.000	T2	0.000	-0.449	0.000	0.000
T3	0.000	0.000	-0.239	0.000	T3	0.000	0.000	-0.376	0.000
T4	0.000	0.000	0.000	-0.210	T4	0.000	0.000	0.000	-0.322

Table XXII.

Households, men & women of age 41 or more,
June 1988 - March 1989

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2174.8	-0.02	0.62	T1	34.8	-0.99	-0.09
T2	2359.9	-0.01	0.34	T2	3.5	-0.07	0.01
TOT	4534.7	-0.03	0.97	TOT	38.3	-1.06	-0.08
USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2.0	-2.15	-1.67	T1	4.2	-1.05	-0.50
T2	1.2	-0.94	-0.49	T2	2.6	-0.42	-0.04
TOT	3.2	-3.09	-2.16	TOT	6.8	-1.47	-0.54
Trunk calls							
d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	4.6	-0.01	0.17	T1	34.2	-0.03	0.19
T2	8.8	-0.02	0.23	T2	53.9	-0.04	0.22
T3	13.0	-0.02	0.30	T3	61.9	-0.04	0.22
T4	12.1	-0.02	0.24	T4	68.9	-0.04	0.22
TOT	38.6	-0.07	0.93	TOT	218.8	-0.14	0.85
45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	41.8	-0.06	0.14	T1	46.3	-0.07	0.06
T2	57.8	-0.06	0.17	T2	91.6	-0.10	0.13
T3	82.5	-0.08	0.22	T3	142.4	-0.13	0.20
T4	79.7	-0.06	0.19	T4	142.6	-0.11	0.18
TOT	261.8	-0.26	0.72	TOT	422.9	-0.40	0.58
180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	9.0	-0.06	0.06	T1	10.4	-0.07	0.07
T2	18.6	-0.10	0.13	T2	18.5	-0.09	0.12
T3	29.7	-0.13	0.20	T3	31.3	-0.13	0.20
T4	29.4	-0.11	0.19	T4	33.9	-0.12	0.20
TOT	86.8	-0.40	0.58	TOT	94.2	-0.40	0.58

5.1.6 Men, 41 years old or more

Table XXIII.

Households, men of age 41 or more,
June 88 - March 89

Parameter	Estimate	Std. Err.

B02	0.0304	0.0047
B12	0.2991	0.0896
B13	0.5913	0.0936
B14	0.5301	0.0815
DELTA	0.0131	0.0057
THETA	-0.4680	0.0579

B01=0.0 & B11=0.0		
DEL assumed to be 0.0		

Table XXIV.

Price elasticities

Local calls			Nordic countries		
	T1	T2		T1	T2
T1	-0.037	0.000	T1	-1.044	0.000
T2	0.000	-0.019	T2	0.000	-0.739
USA & Canada			NMT		
	T1	T2		T1	T2
T1	-3.229	0.000	T1	-1.615	0.000
T2	0.000	-2.485	T2	0.000	-1.076

Trunk calls

d<45 km reduced, TC 103					d<45 km normal, TC 104				
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.103	0.000	0.000	0.000	T1	-0.211	0.000	0.000	0.000
T2	0.000	-0.070	0.000	0.000	T2	0.000	-0.145	0.000	0.000
T3	0.000	0.000	-0.061	0.000	T3	0.000	0.000	-0.126	0.000
T4	0.000	0.000	0.000	-0.051	T4	0.000	0.000	0.000	-0.108
45<d<90 km, TC 105					d>90 km, TC 106-108				
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.379	0.000	0.000	0.000	T1	-0.585	0.000	0.000	0.000
T2	0.000	-0.267	0.000	0.000	T2	0.000	-0.431	0.000	0.000
T3	0.000	0.000	-0.229	0.000	T3	0.000	0.000	-0.360	0.000
T4	0.000	0.000	0.000	-0.201	T4	0.000	0.000	0.000	-0.309

Table XXV.
Households, men of age 41 or more,
June 88 - March 89

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2110.0	-0.02	0.63	T1	31.0	-0.90	-0.05
T2	2214.4	-0.01	0.34	T2	5.1	-0.10	0.03
TOT	4324.4	-0.03	0.97	TOT	36.2	-1.00	-0.02

USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2.4	-2.04	-1.56	T1	5.4	-1.00	-0.45
T2	1.4	-0.91	-0.47	T2	3.3	-0.41	-0.03
TOT	3.7	-2.96	-2.03	TOT	8.6	-1.41	-0.47

Trunk calls

d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	3.9	-0.01	0.16	T1	35.2	-0.03	0.18
T2	7.5	-0.02	0.22	T2	60.2	-0.04	0.23
T3	11.6	-0.02	0.30	T3	65.0	-0.04	0.23
T4	10.9	-0.02	0.24	T4	68.6	-0.03	0.21
TOT	33.9	-0.06	0.93	TOT	229.0	-0.14	0.85

45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	39.7	-0.06	0.14	T1	53.4	-0.07	0.07
T2	62.3	-0.06	0.19	T2	99.8	-0.10	0.14
T3	82.2	-0.07	0.22	T3	145.4	-0.12	0.19
T4	74.6	-0.06	0.18	T4	144.5	-0.10	0.18
TOT	258.8	-0.25	0.73	TOT	443.2	-0.39	0.59

180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	10.2	-0.07	0.07	T1	11.4	-0.07	0.07
T2	18.0	-0.09	0.13	T2	16.4	-0.07	0.11
T3	30.8	-0.13	0.21	T3	36.6	-0.14	0.23
T4	29.5	-0.10	0.18	T4	31.4	-0.10	0.18
TOT	88.5	-0.38	0.59	TOT	95.8	-0.38	0.59

5.1.7 Women, 41 years old or more

Table XXVI.
Households, women of age 41 or more,
June 88 - March 89

Parameter	Estimate	Std. Err.

B02	0.1008	0.0055
B12	0.2129	0.1278
B13	0.6615	0.1453
B14	0.6428	0.1288
DELTA	-0.0231	0.0080
THETA	-0.5126	0.0894

B01=0.0 & B11=0.0		

Table XXVII.
Price elasticities

Local calls				Nordic countries					
	T1	T2			T1	T2			
T1	-0.041	0.000		T1	-1.143	0.005			
T2	0.001	-0.021		T2	0.012	-0.810			
USA & Canada				NMT					
	T1	T2			T1	T2			
T1	-3.537	0.002		T1	-1.768	0.004			
T2	0.005	-2.722		T2	0.013	-1.179			
Trunk calls									
d<45 km reduced, TC 103				d<45 km normal, TC 104					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.113	0.002	0.001	0.001	T1	-0.231	0.003	0.002	0.002
T2	0.001	-0.077	0.001	0.001	T2	0.002	-0.159	0.001	0.001
T3	0.001	0.001	-0.067	0.001	T3	0.002	0.002	-0.138	0.001
T4	0.001	0.001	0.001	-0.056	T4	0.002	0.001	0.001	-0.118
45<d<90 km, TC 105				d>90 km, TC 106-108					
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.415	0.004	0.002	0.002	T1	-0.641	0.004	0.002	0.002
T2	0.003	-0.292	0.001	0.001	T2	0.003	-0.472	0.001	0.001
T3	0.002	0.002	-0.251	0.001	T3	0.002	0.002	-0.395	0.001
T4	0.002	0.002	0.001	-0.220	T4	0.002	0.001	0.001	-0.338

Table XXVIII
Households, women of age 41 or more,
June 88 - March 89

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2266.7	-0.02	0.61	T1	40.3	-1.11	-0.15
T2	2565.5	-0.01	0.35	T2	1.1	-0.01	0.02
TOT	4832.2	-0.03	0.97	TOT	41.3	-1.12	-0.14
USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1.6	-2.29	-1.81	T1	2.6	-1.11	-0.56
T2	0.9	-0.96	-0.51	T2	1.5	-0.43	-0.05
TOT	2.4	-3.25	-2.32	TOT	4.1	-1.54	-0.61
Trunk calls							
d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	5.6	-0.01	0.17	T1	32.7	-0.04	0.19
T2	10.7	-0.02	0.23	T2	45.1	-0.03	0.20
T3	15.0	-0.02	0.29	T3	57.5	-0.04	0.22
T4	13.9	-0.02	0.23	T4	69.1	-0.04	0.23
TOT	45.1	-0.07	0.93	TOT	204.5	-0.15	0.84
45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	44.7	-0.07	0.15	T1	36.3	-0.06	0.05
T2	51.5	-0.06	0.15	T2	80.0	-0.09	0.12
T3	83.0	-0.08	0.21	T3	138.1	-0.14	0.20
T4	86.8	-0.07	0.20	T4	139.8	-0.12	0.19
TOT	266.0	-0.27	0.71	TOT	394.3	-0.41	0.57
180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	7.3	-0.05	0.05	T1	9.0	-0.06	0.06
T2	19.4	-0.11	0.14	T2	21.4	-0.11	0.14
T3	28.3	-0.13	0.19	T3	24.0	-0.10	0.15
T4	29.3	-0.12	0.19	T4	37.5	-0.14	0.22
TOT	84.3	-0.41	0.57	TOT	91.9	-0.41	0.57

5.2. Private households, March 1988.

Now, we will present the estimated parameters och derived elasticities of one single month, March 1988. That month, all 59 exchanges were measured. In order to prepare for an evaluation of the price adjustments that took place on April 1:st 1988, the elasticities of a subset of 40 exchanges that were also measured in March 1989 will be presented. Further details will be presented below.

Table XXIX.

March 1988, active private households

	All available		The 40 exchanges comp. March 1989	
Parameter	Estimate	Std. Err.	Estimate	Std. Err.

B02	0.1464	0.0051	0.1393	0.0051
B12	0.1851	0.1081	0.2029	0.1064
B13	0.5303	0.1135	0.5382	0.1115
B14	0.5587	0.1044	0.5303	0.1009
DELTA	-0.0635	0.0055	-0.0591	0.0054
THETA	-0.3739	0.0722	-0.3782	0.0716

B01=0.0 & B11=0.0				

Table XXX.

Price elasticities, "the 40 comparable exchanges"

Local calls			Nordic countries		
	T1	T2		T1	T2
T1	-0.023	0.001	T1	-0.843	0.014
T2	0.001	-0.011	T2	0.028	-0.598
USA & Canada			NMT		
	T1	T2		T1	T2
T1	-3.676	0.004	T1	-1.305	0.012
T2	0.013	-2.837	T2	0.033	-0.870

Trunk calls

d<45 km reduced, TC 103					d<45 km normal, TC 104				
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.083	0.004	0.003	0.003	T1	-0.170	0.006	0.004	0.004
T2	0.003	-0.057	0.002	0.002	T2	0.005	-0.117	0.003	0.003
T3	0.003	0.002	-0.049	0.001	T3	0.004	0.004	-0.102	0.003
T4	0.002	0.002	0.001	-0.042	T4	0.004	0.003	0.002	-0.087
45<d<90 km, TC 105					90<d<180 km, TC 106 (*)				
	T1	T2	T3	T4		T1	T2	T3	T4
T1	-0.306	0.009	0.006	0.006	T1	-0.473	0.010	0.007	0.007
T2	0.007	-0.216	0.004	0.004	T2	0.008	-0.348	0.004	0.004
T3	0.006	0.005	-0.185	0.003	T3	0.006	0.005	-0.291	0.004
T4	0.005	0.004	0.003	-0.163	T4	0.005	0.004	0.003	-0.250

d>180 km, TC 107-108 (**)					weighted average of (*) & (**)				
	T1	T2	T3	T4	T1	T2	T3	T4	
T1	-0.579	0.010	0.007	0.007	-0.544	0.010	0.007	0.007	
T2	0.008	-0.435	0.004	0.005	0.008	-0.401	0.004	0.005	
T3	0.006	0.005	-0.348	0.003	0.006	0.005	-0.327	0.003	
T4	0.004	0.004	0.003	-0.291	0.004	0.004	0.003	-0.275	

Table XXXI.

Active private households

March 1988, "the 40 comparable exchanges"

=> One per cent price increase of a distance class
the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2295.6	-0.01	-0.62	T1	30.3	-0.79	-0.14
T2	2691.4	-0.01	0.37	T2	2.0	-0.01	0.04
TOT	4987.0	-0.02	0.98	TOT	32.3	-0.80	0.19

USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	1.7	-2.01	-1.65	T1	6.1	-0.77	-0.21
T2	1.4	-1.28	-0.72	T2	4.2	-0.34	0.06
TOT	3.0	-3.29	-2.37	TOT	10.3	-1.10	-0.15

Trunk calls

d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	5.9	-0.01	0.22	T1	31.0	-0.02	0.18
T2	7.9	-0.01	0.20	T2	53.1	-0.02	0.22
T3	14.7	-0.02	0.33	T3	65.6	-0.03	0.24
T4	10.4	-0.01	0.20	T4	77.7	-0.03	0.25
TOT	38.8	-0.05	0.95	TOT	227.4	-0.10	0.89

45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	40.2	-0.03	0.14	T1	28.1	-0.05	0.09
T2	84.3	-0.05	0.22	T2	54.6	-0.07	0.16
T3	99.9	-0.05	0.23	T3	82.4	-0.09	0.22
T4	99.7	-0.05	0.21	T4	90.4	-0.09	0.22
TOT	324.2	-0.19	0.80	TOT	255.4	-0.29	0.69

180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	22.3	-0.08	0.10	T1	35.7	-0.07	0.09
T2	35.6	-0.10	0.15	T2	49.6	-0.07	0.12
T3	46.1	-0.10	0.18	T3	99.9	-0.12	0.22
T4	50.1	-0.09	0.18	T4	98.4	-0.10	0.19
TOT	154.0	-0.37	0.60	TOT	283.6	-0.36	0.62

5.3. Firms and public institutions

The estimated Θ and δ parameters of the average firm and public institution, are in no case significantly different from zero. The cases considered are all five single weeks and the average demand of the four weeks in June, September and December 1988 and March 1989. The result from this aggregate over time is shown as an example. The obvious conclusion is that the firm's demand for calling time seems to be totally price inelastic.

Table XXXII.
All measured active firms,
average demand, four weeks
of June 88 - March 89

Parameter	Estimate	Std. Err.

B02	-1.7499	0.0395
B12	0.2715	0.1732
B13	-1.4954	0.1389
B14	-1.7481	0.1378
DELTA	0.4425	0.0293
THETA	-0.0461	0.0597

B01=0.0 & B11=0.0		
DEL assumed to be 0.0		
THT assumed to be 0.0		

The own- and cross price elasticities are zero in all instances. That does not mean that firms ignore their costs. The implication may well be that the cost of using the telephone at high-price periods, is negligible as compared to the cost of not using it, if seen from an overall firm perspective. Further, high-price time and normal working hours coincide to a large extent, which makes the demand equation (1) somewhat inappropriate when applied to firms.

Table XXXIII
All measured active firms,
average demand, four weeks
of June 88 - March 89

One per cent price increase of a distance class
=> the following relative change of demand & cost

Local calls				Nordic countries			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	2800.2	0.00	0.86	T1	98.3	0.00	0.98
T2	932.6	0.00	0.14	T2	2.5	0.00	0.02
TOT	3732.9	0.00	1.00	TOT	100.8	0.00	1.00
USA & Canada				NMT			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	10.7	0.00	0.93	T1	48.1	0.00	0.78
T2	1.1	0.00	0.07	T2	19.9	0.00	0.22
TOT	11.8	0.00	1.00	TOT	68.0	0.00	1.00
Trunk calls							
d<45 km reduced, TC 103				d<45 km normal, TC 104			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	12.0	0.00	0.50	T1	74.5	0.00	0.36
T2	9.2	0.00	0.26	T2	128.7	0.00	0.42
T3	2.7	0.00	0.07	T3	46.6	0.00	0.13
T4	8.4	0.00	0.18	T4	36.4	0.00	0.09
TOT	32.3	0.00	1.00	TOT	286.2	0.00	1.00
45<d<90 km, TC 105				90<d<180 km, TC 106			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	111.0	0.00	0.36	T1	312.8	0.00	0.44
T2	159.3	0.00	0.36	T2	372.1	0.00	0.39
T3	93.9	0.00	0.18	T3	113.2	0.00	0.10
T4	59.9	0.00	0.10	T4	96.1	0.00	0.07
TOT	424.1	0.00	1.00	TOT	894.3	0.00	1.00
180<d<270 km, TC 107				d>270 km, TC 108			
	SECONDS	% VOL	% COST		SECONDS	% VOL	% COST
T1	68.5	0.00	0.45	T1	64.4	0.00	0.43
T2	80.9	0.00	0.39	T2	71.9	0.00	0.35
T3	18.4	0.00	0.07	T3	31.5	0.00	0.13
T4	25.3	0.00	0.09	T4	24.9	0.00	0.09
TOT	193.1	0.00	1.00	TOT	192.7	0.00	1.00

6. The price reform of April 1:st 1988

On the 1:st of April 1988, Sweden became "rounder" with respect to the price differences among some distance classes. Local calls became more expensive while long distance trunk calls and calls to the USA and Canada became cheaper.

		Table XXXIV. Price (SEK/minute)		
		March 1988	March 1989	Relative change, %
Local calls	T1	0.06	0.08	33.3
	T2	0.03	0.04	33.3
USA, Canada	T1	9.72	6.90	-29.0
	T2	7.50	5.31	-29.2
Trunk calls d>180 km /107,108/	T1	1.53	1.25	-13.2
	T2	1.15	0.92	-13.2
	T3	0.92	0.77	-11.5
	T4	0.77	0.66	- 9.6
Trunk calls d>90 km /106,107,108/ * weighted avg	T1	1.44 *	1.25	-13.2
	T2	1.06 *	0.92	-13.2
	T3	0.87 *	0.77	-11.5
	T4	0.73 *	0.66	- 9.6

In March 1988 the telephone traffic was logged for all participating exchanges. One year later, only 40 exchanges were measured. All eleven exchanges of the Gothenburg area were excluded as were three exchanges in Stockholm and one in each of the medium sized country towns Borås, Gävle, Jönköping, Sundsvall and Luleå. If we select the same set of exchanges in March 1988 that participated one year later, we should hopefully be in as good conditions as possible to compare the demand before and after the price reform.

		Table XXXV. Volume (seconds)			
		March 1988 observed	March 1989 predicted (%)	March 1989 observed (%)	
Local calls	T1	2295.6	2278.8 (-0.73)	2236.3 (-2.6)	
	T2	2691.4	2682.4 (-0.33)	2691.6 (0.0)	
USA, Canada	T1	1.7	3.5 (106.5)	1.9 (11.8)	
	T2	1.4	2.6 (82.5)	1.8 (28.6)	
Trunk calls d>90 km	T1	86.1	92.0 (6.9)	79.3 (-7.9)	
	T2	139.8	146.9 (5.1)	153.2 (9.6)	
	T3	228.4	236.6 (3.6)	237.8 (4.1)	
	T4	238.9	244.9 (2.5)	202.9 (-15.1)	

There is one obvious comment to these results. The assumption of a direct proportionality of price elasticity and price level seems too strong if the price level is high enough, like it is for calls to the USA and Canada. Another comment is that the demand for calling time is determined by the price but also by other circumstances. Equation (1), that makes use of the available aggregate information, is probably incomplete, i.e. at least one independent variable is missing.

In spite of that, the predictions made by the model seem to be correct with respect to the direction of the change, with two exceptions. There is of course no guarantee for this outcome in other experiments.

7. Final comments

The demand equation (1) is to be consistent with the standard microeconomic theory of a utility maximizing consumer under the restriction that the own price elasticity of demand of a certain category is directly proportional to its price. The model is parsimonious with respect to its parametric representation of the price effects (own- and cross price effects). The benefits of this application of "the Ockhams' razor principle" is a considerable stability and efficiency of the parameter estimates. The problem is certainly that particular features of the demand within each particular distance class, are "swept under the carpet". With reference to the available 32 aggregate observations, this simplification seems to be necessary.

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9. Appendix 1, The frequency of markings in Sweden (1988-1989)

The price of a telephone call is proportional to the number of markings produced by the activity. In 1988-1989 the price per marking was 23 öre (0.23 SEK). The marking frequency of all distance classes is tabulated below.

TableXXXVI.

# seconds / marking;	Local Calls	

Distance class	Time during the week	
"TC"	W 08-18	W 18-08 & other

100, 101, 102	180	360) 1

)1 to March 31 1988,	240	480

Table XXXVII

# seconds / marking;	Trunk calls			

Distance class	Time during the week			
"TC"	W 08-12	W 12-18	W 18-22	W 22-08 & other

103 (d<45 km) reduced	62	90	105	120
104 (d<45 km) normal	31	45	52	60
105 (45<d<90 km)	17	24	28	32
106 (90<d<180 km)	11	15	18	21
107 (180<d<270 km)	11	15	18	21) 2
108 (d>270 km)	11	15	18	21) 2

)2 to March 31, 1988	9	12	15	18

Appendix 1, The frequency of markings in Sweden (1988-1989)

Table XXXVII							
# seconds / marking;	International group 1 & Nordic Mobile Telephone						

Distance class	Time during the week						
"TC"	All d	All d	Mon-Sat	Mon-Sat	Mon-Fri	Mon-Fri	
	08-22	22-08	10-22	22-10	08-18	18-08	
				& other		& other	

58 Nordic C (high)	6.20						
62 Nordic C (low)		8.72					
21 USA & Canada (high)			2.00				)1
26 USA & Canada (low)				2.60			)1
109 NMT					4.0	6.0	

)1 to March 31, 1988			1.42	1.84			

		Table XXXIX.			
# seconds / marking;		International group 2 & special services			
*****		*****			
Distance class		Time during the week			
"TC"		All days			
*****		*****			
78 Boarder NOR, FIN	24.8				
69 Coast zone DEN	13.5				
67 Nordkalotten	11.4				
29 Northern Europe	3.38	(3.10)		)2	
27 Middle Europe	2.80	(2.60)		)2	
22 Southern Europe	2.20	(2.00)		)2	
16 Middle East	1.30				
90 Oth intercontinental	0.90	(0.71)		)2	
40 PLUS-services	10 markings when used				
41 collect call	1 marking (A-subscriber)				
31 e.g. 90100	1 marking				
30 free	0 marking				
*****		*****			
)2 to March 31 1988					

10. Appendix 2, Matrices of accumulated calling time.

Table XL., March 1988
 Row number survey of the demand matrix

Distance class TC	Period of equal price						24-hours comments
	T01	T02	T11	T12	T13	T14	
100-102	1	2					local calls
103			3	4	5	6	Swe, d<45 low
104			7	8	9	10	Swe, d<45 normal
105			11	12	13	14	Swe, 45<d<90
106			15	16	17	18	Swe, 90 <d<180
107			19	20	21	22	Swe, 180<d<270
108			23	24	25	26	Swe, d>270
58, 62	27	28					Nordic Countries
78							29 Boarder NO & FI
69							30 Coast zone
67							31 Nordkalotten
28							32 Northern Europe
26							33 Middle Europe
21							34 Southern Europe
19							35 North Africa
17, 10	36	37					USA, Canada
16							38 Iran, Israel
97							39 other intercont
30							40 free
31							41 1 marking at start
40							42 AXE-service
41							43 national 020
61							44 MBS
82							45 "Inmarsat"
109	46	47					NMT

March 1988, all private households, # seconds calling time during one week

period	0	1	2	3	4	5	6	7	8	9	10	11	12	1
#activ	3378	3744	3756	3980	3998	4117	3902	3902	3276	3517	3742	3531	3531	343
1	597582	1064228	634526	1067898	752115	1218236	725531	1066630	547121	952214	0	0	0	
2	63890	1168436	58717	1063574	80470	1149152	75459	1273802	61567	745333	655733	1365356	561534	166254
3	3412	0	6429	0	3757	0	3612	0	2567	0	0	0	0	
4	0	5324	0	7775	0	3896	0	6030	0	3171	0	0	0	
5	0	11520	0	10747	0	8382	0	10918	0	10999	0	0	0	
6	111	0	0	35	84	3052	428	2322	815	0	3329	12171	2088	1147
7	14846	0	35704	0	25413	0	20163	0	21796	0	0	0	0	
8	0	43806	0	40361	0	53231	0	34559	0	35807	0	0	0	
9	0	58325	0	50666	0	49637	0	48163	0	33765	0	0	0	
10	2252	2665	1765	849	2299	15954	155	6332	1852	2887	41502	69169	23254	8338
11	25249	0	26802	0	35711	0	26839	0	24137	0	0	0	0	
12	0	57011	0	60619	0	63418	0	74326	0	55918	0	0	0	
13	0	56285	0	101113	0	82589	0	71285	0	45658	0	0	0	
14	2850	3822	590	4633	1067	16478	5252	4814	2659	3764	90707	94621	45085	11169
15	21485	0	20844	0	17839	0	17454	0	16462	0	0	0	0	
16	0	25795	0	36529	0	52403	0	39021	0	40084	0	0	0	
17	0	63904	0	41292	0	74815	0	68453	0	55872	0	0	0	
18	2490	19600	2111	18105	2115	5604	1875	10325	1552	5350	25582	55994	27271	12406
19	12224	0	18822	0	28331	0	19826	0	14542	0	0	0	0	
20	0	33864	0	30904	0	26998	0	23908	0	21143	0	0	0	
21	0	53197	0	33278	0	51510	0	37975	0	25144	0	0	0	
22	615	8542	61	10494	393	4442	18	7558	682	6560	17675	49818	16260	4033
23	29244	0	21597	0	28039	0	24637	0	27029	0	0	0	0	
24	0	42121	0	36403	0	36381	0	38763	0	41558	0	0	0	
25	0	74925	0	75619	0	89576	0	90915	0	62642	0	0	0	
26	5949	15202	3594	7079	7349	15137	2752	11392	2829	11474	38973	91342	34589	12251
27	774	10554	2842	16479	819	13961	307	14894	9088	12736	138	10269	491	1827
28	616	183	1429	2820	2	30	0	631	1469	0	0	0	1619	44
29	9	75	303	75	1074	248	14	134	621	41	0	23	6	
30	0	1535	0	1408	0	0	1062	1886	206	631	0	0	0	249
31	0	0	0	0	0	895	0	0	0	0	0	0	0	149
32	1564	6394	809	7443	4052	7162	1401	4154	1166	4127	1714	3008	0	292
33	1033	6275	1733	7745	974	9936	57	2768	3601	1850	3997	4001	837	542
34	2243	1135	246	4071	0	859	1473	4332	5887	842	564	4766	912	331
35	0	0	0	296	0	416	0	547	112	37	36	698	0	47
36	0	2466	0	896	0	1663	0	648	0	962	0	209	0	
37	0	800	0	1107	0	396	89	1211	1141	272	0	0	0	
38	0	950	0	0	0	481	0	0	0	0	0	170	0	
39	66	332	1875	205	0	0	0	0	301	1227	0	0	0	
40	10	70	8	38	5	366	32	46	9	79	12	50	23	28
41	8402	8345	3198	11660	9467	9599	4273	6114	2182	7612	3553	2744	1652	4135
42	12	19	21	16	14	24	14	24	12	15	14	12	0	8
43	0	0	0	0	0	0	0	0	0	0	0	0	0	
44	0	0	0	0	0	0	0	0	0	0	0	0	0	
45	0	0	0	0	0	0	0	0	0	0	0	0	0	
46	1355	3883	950	2590	1952	3282	467	3128	765	2725	0	0	0	
47	1121	538	18	685	263	2393	27	2719	163	676	385	2737	582	2342

Table XLI., June 1988 - March 1989
 Row number survey of the demand matrix

		Period of equal price						24-hours	comments
		T01	T02	T11	T12	T13	T14		
Distance									
class TC									
100-102		1	2						local calls
103				3	4	5	6		Swe, d<45 low
104				7	8	9	10		Swe, d<45 normal
105				11	12	13	14		Swe, 45<d<90
106				15	16	17	18		Swe, 90 <d<180
107				19	20	21	22		Swe, 180<d<270
108				23	24	25	26		Swe, d>270
58, 62		27	28						Nordic Countries
78								29	Boarder NO & FI
69								30	Coast zone
67								31	Nordkalotten
29 *								32	Northern Europe
27 *								33	Middle Europe
22 *								34	Southern Europe
21, 26 *	35	36 *							USA, Canada
16								37 *	Iran, Israel
11 *								38 *	Hong Kong, Sing
90 *								39	other intercont
30								40	free
31								41	1 marking at start
40								42	AXE-service
41								43	national 020
61								44	MBS
82								45	"Inmarsat"
109	46	47							NMT

note: * means difference from March 1988 table

June 1988, all private households, # seconds calling time during one week

period	0	1	2	3	4	5	6	7	8	9	10	11	12	13
#activ	2430	3134	3369	3444	3647	3731	3731	3731	3481	3428	3416	3416	3416	3185
1	399675	790586	475034	843372	565322	979693	553439	919242	576403	830099	0	0	0	0
2	55293	910404	62725	988119	92945	1191682	69679	1000429	76973	668370	577099	1122240	499509	1246200
3	423	0	5535	0	1674	0	1712	0	1683	0	0	0	0	0
4	0	4788	0	4601	0	3404	0	4574	0	8982	0	0	0	0
5	0	5205	0	10839	0	7866	0	3706	0	2565	0	0	0	0
6	208	268	274	645	0	0	1914	0	0	0	2978	11183	5719	14488
7	22944	0	22908	0	26350	0	24710	0	19606	0	0	0	0	0
8	0	29993	0	27932	0	31689	0	27359	0	46419	0	0	0	0
9	0	55557	0	53171	0	56267	0	54509	0	28951	0	0	0	0
10	2459	1091	1155	4575	1614	7160	1551	7331	2473	2786	19413	51083	31147	64121
11	16985	0	17920	0	22532	0	28304	0	25201	0	0	0	0	0
12	0	30537	0	42879	0	31159	0	37716	0	38931	0	0	0	0
13	0	61828	0	57706	0	63006	0	68182	0	50871	0	0	0	0
14	1236	1470	5863	9578	2426	16448	5800	9237	2747	2529	24836	59968	34171	75583
15	12360	0	19725	0	12613	0	19092	0	23087	0	0	0	0	0
16	0	21952	0	28229	0	33495	0	36508	0	37703	0	0	0	0
17	0	48266	0	65597	0	61819	0	45763	0	43299	0	0	0	0
18	501	5539	1318	11795	2281	13077	1661	13051	614	5592	30964	55982	35973	78578
19	5510	0	13702	0	10317	0	14313	0	13270	0	0	0	0	0
20	0	14066	0	25410	0	28019	0	26307	0	30010	0	0	0	0
21	0	27885	0	25191	0	50739	0	37496	0	20106	0	0	0	0
22	141	9576	3084	3053	1603	1415	340	6373	952	3264	15306	36353	13751	39013
23	11583	0	24176	0	23157	0	29447	0	32928	0	0	0	0	0
24	0	36796	0	44160	0	41567	0	44701	0	42542	0	0	0	0
25	0	77025	0	59245	0	65528	0	62552	0	51021	0	0	0	0
26	7279	14168	3238	16741	3940	17955	3040	12503	2484	2314	37611	61594	31729	93755
27	141	15898	3071	14532	1217	12802	2510	10737	7372	14204	4012	11362	2769	9385
28	0	3739	0	168	0	524	0	849	0	5917	546	0	0	3570
29	11	160	31	1012	1027	17	25	45	8	13	5	15	0	52
30	0	45	21	1689	0	2556	0	0	0	391	0	0	0	0
31	0	0	0	515	0	0	0	2415	373	0	525	0	0	0
32	1368	6269	1287	1382	1419	4592	1009	5067	695	7762	1601	2879	426	5541
33	307	1425	664	5752	3663	7460	435	6262	0	4075	1217	6814	1305	4148
34	0	1817	488	714	376	1248	2780	1537	29	979	0	778	0	0
35	0	108	0	0	0	696	0	1305	0	724	0	2766	0	0
36	4	2449	940	417	1170	22	538	743	0	435	0	185	0	3072
37	0	0	0	0	0	539	0	0	0	0	0	0	0	1648
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	966	0	891	0	0	0	0	1286	356	284	0
40	9	37	23	44	7	34	41	51	5	62	48	64	14	33
41	4847	6391	6801	9118	4130	5524	7026	6341	3407	8587	3479	4142	2095	3472
42	1	11	14	15	17	24	20	11	14	21	30	15	17	7
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	3	57	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	325	2919	391	1816	547	1716	672	3356	1801	4584	0	0	0	0
47	109	454	369	1087	726	3351	74	2043	197	3488	895	2579	895	1864

September 1988, all active households, # seconds calling time during one week

period	0	1	2	3	4	5	6	7	8	9	10	11	12	13
#activ	2304	2854	3024	3024	3024	3024	3024	2951	2877	2869	2942	2942	2776	2776
1	396085	751148	420280	734888	478664	725053	430871	698052	452307	689302	0	0	0	0
2	35279	778271	45124	819817	47241	753599	45577	805314	39188	554110	503270	933307	441608	1085321
3	1290	0	2857	0	2817	0	6881	0	916	0	0	0	0	0
4	0	4496	0	6104	0	4508	0	3778	0	2872	0	0	0	0
5	0	5338	0	6884	0	7903	0	7140	0	7393	0	0	0	0
6	0	0	0	0	384	1038	324	0	0	0	4570	5277	481	6878
7	13022	0	21228	0	32142	0	18929	0	21175	0	0	0	0	0
8	0	39471	0	40031	0	26017	0	35214	0	36641	0	0	0	0
9	0	33664	0	55823	0	33570	0	59543	0	34926	0	0	0	0
10	5153	5161	2927	467	1762	7694	539	959	3533	0	18598	38672	23411	52851
11	16043	0	22215	0	24482	0	19976	0	32950	0	0	0	0	0
12	0	29910	0	39468	0	32979	0	50435	0	39019	0	0	0	0
13	0	67138	0	62988	0	62361	0	56953	0	39850	0	0	0	0
14	1532	1350	1151	6436	1032	8532	3164	15382	3915	6636	36733	58084	30298	66766
15	26605	0	34616	0	26783	0	19607	0	18760	0	0	0	0	0
16	0	51319	0	36515	0	46241	0	37596	0	40999	0	0	0	0
17	0	72773	0	62662	0	73203	0	62978	0	55142	0	0	0	0
18	3086	2310	813	6510	2106	11252	639	11773	3077	4764	21961	53342	29395	92423
19	8347	0	12153	0	19911	0	13868	0	9554	0	0	0	0	0
20	0	24194	0	24698	0	30356	0	24912	0	19547	0	0	0	0
21	0	45345	0	40939	0	43116	0	48698	0	26216	0	0	0	0
22	640	7918	1911	13082	2544	7117	1123	6660	4183	3898	23518	50962	10686	71261
23	5421	0	4650	0	2025	0	4409	0	3803	0	0	0	0	0
24	0	10471	0	11309	0	10854	0	14521	0	3263	0	0	0	0
25	0	20746	0	18028	0	17174	0	12005	0	14581	0	0	0	0
26	133	317	337	2148	1017	872	42	870	1045	0	8752	17018	4037	30624
27	1430	11802	8864	10592	3764	8120	1400	9679	4114	9058	486	5600	2738	7171
28	1156	0	425	379	91	0	853	814	1886	0	771	389	223	0
29	392	14	89	7	11	0	4	807	12	35	0	8	253	307
30	1181	496	0	75	11	0	0	361	211	347	171	0	248	83
31	23	396	0	0	118	0	0	0	0	0	0	0	0	0
32	3782	2585	1182	1759	1579	1574	1742	1673	553	1560	0	1789	960	2648
33	434	836	489	2348	0	894	1225	5379	691	932	88	3531	521	3782
34	5	0	0	76	254	2565	228	110	288	52	628	188	147	2303
35	0	662	0	0	0	1099	1277	582	0	665	0	103	0	0
36	0	0	0	1572	0	0	0	2437	0	0	170	0	0	1396
37	604	0	0	1372	0	0	0	0	0	710	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	698	0	0	0	0	0	0	0	0	1029
40	30	73	12	99	14	108	26	117	41	112	34	56	10	50
41	2895	5014	2766	6581	2500	8901	2483	3707	2904	9479	1293	3710	1802	2300
42	15	14	12	13	12	4	23	6	12	0	15	8	5	25
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	1623	1542	1007	1152	1276	1887	1034	6206	1608	2589	0	0	0	0
47	168	916	78	668	33	1320	808	1336	0	579	298	2425	654	733

December 1988, all private households, # seconds calling time during one week

period	0	1	2	3	4	5	6	7	8	9	10	11	12	13
#activ	2237	2718	2683	2767	2767	2677	2677	2767	2446	2675	2747	2747	2829	2829
1	407430	852162	492310	766856	481439	773056	481623	806955	434476	796619	0	0	0	0
2	34700	897733	48468	829265	43219	784068	51308	818891	49690	682205	497156	1303836	529192	1307520
3	1133	0	2741	0	1072	0	520	0	254	0	0	0	0	0
4	0	10786	0	7074	0	7878	0	6727	0	2628	0	0	0	0
5	0	3302	0	15023	0	7270	0	8963	0	6958	0	0	0	0
6	479	2169	154	0	0	0	1536	0	0	0	2506	12167	79	13583
7	8928	0	21325	0	17982	0	18175	0	17249	0	0	0	0	0
8	0	27209	0	36348	0	23168	0	34466	0	34879	0	0	0	0
9	0	25440	0	30942	0	19174	0	43814	0	23292	0	0	0	0
10	172	2157	1762	4267	3650	3078	2120	4216	2392	4397	23609	43112	35279	66599
11	15932	0	34041	0	27446	0	26055	0	23419	0	0	0	0	0
12	0	25466	0	43368	0	45414	0	20464	0	35039	0	0	0	0
13	0	42473	0	45152	0	48855	0	54355	0	33082	0	0	0	0
14	1767	48	567	6718	5616	3883	1865	10786	1105	3185	20497	71845	19369	83338
15	27791	0	38465	0	31590	0	30870	0	33332	0	0	0	0	0
16	0	71514	0	72065	0	67993	0	73241	0	74184	0	0	0	0
17	0	145513	0	111240	0	99101	0	93322	0	72138	0	0	0	0
18	1817	24344	1270	14042	2832	19140	908	14694	2358	6849	51331	182558	49998	194378
19	393	0	1268	0	1314	0	5510	0	3250	0	0	0	0	0
20	0	3341	0	4967	0	5634	0	1901	0	2711	0	0	0	0
21	0	1911	0	4157	0	9259	0	9909	0	5170	0	0	0	0
22	106	0	0	1280	51	54	0	0	0	0	705	7799	2762	8249
23	0	0	0	0	0	0	1233	0	914	0	0	0	0	0
24	0	1520	0	371	0	444	0	73	0	211	0	0	0	0
25	0	0	0	0	0	2071	0	1735	0	1189	0	0	0	0
26	0	0	0	0	0	0	0	44	0	0	0	2195	0	8248
27	2213	12730	2587	12881	5252	10064	778	11783	4205	14358	251	9444	6466	13818
28	0	66	52	4827	399	1286	396	0	3136	107	829	61	225	342
29	0	25	22	393	14	21	2208	197	0	69	32	10	18	9
30	0	2715	170	0	0	2038	41	138	23	2910	291	1495	0	599
31	0	522	0	637	0	613	0	1587	0	95	0	0	0	0
32	481	4089	140	7819	343	7237	970	1692	1092	3580	1502	2797	3007	5182
33	325	4437	1140	6575	502	4050	446	2844	0	9298	1539	6585	591	5187
34	412	0	1110	372	113	630	83	991	0	2271	0	551	0	2809
35	303	3211	0	227	0	3551	0	1715	0	3203	0	885	0	0
36	0	687	0	176	521	1762	0	5277	0	712	864	181	0	645
37	0	88	0	0	0	0	0	688	0	0	0	583	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	13	1395	0	0	435	0	315	800	0	0	370
40	23	88	20	68	17	65	21	55	43	95	13	81	19	137
41	2627	4452	2079	4089	2482	4983	2043	3964	3349	4836	962	2653	883	2307
42	8	19	1	14	0	9	11	12	2	0	2	0	0	5
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	667	4237	969	1540	1861	3479	830	1472	3196	3065	0	0	0	0
47	237	1271	1136	1841	408	1464	452	1119	167	952	3691	1611	1175	1843

March 1989, all private households, # seconds calling time during one week

period	0	1	2	3	4	5	6	7	8	9	10	11	12	13
#activ	2319	2818	3033	3068	2988	2988	2990	3068	2842	2839	3068	2915	2834	2834
1	450299	761422	509724	838309	496939	819489	478584	808993	475236	849067	0	0	0	0
2	38176	801403	47932	908456	58970	790647	93023	868924	80490	673308	567476	1131548	471267	1346884
3	1180	0	4860	0	2470	0	943	0	429	0	0	0	0	0
4	0	7262	0	6742	0	5424	0	9513	0	7991	0	0	0	0
5	0	13311	0	17416	0	6486	0	16571	0	3852	0	0	0	0
6	0	0	0	3687	1120	645	3406	756	261	0	3093	13133	854	11608
7	11926	0	15326	0	18888	0	22903	0	11110	0	0	0	0	0
8	0	42071	0	29328	0	28520	0	22266	0	28720	0	0	0	0
9	0	39376	0	55716	0	44033	0	31834	0	23273	0	0	0	0
10	634	1884	1627	2117	1393	3197	1890	1089	1923	1682	29540	53287	20920	63009
11	28503	0	25287	0	22921	0	20600	0	32285	0	0	0	0	0
12	0	24145	0	42184	0	47438	0	30823	0	43113	0	0	0	0
13	0	63586	0	49868	0	50036	0	64918	0	37265	0	0	0	0
14	2341	13811	1378	6185	1278	6194	3265	8316	2338	2885	33226	51124	28146	69854
15	35883	0	55331	0	43786	0	38159	0	44893	0	0	0	0	0
16	0	84919	0	98720	0	95228	0	82679	0	82020	0	0	0	0
17	0	140557	0	140599	0	148258	0	136876	0	108327	0	0	0	0
18	1572	14356	6473	15605	5267	14339	1958	16283	4390	5562	60658	154674	69916	202833
19	450	0	136	0	882	0	267	0	1044	0	0	0	0	0
20	0	510	0	3522	0	3251	0	1706	0	186	0	0	0	0
21	0	2646	0	3830	0	3995	0	7738	0	2135	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	3997	0	685
23	2299	0	1265	0	0	0	0	0	0	0	0	0	0	0
24	0	573	0	0	0	0	0	0	0	0	0	0	0	0
25	0	7910	0	0	0	136	0	0	0	0	0	0	0	0
26	44	0	0	0	0	0	0	0	0	0	3339	1220	1332	3319
27	2155	9407	6617	9441	1482	10345	3448	7446	901	14063	582	6033	1774	10887
28	0	185	659	0	0	0	357	0	0	0	0	456	90	157
29	13	181	5	340	20	863	46	328	25	167	136	574	209	358
30	0	1810	61	69	146	228	0	0	204	682	254	0	104	818
31	0	0	576	0	0	396	0	0	0	1816	0	0	908	513
32	319	5972	683	1632	1492	5285	152	2850	1285	3896	1027	1016	3603	4782
33	415	4317	2787	7244	739	5852	591	5030	514	3767	2269	4187	2630	6196
34	0	1034	249	1541	52	187	0	2174	0	122	118	1147	0	1849
35	0	1359	0	1266	0	172	0	1083	0	0	0	1863	0	0
36	1875	1043	0	85	196	0	0	0	0	0	0	306	0	1249
37	0	0	0	0	0	0	0	797	0	1266	0	0	0	599
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	381	0	698	0	1433	369	106	0	115	1302	742	0	0
40	42	121	38	152	32	141	24	190	18	161	57	115	12	113
41	2275	7005	2714	3810	2044	11842	3698	3691	2978	6887	1246	2578	976	2623
42	24	15	22	4	30	6	6	5	18	0	24	0	34	12
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	752	2812	1945	4378	4587	1674	1209	1972	3027	3412	0	0	0	0
47	495	995	380	1343	0	2662	661	1448	201	3020	1927	2028	0	2153

11. Appendix 3, Participating telephone exchanges

ID	Administrative area	AXE-exchange	Area number
011A	Norrköping	Norrköping	011
0155A	Norrköping	Nyköping	0155
016A	Västerås	Eskilstuna	016
0176A	Uppsala	Norrtälje	0176
018A	Uppsala	Uppsala/A	018
021A	Västerås	Västerås	021
021B	Västerås	Vedbo	021
023A	Falun	Falun	023
026A	Gävle	Gävle	026
026B	Gävle	Bomhus	026
026C	Gävle	Sandviken	026
031A	Göteborg	Masthugget	031
031B	Göteborg	Tranered	031
031C	Göteborg	Örgryte	031
031D	Göteborg	Kaserntorget	031
031E	Göteborg	Frölunda	031
031F	Göteborg	Änggården	031
031G	Göteborg	Sävedalen	031
031H	Göteborg	Källtorp	031
031I	Göteborg	Hisingen	031
031J	Göteborg	Backadalen	031
0322K	Göteborg	Alingsås	0322
033A	Borås	Borås	033
0346A	Helsingborg	Falkenberg	0346
036A	Jönköping	Jönköping	036
040A	Malmö	Kirseberg	040
040B	Malmö	Rosengård	040
040C	Malmö	Sparven	040
0410A	Malmö	Trelleborg	0410
0413A	Malmö	Eslöv	0413
042A	Helsingborg	Helsingborg	042
044A	Kristianstad	Kristianstad	044
0455A	Kalmar	Karlskrona	0455
046A	Malmö	Lund	046
0470A	Kristianstad	Växjö	0470
0480A	Kalmar	Kalmar	0480
0491A	Kalmar	Oskarshamn	0491
0500A	Borås	Skövde	0500
0522A	Uddevalla	Uddevalla	0522
054A	Karlstad	Karlstad	054
0570A	Karlstad	Arvika	0570
0586A	Örebro	Karlskoga	0586
060A	Sundsvall	Sundsvall	060
063A	Östersund	Östersund	063

ID	Administrative area	AXE-exchange	Area number
0753A	Stockholm	Tumba	0753
0755A	Stockholm	Södertälje	0755
08A	Stockholm	Kista	08
08B	Stockholm	Örby	08
08C	Stockholm	Djursholm	08
08D	Stockholm	Råsunda	08
08E	Stockholm	Hässelby	08
08F	Stockholm	Ulriksdal	08
08G	Stockholm	Aspudden	08
08H	Stockholm	Sundbyberg	08
08I	Stockholm	Birka	08
08J	Stockholm	City	08
090A	Umeå	Umeå	090
0910A	Umeå	Skellefteå	0910
0920A	Luleå	Luleå	0920

12. Appendix 4a, measured exchanges, March 1988

Exchange ID	Measured during period														# measured	
	1=yes, 0=no														subscribers	
	0	1	2	3	4	5	6	7	8	9	1	1	1	1	HOUSE HOLDS	FIRMS
011A	1	1	1	1	1	1	0	0	0	0	1	1	1	1	93	7
0155A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	92	8
016A	1	1	1	1	1	1	1	1	1	1	1	0	0	0	85	14
0176A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	169	0
018A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	144	0
021A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	88	10
021B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	91	7
023A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	84	17
026A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	85	15
026B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	102	6
026C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	101	5
031A	0	0	0	0	1	1	1	1	1	1	1	1	1	1	47	3
031B	1	0	0	1	1	1	1	1	1	1	1	1	1	1	44	6
031C	0	0	0	1	1	1	1	1	1	1	1	1	1	1	44	8
031D	1	0	0	1	1	1	1	1	1	1	1	1	1	1	7	2
031E	1	0	0	0	1	1	1	1	1	1	1	1	1	1	41	7
031F	1	0	0	0	0	0	1	1	1	1	1	1	1	1	45	5
031G	1	0	0	1	1	1	1	1	1	1	1	1	1	1	48	1
031H	1	0	0	0	1	1	1	1	1	1	1	1	1	1	19	1
031I	1	0	0	1	1	1	1	1	1	1	1	1	1	1	45	4
031J	1	0	0	1	1	1	1	1	1	1	1	1	1	1	44	5
031K	1	0	0	0	1	1	1	1	1	1	1	1	1	1	45	3
033A	1	1	1	1	0	1	1	1	1	1	1	1	1	1	88	12
0346A	1	1	0	1	1	1	1	1	1	1	1	1	1	1	91	16
036A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	94	12
040A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	83	17
040B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	91	8
040C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	80	20
0410A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	92	7
0413A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	93	7
042A	0	0	0	0	0	1	1	1	1	0	0	0	0	0	41	8
044A	1	1	1	1	1	1	1	1	0	1	1	1	1	1	89	10
0455A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	93	6
046A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	105	3
0470A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	86	16
0480A	1	1	1	1	1	1	1	1	1	1	1	0	0	0	97	11
0491A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	95	14
0500A	1	1	1	1	1	1	1	1	0	1	1	1	1	1	85	15
0522A	0	0	1	1	1	1	1	1	1	1	1	1	1	1	99	8
054A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	86	16
0570A	0	1	1	1	1	1	1	1	1	1	1	1	1	0	99	8
0586A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	101	6
060A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	0
063A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	95	10
0753A	1	1	1	1	1	1	1	1	0	0	1	1	1	1	64	4
0755A	1	1	1	1	1	1	1	1	0	1	1	1	1	1	91	17

Appendix 4a, measured exchanges, March 1988

Exchange ID	Measured during period 1=yes, 0=no														# measured subscribers	
	0	1	2	3	4	5	6	7	8	9	1	1	1	1	HOUSE	FIRMS
											0	1	2	3	HOLDS	
08A	0	1	1	1	1	1	1	1	1	0	0	0	0	0	89	10
08B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	87	4
08C	0	1	1	1	1	1	1	1	1	0	0	0	0	0	91	10
08D	0	1	1	1	1	1	1	1	0	0	0	0	0	0	88	15
08E	0	1	1	1	1	1	1	1	0	0	0	0	0	0	95	5
08F	0	1	1	1	1	1	1	1	0	0	0	0	0	0	86	14
08G	1	1	1	1	1	1	1	1	0	1	1	1	1	1	91	9
08H	0	1	1	1	1	1	1	1	1	0	0	0	0	0	70	16
08I	1	1	1	1	1	1	0	0	0	0	1	1	1	1	82	17
08J	1	1	1	1	1	1	1	1	1	1	1	0	0	0	49	49
090A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	88	10
0910A	1	1	1	1	1	1	1	1	0	1	1	1	1	1	87	13
0920A	1	1	1	1	1	1	0	0	1	1	1	1	1	1	98	12

Appendix 4b, measured exchanges, June 1988

[illegible]

Appendix 4e, measured exchanges, March 1989

Exchange ID	Measured during period															# measured subscribers		
	1=yes, 0=no															HOUSE HOLDS	FIRMS	
	0	1	2	3	4	5	6	7	8	9	1	1	1	1	0			1
011A	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0		85	7
0155A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		86	8
016A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		77	13
0176A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		109	0
018A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		116	0
021A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		77	9
021B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		81	6
023A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		74	16
026B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		97	6
026C	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1		97	3
0346A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		83	15
040A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		64	16
040B	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		77	7
040C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		69	17
0410A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		86	7
0413A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		90	7
042A	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1		39	5
044A	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1		80	10
0455A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		85	5
046A	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1		98	3
0470A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		81	16
0480A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		89	7
0491A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		90	13
0500A	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1		75	12
0522A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		93	7
054A	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1		76	16
0570A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		91	6
0586A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		94	5
063A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		89	10
0753A	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		59	4
0755A	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0		89	15
08B	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1		76	4
08C	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1		88	10
08E	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		88	5
08F	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		80	14
08H	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		62	13
08I	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0		44	41
08J	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		75	17
090A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		85	10
0910A	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1		83	12