Inertia in the Market for Mobile Telephony

PhD Research Seminar in Microeconomics

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Research Question

- Why do consumers keep expensive (telecom) contracts?
- Significant inertia in the mobile telephony market
  - RTR (2021): 80% stay with *provider* 2019-2021
  - Ofcom (2019): 1.4m stay with *plan* after bundled contract (phone+plan) expires
- Liberalised market: there are many cheap plans nowadays
- But many consumers still leave up to 450€ (over 2 years) on the table
- What is the main mechanism?

Possible Explanations

- Hard to explain with taste alone ("I love A1")
- Market frictions
  - switching cost?
  - search cost?
  - limited information about product characteristics?
- "Mental gaps": forgetting, beliefs, overconfidence, loss/risk aversion, present bias, trust?

Outline

Motivation

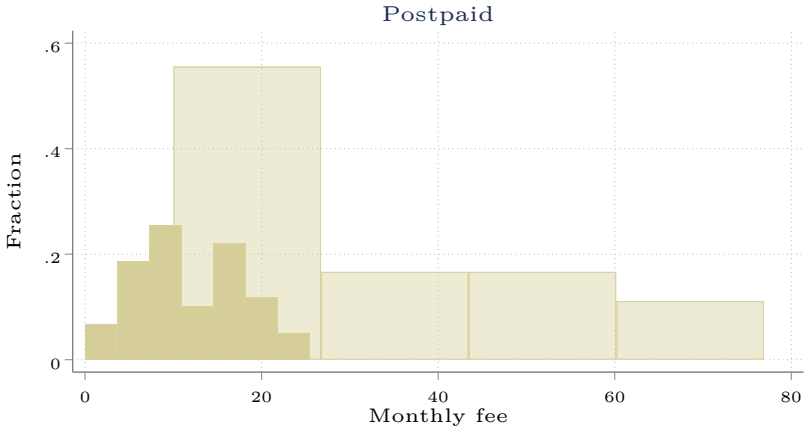
- Active choice is the basis of market competition
- Market competition incentivises firms to produce high quality for a low price
- Thus, regulators have tried to mitigate consumer inertia in the past
- EU: directive 2018/1972 “European Electronic Communications Code”

Approach

- Gather plan-level data that includes both within- and between provider switching
- Estimate a structural model of demand that accounts for several sources of inertia
  - Taste
  - Switching cost
  - Inattention
  - Limited consideration
- Evaluate different policy options in counterfactual scenarios where frictions are removed

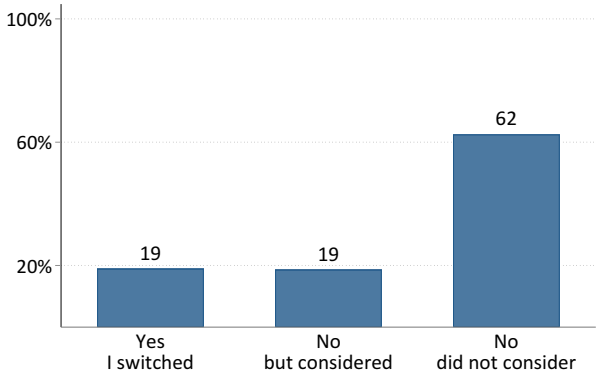
Significant price dispersion (2024)

Show figure for 2021 data so that it connects more closely with next slide? (looks similar)



Despite availability of cheap plans there is significant inertia

Figure 1: Did you switch provider in 2019-2021?



Data source: RTR (2021)

Questions

- What part of the observed inertia is suboptimal given usage profile?
- Which market frictions matter most for explaining observed inertia?
- What is the optimal regulatory response? Regulators try to lower several frictions at once: EU directive 2018/1972, TKG (2021)
- Should consumers be "forced to make a choice"?

Related Literature

- **Demand estimation for telecom services.** Train et al. (1987), Grubb and Osborne (2015), Bourreau et al. (2021), Weiergraeber (2022)

- **Quantification of frictions.** Shcherbakov (2016), Heiss et al. (2021), Abaluck and Adams (2021), Dressler and Weiergraeber (2023)

Product Market

- Austrian retail mobile telephony plans 2022-2024
- Differentiated product (included minutes, sms, data, speed, 5G, etc)
- Focus on most relevant plans:
  - Plans that allow you to make a national phone call
  - Plans that are available to everyone
  - Post- and prepaid plans which are available sim-only
  - For now: plans with at most monthly fee period,

    exclude, e.g., fringe plans where you pay upfront for 6 months

Market structure

- Mobile Network Operators (MNOs): A1, Magenta, Drei
  - Small MNO-owned brands: Bob, yesss!, etc
  - Branded resellers: Red Bull Mobile, Educom, etc
- Mobile Virtual Network Operators (MVNOs): HoT, Spusu, etc

Number of brands by owner

	d_mno		
	0	1	Total
owner			
A1	9	1	10
Drei	3	1	4
HoT	1		1
LTK Telekom	1		1
Lycamobile	1		1
MTEL	1		1
Magenta	2	1	3
Mass Response	3		3
Russmedia	1		1
kabelplus	1		1
Total	23	3	26

Brand names by owner

	List of distinct values
owner	
A1	**A1 Ge-org! Krone Mobil Red Bull MOBILE SIMfonie Wowww Yesss bob goood yooopi!**
Drei	**Drei Educom Eety LIDL connect**
HoT	**HoT**
LTK Telekom	**LIWEST Mobil**
Lycamobile	**Lyca Mobile**
MTEL	**MTEL**
Magenta	**Magenta Raiffeisen mobil S-Budget**
Mass Response	**HELP Mobile Spusu Tchibo mobil**
Russmedia	**VOLMobile**
kabelplus	**kabelplusMobile**

Plans by owner

	d_owner_mno	
	0	1
owner		
A1		**60**
Drei		**24**
HoT	**5**	
LTK Telekom	**4**	
Lycamobile	**12**	
MTEL	**6**	
Magenta		**24**
Mass Response	**23**	
Russmedia	**4**	
kabelplus	**4**	
Total	**58**	**106**

More on plans (2024)

- Sample: 164 plans by 26 brands
- Half of that are prepaid plans, the other half are postpaid plans
- 3/4 of prepaid plans can be automatically recharged
- Almost all plans are available as sim-only plan (exceptions: high-end)
- Almost all plans have no commitment period (if sim-only)
- Only about 20 plans have 5G
- 20% of plans still have activation costs, most have no annual fee
- The main price component is the monthly fee (also for prepaid plans)

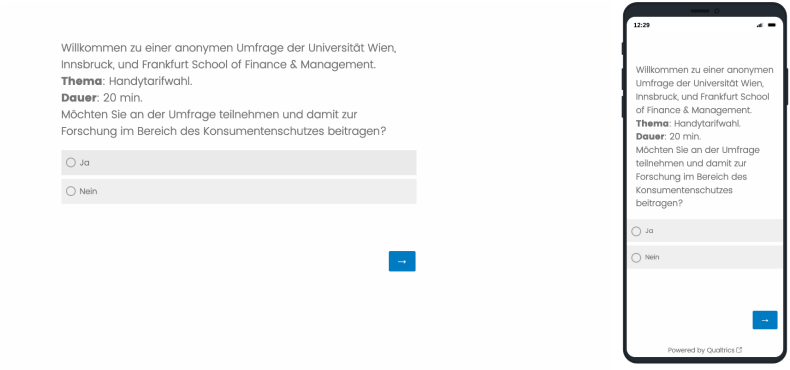
Data

I construct a data set on individual-time-product level by matching two data sources:

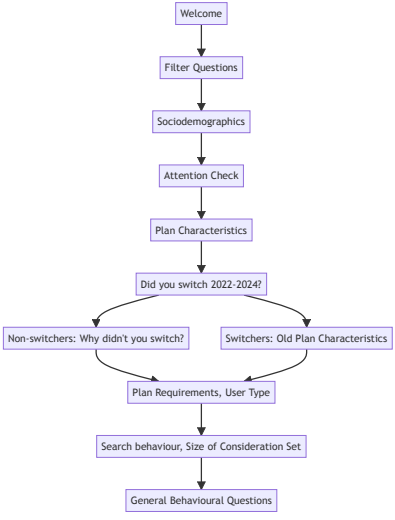
- Survey[1]
  - $N = 2000$–3000 Austrian consumers Sampling
  - Consumer sociodemographics, user type, search behaviour Full list
  - Current and previous plan choice in 2022-2024 Timing
- Tarife.at
  - Plan prices and characteristics 2019Q2-2024Q1 Full list

[1]The survey is joint work with Elisabeth Gsottbauer, Heiko Karle, Heiner Schuhmacher, & Christine Zulehner.

Screenshot of Survey



Survey Flow


Welcome
Filter Questions
Sociodemographics
Attention Check
Plan Characteristics
Did you switch 2022-2024?
Non-switchers: Why didn't you switch?
Switchers: Old Plan Characteristics
Plan Requirements, User Type
Search behaviour, Size of Consideration Set
General Behavioural Questions

Key Questions in Survey

- How often did you switch in 2022/2023/2024? (never, 1x, more than 1x)
  - Focus on single switchers and stayers
- How many plans did you compare?
- How much do you believe could you save by switching to the cheapest plan given your usage profile?
- Usage profile (e.g., How often do you use your phone as hotspot?)

Model

- I follow Abaluck and Adams (2021): combine conditional logit with consideration sets
- 3 channels how characteristics $\mathbf{x}_{jt}$ and demographics $\mathbf{z_i}$ affect whether consumer i chooses plan j (plan $j = 0$ is the previous plan choice)

Utility $$u_{ijt} = \mathbf{x}'_{jt}\beta + \zeta \cdot Switch_{ijt} + \xi_j + \varepsilon_{ijt} = \delta_{ijt} + \varepsilon_{ijt}$$

Attention $$\mu_{it} = Pr(\text{shop around}) := \Lambda(\mathbf{x}_0, \mathbf{z}_i, \xi_0)$$

Consideration $$\phi_{ijt} = Pr(\text{consider product } j) := \Lambda(\mathbf{x}_{jt}, \mathbf{z}_i, \xi_j)$$

- where ε_{ijt} is distributed i.i.d. type 1 extreme value, ξ_j is a brand fixed effect, and $\phi_{i0t} = 1$

Why would characteristics affect attention?

- Prices
  - Reme et al. (2022) find churn increases rater after price changes, even after price *de*creases
  - Ascarza et al. (2016) find that churn increases after plan recommendations (which are based on variation in characteristics of available plans; and usage)
  - Price comparison websites offer reminders
  - Can include potential savings (with come caveats) rather than price

Conditional choice probabilities

- Choice probabilities $s_j^\star$ depend on consideration – consumer only chooses from products in consideration set C

$$s_j^\star(\mathbf{x} \mid C) = \begin{cases} \frac{\exp(\delta_j)}{\sum_{k \in C} \exp(\delta_k)} & \text{if } j \in C \\ 0 & \text{otherwise} \end{cases}$$

- The probability that a consumer chooses from consideration set C is

$$\pi_C(\cdot) = \prod_{j \in C} \phi_j(\cdot) \prod_{j' \notin C} (1 - \phi_{j'}(\cdot))$$

- For every consumer and time period, consideration set probabilities π_C sum up to 1

Unconditional choice probabilities

- We need to weight each conditional choice probability $s_j^\star(\mathbf{x}_t \mid C)$ with probability that the consumer chooses from consideration set C, which is π_C
- This implies the following unconditional choice probabilities s_j:

$$s_j(\cdot) = \mu(\cdot) \sum_{C \in \mathbb{P}(j)} \pi_C(\cdot) s_j^\star(\cdot \mid C) \quad \text{for } j \neq 0,$$
$$s_0(\cdot) = \mu(\cdot) \sum_{C \in \mathbb{P}(0)} \pi_C(\cdot) s_j^\star(\cdot \mid C) + (1 - \mu(\cdot)),$$

- where $\mathbb{P}(j)$ is the set of consideration sets which include product j (and the previous plan)
- If a consumer does not shop around, $\mu = 0$, she chooses her previous plan, $s_0 = 1$

Identification

- Consideration probabilities π_C are identified from asymmetric demand responses
  - Main intuition: consumers switch away when their current plan increases in price, but not when other plans decrease in price (violation of analog of Slutsky symmetry)
  - In the model this can only happen because of inattention/limited consideration
    Daly-Zachary
  - Technically, a (testable) rank condition on the coefficient matrix of choice share differences between goods needs to be fulfilled

Identification

- Provided we identify cross-characteristics responses, e.g., $\frac{\partial s_j}{\partial x_{j'}}$
  $\rightarrow$ Assume there are no time varying unobserved characteristics correlated with price
  - Latent choice probabilities $s^\star(\cdot \mid C)$ are identified from absence of nominal illusion
  - Given identification of $\frac{\partial s_j}{\partial x_{j'}}, \pi_C, s_j^\star$, identification of mean preferences is standard (how choice shares vary with own characteristics)

Latest Policies against inertia

- EU: directive 2018/1972 “European Electronic Communications Code”
- AUT: Telekommunikationsgesetz Oct 2021 “TKG 2021”
  - 1 month cancellation period (maximum)
  - 24 months commitment (maximum)
  - Provider has to notify consumer when commitment is about to end
  - 1/year provider has to highlight cheapest plan to consumer based on usage
- If consumers have full consideration these policies have no effect
- Empirical question if they work if consumers have limited consideration

Estimation

- I estimate the model by maximum likelihood

$$\log \mathcal{L}(y_{it}, X; \theta) = \sum_{i=1}^{N} \sum_{t=1}^{T} \sum_{j \in \mathcal{J}_{it}} \mathbb{1}_{y_{it}=j} \log s_{itj}(\mathbf{x}_t, \mathbf{z}_i; \theta)$$

- where y_{it} is the index of the product that consumer i chooses in period t
- Computational challenge: large number of consideration sets ($2^{\#\text{products}}$)
  - But many fringe firms, largest 5 providers capture ~97% market share
  - Can, e.g., aggregate over plans by user types (low, medium, high, power user)

Simulation

Simulation Set Up

- market shares as reported by RTR Telekom Monitor

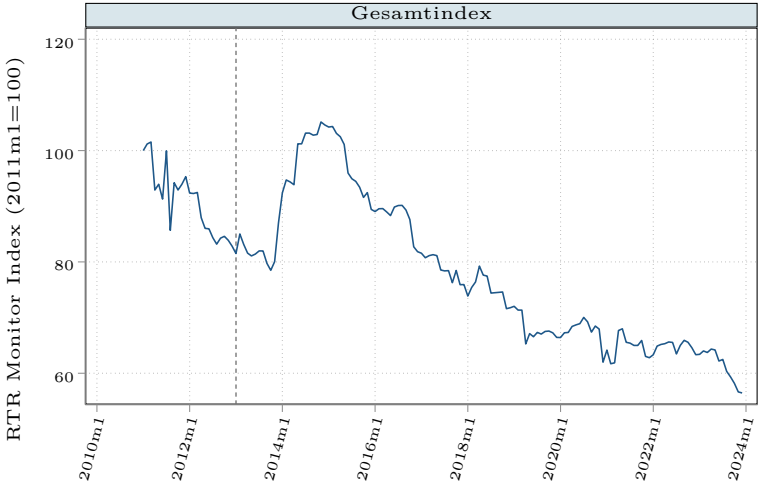
Simulation Results

Next Steps

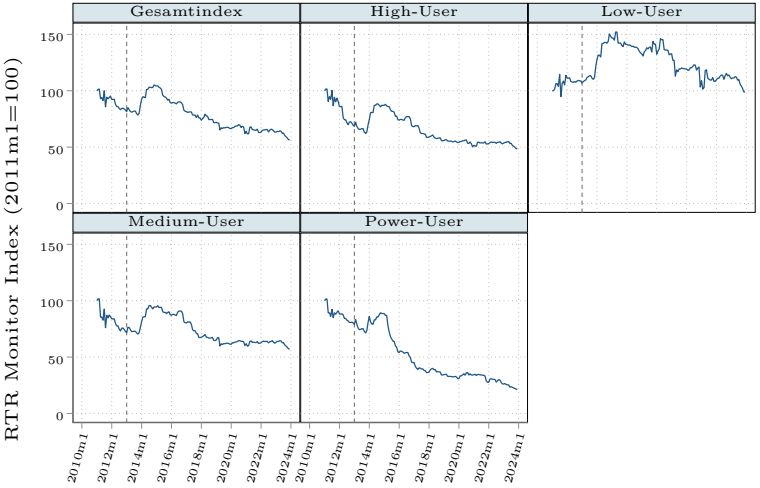
- Run pre-test (expected: 2024Q2) and final survey
- Expand model to account for heterogeneities
- Code up estimator and estimate model
- Simulate counterfactuals and compare switching rates $\frac{1}{N}\sum_{i=1}^{N}(1 - s_{i0})$:
  - Forced attention/choice: $\mu = 1$
  - Remove switching cost: $\xi = 0$
  - Full consideration: $\phi = 1$
  - Differences in switching rates reveal relative importance of frictions

Appendix

RTR Monitor


Gesamtindex
RTR Monitor Index (2011m1=100)
120
100
80
60
2010m1
2012m1
2014m1
2016m1
2018m1
2020m1
2022m1
2024m1

RTR Monitor - by user group



Sample restrictions

- There are about 200 plans available in Austria in 2024
- Exclude hand full of phone-only plans
- Focus on unrestricted plans and thus exclude group-specific plans:
  - children
  - people below age 28
  - students
  - teachers
  - pensioners
  - unemployed etc
- A few fringe players are not indexed by tarife.at

Retail providers not covered by tarife.at

- KURIER Mobil
- Kraftcom
- joymobile
- kwikki

What do you perceive as barriers to switching?

image-20240321224916208

Figure 2: image-20240321224916208

Switchers: what did you perceive as obstacle?

image-20240321225327379

Figure 3: image-20240321225327379

Why do you consider switching provider?

image-20240319103040604

Figure 4: image-20240319103040604

Why did you consider switching provider?

image-20240321223936775

Figure 5: image-20240321223936775

Why did you eventually not switch provider?

image-20240321215405407

Figure 6: image-20240321215405407

Why did you not consider switching provider?

image-20240321215652601

Figure 7: image-20240321215652601

Why did you choose your current provider?

image-20240319102920601

Figure 8: image-20240319102920601

Why did you choose your current provider (N=40,000)?

image-20240321224525400

Figure 9: image-20240321224525400

Willingness to pay for 5G

image-20240319103325445

Figure 10: image-20240319103325445

Sampling

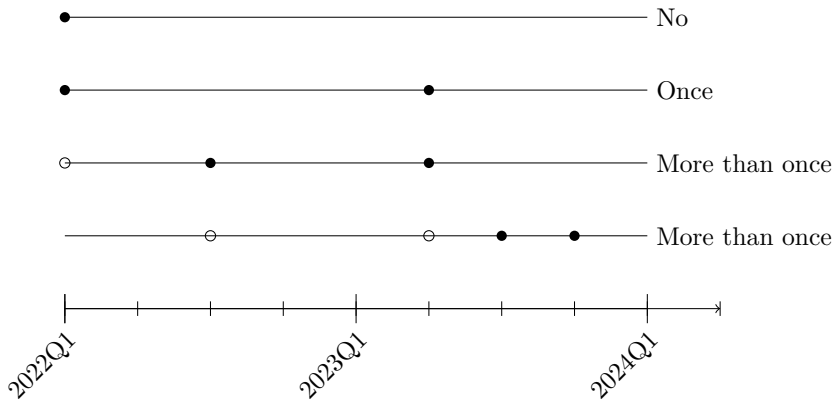
The survey filters for consumers that fulfil the following criteria:

- At least 18 years old in 2022
- They have and know about their Austrian (domestic) plan
- The plan is for retail customers
- They pay for the plan themselves

Criteria must be fulfilled for both current and previous plan Back

Possibilities of single wave

Did you switch mobile telephony plan in 2022/2023/2024? Back



If we see much switching in recent time we have a shorter panel, but then something is likely to be important there.

Specification

adjust notation to match with above model slide?

Attention

$$\mu_{it} = \frac{\exp(\mathbf{x}'_{0_i t}\lambda + \mathbf{z}'_i\kappa + \xi^{in}_{\psi(0_i)})}{1 + \exp(\mathbf{x}'_{0_i t}\lambda + \mathbf{z}'_i\kappa + \xi^{in}_{\psi(0_i)})}$$

Consideration

$$\phi_{ijt} = \frac{\exp(\mathbf{x}'_{jt}\gamma + \mathbf{z}'_i\rho + \xi^{c}_{\psi(j)})}{1 + \exp(\mathbf{x}'_{jt}\gamma + \mathbf{z}'_i\rho + \xi^{c}_{\psi(j)})}$$

Choice

$$\begin{aligned} u_{ijt} &= \mathbf{x}'_{jt}\beta + \zeta_1 \cdot \mathbb{1}_{y_{it} \neq y_{it-1}} + \zeta_2 \cdot \mathbb{1}_{\psi(y_{it}) \neq \psi(y_{it-1})} + \xi^{u}_{\psi(j)} + \epsilon_{ijt} \\ &= \delta_{ijt} + \epsilon_{ijt} \end{aligned}$$

Survey in Detail

(Risk and Loss Aversion, Time Preference, Trust, CRT)

Second Choice (Provider), Beliefs about Search Cost, Cheapest Offer, Switching in Other Markets

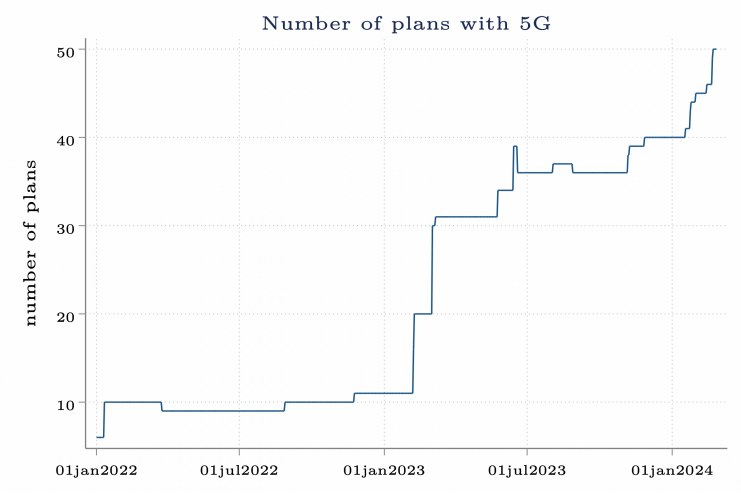
Variables $(\mathbf{z}_i, \mathbf{x}_t)$

Sociodemographics	Plan Characteristics
Gender Back	Monthly fee
Age	Annual fee
Region	SMS
Income Bracket	Minutes
Education	Gigabyte
Marital Status	5G
Household Size	Download Speed
Children	Commitment period
Employment Status	EU Roaming
User Type	Non-EU Roaming
Has searched in price comparison websites	Bundle (plan+wifi, plan+fixed line)
Has searched in local shops	Family rebate

Potential further variables

- provider specific
  - brick and mortar shops by region
  - network quality by region
  - advertising expenditure over time
  - offer of phones, or at least number of phones available for bundle
- individual/demographic specific
  - ad exposure
  - proxy for ad exposure like media exposure

5G


Number of plans with 5G
number of plans
50
40
30
20
10
01jan2022
01jul2022
01jan2023
01jul2023
01jan2024

Unobserved product characteristics

1. What would these be? I observe essentially all characteristics related to the *plan*
2. I do not observe characteristics related to the *provider/brand*, but what would this be? Customer service?
3. Does customer service vary over time? Maybe, but how much in 2-3 years? (Investment data from RTR shows no trend 2018-2022, except for covid drop in 2021)
4. Sample period has rather stable market conditions
5. Even if customer service varies over time, prices do not vary much –> would customer service then be correlated with price?

Identification of switching cost

- Assumptions
  - characteristics are exogenous
  - no consumer learning (time invariant preferences)
- Thought experiment: two products have same characteristics today, one was upgraded to 5G earlier than the other, which attracted consumers, if choice shares are different today then that can only be because of switching cost
- (Churn data can also help)

Daly-Zachary Conditions

Intuition:

- All cross-derivative asymmetries are due to imperfect consideration

Conditions

- partial derivative of latent choice probability wrt to all other goods prices (compounded) exists, is non-negative and continuous
- cross-price derivatives of latent choice probabilities are symmetric
- no nominal illusion (latent choice probabilities are invariant to price shifts across the board) Back

Latest Policies against inertia

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- AUT: Telekommunikationsgesetz Oct 2021 “TKG 2021”
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  - 24 months commitment (maximum)
  - Provider has to notify consumer when commitment is about to end
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§ 135 (7)

Anbieter nach Abs. 1 haben Endnutzern, in den Fällen einer automatischen Verlängerung nach einer Befristung, zumindest einmal jährlich, jedenfalls aber zum Zeitpunkt einer Information nach Abs. 6, über den anhand ihres Nutzungsverhaltens im vergangenen Jahr bestmöglichen Tarif in Bezug auf ihre Dienste zu informieren.

EU Directive

Article 105(3)

Where a contract or national law provides for automatic prolongation of a fixed duration contract for electronic communications services other than number-independent interpersonal communications services and other than transmission services used for the provision of machine-to-machine services, Member States shall ensure that, after such prolongation, end-users are entitled to terminate the contract at any time with a ***maximum one-month notice period****, as determined by Member States, and* ***without incurring any costs*** *except the charges for receiving the service during the notice period. Before the contract is automatically prolonged,* ***providers shall inform end-users****, in a prominent and timely manner and on a durable medium,* ***of the end of the contractual commitment*** *and of the means by which to terminate the contract. In addition, and at the same time, providers shall give end-users best tariff advice relating to their services.* ***Providers shall provide end-users with best tariff information at least annually.***

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