# Inertia in the Market for Mobile Telephony

PhD Research Seminar in Microeconomics

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# Outline

- Introduction: Research question and Motivation
- Approach, Evidence for inertia, Literature
- Survey
- Market Background
- Model
- Summary, Next Steps

# Research Question

- Why do consumers keep expensive (telecom) contracts?
- Significant inertia in the market for mobile telephony
  - RTR (2021): 80% stay with *provider* during 2019-2021
  - Ofcom (2019): 11% stay with *plan* after bundled contract (phone+plan) expires
- Liberalised market: there are many cheap plans nowadays
- AK: but consumers still leave up to 450€ (over 2 years) on the table

# Motivation

- Active choice is the basis of market competition
- Market competition incentivises firms to produce high quality for a low price
- Thus, regulators have recently tried to mitigate consumer inertia
  - EU: directive 2018/1972 “European Electronic Communications Code”
  - AUT: Telekommunikationsgesetz Oct 2021 – “TKG 2021”

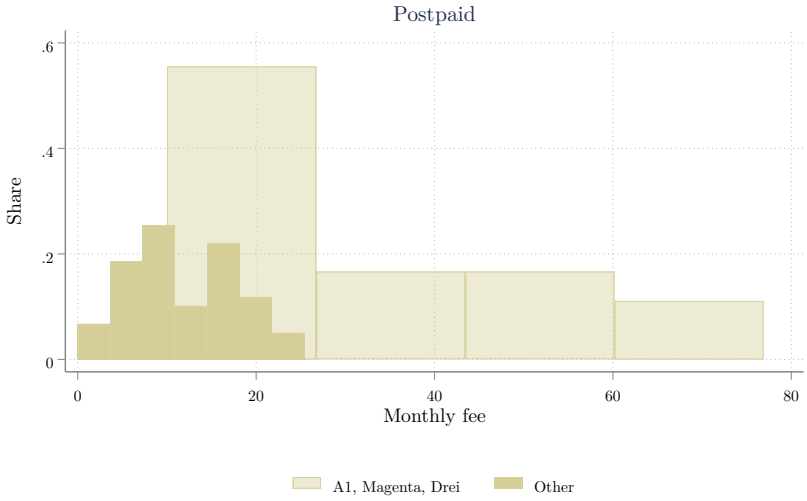
# What is the main mechanism behind consumer inertia?

- Taste?
  - Do consumers attach a high brand value to expensive brands ("I love A1")?
  - Do consumers value expensive contracts that contain a lot of minutes or data?
- Market frictions?
  - Switching cost?
  - Limited information about products (search cost)?
- "Mental gaps": forgetting, beliefs, overconfidence, loss/risk aversion, present bias, trust?

# 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 (regulatory priorities) in counterfactual scenarios where frictions are removed

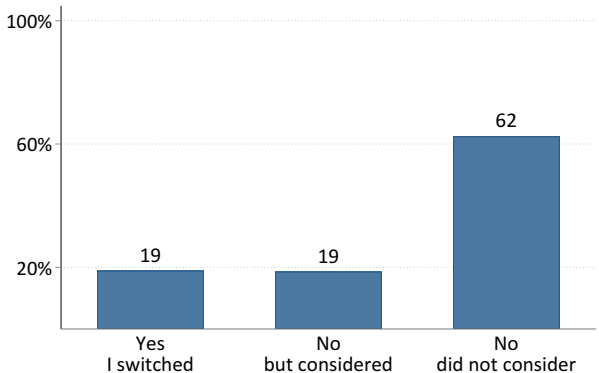
# Significant price dispersion (2024)




Data source: tarife.at

# 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?
  - Recent regulation targets several frictions at once, is there a priority?
  - Should we force providers to default consumers to better plans?
  - Should we force consumers to make active choices?

# 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)

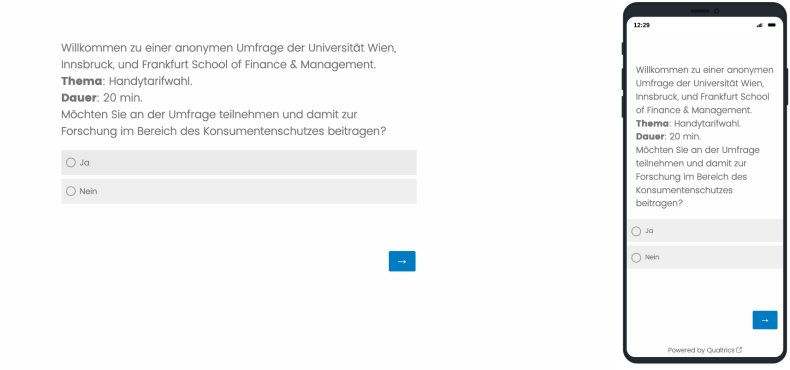
# Data

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

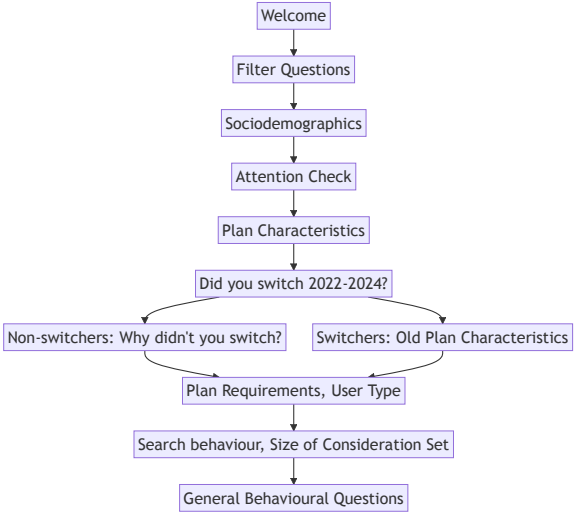
- Survey[1]
  - $N = 2000$–$3000$ Austrian consumers Sampling
  - Consumer sociodemographics, user type, search behaviour Full list
  - Current and previous plan choice in 2022-2024 Timing
- Tarife.at
  - Plan prices and characteristics 2019Q2-2024Q1 Full list

[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?)

# Product Market

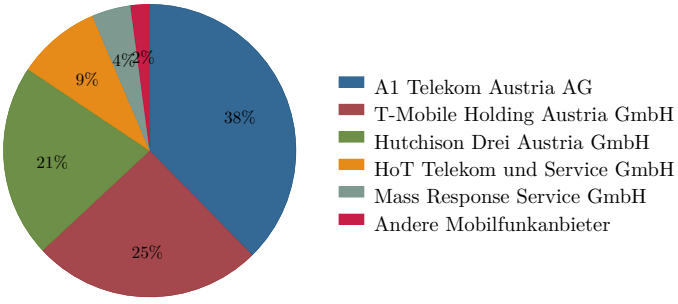
- Austrian market for mobile telephony plans (private customers)
- Differentiated product (included minutes, sms, data, speed, 5G, etc)
- Focus on most relevant plans:
  - Plans that allow you to make a national phone call
  - Plans that are available to everyone
  - Post- and prepaid plans which are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

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

# Market structure

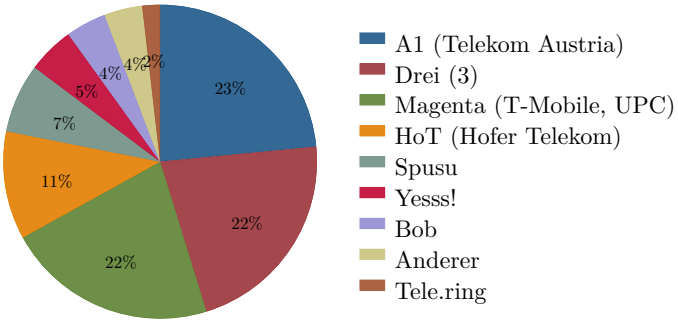
- 3 Mobile Network Operators (MNOs): A1, Magenta, Drei
  - Several MNO-owned brands: Bob, yesss!, etc
  - Several branded resellers: Red Bull Mobile, Educom, etc $\rightarrow$ Non-telco brand sells telco services of MNO
- Several Mobile Virtual Network Operators (MVNOs): HoT, Spusu, etc

# Market Shares by Owner (2023)




Source: RTR Monitor (2023)

# Market Shares by Brand (2021)




Source: own calculations based on data from RTR (2021)

# Coverage of Tarife.at Data (2024)

| | Market | Tarife.at | Sample |
|---|---|---|---|
| Brands | 31 | 27 | 25 |
| Plans | ~225 | 209 | 167 |

- This focusses on providers/plans which fulfil **all** of the following criteria:
  - Available to any private customer (e.g., not only Rapid club members)
  - Plans with domestic calls (not only data plans or only foreign calls)
  - Available on standalone basis (not only in bundle with TV/broadband/fixed line)
  - Available in 2024
  - Sim-only plans (no phone included)
- Prepaid plans are included, its share is about 50%

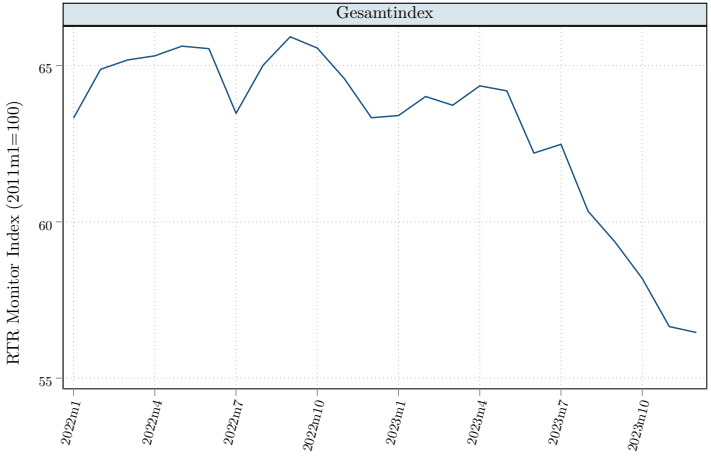
# Prepaid became similar to Postpaid

- The main price component is the monthly fee (also for prepaid plans)
- 20% of plans still have activation costs, most have no annual fee
- 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)

# Most allowances are not binding

- Providers report usage statistics to RTR every year
- In 2022 the 87.5th percentile of consumers on average needed (per month)
  - 521 minutes
  - 16 sms
  - 16 GB of data
- Most plans above 9€ include
  - 1000 minutes
  - 500 sms
  - 20-40 GB of data
- Would be interesting to know standard deviations as well

# Prices for new customers 2022-2023




Data: RTR Monitor

# Switching costs are decreasing

- Only 1 provider (A1) still has simlock –> can be unlocked for free online
- Latest regulation also lowered switching costs

## Latest Regulation

- 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
  - Free number portability
  - Porting the number automatically cancels old contract
- If consumers have full consideration these policies have no effect
- Empirical question if they work if consumers have limited consideration

# 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 $\varepsilon_{ijt}$ is distributed i.i.d. type 1 extreme value, $\xi_j$ 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
- Speed, 5G
  - 5G was newly introduced, big in the media
  - Providers send notification when they update speed of existing contracts
- Can restrict to specific characteristics on price comparison website

## 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 $\pi_C$ 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 $\pi_C$
- 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 $\pi_C$ 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)

# 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 owners capture ~97% market share
  - Can, e.g., aggregate over plans by user types (low, medium, high, power user)

# Counterfactuals

Simulate 3 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

# Summary: mechanisms behind inertia

- Hard to explain with taste alone
  - High brand value for ("I love A1") seems implausible
  - Expensive contracts contain more data, which, however, few people use
- Market frictions
  - switching costs have declined
  - search costs have declined
  - Limited information about products (inattention)?

# Next Steps

- Run pre-test (expected: 2024Q2) and final survey
- Expand model to account for heterogeneities
- Code up estimator, simulate, and estimate model
- Simulate counterfactuals and compare switching rates across simulated scenarios

# Appendix

# 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

- DIALOG
- joymobile
- Kraftcom
- KURIER Mobil
- kwikki

# Sampling

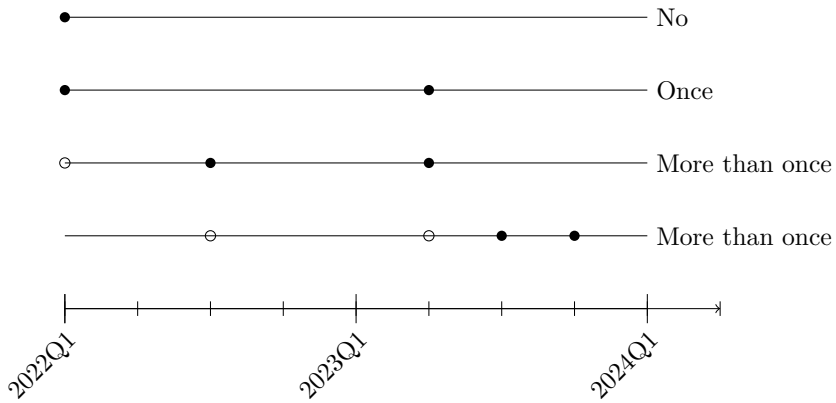
The survey filters for consumers that fulfil the following criteria:

- 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

**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**

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

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

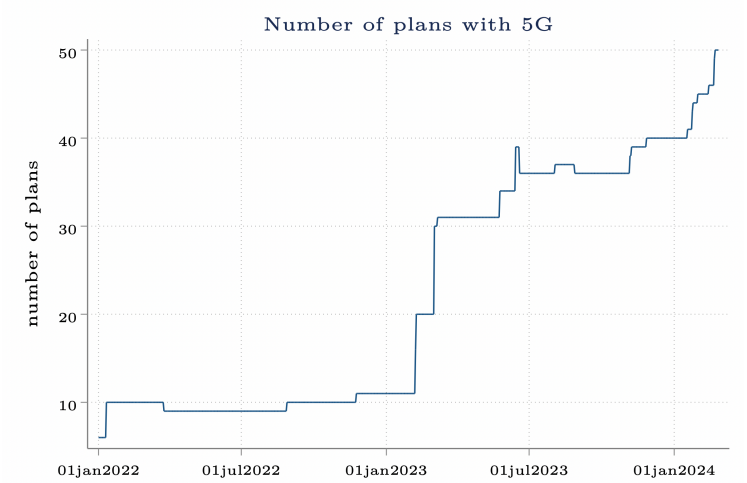
| Sociodemographics | Plan Characteristics |
|---|---|
| Gender Back | Monthly fee |
| Age | Annual fee |
| Region | SMS |
| Income Bracket | Minutes |
| Education | Gigabyte |
| Marital Status | 5G |
| Household Size | Download Speed |
| Children | Commitment period |
| Employment Status | EU Roaming |
| 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

- Only about 20 plans have 5G (in 2024)
- Growth in 5G plan reflects both entry and existing plans becoming 5G enabled



# 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

- 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

§ 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.***

# 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** |

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