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The Role of Pricing for QoE Marketization

A Fixed-point and Measurement Problem

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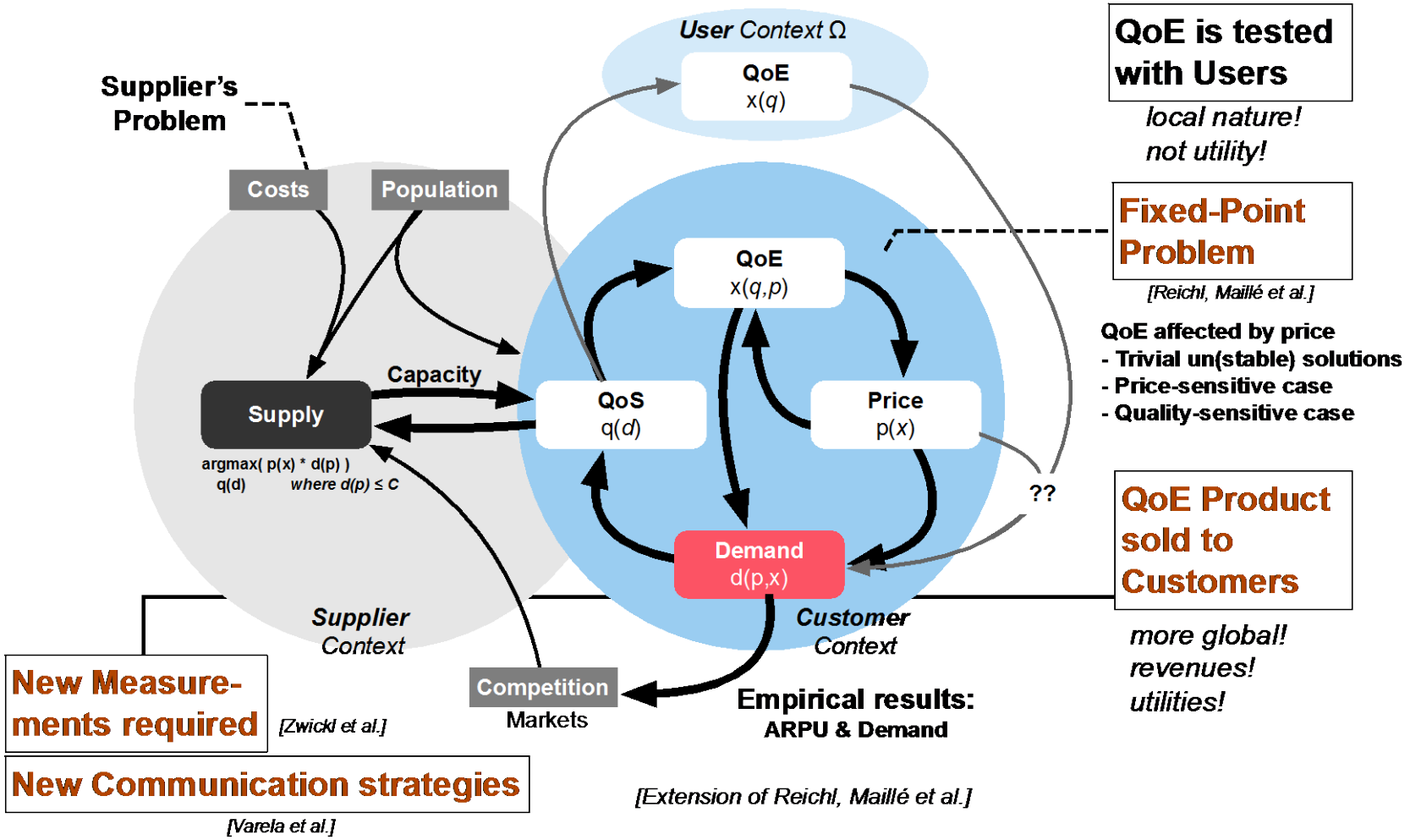
QoE and Utility are Disparate Concepts



Willingness-To-Pay (WTP) Measurements

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Idea: Investigate **third-degree price discrimination** (price and quality differentiation) for **HD streams** *+ first-degree p. discrimination**

Approach:

- 17 quality levels (bitrates; logarithmic spacing) *+ 3 additional classes**
- Prices between €0 and €2/3/4 [from worst to best quality level]
- Users receive €10 in cash which can be spent on quality

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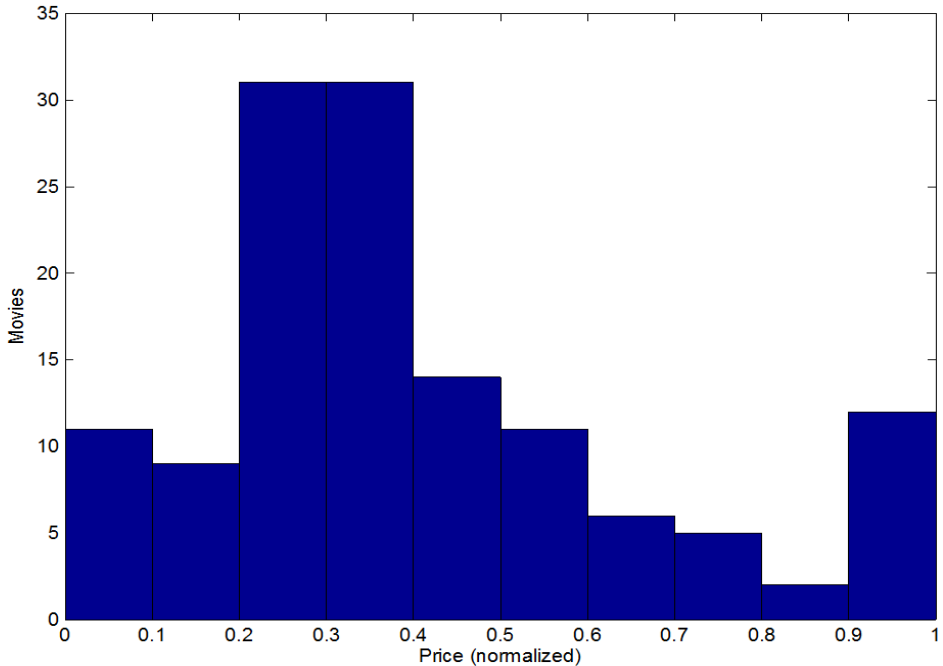


- **Intermediary quality levels** most popular, but **local peaks** at end points
- **Customer segments** with different **motives**
- **Spending behavior can be influenced**

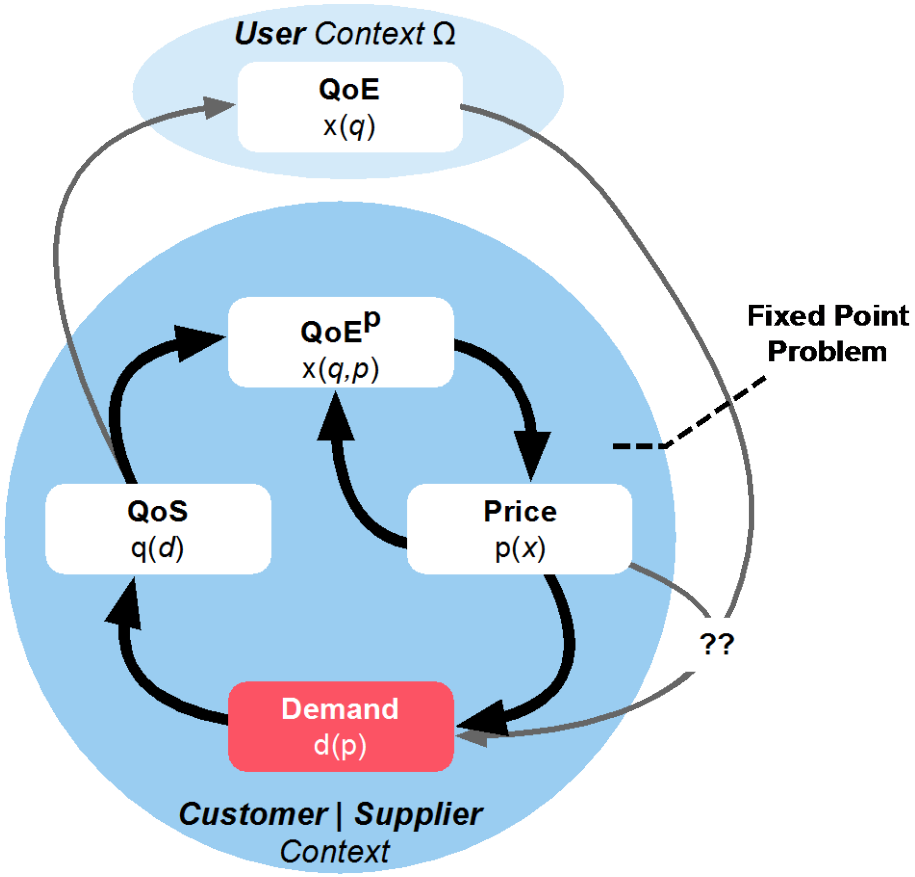
  (historic pricing, product range,…)

[Sackl, Zwickl, Reichl 2013]

Utility Approximation from QoE (etc.)

- **Insufficient data** (few trials, difficult testing, one service so far)
  - **2002**: Trial in UK [M3I proj.]
  - **2011-2013**: Two trials in Austria
  - **2015**: Trials in Finland + Austria

- **Approximation:**
  - **QoE** as **starting point; user** context
  - **Transition** to **customer** context is **specific**
  - **Solution Approach**: see *[Zwickl, Reichl, Skorin-Kapov, Dobrijevic]*



Pricing for QoE vs. QoE trials

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question

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References & Further Reading

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Add-On Material

Might not be presented.

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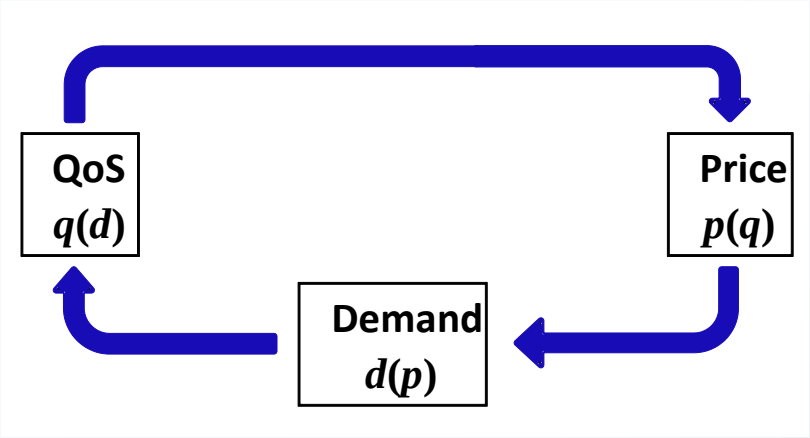
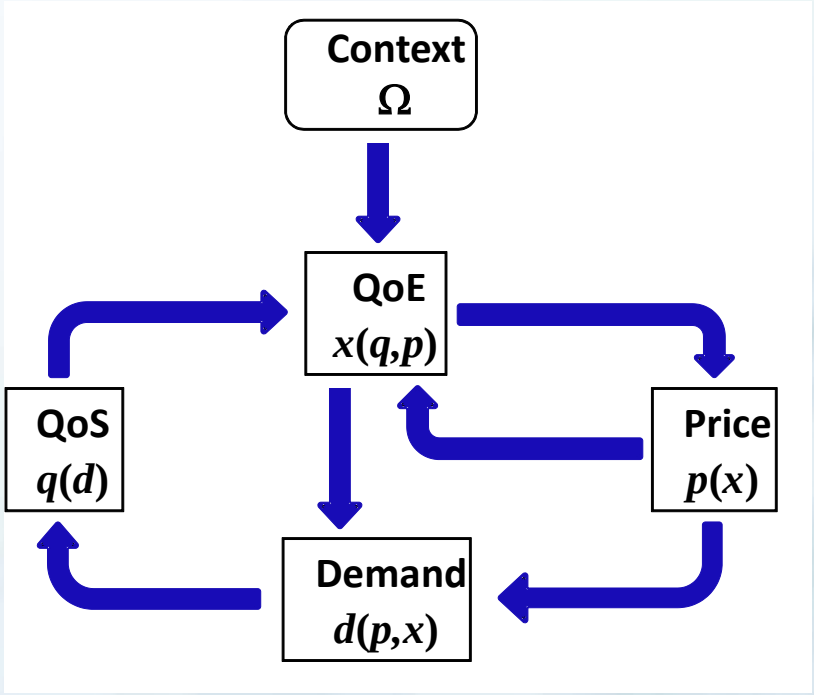
Fixed-Point Problem

And Empirical Confirmation / Testing

Fixed-Point Problem: Charging for QoE

- Simple (but instructive) quality model:



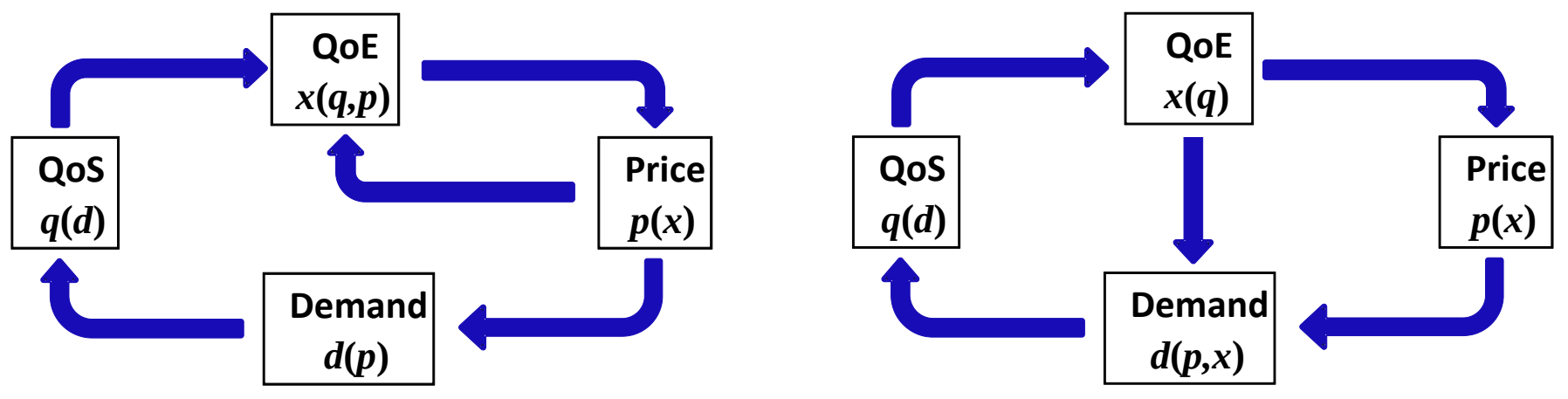


- Characterization by set of functions:
  - *Price function* p = p(q) → p = p(x)
  - *Demand function* d = d(p) → d = d(p,x)
  - *QoS function* q = q(d) q = q(d)
  - *QoE function* x = x(q,p;Ω)

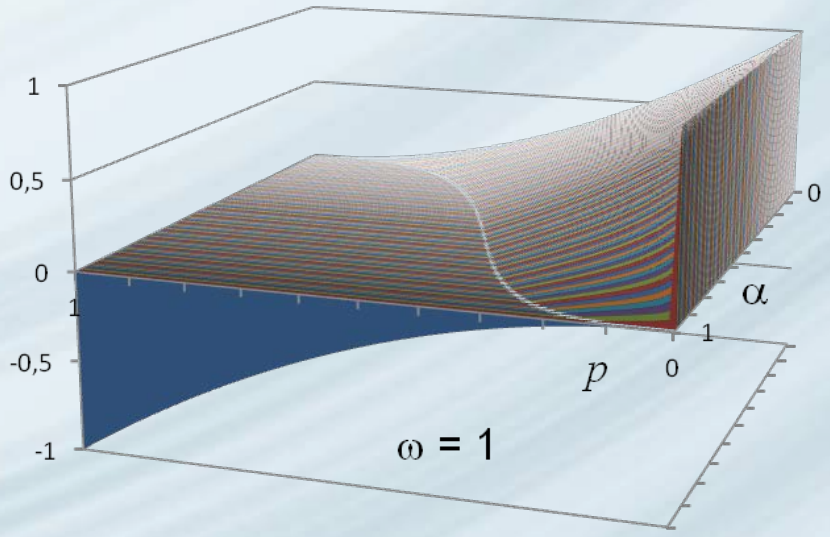
- Wanted: fixed point solutions (existence, characteristics)

[Reichl et al. 2013]

Price-Sensitive vs Quality-Sensitive Case



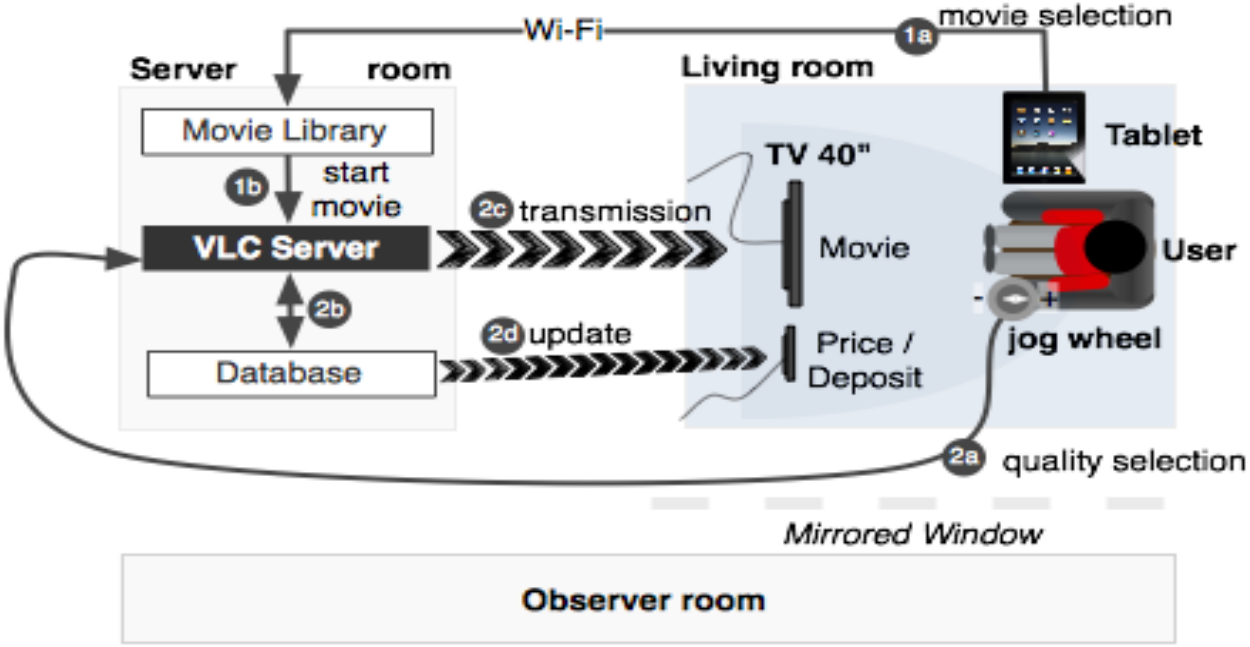
- Key result (under rather mild conditions):
  - QoS case: two (trivial) fixed points
    → excellent QoS at high price (stable)
    → bad QoS for free (unstable)
  - QoE case: one (non-trivial) fixed point
    → tradeoff between charge/tariff and expected user QoE
  - Integrated model for price-sensitive vs quality-sensitive case



[Reichl, Maillé, Zwickl, Sackl 2013]

Willingness-To-Pay (WTP) Measurements

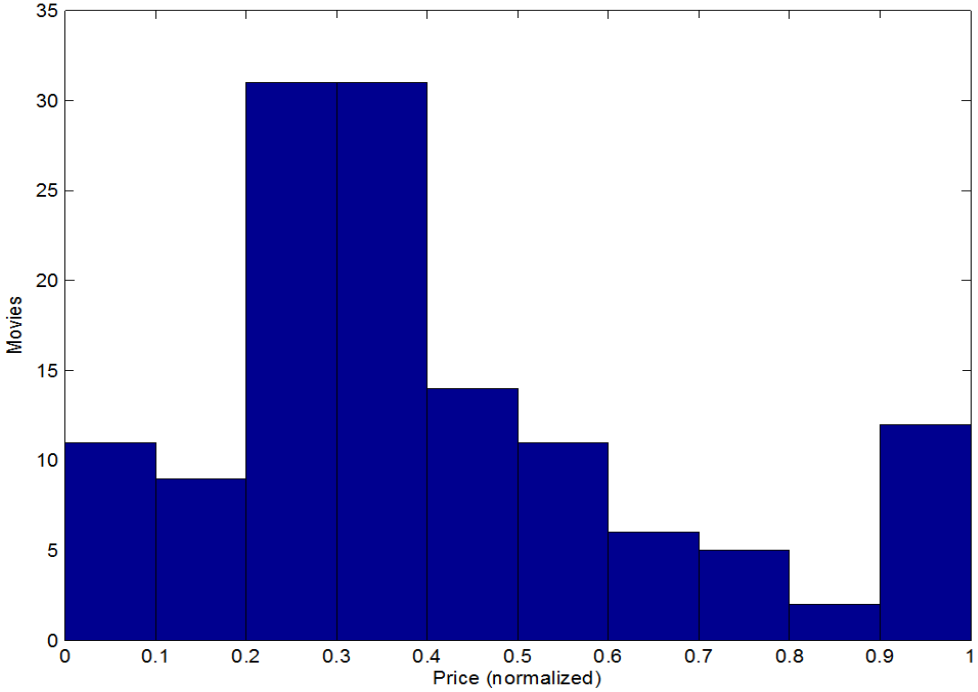
- **Idea**: Investigate WTP for quality-differentiated network markets
- **Approach**:
  - Third-degree + first-degree price discrimination
  - 17 quality levels (bitrates; logarithmic spacing) + 3 additional classes
  - Prices between €0 and €2/3/4 *[from worst to best quality level]*
  - Users receive €10 in cash which can be spent on quality



[Sackl, Zwickl, Reichl 2013]

Some Results

Distribution of payments



[Sackl, Zwickl, Reichl 2013] [Zwickl, Sackl, Reichl, 2013]

- **Intermediary quality levels** most popular, but **local peaks** at end points
- **Customer segments** with different **motives**
- **Spending behavior can be influenced** (historic pricing biases, offered selection of qualities)

- **Until 2013**: Two studies in Vienna, Austria; one study in 2002 in the UK
- **2015**: Retesting in Oulu (Finland) and Vienna (Austria) in 2015

  [submitted to IFIP Networking 2015; together VTT Finland / Oulu]

Local Character of QoE

Do we measure what we should measure?

Limitations of QoE

QoE = user-centric perspective on networks

- Highly local, difficult to generalize across services minding user objectives etc.

QoE = cost-centric perspective for network operators

- Strengthened focus on **customer satisfaction**
- Means for **efficient traffic management**
- **“As low as you can go” strategy …**

QoE is affected by pricing

- See fixed-point problem!
- Commercialization and testability challenge!

"Utility is to QoE as money is to chocolate"

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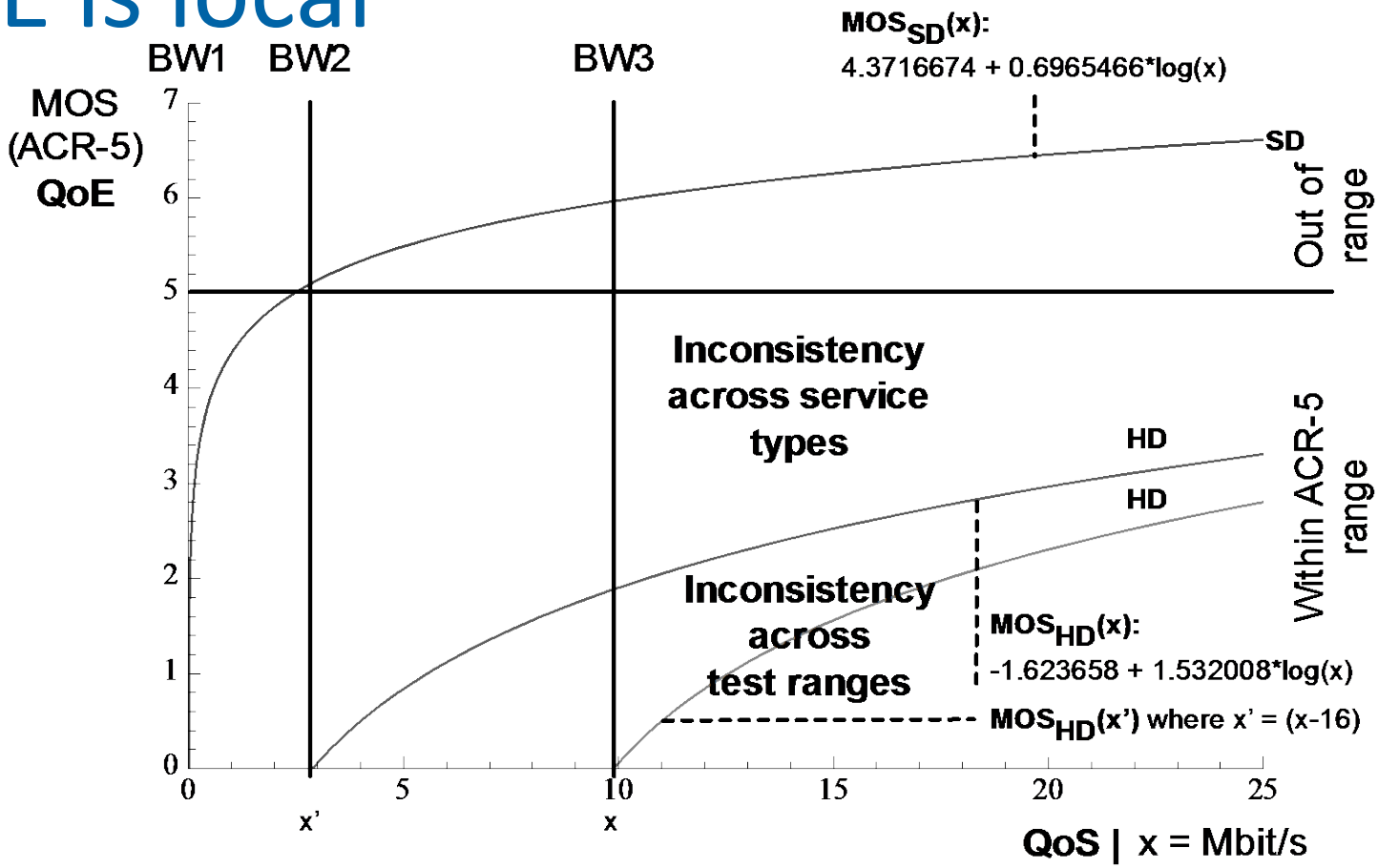
- **QoE** and **utility** are **disparate** *[Zwickl, Reichl, Skorin-Kapov, Dobrijevic]*
- **Appreciation need not trigger a purchase!**
- **Utility** requires a **linear scale with broad validity** (e.g., currencies)
  - **What utilities do customers (not users) have?** (*demand*?) -- objectives matter
  - **What is Willing-To-Pay (WTP) of customers for a service?** (*revenue*?) -- alignment to cost situation

We want more and more and more!

First chocolate bar much more attractive than fifth!

Measurement Problem: QoE is local



QoE measurements bound to test parameters, scenario etc.

Inconsistencies arise when comparing separate testings

Generalisation (to a universal understanding) of QoE difficult

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Utility Approximation

Utility Approximation from QoE (etc.)

- **Problem:**
  - **Insufficient data** (few trials, difficult testing, one service so far)
  - **Approximation strategies** from QoE and QoE in puchasing situations relevant
- **Solution Approach: see in *[Zwickl, Reichl, Skorin-Kapov, Dobrijevic]***
  - Model the **service preference** of customers (*I want HD streams over SD streams with that degree*)
  - **Stitch together QoE curves** minding service preference
  - **Shift known QoE curves for data acquired during purchasing situations** based on the identified relationship (i.e., customer utility)
  - Shift known WTP curves (demand; price) in similar fasion (i.e., ISP utility)