Monitoring institutions in health care markets: Experimental evidence

Silvia Angerer\textsuperscript{1}, Daniela Glätzle-Rützler\textsuperscript{2} & Christian Waibel\textsuperscript{3}

\textsuperscript{1}Institute for Management and Economics in Healthcare, UMIT Hall
\textsuperscript{2}University of Innsbruck
\textsuperscript{3}ETH Zurich

December 13, 2018
Table of contents

1 Motivation
2 Related Literature
3 Experimental Design
4 Theoretical predictions and hypotheses
5 Results
6 Discussion
Background

- Health markets characterized by information asymmetries
  - Patients: Diagnosis? Treatment?
  - Physicians know more about diagnosis and treatment
- Problem: Physicians may exploit information advantage
- Patients have to trust in physicians
- Health care thus known as credence good (Darby and Karni, 1973; Dulleck and Kerschbamer, 2006)

Goods and services where the quality may be unobservable by consumers even after consumption.

Typical examples: repair services, taxi rides, health care.
Credence Goods II

Key characteristics:
- Asymmetric Information
- Joint provision of diagnosis and treatment
- Financial incentives

Consequences:
- Undertreatment
- Overtreatment
- Overcharging

Possible solutions (Dulleck und Kerschbamer, 2006):
- Liability
- Verifiability
Aim - Research Question

- Can Monitoring reduce physician misbehavior in a credence goods setting?
- Assumptions of our baseline model:
  - Patients cannot verify the type of treatment
  - Physicians are not liable
- Monitoring can be...
  - Endogenous: patients decide on monitoring
  - Exogenous: third party randomly monitors physicians
- Monitoring is costly and in case of physician misbehavior monitoring leads to a reimbursement of the damage caused to the patient
Method

- Laboratory experiment with students in the role of physicians and patients
- Advantages:
  - Controlled environment
  - Identification of causal effects
  - No harm to patients
Institutions in credence goods markets

- Verifiability and liability (Dulleck et al., 2011)
- Competition (e.g. Dulleck et al., 2011; Rasch and Waibel, 2018; Mimra et al. 2016a)
- Second Opinion (Mimra et al., 2016b)
- Separation of diagnosis and treatment (Greiner et al., 2017)
- Insurance (e.g. Kerschbamer et al., 2016; Huck et al., 2016)
Related Literature II

- Laboratory experiments in health economics
  - Comparison of payment systems (e.g. Hennig-Schmidt et al., 2011; Brosig-Koch et al., 2017; Brosig-Koch et al., 2013; Green, 2014; Kairies and Krieger, 2013; Keser et al., 2014)
  - Effect of professional norms (Kesternich et al., 2015)
  - Demand of health insurance contracts (Schram and Sonnemans, 2011)
  - Effect of health care financing schemes on WTP for private health insurance and access to care (Buckley et al., 2012a, 2012b)
Related Literature III

- Monitoring experiments (in different contexts)
  - Tax adherence (Slemrod et al., 2011)
  - Reduction of corruption (Olken, 2007)
  - Absenteeism of teachers (Duflo et al., 2012)
  - Punishment in public goods games (e.g. Fehr and Gächter, 2000; Masclet et al., 2003; Sefton et al., 2007; Grosse et al., 2011)
Contribution

- Institutions in credence goods markets
  - Monitoring as institutions to enforce liability and verifiability
- Laboratory experiments in health economics
  - Effect of misbehavior on market interaction
- Monitoring experiments
  - New setting
Experimental Design: Model

- Design based on the model of Dulleck and Kerschbamer (2006) and Dulleck et al. (2011)

- Market set-up:
  - Health frame (Kairies-Schwartz et al, 2017; Kesternich et al., 2015)
  - 2 roles: physicians, patients
  - 2 types of illness: severe $h$, mild $1-h$
  - $h$ is common knowledge, however patient is not informed about the type of illness in the respective period
  - Physician can diagnose illness with certainty and chooses type and price of treatment:
    - Treatment types: $q_H, q_L$ with costs of $c_H, c_L$ (where $c_H > c_L$)
    - Prices: $p_H, p_L$ (where $p_H > p_L$)
  - $q_H$ cures both types of illness; $q_L$ cures only mild illness
  - Payoff patient: $v - p_i$, $i \in \{H, L\}$
  - Payoff physician: $p_i - c_j$, $i \in \{H, L\}, j \in \{H, L\}$
  - Payoffs outside option: $o_{pat} < 0, o_{doc} = 0$
Experimental Design: Conditions

- 6 Conditions:
  - Baseline ($B$): without verifiability and liability
  - Monitoring ($M$): with verifiability and liability
    - $M$-$\text{End}$: patient decides whether to monitor or not
    - $M$-$\text{Ex65}$, $M$-$\text{Ex35}$, $M$-$\text{Ex10}$: third party randomly monitors behavior of physician with 65%, 35%, 10% probability (probability common knowledge)
    - $M$-$\text{ExUnk}$: third party randomly monitors behavior of physician with 10% probability (probability unknown)

- Compensation in case of misbehavior AND monitoring: difference between patient payoff in case of honest treatment and pricing and the patient payoff resulting from the offered treatment and the charged price $\Rightarrow$ pays physician to patient

- Monitoring costs ($m$) pays physician in case of misbehavior, otherwise patient in $M$-$\text{End}$ or third party in $M$-$\text{Ex}$
Experimental Design: Parameter

- Type of illness: $h = 0, 5$
- Prices and costs: $p_H = 8$, $p_L = 3$; $c_H = 6$, $c_L = 2$
  - $p_H - c_H > p_L - c_L$
- Patient utility: $\begin{cases} v = 10 & \text{cure} \\ v = 0 & \text{otherwise} \end{cases}$
- Payoff market exit
  - Patient: $o_{\text{pat}} = -4$
  - Physician: $o_{\text{doc}} = 0$
- Monitoring costs: $m = 1$
- Monitoring probabilities in $M-Ex$:
  $$\mu = \begin{cases} 0.65 & M-Ex_{65} \\ 0.35 & M-Ex_{35} \\ 0.10 & M-Ex_{10}, M-Ex_{Unk} \end{cases}$$
Experimental Design: Protocol

- 16 periods
- Random assignment of role before 1st period; role remains fixed
- Random matching of patient and physician in each period within matching group (market)
- Matching group of 8 subjects (4 physicians and 4 patients)
- Information: all subjects are informed about own payoffs at the end of each period (and before the monitoring decision in $M$)
- 12 sessions in the Innsbruck EconLab
- Program with zTree and recruitment with hroot (Bock et al., 2012)
- Comprehension questions (incentivized)
- Endowment: 16 points (1 point = 0.60 Euro)
- 4 periods randomly selected for payment
Experimental Design: Additional Data

- Additional tasks (one randomly selected for payment)
  - Dictator game: endowment of 12 Euro, receiver "Licht für die Welt"
  - Risk preferences: choice list with 20 choices between sure payoff, increasing throughout the 20 choices (from 0.60 Euro to 12 Euro in 60-Cent increments) and a fixed lottery $l = (p \circ 0, (1 - p) \circ 12)$ where $p = 0.5$
  - Lying task: 12 guesses of a dice roll
  - Trust game (Berg et al., 1995)

- Questionnaire
  - Short version of the BIG 5 personality traits
  - Socio-demographic background
  - Payment questionnaire: 2 Euro
Subjects / markets and earnings

<table>
<thead>
<tr>
<th>Condition</th>
<th># Subjects</th>
<th># Markets</th>
<th>Earnings (in Euro) Physicians</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>48</td>
<td>6</td>
<td>28.57</td>
<td>17.16</td>
</tr>
<tr>
<td>M-End</td>
<td>48</td>
<td>6</td>
<td>22.81</td>
<td>29.69</td>
</tr>
<tr>
<td>M-Ex65</td>
<td>40</td>
<td>5</td>
<td>22.65</td>
<td>29.03</td>
</tr>
<tr>
<td>M-Ex35</td>
<td>48</td>
<td>6</td>
<td>24.55</td>
<td>26.90</td>
</tr>
<tr>
<td>M-Ex10</td>
<td>48</td>
<td>6</td>
<td>26.96</td>
<td>22.20</td>
</tr>
<tr>
<td>M-ExUnk</td>
<td>48</td>
<td>6</td>
<td>29.03</td>
<td>22.66</td>
</tr>
</tbody>
</table>
Theoretical Predictions: Assumptions

Subjects are ...

1. Rational
2. Riskneutral
3. Selfish (only interested in their own monetary earnings)
Theoretical Prediction: $B$

Equilibrium:
- Physicians choose $q_L$ and charge $p_H$
- Patients always enter the market
- Efficiency $\frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}} = 0.50$
Theoretical Prediction: \textbf{M-End}

**Equilibrium:**
- Patients monitor if payoff-signal $\in \{-8, -3, 2\}$
- Physicians choose: $\begin{cases} q_H, p_H & \text{severe illness} \\ q_L, p_L & \text{mild illness} \end{cases}$
- Patients always enter the market
- Efficiency $\frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}} = 0.92$
Theoretical Prediction: \textbf{M-Ex65}

Equilibrium:

- Physicians choose: \begin{align*}
&\begin{cases}
q_H, p_H & \text{severe illness} \\
q_L, p_H & \text{mild illness}
\end{cases}
\end{align*}
- Patients always enter the market
- Efficiency $\frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}} = 0.89$
Theoretical Prediction: **M-Ex35, M-Ex10**

Equilibrium:
- Physicians choose $q_L$ and charge $p_H$
- Patients always enter the market
- Efficiency $\frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}}$
  - **M-Ex35**: 0.44
  - **M-Ex10**: 0.48
Theoretical Prediction: **M-ExUnk**

**Equilibrium**

- **1st period:**
  - $\hat{\mu} = 0.50$
  - Physicians choose: \( q_H, p_H \) severe illness, \( q_L, p_H \) mild illness
  - Patients always enter the market
  - Efficiency \( \frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}} = 0.95 \)

- **16th period:**
  - $\hat{\mu} = 0.10$
  - Physicians choose \( q_L \) and charge \( p_H \)
  - Patients always enter the market
  - Efficiency \( \frac{E(\text{Total market surplus})}{\text{Maximum possible market surplus}} = 0.48 \)
Hypotheses: Relaxing the Assumptions

- Limited validity of theoretical assumptions
- Subjects are ...
  1. Not always perfectly rational
  2. Mostly risk-averse
  3. Often interested in monetary payoff of other subjects
Hypotheses:  \textit{B, M-End, M-Ex65}

\begin{itemize}
\item \textbf{Hypothesis 1}  
   \textit{In B undertreatment and overcharging is observed. The frequency, however, is smaller than 100\% and the level of efficiency is higher than 50\%.}
\item \textbf{Hypothesis 2}  
   \textit{The frequency of undertreatment and overcharging in M-End is smaller and efficiency is higher than in B.}
\item \textbf{Hypothesis 3}  
   \textit{The frequency of undertreatment and overcharging and the level of efficiency in M-Ex65 is equal to M-End.}
\end{itemize}
Hypotheses: **M-Ex35, M-Ex10, M-ExUnk**

**Hypothesis 4**

The frequency of undertreatment in **M-Ex35** is equal to **M-Ex65**. The frequency of overcharging in **M-Ex35** is higher than in **M-Ex65**. The level of efficiency in **M-Ex35** is higher or equal to **M-Ex65**.

**Hypothesis 5**

The frequency of undertreatment and overcharging in **M-Ex10** is equal to **B**. The level of efficiency in **M-Ex10** is smaller or equal to **B**.

**Hypothesis 6**

The frequency of undertreatment and overcharging in **M-ExUnk** in periods 1-8 is lower and in periods 9-16 is equal to **B**. The level of efficiency in **M-ExUnk** in periods 1-8 is higher and in periods 9-16 is smaller or equal to **B**.
Main Results: All Conditions

Table 2 Overview of results across periods

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>M-End</th>
<th>M-Ex65</th>
<th>M-Ex35</th>
<th>M-Ex10</th>
<th>M-ExUnk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overtreatment</td>
<td>0.01&lt;sup&gt;b,d&lt;/sup&gt;</td>
<td>0.02</td>
<td>0.04&lt;sup&gt;b,g&lt;/sup&gt;</td>
<td>0.01&lt;sup&gt;g&lt;/sup&gt;</td>
<td>0.00&lt;sup&gt;i&lt;/sup&gt;</td>
<td>0.07&lt;sup&gt;d,i&lt;/sup&gt;</td>
</tr>
<tr>
<td>Undertreatment</td>
<td>0.40&lt;sup&gt;a,b,c&lt;/sup&gt;</td>
<td>0.09&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.12&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.16&lt;sup&gt;c,h&lt;/sup&gt;</td>
<td>0.41&lt;sup&gt;h&lt;/sup&gt;</td>
<td>0.31</td>
</tr>
<tr>
<td>Overcharging</td>
<td>0.91&lt;sup&gt;a,b,c,e,d&lt;/sup&gt;</td>
<td>0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.46&lt;sup&gt;b,g&lt;/sup&gt;</td>
<td>0.73&lt;sup&gt;c,g&lt;/sup&gt;</td>
<td>0.84&lt;sup&gt;i&lt;/sup&gt;</td>
<td>0.67&lt;sup&gt;d,i&lt;/sup&gt;</td>
</tr>
<tr>
<td>Interaction rate</td>
<td>0.97&lt;sup&gt;a,b,d&lt;/sup&gt;</td>
<td>1.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.99&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.99</td>
<td>0.99&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.98</td>
</tr>
<tr>
<td>Efficiency</td>
<td>0.63&lt;sup&gt;a,b,c&lt;/sup&gt;</td>
<td>0.81&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.76&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.80&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.69</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Number of subjects: 48

Notes:
Mann-Whitney U-tests (MWU) for pairwise difference between conditions with matching groups of 8 subjects as one independent observation.

- <sup>a</sup> B versus M-End (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>b</sup> B versus M-Ex65 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>c</sup> B versus M-Ex35 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>d</sup> B versus M-Ex10 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>e</sup> B versus M-ExUnk (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>f</sup> M-End versus M-Ex65 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>g</sup> M-Ex65 versus M-Ex35 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>h</sup> M-Ex35 versus M-Ex10 (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
- <sup>i</sup> M-Ex10 versus M-ExUnk (<i>p</i> < 0.05), <sup>*</sup> (<i>p</i> < 0.1)
Main Results: \textbf{B, M-End, M-Ex65}

![Graphs showing data trends for B, M-End, M-Ex65 over periods A to F.]

Legend:
- \textbf{B}
- \textbf{M-End}
- \textbf{M-Ex65}
Main Results: **M-Ex35, M-Ex10, M-ExUnk**
## Table: Untertreatment (UT), Overcharging (OC) and Efficiency (EFF)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>OC (1)</th>
<th>UT (1)</th>
<th>EFF (1)</th>
<th>OC (2)</th>
<th>UT (2)</th>
<th>EFF (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M$-End (=1)</td>
<td>-1.577***</td>
<td>-1.896***</td>
<td>0.187***</td>
<td>-1.292***</td>
<td>-1.797***</td>
<td>0.157***</td>
</tr>
<tr>
<td>(0.312)</td>
<td>(0.427)</td>
<td>(0.060)</td>
<td>(0.257)</td>
<td>(0.361)</td>
<td>(0.057)</td>
<td></td>
</tr>
<tr>
<td>$M$-Ex65 (=1)</td>
<td>-2.021***</td>
<td>-1.417***</td>
<td>0.138**</td>
<td>-1.972***</td>
<td>-1.253***</td>
<td>0.106</td>
</tr>
<tr>
<td>(0.357)</td>
<td>(0.388)</td>
<td>(0.060)</td>
<td>(0.311)</td>
<td>(0.431)</td>
<td>(0.0745)</td>
<td></td>
</tr>
<tr>
<td>$M$-Ex35 (=1)</td>
<td>-0.937**</td>
<td>-1.273***</td>
<td>0.172***</td>
<td>-0.883**</td>
<td>-1.314***</td>
<td>0.189***</td>
</tr>
<tr>
<td>(0.437)</td>
<td>(0.385)</td>
<td>(0.064)</td>
<td>(0.348)</td>
<td>(0.392)</td>
<td>(0.0663)</td>
<td></td>
</tr>
<tr>
<td>$M$-Ex10 (=1)</td>
<td>-0.391</td>
<td>-0.092</td>
<td>0.060</td>
<td>-0.228</td>
<td>0.227</td>
<td>0.0271</td>
</tr>
<tr>
<td>(0.497)</td>
<td>(0.431)</td>
<td>(0.074)</td>
<td>(0.366)</td>
<td>(0.390)</td>
<td>(0.0721)</td>
<td></td>
</tr>
<tr>
<td>$M$-ExUnk (=1)</td>
<td>-1.510***</td>
<td>-1.200**</td>
<td>0.224***</td>
<td>-1.354***</td>
<td>-1.044*</td>
<td>0.218***</td>
</tr>
<tr>
<td>(0.392)</td>
<td>(0.495)</td>
<td>(0.074)</td>
<td>(0.365)</td>
<td>(0.567)</td>
<td>(0.0844)</td>
<td></td>
</tr>
<tr>
<td>Periods</td>
<td>0.027*</td>
<td>0.015</td>
<td>-0.002</td>
<td>0.026*</td>
<td>0.0165</td>
<td>-0.0022</td>
</tr>
<tr>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.002)</td>
<td>(0.016)</td>
<td>(0.0169)</td>
<td>(0.0022)</td>
<td></td>
</tr>
<tr>
<td>Periods $\times$ $M$-ExUnk</td>
<td>0.037</td>
<td>0.079**</td>
<td>-0.017**</td>
<td>0.0399</td>
<td>0.077*</td>
<td>-0.017**</td>
</tr>
<tr>
<td>(0.031)</td>
<td>(0.040)</td>
<td>(0.008)</td>
<td>(0.031)</td>
<td>(0.041)</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Risk-aversion</td>
<td>0.176***</td>
<td>0.0295</td>
<td>-0.0517</td>
<td>0.453**</td>
<td>0.0552*</td>
<td></td>
</tr>
<tr>
<td>(0.0496)</td>
<td>(0.0490)</td>
<td>(0.025)</td>
<td>(0.106)</td>
<td>(0.225)</td>
<td>(0.0293)</td>
<td></td>
</tr>
<tr>
<td>Lying (=1)</td>
<td>-0.0517</td>
<td>-0.453**</td>
<td>0.0552*</td>
<td>0.352</td>
<td>0.326</td>
<td></td>
</tr>
<tr>
<td>(0.0361)</td>
<td>(0.037)</td>
<td>(0.00533)</td>
<td>(0.352)</td>
<td>(0.326)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-0.0517</td>
<td>-0.453**</td>
<td>0.0552*</td>
<td>0.352</td>
<td>0.326</td>
<td></td>
</tr>
<tr>
<td>(0.0361)</td>
<td>(0.037)</td>
<td>(0.00533)</td>
<td>(0.352)</td>
<td>(0.326)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.713***</td>
<td>-0.424</td>
<td>0.646***</td>
<td>0.485</td>
<td>3.836*</td>
<td>0.352</td>
</tr>
<tr>
<td>(0.336)</td>
<td>(0.290)</td>
<td>(0.056)</td>
<td>(1.563)</td>
<td>(2.268)</td>
<td>(0.326)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1,135</td>
<td>1,074</td>
<td>2,240</td>
<td>1,129</td>
<td>1,064</td>
<td>2,224</td>
</tr>
<tr>
<td>Number of IDs</td>
<td>140</td>
<td>140</td>
<td>140</td>
<td>139</td>
<td>139</td>
<td>139</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors clustered on market level in parantheses.  *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Angerer S.  6th BEHnet Workshop  December 13, 2018  30 / 37
## Table: Interaction (INT), Undertreatment (UT) und Overcharging (OC)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>INT (1)</th>
<th>UT (2)</th>
<th>UT (3)</th>
<th>OC (4)</th>
<th>OC (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT&lt;sub&gt;t−1&lt;/sub&gt; (=1)</td>
<td>-0.692***</td>
<td>0.204</td>
<td>0.0861</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.202)</td>
<td>(0.195)</td>
<td>(0.227)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MON&lt;sub&gt;t−1&lt;/sub&gt; (=1)</td>
<td>0.106</td>
<td>0.0486</td>
<td>0.095</td>
<td>-0.061</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.182)</td>
<td>(0.193)</td>
<td>(0.147)</td>
<td>(0.174)</td>
<td></td>
</tr>
<tr>
<td>UT&lt;sub&gt;t−1&lt;/sub&gt; × MON&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td></td>
<td>0.529</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.426)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OC&lt;sub&gt;t−1&lt;/sub&gt; (=1)</td>
<td></td>
<td></td>
<td></td>
<td>0.053</td>
<td>-0.178</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.146)</td>
<td>(0.165)</td>
</tr>
<tr>
<td>OC&lt;sub&gt;t−1&lt;/sub&gt; × MON&lt;sub&gt;t−1&lt;/sub&gt;</td>
<td></td>
<td>0.559**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.242)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Konstante</td>
<td>2.775***</td>
<td>-1.243***</td>
<td>-1.226***</td>
<td>0.679***</td>
<td>0.751***</td>
</tr>
<tr>
<td></td>
<td>(0.227)</td>
<td>(0.207)</td>
<td>(0.205)</td>
<td>(0.201)</td>
<td>(0.208)</td>
</tr>
<tr>
<td>Beobachtungen</td>
<td>2.240</td>
<td>871</td>
<td>871</td>
<td>966</td>
<td>966</td>
</tr>
<tr>
<td>Anzahl IDs</td>
<td>140</td>
<td>116</td>
<td>116</td>
<td>116</td>
<td>116</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors clustered on market level in parantheses

*** p < 0.01, ** p < 0.05, * p < 0.1
Summary Results

Monitoring...

- ... reduces significantly the frequency of undertreatment and increases the level of efficiency as long as the monitoring probability is at least 35%
- ... reduces significantly the frequency of overcharging as long as the monitoring probability is at least 65% or 10% and unknown
- ... reduces significantly the frequency of undertreatment and increases the level of efficiency in the short run of \textit{M-ExUnk}; due to learning no difference in the long run
- ... announcement deters subjects from defraud $\Rightarrow$ actual experience of monitoring in case of misbehavior has no effect on subsequent behavior
Discussion

- Policy implications?
- External validity
- Future Research:
  - Increase in monitoring costs
  - Uncertainty verifiability physician misbehavior
Thanks!

Contact: Silvia.Angerer@umit.at
Types

8 Types

1. Honest (no overcharging, no undertreatment): 5%
2. Overcharge-Low (less than 50% of cases overcharging; no undertreatment): 6.4%
3. Overcharge-High (more than 50% of cases overcharging; no undertreatment): 20.4%
4. Overcharge (always overcharging; no undertreatment): 12.1%
5. Mix-Low (less than 50% of cases overcharging AND undertreatment): 8.6%
6. Mix-High (more than 50% of cases overcharging AND undertreatment): 17.1%
7. Dishonest (always overcharging AND undertreatment): 5.7%
8. Undertreat (no overcharging; always undertreatment): 0%
9. Other: 24.3%
Types

Honest Type

Overcharge-Low Type

Overcharge-High Type

Overcharge Type

Mix-Low Type

Mix-High Type

Dishonest Type

Other Type

Angerer S.
Additional games

Dictator Game

Risk Preferences

Lying Task

Trust Game