Balancing the Desire for Privacy Against the Desire to Hedge Risk

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Summary

- For an **efficient risk transfer**, it is crucial to address **hidden information** between insurer and insured.

- With digital monitoring devices, insurers can implement **transparency contracts** where they can price the insurance on the observed behavior.

- However, opting into a transparency contract comes at a cost for individuals – the **disutility of giving up privacy and sharing personal information**.

- A large stream of literature analyzes the economic value of privacy, but no one has tested it in an insurance setting.

- We quantify the **willingness to pay (WTP)** for transparency and standard full insurance contracts in an **incentivized laboratory experiment**.

- Participants buying the transparency contract have to share their **WhatsApp GPS live location** with us.

- Our results suggest that the **reduction in WTP** from introducing digital monitoring is in the range of **25 to 50 percentage points**.
Motivation – examples of telematics contracts

Motor insurance
- 230 telematics programmes worldwide.
- Mainstream in US and Italy (approx. 30% of new business if the insurance companies offer telematic solutions).
- In 2030 nearly 50% of the global vehicles will be insured by telematic policies.


Health insurance
- Wearables (e.g., Apple Watch, FitBit) record detailed information about fitness and activity levels.
- Some insurance companies use the activity data for rewards given to insured (e.g., Oscar, John Hancock).

Source: http://www.techzone360.com
WTP for a full insurance contract

With:
- \( w_n/w_a \): no-/accident state
- \( w_0 \): initial wealth
- \( \pi \): loss probability
- \( D \): loss
- \( A \): no insurance state
- \( CE_{noIns} \): Certainty Equilibrium no Insurance
- Max WTP\(_{FI}\): maximum willingness to pay for a full insurance contract
- FI1: full insurance contract individual would buy
- FI2: full insurance contract individual would not buy
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WTP for a transparency contract (based on Gemmo, Brown, & Gründl, 2017)

With:
- \( w_n/w_a \): no-/accident state
- \( w_0 \): initial wealth
- \( \pi \): loss probability
- \( D \): loss
- \( A \): no insurance state
- \( CE_{noIns} \): Certainty Equilibrium no Insurance
- \( \psi \): Disutility of giving up privacy
- \( \text{Max WTP}_{TC} \): maximum willingness to pay for the transparency contract
Hypotheses

- There are studies suggesting that individuals assign a positive value to their privacy (e.g., Schudy & Utikal, 2017), which might be caused by concerns about inappropriate usage or access (Smith, Milberg, & Burke, 1996).

- Thus we assume that $\psi > 0$ and because $U(x)$ is increasing in wealth, we can formulate the following hypothesis:

  **Hypothesis 1.**—*Individuals experience a disutility from giving up privacy and thus $\Delta WTP = WTP_{FI} - WTP_{TC} > 0$."

- Moreover, we think that the disutility increases with the amount of data or the duration of data sharing, thus we formulate:

  **Hypothesis 2.**—*ΔWTP increases with duration of data sharing.*

- The disclosure of personal data to an insurer entails risk because you cannot be absolutely sure about the usage of the data, thus we investigate:

  **Hypothesis 3.**—*ΔWTP is larger for more risk averse individuals.*
### Experimental setup

In a series of 15 insurance decisions (we vary the premium between 0.50 EUR and 7.50 EUR), participants have to decide if they opt into the full insurance contract.

<table>
<thead>
<tr>
<th></th>
<th>Control 1</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Control 2</th>
<th>Treatment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment</td>
<td></td>
<td>17 EUR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss</td>
<td></td>
<td>15 EUR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss probability</td>
<td></td>
<td>20 %</td>
<td></td>
<td></td>
<td>30 %</td>
</tr>
<tr>
<td>Time horizon of live</td>
<td>0</td>
<td>1 hour</td>
<td>8 hours</td>
<td>0 hour</td>
<td>8 hours</td>
</tr>
<tr>
<td>GPS Data sharing</td>
<td></td>
<td></td>
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</tbody>
</table>
Binary lottery choice: full insurance

Do you want purchase insurance at the price 3.00 EUR?

NO!

WTP = 2.50 EUR
Binary lottery choice: transparency contract

Do you want purchase insurance at the price 2.50 EUR? But you have to share your GPS status!

NO!

WTP = 2.00 EUR
WhatsApp feature of sharing ones live location
Main results

- Using the relative WTP (WTP / exp. value of the policy), our treatment effects provide **strong support for H1 and H2**.
- Profit margins are cut down from 63.5 to 13.9 percentage points (low-risk condition), in the high risk setting even below the expected value.
- Difference between low and high risk setting can potentially be explained by probability weighting.

### Results:

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
<th>Expected payoff difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10 of $2.00, 9/10 of $1.60</td>
<td>1/10 of $3.85, 9/10 of $0.10</td>
<td>$1.17</td>
</tr>
<tr>
<td>2/10 of $2.00, 8/10 of $1.60</td>
<td>2/10 of $3.85, 8/10 of $0.10</td>
<td>$0.83</td>
</tr>
<tr>
<td>3/10 of $2.00, 7/10 of $1.60</td>
<td>3/10 of $3.85, 7/10 of $0.10</td>
<td>$0.50</td>
</tr>
<tr>
<td>4/10 of $2.00, 6/10 of $1.60</td>
<td>4/10 of $3.85, 6/10 of $0.10</td>
<td>$0.16</td>
</tr>
<tr>
<td>5/10 of $2.00, 5/10 of $1.60</td>
<td>5/10 of $3.85, 5/10 of $0.10</td>
<td>$0.18</td>
</tr>
<tr>
<td>6/10 of $2.00, 4/10 of $1.60</td>
<td>6/10 of $3.85, 4/10 of $0.10</td>
<td>$0.51</td>
</tr>
<tr>
<td>7/10 of $2.00, 3/10 of $1.60</td>
<td>7/10 of $3.85, 3/10 of $0.10</td>
<td>$0.85</td>
</tr>
<tr>
<td>8/10 of $2.00, 2/10 of $1.60</td>
<td>8/10 of $3.85, 2/10 of $0.10</td>
<td>$1.18</td>
</tr>
<tr>
<td>9/10 of $2.00, 1/10 of $1.60</td>
<td>9/10 of $3.85, 1/10 of $0.10</td>
<td>$1.52</td>
</tr>
<tr>
<td>10/10 of $2.00, 0/10 of $1.60</td>
<td>10/10 of $3.85, 0/10 of $0.10</td>
<td>$1.85</td>
</tr>
</tbody>
</table>

- Extended set of lottery choices
- Dohmen et al. (2011) survey measure

We interpret our results as suggestive in favor of H3.
Conclusion

- This paper quantifies the impact of digital monitoring on the willingness to pay for insurance in an incentive-compatible behavioral experiment.

- We find that sharing one's live location reduces the relative WTP by 25-50 per. points.

- For high frequency risks WTP falls below the expected value of the policy.

- Also, we find suggestive evidence that the disutility of data sharing is larger for more risk averse individuals.

Implications

- Our results provide a benchmark for the demand-side which have to be contrasted with the benefits of digital technologies (prevention, reduction of moral hazard).

- We find that a large fraction of the profit margin is marginalized by the discount agents demand to buy transparency contract.

- When thinking about mandatory data sharing, policymakers need to consider individual welfare losses.