A Behavioral and Health Economic Analysis of Gambling

Dr. Ingo Fiedler

Presentation for ARJEL and ODJ

2nd October 2015
Agenda

- Introduction: Social Costs, Benefits and their Relationship to Welfare
- Bounded Rationality: Are Private Costs are Relevant to Welfare?
- The Social Costs and Benefits of Gambling in Germany
- Two shortcuts for the evaluation of gambling (segments)
- Concluding remarks for regulation
- Discussion
Introduction: Social Costs, Benefits and their Relationship to Welfare
Introduction to the topic of social costs

- Calculation of social costs is a (young) task of economics; the methodology is not matured
- Different concepts lead to different meaning of same terms → Misunderstandings and non-comparable studies
- Problems intensified by non-disclosed assumptions and concepts as well as implicitly and ill-defined terms
- Assessment of different costs as „social costs“ often ad-hoc, arbitrary and not well-grounded
- Especially true for studies regarding the social costs of gambling
- And by the way: it is all about social welfare not social costs!

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Social welfare, the typical shortcut is to add net-figures (assuming rationality)

- **Costs**
  - Negative Externalities

- **Benefits**
  - Consumer Surplus
  - Producer Rent
  - Positive Externalities
Social welfare, the long way by adding gross-figures

Costs

Consumer Costs
Producer Costs
Negative Externalities

Benefits

Consumer Benefits
Producer Benefits
Positive Externalities

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Methodology: Social Costs of Gambling

- Social costs opposed to social benefits yield effect on welfare
- Social costs as sum of private and external costs
- Monetary externalities have corresponding benefit
- Technological externalities have no corresponding benefit
- Players losses (tangible private costs) equal industry earnings
- Intangible private costs mostly due to gambling addiction
Welfare Effect if Consumers are Rational

- Welfare effect (WE) = Benefits (B) – costs (C)
  - Industry earnings (IE)
  - Consumer benefits (CB)
  - Private Costs (PC)
  - Externalities (EX)
  \[\text{WE} = \text{IE} + \text{CB} - \text{PC} - \text{EX}\]

If consumers are rational: CB > PC
  - rational consumers completely internalize their costs

- CB - PC = Consumer surplus (CS) \(\rightarrow\) CB = PC + CS
  \[\text{WE} = \text{IE} + \text{PC} + \text{CS} - \text{PC} - \text{EX}\]
  \[\text{WE} = \text{IE} + \text{CS} - \text{EX}\]

- Regulation only in relation to negative externalities
Bounded Rationality: Are Private Costs are Relevant to Welfare?
Can private costs be relevant to welfare? The case of intra-personal externalities

- Intra-personal externalities are costs an agent does not account for but still has to bear
- Intra-personal externalities exist if…

1) …people are irrational
   - Rationality is a common assumption in economics
     - „The earth is round, but for most purposes it's sensible to treat it as flat.” (Theodore Levitt)
     - Do „most purposes“ include addictions?
     - Do „most purposes“ include gambling?

2) …path dependency is combined with information deficiency
Cues and Consistent Preferences

- Cues are stimuli of the environment, that temporarily increase the marginal utility of a good $c$

$$\begin{align*}
U_c \quad \uparrow
\end{align*}$$

- „Conditioned response“: In the moment of a cue (hot mode), individuals decide to consume because $U_c > C_c$. Afterwards (cold mode) they may regret their decision

- Cues temporarily change the preference order (Laibson 2001)
- Individuals are willing to bear huge costs to avoid cues (Laibson 2001)
- This leads to Cue-Management (Schelling 1984)
Discounting and Consistent Preferences

- People discount hyperbolically (Ainslie 1975, Thaler 1981), especially addicted people (Vuchini and Simpson 1998)
- Hyperbolic discounting and addiction are closely linked (Skog 2005)
- Hyperbolic discounting can be modelled best in a utility function based on two systems with different discount rates (McClure et al. 2007)
  - $\beta$-system: high discounting, related to the mesolimbic system
  - $\delta$-system: slow discounting, related to the prefrontal cortex
  - $\beta$-system activated by cues $\rightarrow$ discount rate increases temporarily

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Consistent Preferences & Reward Bundling

- Decision bundling can lead to exponential discounting (Ross et al. 2008)

- Horizon: amount of bundled decisions
- The greater the path dependency of decisions, the longer the horizon, that is needed for consistent decisions
Addictive goods are highly path dependent

- Path dependent decisions: Utility in the future depends on today's decisions
- Costs of addiction arise in later periods and depend on consumption in earlier periods
- Consumption of addictive goods create so called "consumption capital": The higher the consumption capital, the lower the overall utility and the higher the marginal utility of consumption
- Consumption capital increases with consumption and decreases over time
- Consumption capital in equilibrium: $CC^*$
Do people know the costs of consuming an addictive good?

- Cost of addiction varies from person to person
  - Cost of addictions is an unknown to the decision maker (at least in advance)
- Probability of getting addicted differs from person to person
  - Probability of getting addicted is an unknown to the decision maker (at least in advance)
- Even if range of costs and range of probability of addiction are known, decision are suboptimal
  - Even with rationality, information deficiency paired with path dependency lead to suboptimal decisions in non-one-shot-games
- Even if people predict everything correctly: Do they bundle their decisions until \( t^* \), given that many addicted people started consumption as juveniles?
Do gamblers evaluate their utility correctly?

• Gamblers overestimate their chances of winning (Weinstein 1980)
  ➢ Illusion of control (Langer and Roth 1975)
  ➢ 75% of all gamblers believe that winnings occur in cycles and events are not independent (Australian Productivity Commission 2009)
  ➢ 32% of all problem gamblers think it is possible to win money consistently (Australian Productivity Commission 2009)

• People overestimate the utility of winning a jackpot
  ➢ People assume the same marginal utility of money as in their current situation
First resumé

- Gambling is an addictive good
- Cues lead to hyperbolic discounting and therefore to intransitive utility functions and inconsistent decisions
- People, especially addicts, have a too short horizon and do not bundle enough decisions
- People underestimate the costs of addiction
- Gamblers overestimate their marginal utility

→ Gamblers do not internalize their costs completely
→ What about the welfare effect of gambling?
The Social Costs and Benefits of Gambling in Germany
Degree of rationality: conservative estimate

<table>
<thead>
<tr>
<th>Player group</th>
<th>Degree of rationality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Recreational</td>
<td>95%</td>
</tr>
<tr>
<td>Problematic</td>
<td>50%</td>
</tr>
<tr>
<td>Pathological</td>
<td>25%</td>
</tr>
</tbody>
</table>

Figures in million Euro per year

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Institute of Law & Economics
Division on Gambling

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Number of compulsive gamblers is the key parameter for three scenarios

<table>
<thead>
<tr>
<th></th>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathological gamblers</td>
<td>100,000</td>
<td>195,000</td>
<td>290,000</td>
</tr>
<tr>
<td>Problematic gamblers</td>
<td>149,000</td>
<td>245,000</td>
<td>340,000</td>
</tr>
</tbody>
</table>

Figures in million Euro per year
Private costs: have to be multiplied with degree of bounded rationality (0 with perfect rationality)

<table>
<thead>
<tr>
<th>Type of Cost</th>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary losses</td>
<td>10,618</td>
<td>10,618</td>
<td>10,618</td>
</tr>
<tr>
<td>Income losses due to loss of job</td>
<td>117.1</td>
<td>201.7</td>
<td>281.2</td>
</tr>
<tr>
<td>Income losses due to lowered wages</td>
<td>157</td>
<td>286</td>
<td>414</td>
</tr>
<tr>
<td>Loss of housing</td>
<td>3.2</td>
<td>6.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Penalties due to delinquency</td>
<td>7.1</td>
<td>39.2</td>
<td>57.0</td>
</tr>
<tr>
<td>Loss of life quality</td>
<td>1,433</td>
<td>2,700</td>
<td>3,965</td>
</tr>
<tr>
<td>Opportunity costs of time</td>
<td>2,254.1</td>
<td>2,254.1</td>
<td>2,254.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,615.2</strong></td>
<td><strong>16,146.3</strong></td>
<td><strong>17,474.2</strong></td>
</tr>
<tr>
<td><strong>Total relevant to welfare</strong></td>
<td><strong>2,089</strong></td>
<td><strong>2,522</strong></td>
<td><strong>2,955</strong></td>
</tr>
</tbody>
</table>

Figures in million Euro per year

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Pecuniary externalities: not relevant to welfare

<table>
<thead>
<tr>
<th>Type of Cost</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to repay debts and third party debt enforcement</td>
<td>/</td>
</tr>
<tr>
<td>Increased social transfer payments</td>
<td>/</td>
</tr>
<tr>
<td>Direct costs of gambling-induced crime</td>
<td>/</td>
</tr>
<tr>
<td>Direct costs of associated crime: Match fixing</td>
<td>/</td>
</tr>
<tr>
<td>Costs to the landlord from loss of housing</td>
<td>/</td>
</tr>
<tr>
<td>Crowding out of other industries by the gambling industry</td>
<td>/</td>
</tr>
<tr>
<td>General overview of pecuniary externalities</td>
<td>/</td>
</tr>
<tr>
<td><strong>Total: not relevant to welfare</strong></td>
<td>/</td>
</tr>
</tbody>
</table>
Technological externalities: „classical social costs“ 1/2

<table>
<thead>
<tr>
<th>Type of Cost</th>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical treatment</td>
<td>131.4</td>
<td>256.3</td>
<td>381.2</td>
</tr>
<tr>
<td>Administering social transfers</td>
<td>0.4</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Productivity losses at work</td>
<td>646.3</td>
<td>1,206.8</td>
<td>1,766.0</td>
</tr>
<tr>
<td>Productivity losses outside of work</td>
<td>56.1</td>
<td>103.8</td>
<td>151.3</td>
</tr>
<tr>
<td>Follow-up costs delinquency (w/o intangible costs)</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Follow-up costs associated crime: organized crime, money laundering, match fixing</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Enforcement gambling-induced debts</td>
<td>1.6</td>
<td>2.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Credit counseling insolvency processing</td>
<td>2.1</td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Increased regresiveness due to redistribution</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
# Technological externalities: „classical social costs“ 2/2

<table>
<thead>
<tr>
<th>Type of Cost</th>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs caused by lobbying and corruption</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Costs of legislation, regulation, monitoring, public administration</td>
<td>73.3</td>
<td>73.3</td>
<td>73.3</td>
</tr>
<tr>
<td>Costs of prevention</td>
<td>28.4</td>
<td>28.4</td>
<td>28.4</td>
</tr>
<tr>
<td>Costs of gambling research</td>
<td>13.2</td>
<td>13.2</td>
<td>13.2</td>
</tr>
<tr>
<td>Disruption of families and consequences</td>
<td>2,360.1</td>
<td>4,446.4</td>
<td>6,529.6</td>
</tr>
<tr>
<td>Increased risk of addiction of gamblers‘ children</td>
<td>203</td>
<td>395</td>
<td>588</td>
</tr>
<tr>
<td>Follow-up costs of suicides</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Degentrification/loss of real estate value</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,596</strong></td>
<td><strong>6,611</strong></td>
<td><strong>9,622</strong></td>
</tr>
</tbody>
</table>
Social benefits: profits, taxes, suppliers, jobs are financed by gamblers' losses

Gamblers' Losses ( Costs ) = Industry Revenues ( Benefits )

Profits Operators
Taxes
Suppliers
Jobs
Social benefits: net benefits count, not gross benefits!

<table>
<thead>
<tr>
<th>Type of benefit</th>
<th>In mil. €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer rent (adjusted for opportunity rent)</td>
<td>378.8</td>
</tr>
<tr>
<td>Producer rent (adjusted for opportunity rent)</td>
<td>265.5</td>
</tr>
<tr>
<td>Additional public revenues</td>
<td>1,440</td>
</tr>
<tr>
<td>Improved quality of life of environment of gamblers</td>
<td>11.4</td>
</tr>
<tr>
<td>Technology</td>
<td>?</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,095.6</strong></td>
</tr>
</tbody>
</table>

Figures in million Euro per year
## Welfare effect: balancing of costs and benefits

<table>
<thead>
<tr>
<th>Welfare effect</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect rationality, excluding intangible costs/benefits</td>
<td>+511.7</td>
<td>-410.6</td>
<td>1,331.4</td>
</tr>
<tr>
<td>Perfect rationality, including intangible costs/benefits</td>
<td>-1,500.7</td>
<td>-4,515.5</td>
<td>-7,526.8</td>
</tr>
<tr>
<td>Bounded rationality, excluding intangible costs/benefits</td>
<td>-3,555.8</td>
<td>-6,978.8</td>
<td>-10,397.6</td>
</tr>
<tr>
<td>Bounded rationality, including intangible costs/benefits</td>
<td>-1,110.4</td>
<td>-2,045.1</td>
<td>-2,977.9</td>
</tr>
</tbody>
</table>

Figures in million Euro per year
Welfare effect differs strongly per segment

- Lotteries
- Private slot machines
- State slot machines
- Casino table games
- Betting
- Online casinos
- Card games (Poker)
- Other

Welfare effect in mil. €

- WE rational gamblers in mil. €
- WE rational gamblers in mil. € (w/o intangible)
- WE bounded rational gamblers in mil. €
- WE bounded rational gamblers in mil. € (w/o intangible)
Calculations are conservative

- For each cost type the lower cost estimate was used, if no exact calculation was possible
- Some important costs were not be quantified
  - Follow-up costs associated crime: organized crime, money laundering, match fixing
  - Increased regresiveness due to redistribution
  - Costs caused by lobbying and corruption
  - Degentrification and loss of real estate values
- Degree of bounded rationality most likely much higher

→ Welfare effect most likely worse than figures show
Limitations to the quantification of the welfare effect of gambling

- Most important costs are intangible
- Intangible costs cannot be measured (Walker 2007, Reith 2007) or are even „Impossible to calculate“ (NGISC 1999)
- (Degree of) causality of some effects unknown, e.g. of induced substance disorders
- Insufficient data base on many cost types

→ Are there a simple and practical second-best solutions?
Two shortcuts for the evaluation of gambling (segments)
Example: the market for sports betting

£ 0.5% of the population creates 80% of the market
£ Are those intense gamblers just rich? Or are they addicted?
Shortcut 1: Share of revenues derived from problem gamblers

• The more addictive a game segment, the worse is the effect on welfare
• Problem gamblers play
  ➢ More often
  ➢ More intensely
  ➢ Longer than recreational gamblers

→ Problem gamblers spend much more money per head than recreational gamblers

• Share of revenues derived from problem gamblers as an indicator for the welfare effect of a game segment

\[
X = \frac{\text{Share probl. Gamblers} \times \text{multiplier}}{\text{Share probl. Gamblers} \times \text{multiplier} + \text{share recre. gamblers} \times 1}
\]
Shortcut 2: Industry revenues per problem gambler

• Variable 1) Industry earnings
• Variable 2) Number of addicts
• Ratio: Industry earnings/number of addicts to evaluate different games
• Interpretation
  ➢ How much earnings are needed to accept one addict?
  ➢ Ranking of games by the earnings which can be generated until one addict arises (on average)

\[
X = \frac{\text{Revenues in } \text{€}}{\text{Number of attributed problem gamblers}}
\]
Results: share of revenues with problem gamblers and revenues per problem gambler

<table>
<thead>
<tr>
<th>Game segment</th>
<th>Share of revenues with PG</th>
<th>Revenues per PG (Scenario B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private slot machines</td>
<td>79.7%</td>
<td>€13,477 – €20,367</td>
</tr>
<tr>
<td>State-owned slot machines</td>
<td>75.0%</td>
<td>€8,435 – €24,131</td>
</tr>
<tr>
<td>Online casinos</td>
<td>53.0%</td>
<td>€14,545 – €54,545</td>
</tr>
<tr>
<td>Casino table games</td>
<td>26.3%</td>
<td>€4,608 – €16,818</td>
</tr>
<tr>
<td>Sport and horse betting</td>
<td>21.9%*</td>
<td>€11,159 – €18,589</td>
</tr>
<tr>
<td>Lotteries</td>
<td>14.3%</td>
<td>€157,000 – €236,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>47.0%</strong></td>
<td><strong>€24,131</strong></td>
</tr>
</tbody>
</table>

Most likely an underestimate due to recent increase in sports betting adoption

**Attention:** Shortcuts are relative measures, welfare effect is absolute!
Is there room for improvement by regulation?

- Most forms of gambling cause more costs than benefits
- Negative welfare effect does not necessarily mean there is room for improvement by regulation
  - New regulation could worsen the situation, e.g., a prohibition which leads to a thriving black market
- Room for improvement by regulation, if
  - Regulatory intervention is not coherent with the welfare effect of a gambling segment
  - Regulatory intervention is not focused on reducing the main driver of costs: addiction
Discussion