

Economic Welfare Evaluation of Gambling Behavior

Glenn W. Harrison, Morten I. Lau*,
Don Ross and J. Todd Swarthout

*Copenhagen Business School

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Introduction

- What do we mean by disordered gambling?
 - People that are bad for business?
 - People that should clinically present for treatment?
 - People that suffer economic welfare losses from gambling?
- Prevalence of disordered gambling in DK
 - Our study with FLAGS: 2.6% indicated problem gambling (PG), 2.6% indicated advanced risk, ..., and 87.6% indicated no risk
 - Ekholm et al. [2014]. Two-question "DSM" with 0.8-0.9% PGs
 - Bonke and Borregaard [2009]. NODS with 0.3% PGs

How would economists evaluate welfare?

- Consumer surplus:
 - What do we mean by consumer surplus?
 - Comparison of willingness to pay and cost
 - We focus on certainty equivalents of lotteries (that may vary across decision models)
- Insurance:
 - You pay a premium to avoid income variability
 - You buy the insurance if you are sufficiently risk averse
- Slot machines:
 - You pay a price to play a lottery with a positive house take
 - You should not make the bet if you are risk averse and have correct subjective beliefs about odds

Our overall design



DK Survey

DK Field
Experiment

US Lab
Experiment

Danish field sample

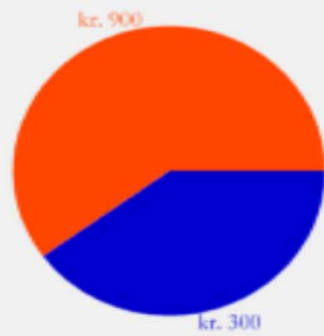
- DK prevalence survey:
 - 8,405 respondents (response rate was 12.8%)
 - Focus on FLAGS measure of problem gambling (we also did DSM and PGSI)
 - Population prevalence rates are corrected for sample weights and sample selection into survey
- Recruitment:
 - Invited all respondents in survey who indicated intermediate or higher risk of problem gambling
 - Eight sessions took place in Copenhagen, with two additional sessions in Jutland (Aarhus and Kolding)
 - Final sample of 217 subjects in DK field experiments (response rate into experiment was 11.4%)

Population and sample distributions of FLAGS

FLAGS Risk Level	Population	Sample
No Detectable Risk	87.6%	79.7%
Early Risk	5.4%	12.0%
Intermediate Risk	1.7%	3.9%
Advanced Risk	2.6%	3.3%
Problem Gambler	2.6%	1.1%

Eliciting risk aversion

Venstre

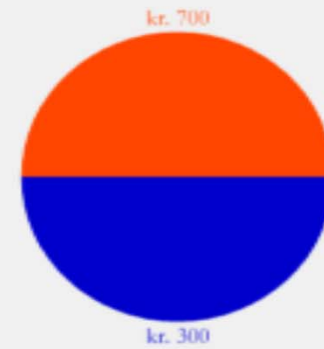


Chancen for at vinde kr. 300 er 40%

Chancen for at vinde kr. 900 er 60%

Vælg venstre

Højre



Chancen for at vinde kr. 300 er 50%

Chancen for at vinde kr. 700 er 50%

Vælg højre

Risk preference tasks

- Experimental design:
 - 60 tasks with choices over two lotteries
 - Each lottery has up to four outcomes
 - Outcomes range from 150 to 4,680 kroner
 - One task and one lottery was randomly chosen for payment
 - Average earnings in risk preference tasks was 1,272 kroner
- Decision theories considered
 - Expected utility theory
 - Flexible two-parameter utility function
 - Rank-dependent utility theory
 - Dual theory

Fraction of Subjects across Winning Models

Log-Likelihood Metric



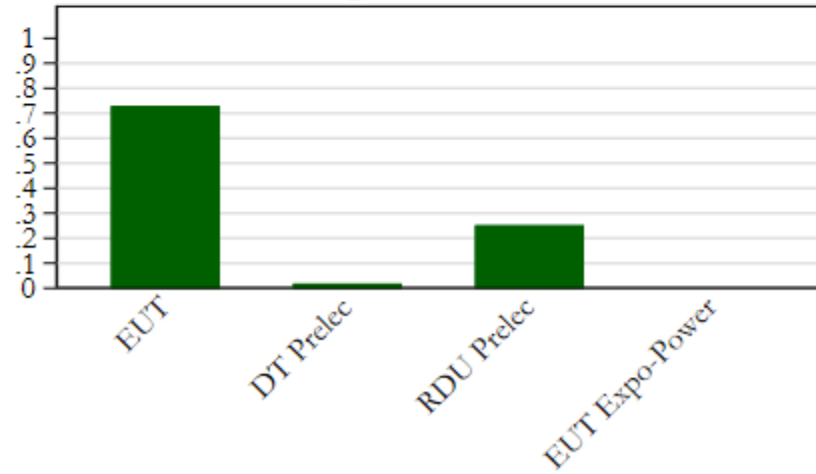
10% Significance Level



5% Significance Level



1% Significance Level

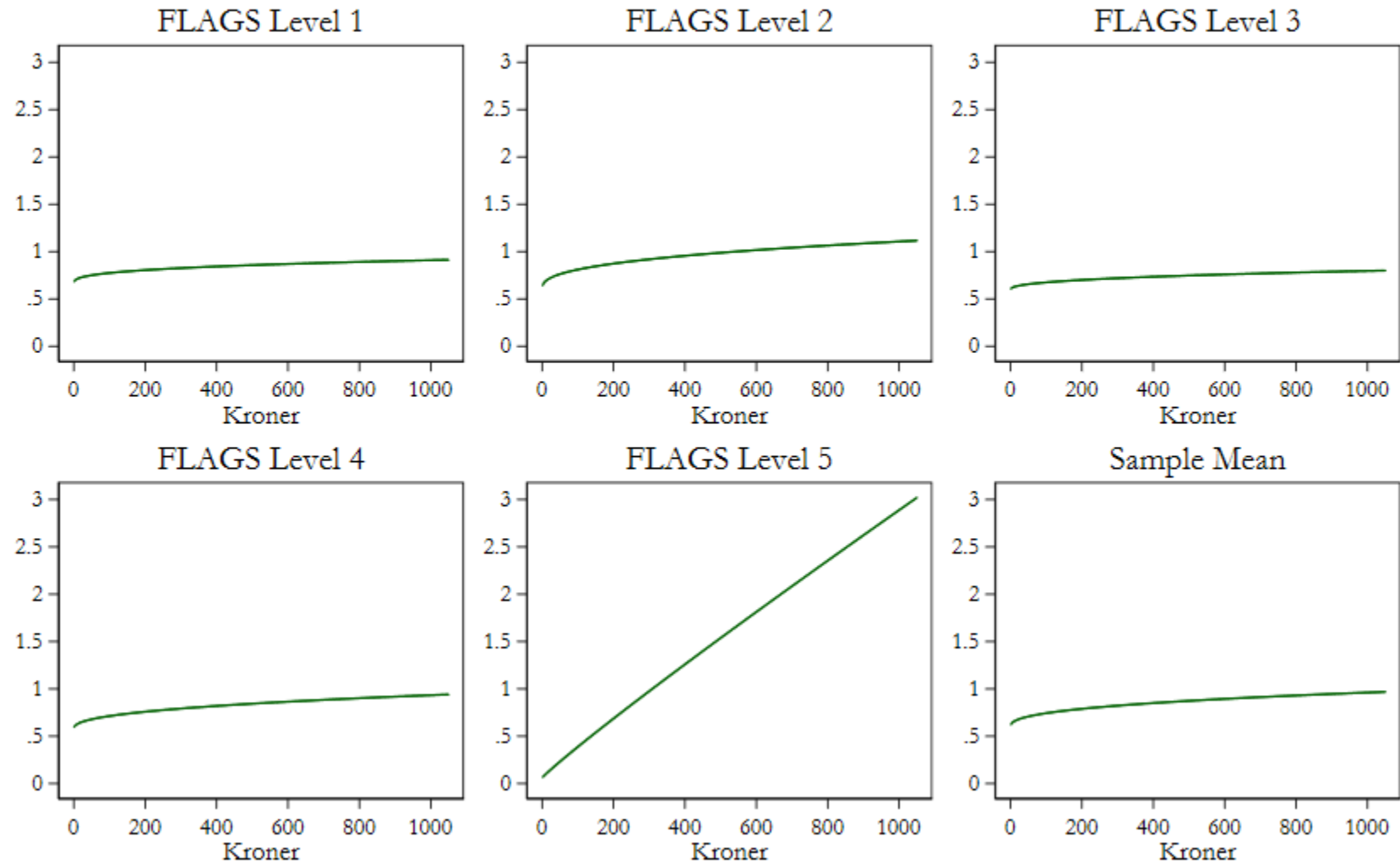


FLAGS risk level and winning model

FLAGS Risk Level (N)	DT Prelec (%)	EUT (%)	RDU Prelec (%)
No Risk (60)	3.33	61.67	35.00
Early Risk (54)	1.85	64.81	33.33
Intermediate Risk (33)	3.03	72.73	24.24
Advanced Risk (52)	0.00	71.15	28.85
Problem Gambler (18)	0.00	55.56	44.44

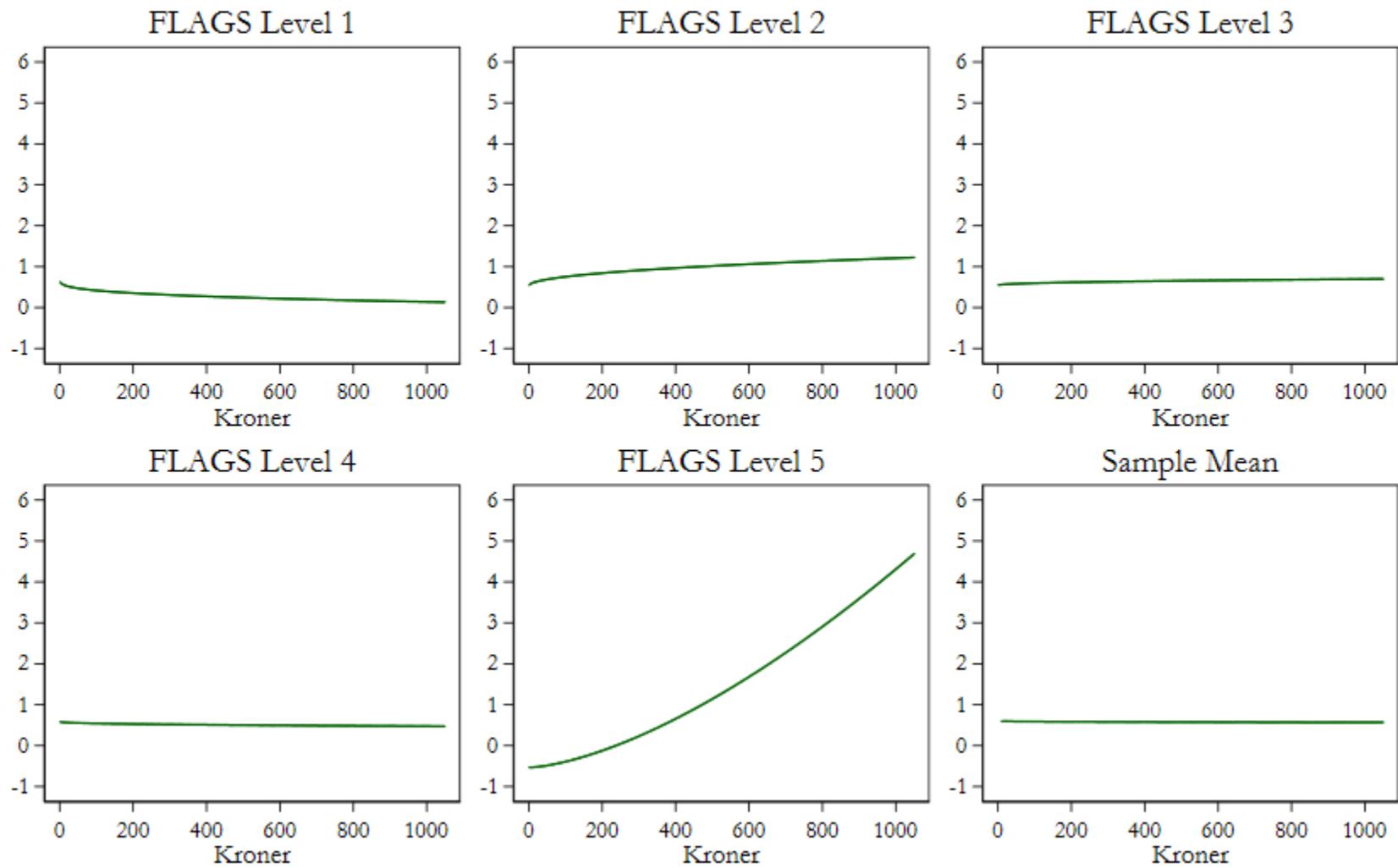
DK Gambling Risk Preferences

EUT: Relative Risk Aversion



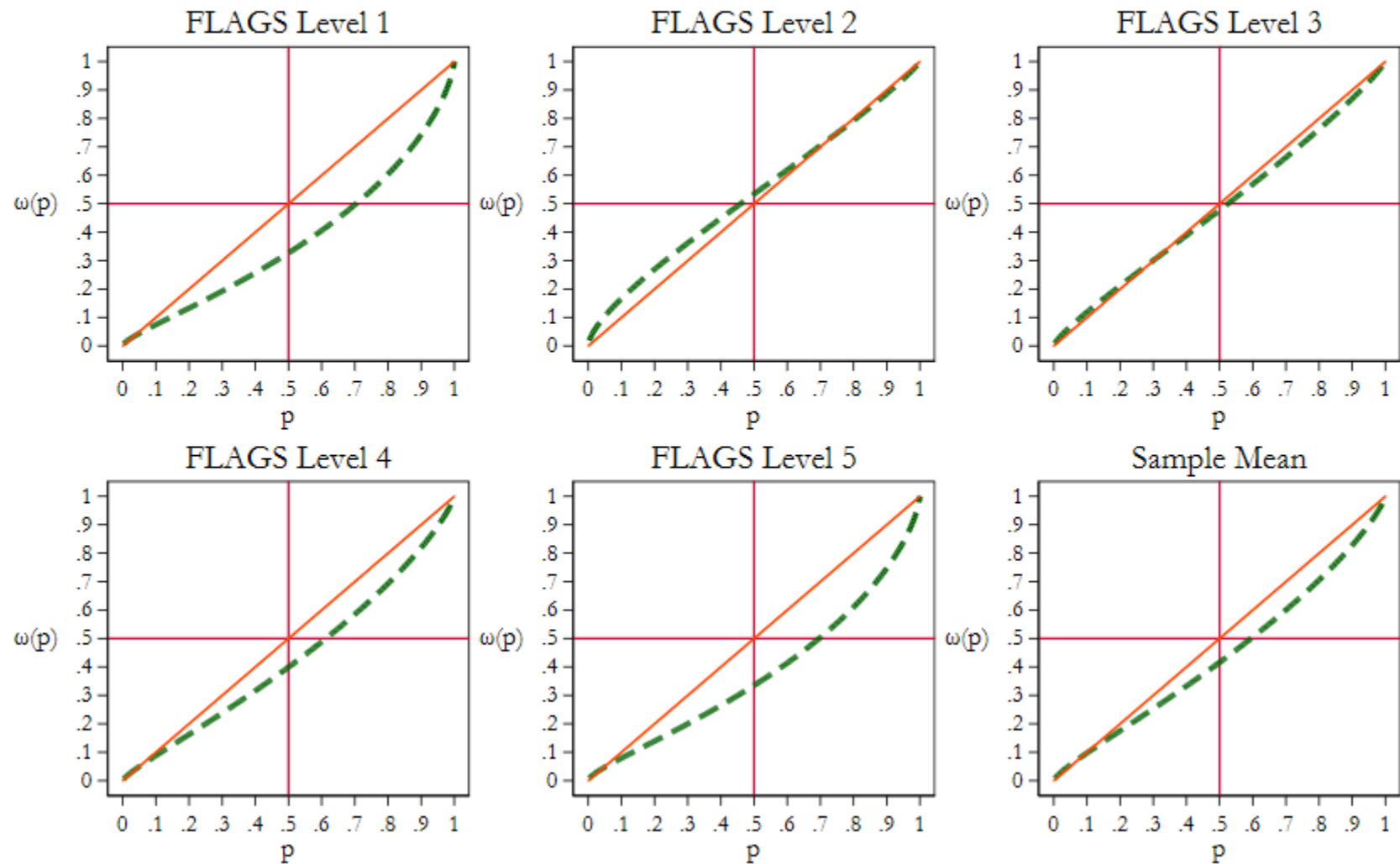
DK Gambling Risk Preferences

RDU: Relative Risk Aversion



DK Gambling Risk Preferences

RDU: Probability Weighting



Evaluating gambling choices

Your credits: \$16.25
Your earnings: \$55.25





Paylines +
Paylines -





Bet per payline: \$0.75
Total bet: \$3.75

Bet +
Bet -

Spin

Result: Any 3 Symbols Any 3 Bars
Payout: \$5.25

Spillelinje	Indsats 1	Indsats 2	Indsats 3
<p>3 x Double 7</p> 	500	1,000	1,500
<p>3 x Single 7</p> 	200	400	600
<p>3 x alle 7</p> 	75	150	225
<p>3 x Triple Bar</p> 	40	80	120

<p>3 x Double Bar</p> 	20	40	60
<p>3 x Single Bar</p> 	10	20	30
<p>3 x alle Bar</p> 	5	10	15
<p>3 x alle symboler</p> 	2	4	6

Gambling treatments

- House credit:
 - Initial house credit was 150 tokens (1 token = 1 kroner)
 - Average number of spins from house credit was 24
 - Average earnings from house credit was 244 kroner
 - Min earnings was 48 kroner and max earnings was 1,832 kroner
 - Belief elicitation tasks on expected earnings from next spin
- Gambling with own money:
 - Earnings from risk preference task is carried over to gambling task (not including recruitment fee of 500 kroner)
 - Earnings from house credit is added
 - 61 subjects (28%) chose to gamble with own money

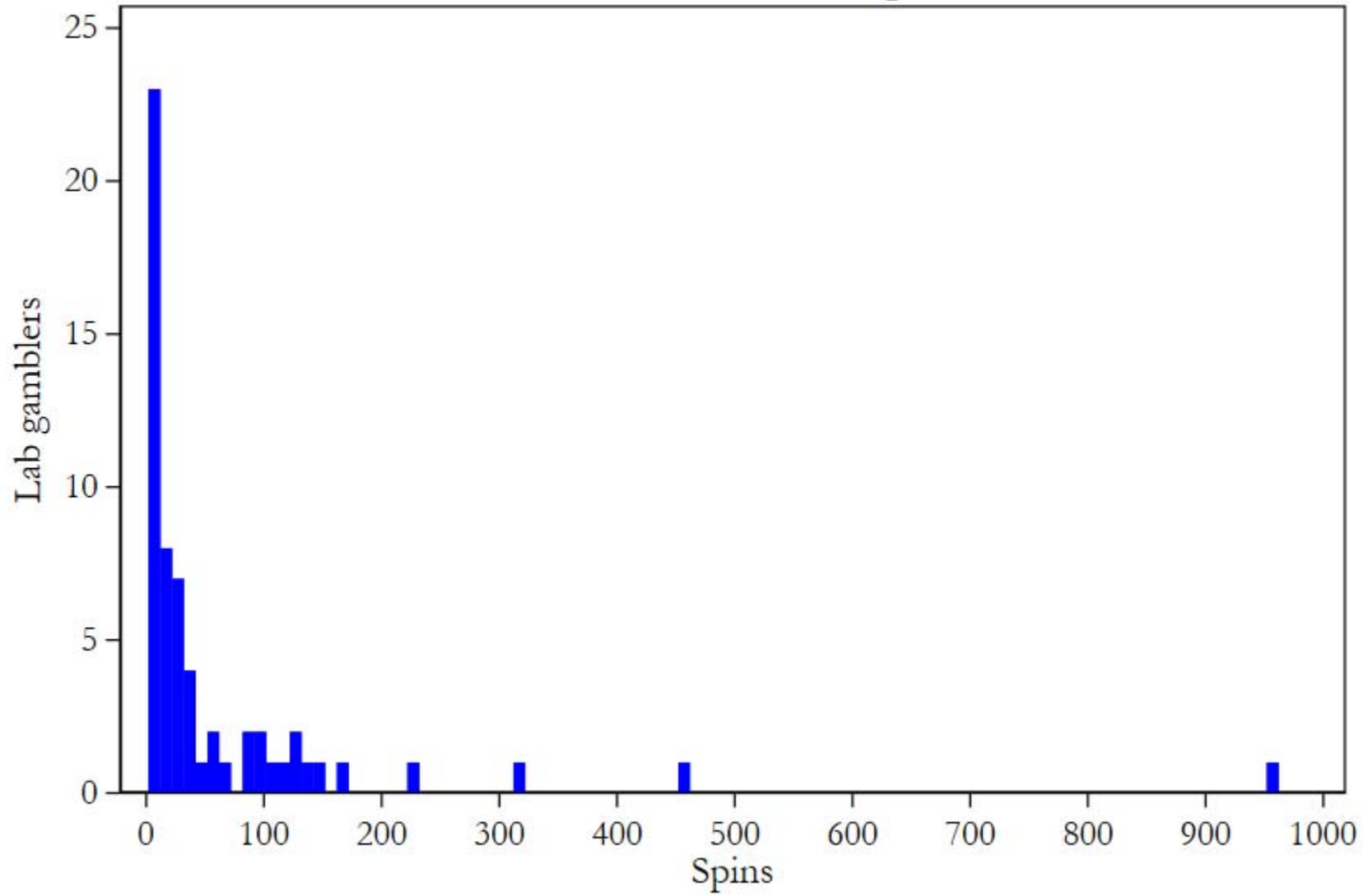
FLAGS risk level and gambling in the lab

FLAGS Risk Level (N)	No Gambling (%)	Gambling (%)
No Risk (60)	66.7	33.3
Early Risk (54)	70.4	29.6
Intermediate Risk (33)	75.8	24.2
Advanced Risk (52)	73.1	26.9
Problem Gambler (18)	83.3	16.7

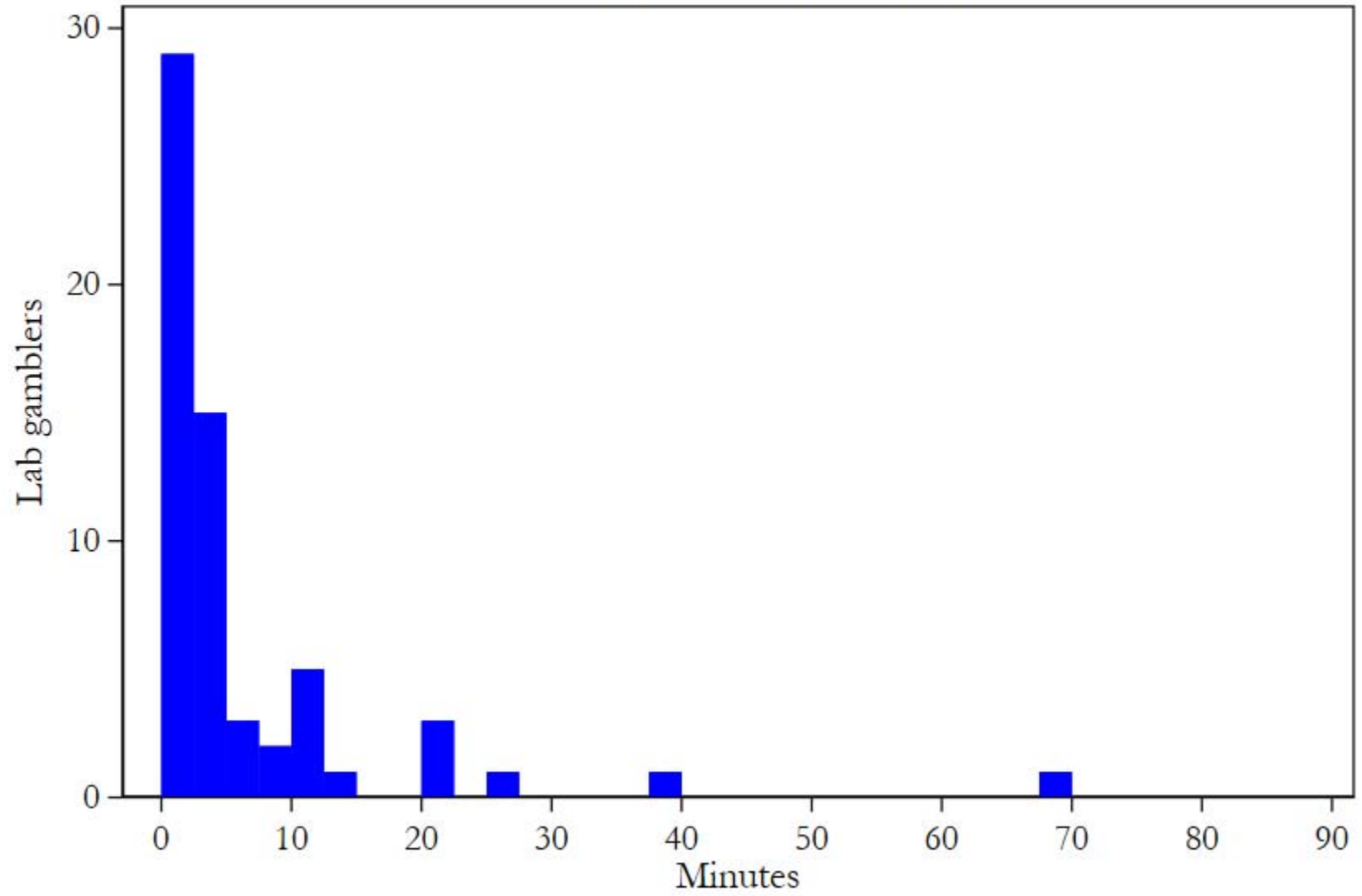
Gambling behavior

- Gambling in the lab
 - Average number of spins from real bets was 19
 - Average earnings from real bets was 9.4 kroner
 - Min earnings was -442 kroner and max earnings was 1,116 kroner
- Extent of gambling?
 - Time on machine (number of spins and actual time)
 - Gambling volume (total bet)
 - Gambling patterns (bet per spin)
 - Economic welfare?

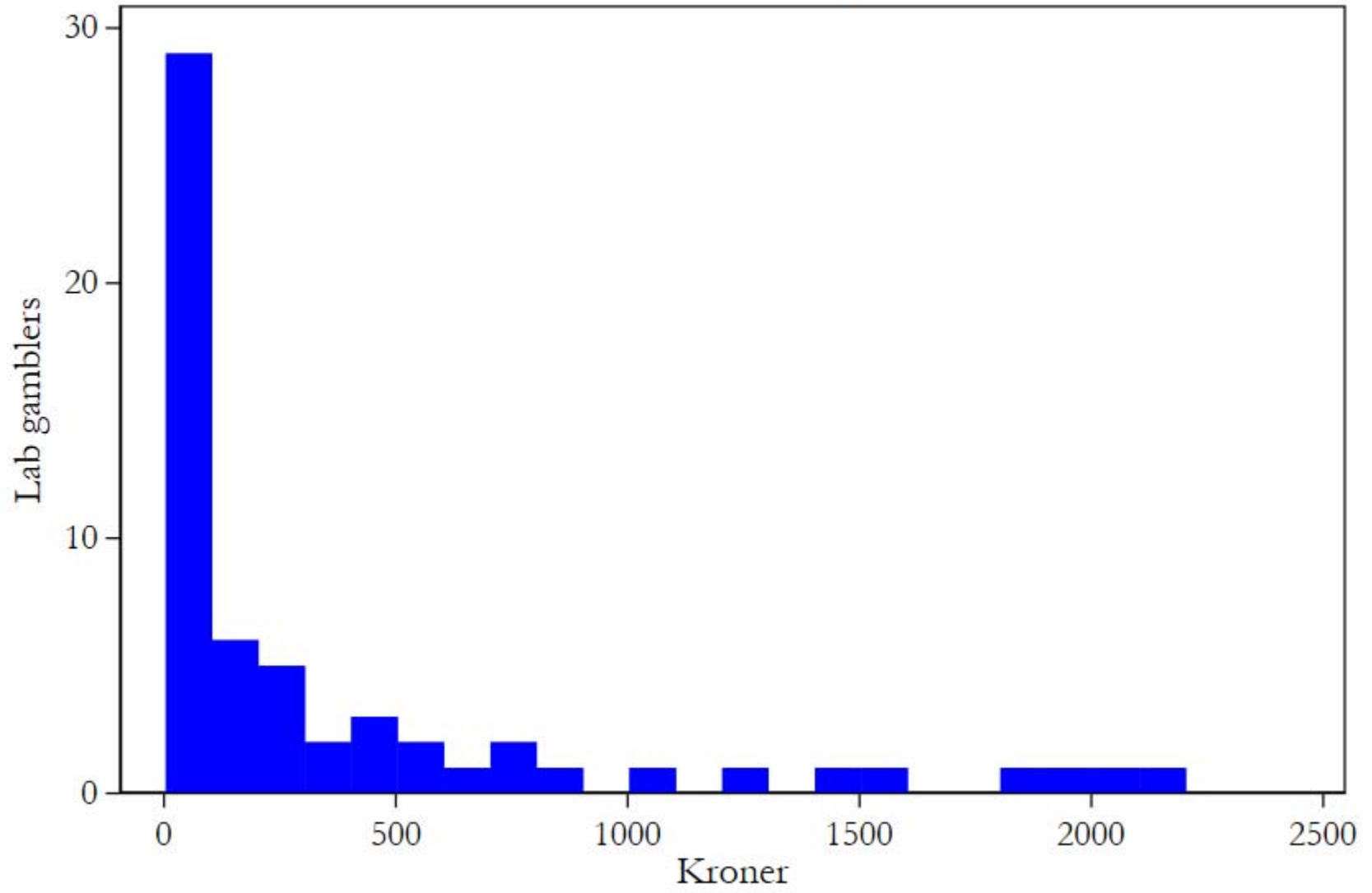
Time on Machine: Spins



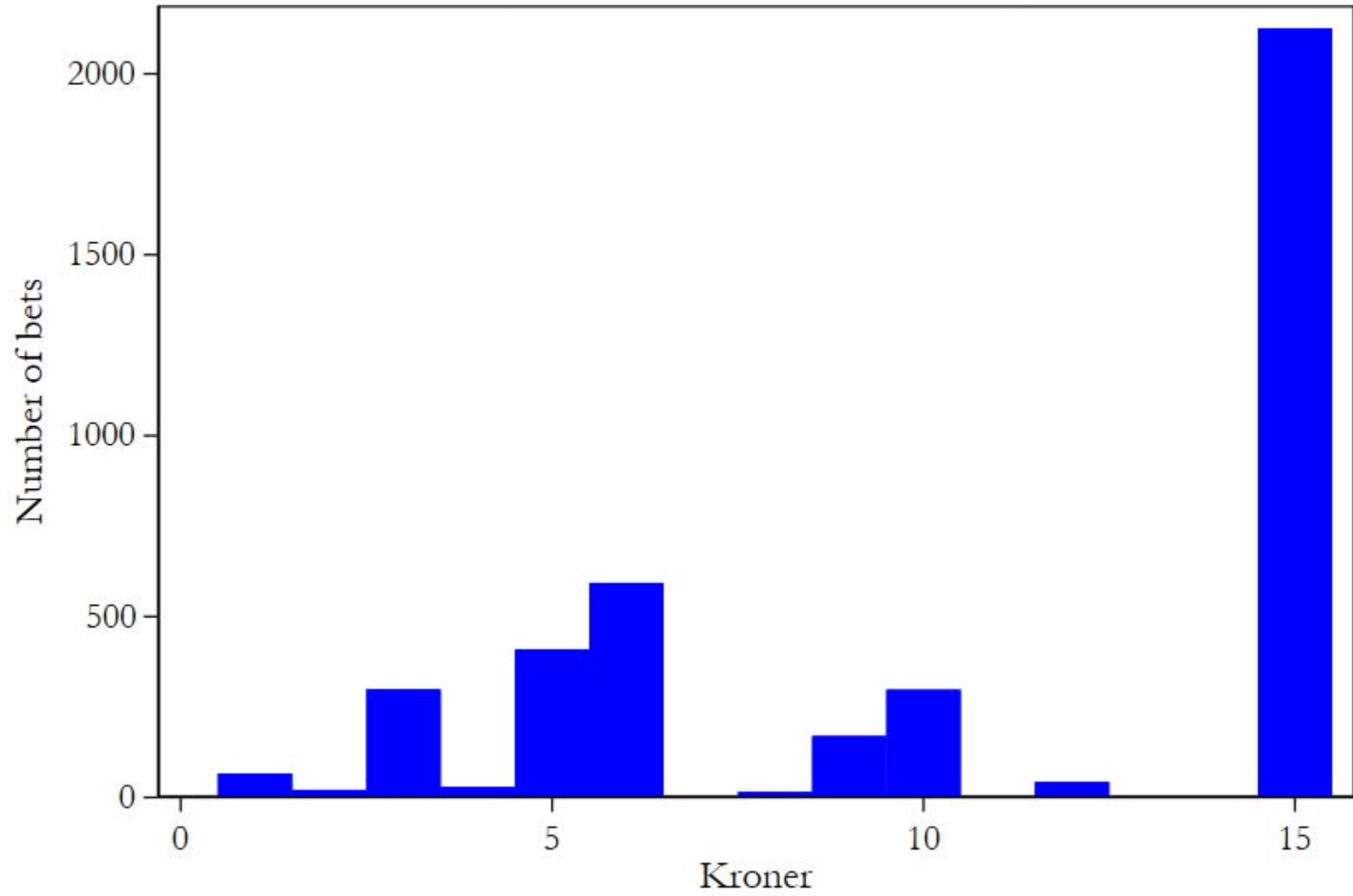
Time on Machine: Minutes



Total Bet on Machine



Distribution of Bets on Machine



Measuring economic welfare

- Certainty equivalents of lotteries on slot machine
 - Expected value of lottery is 0.93 per 1 kroner bet
 - Derive certainty equivalent of lottery based on estimated coefficients in (winning) decision model
 - Initially assume correct beliefs about odds
 - Economic welfare = certainty equivalent – bet
- Welfare comparisons
 - Welfare effects across FLAGS levels
 - Decision models (utility and probability weighting functions)
 - Subjective beliefs *vs* actual probability distribution of outcomes

Conclusions

- Summary
 - Characterize non-gamblers and gamblers in terms of risk preferences to look at welfare effects from gambling
 - Substantial differences in risk preferences between problem gamblers and others
 - Observe some gambling on slot machine in the lab
- What next?
 - Subjective beliefs data on slot machine outcomes
 - GSU lab experiments to look at near misses, variation in stakes (nickels and dimes), and perfect information on payable