On Information and the Demand for Insurance

Amit Gandhi[1] Anya Samek[2] Ricardo Serrano-Padial[3]

[1]UPenn [2]USC [3]Drexel

NBER-SI/IO 2020

Motivation

- Choice under risk sensitive to info frictions *about underlying risks*
  - ambiguous or imprecise information about risks
  - complex or compound risks
- Demand for insurance determined by joint distribution of risk and info attitudes, underlying risks and information frictions
- Potential source of asymmetric information: insurers' increasing ability to assess risks (*InsurTech*)
- Empirical work on insurance (risk preference estimation, demand analysis)
  1. abstracts from informational effects
     - agents 'reduce information' to a distribution over outcomes that...
     - coincides with their actual underlying risk distribution

     or...
  2. assumes information frictions are independent of risk attitudes

Goals

1. Understand relationship between risk, risk preferences and info attitudes
   - Two large scale surveys using representative sample of US households
     - Information environments: simple and ambiguous/compound risks
     - Elicit WTP for insurance
   - Measure info effects on demand: level and selection effects
2. Evaluate impact of info frictions on insurance markets
   - Different pricing and competition scenarios
   - Focus on implications for
     - welfare
     - risk preference estimation
     - information disclosure

Related Literature

Demand for Insurance

- Binary risk $x \in \{0, 1\}$: $p = Prob(x = 0)$, $I =$ information about p
- WTP for insurance under I: $W(I) = \underbrace{p}_{\text{risk}} + \underbrace{\mu(p)}_{\text{risk premium}} + \underbrace{\mu(I)}_{\text{info premium}}$
- Measure demand components by eliciting WTP in two info scenarios
  - A. No info frictions ($I = p$): $\mu(p) = W(p) - p$ (*simple risk*)
  - B. Info frictions: $\mu(I) = W(I) - W(p)$
    - *ambiguous risk*: $I =$ set of possible p
    - *compound risk*: $I =$ distribution over possible p
- Exogenously vary p and I to analyze behavior of $\mu(p), \mu(I)$
- Derive distribution of p from claim frequencies to measure demand effects
  - level effect: $\mathbf{1}_{W(I) \geq \rho}$ vs. $\mathbf{1}_{W(p) \geq \rho}$ $(\rho = price)$
  - selection effect: $(p, \mu(p)) \big| W(I) \geq \rho$ vs. $(p, \mu(p)) \big| W(p) \geq \rho$

Survey Design: UAS Panel

1. Incentivized: $n = 4442$, 10 decisions, BDM mechanism, RLA screenshot

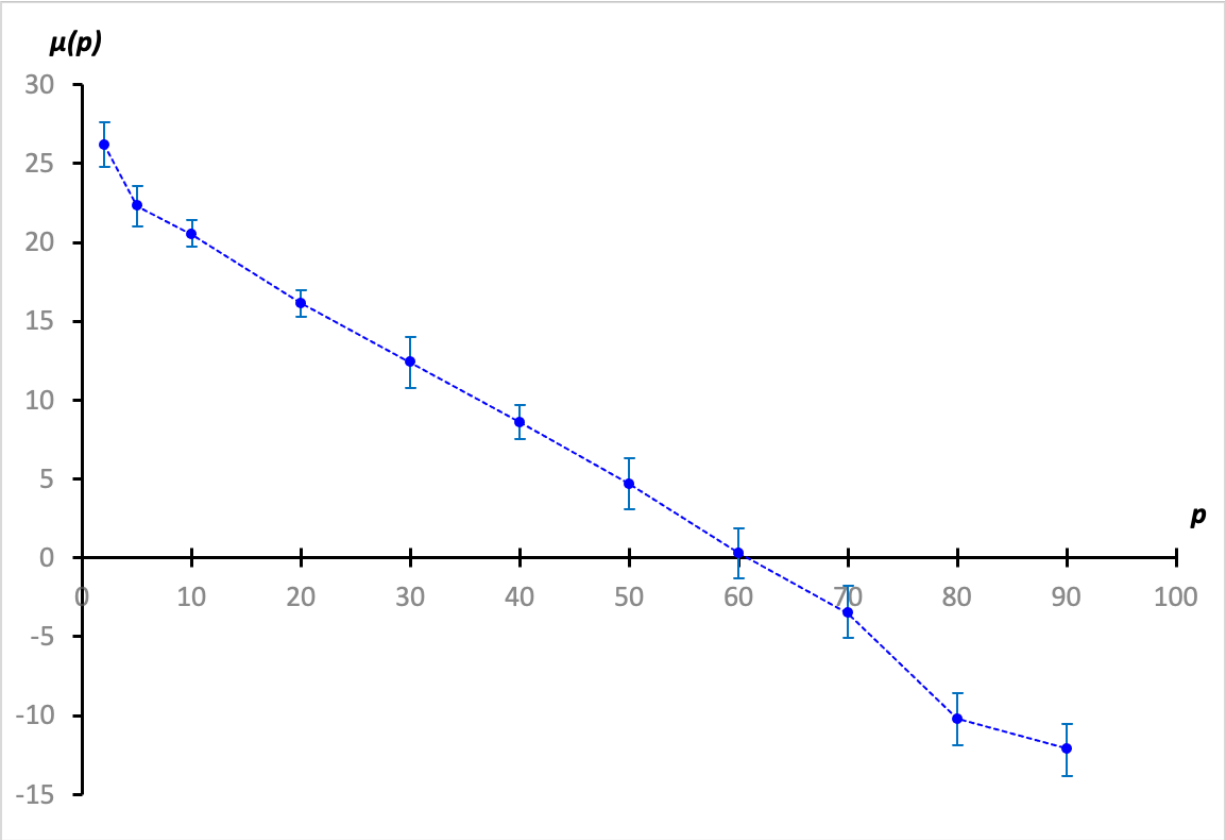
- Two info scenarios for each p: *simple info* ($I = p$) and either *uniform range* ($I = U[p - \varepsilon, p + \varepsilon]$) or *ambiguous range* ($I = [p - \varepsilon, p + \varepsilon]$)

Group	Decision	p	Range
1	1	5	3-7
	2	10	1-19
	3	20	13-27
	4	50	46-54
	5	80	68-72
2	1	5	1-9
	2	10	3-17
	3	20	18-22
	4	40	28-52
	5	70	61-79

Group	Decision	p	Range
3	1	2	1-3
	2	10	6-14
	3	20	8-32
	4	40	38-42
	5	90	83-97
4	1	2	0-4
	2	10	8-12
	3	20	16-24
	4	30	21-39
	5	60	48-72

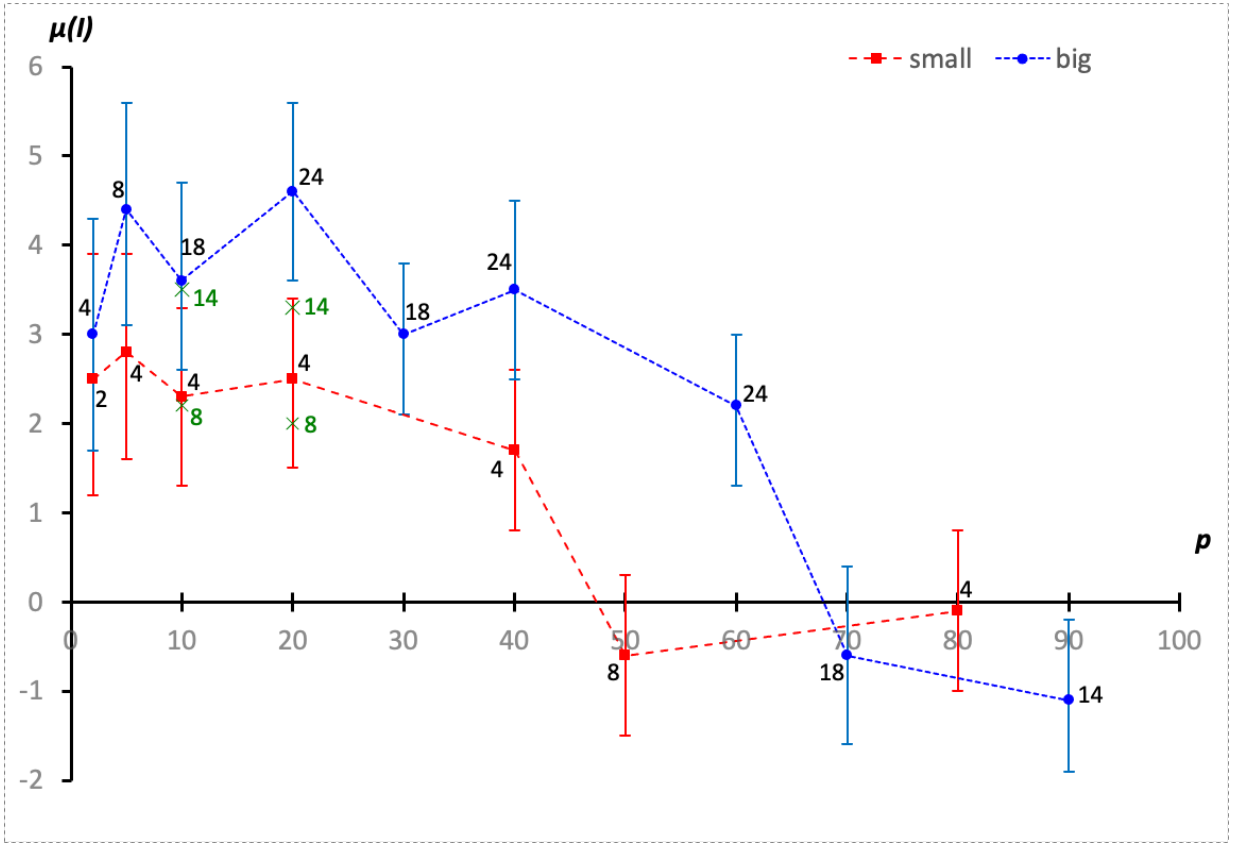
2. High stakes: $n = 5319$, 2 decisions, \$5,000 loss, hypothetical screenshot

Results: Risk Premium



- Wide heterogeneity: $\sigma \in [25, 30]$
- Decreasing $\mu(\cdot)$ mitigates adverse selection
- Lower $\mu(\cdot)$ in high stakes survey, also decreasing high stakes
  - Risk premia correlated across surveys (corr$= 0.39$, $n = 1032$)

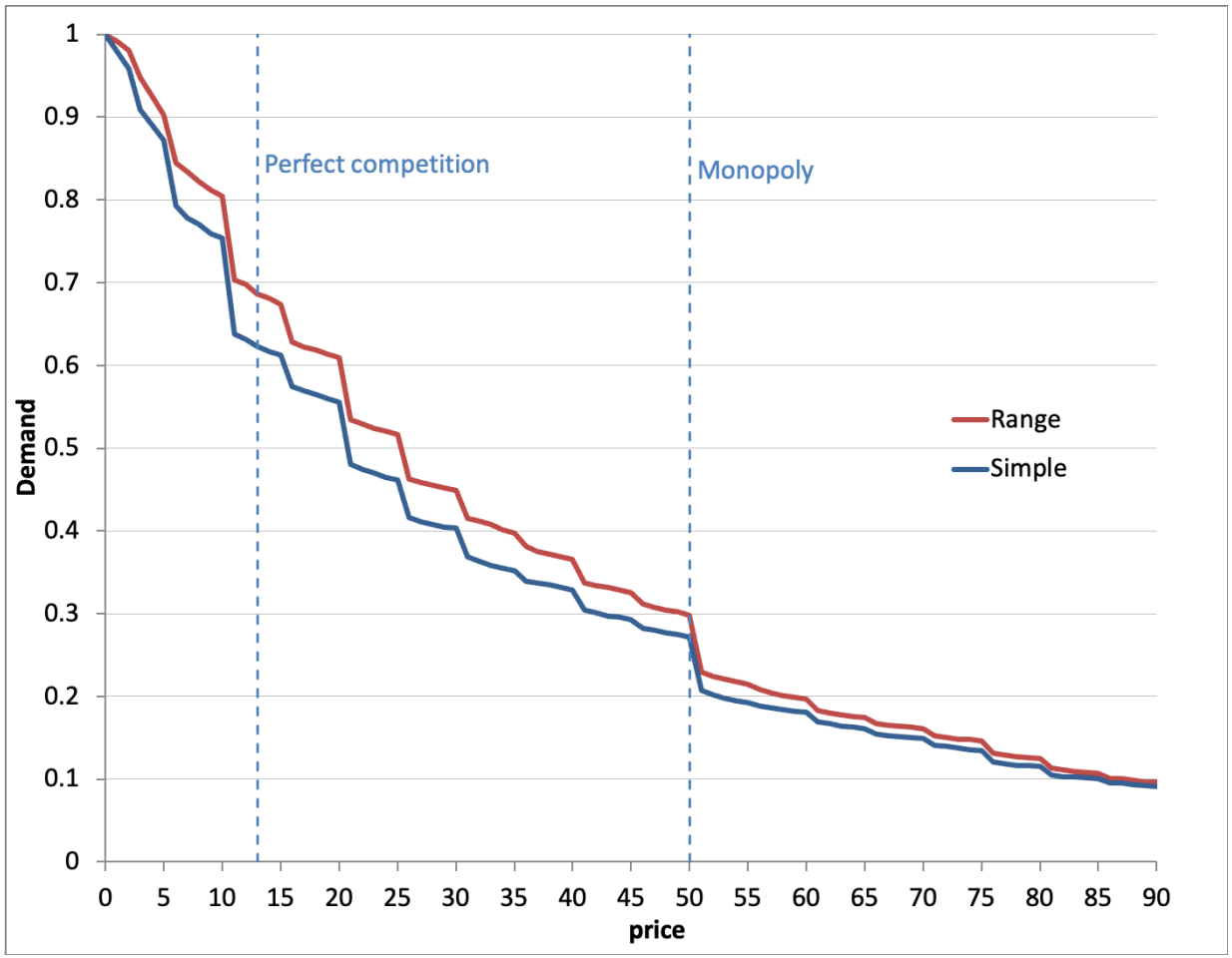
Results: Information Premium



- Less heterogeneous than risk premium ($\sigma \in [14, 20]$), similar for ambiguous range
- Decreasing $\mu(I)$ w.r.t. p mitigates adverse selection
- $\downarrow$ under high stakes (smaller drop than in risk premium) high stakes

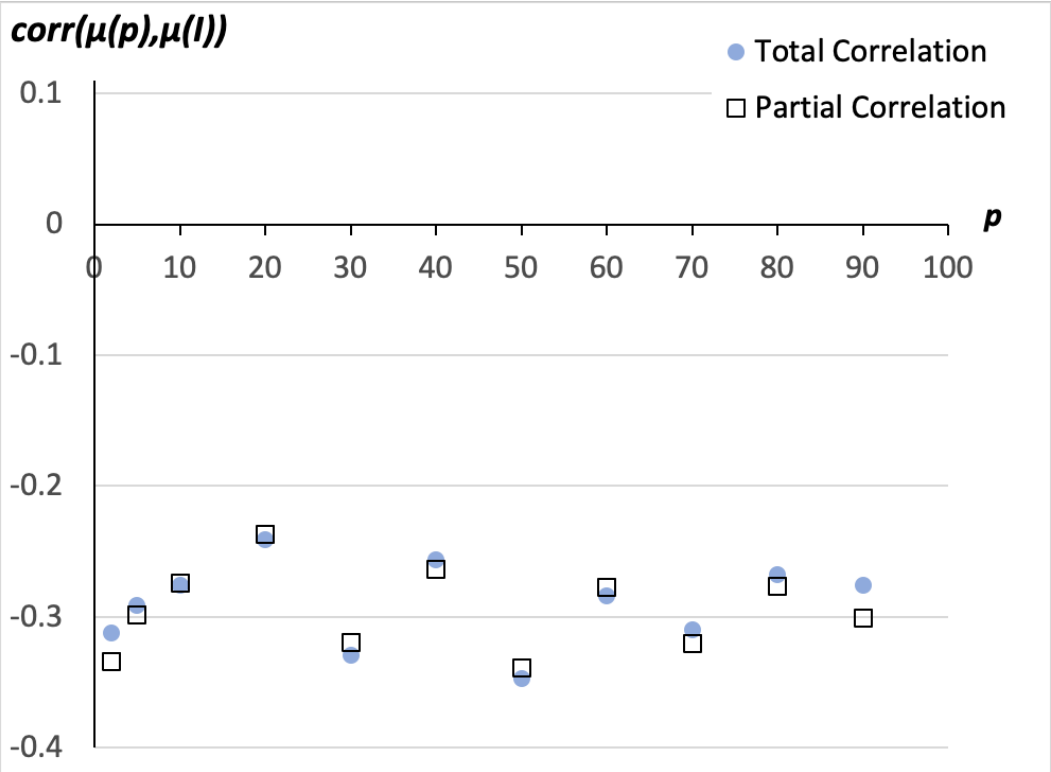
Demand (uniform price): Level Effect

- Aggregate demand about 10% higher under compound/ambiguous risks



Risk distribution

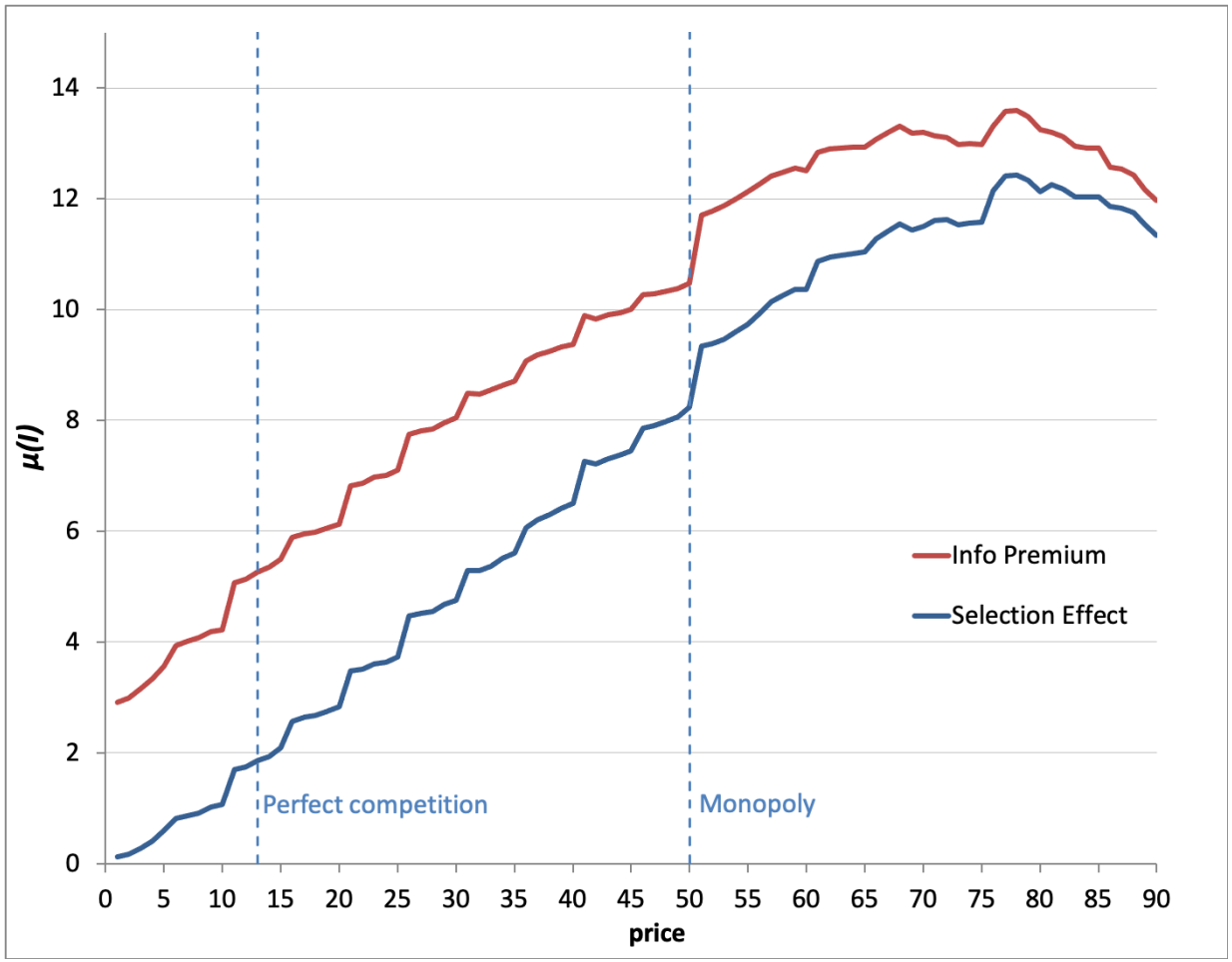
Results: Correlation Risk and Info Premium



- Robust to measurement error ORIV estimates
- Replicated in
  - high-stakes survey Correlation-high stakes
  - lab experiment Correlation-Lab experiment
  - existing experimental data Correlation - existing data

Demand (uniform price): Selection Effect

- Risk premium ↑ under simple risks, difference ↑ with price
- Selection effect $= \bar{\mu}_{aligned}(p) - \bar{\mu}(p)$ keeping demand level fixed



Market Equilibrium

	Whole Population	Perfect Competition		Monopoly	
		Simple	Compound	Simple	Compound
Insured Pool					
Share of Population	100%	62.3%	68.6%	27.2%	29.8%
Risk Probability	9.6%	12.8%	12.1%	15.6%	15.0%
Risk Premium	22.1	34.5	29.9	58.5	48.3
Info Premium	2.8		5.3		10.5
Estimation Bias			17.7%		21.7%
Selection Effect			35.2%		78.6%
Welfare		21.3	19.9	6.6	4.0
Welfare Loss			6.7%		39.4%
Selection Effect			88.4%		95.1%
Corr(risk, coverage)		0.263	0.238	0.238	0.228

- Similar under risk-based pricing Risk pricing and high stakes High stakes
- Strategic information disclosure (monopoly)
  - Risk-based pricing: disclose p only to risky consumers ($p \geq 0.5$)

Conclusions

- Main message: empirical analysis needs to account for
  1. systematic violations of the reduction principle (risk prefs)
  2. risk prefs $\not\perp$ info frictions (selection effects)
  3. risk $\not\perp$ risk and info attitudes (adverse selection, asymmetric info)
- Info frictions about risk have different impact than other frictions
  - $\uparrow$WTP on average, instead of $\downarrow$WTP (e.g., contract complexity)
  - Effect linked to risk profile $\Rightarrow$ insurer info processing advantages (InsurTech) can lead to selective info disclosure to consumers
- Policy recommendation: provide simple information about potential risks to insurance buyers
  - e.g. probability of filing a claim given observables
  - $\uparrow$ adverse selection dominated by selection of risk averse consumers

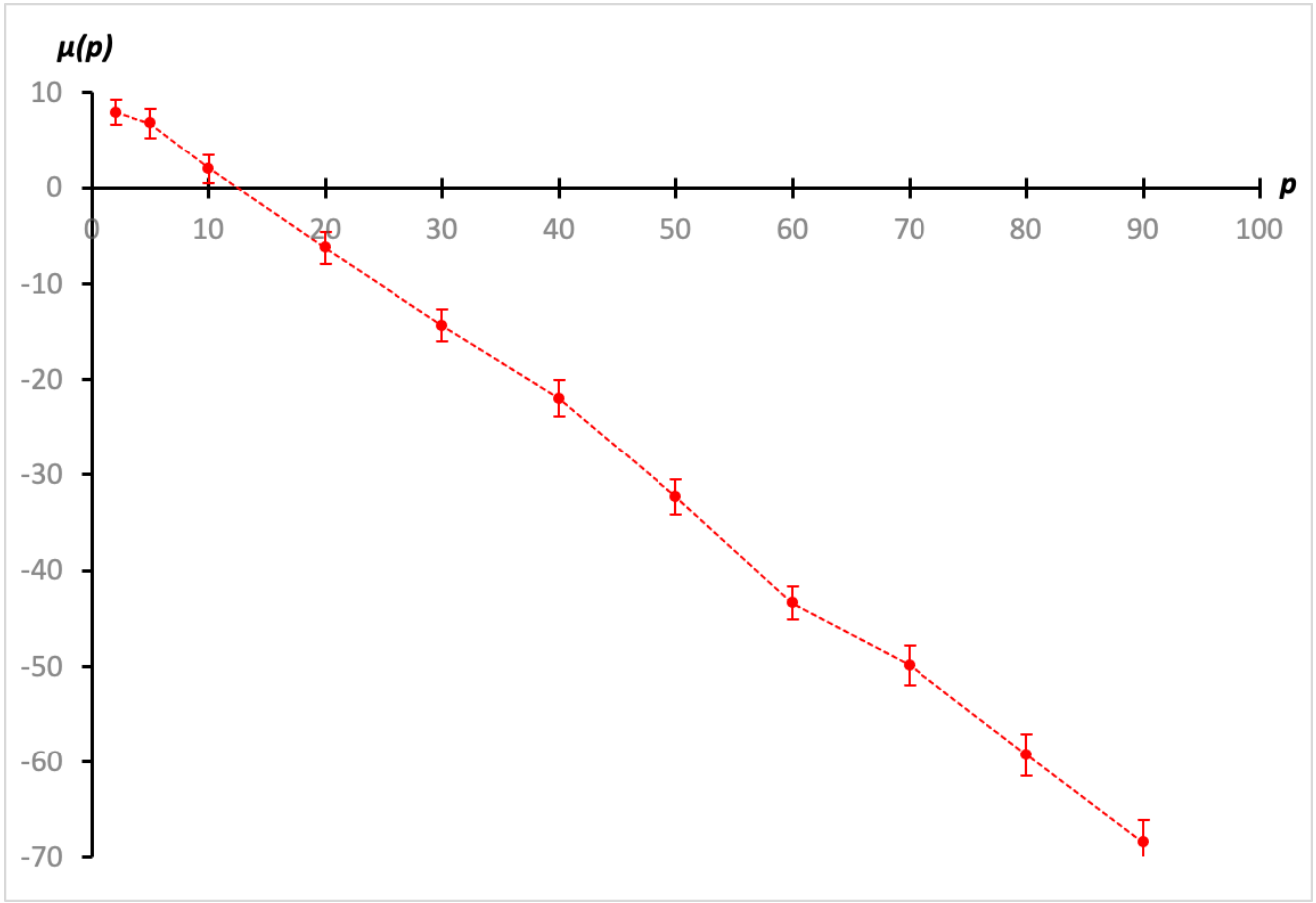
Related Literature

- Info frictions: Handel & Kolstad (2015); Handel, Kolstad & Spinnewijn (2019); Bhargava, Loewenstein & Sydnor (2017); Domurat, Menashe & Yin (2019)
- Selection in markets: Einav, Finkelstein & Cullen 2010; Mahoney & Weyl (2017); Spinnewijn (2017); Jin & Vasserman (2020)
- Risk pref estimation: Barseghyan, Prince & Teitelbaum (2011); Einav, Pascu & Cullen (2012); Sydnor (2010)
- Risk and info attitudes: Halevy (2007); Abdellaoui, Klibanof & Placido (2015); Chew, Miao & Zhong (2017)

Go Back

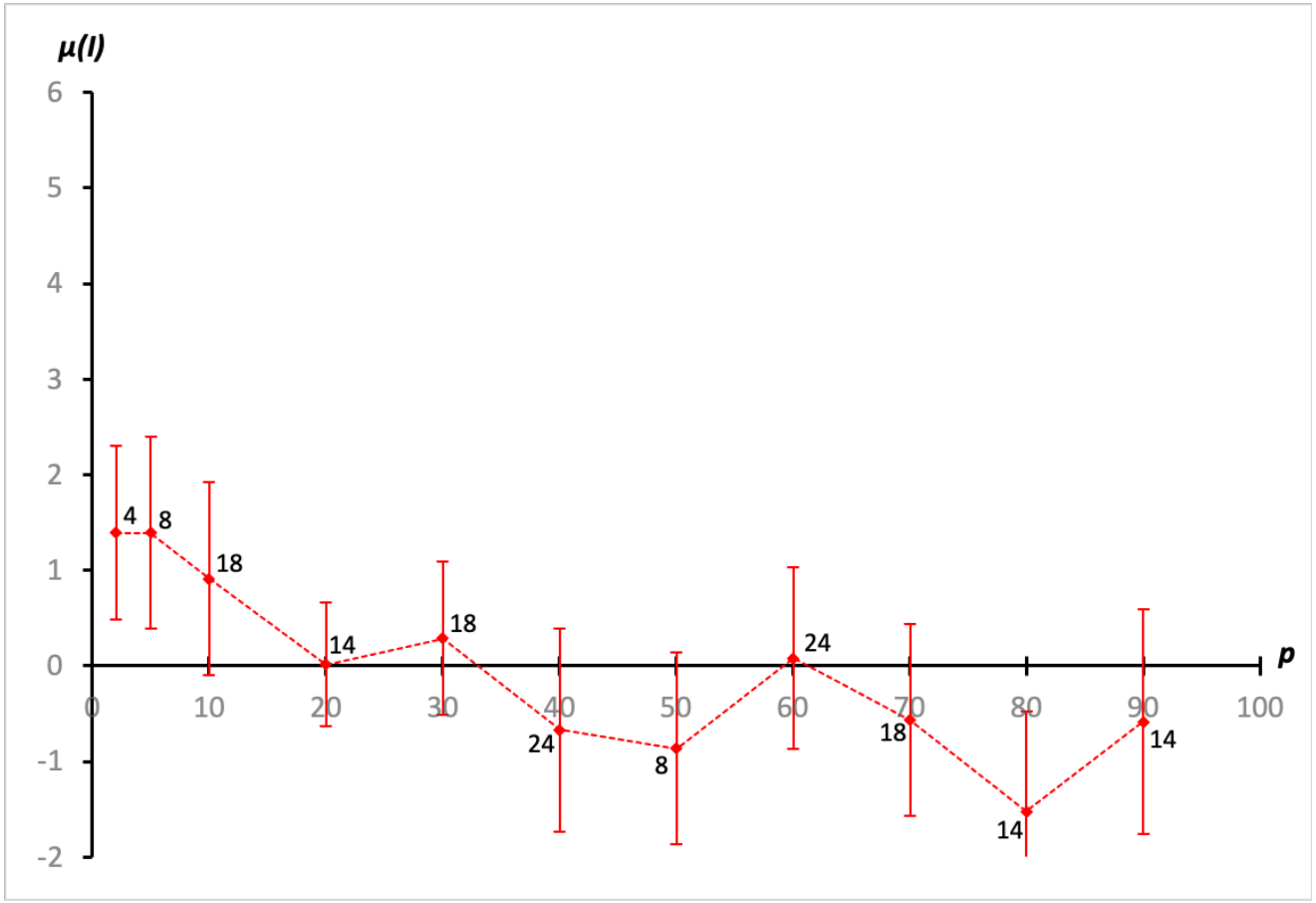
EXTRA SLIDES

Risk Premium - High Stakes



Go Back

Info Premium - High Stakes



Go Back

Risk Distribution

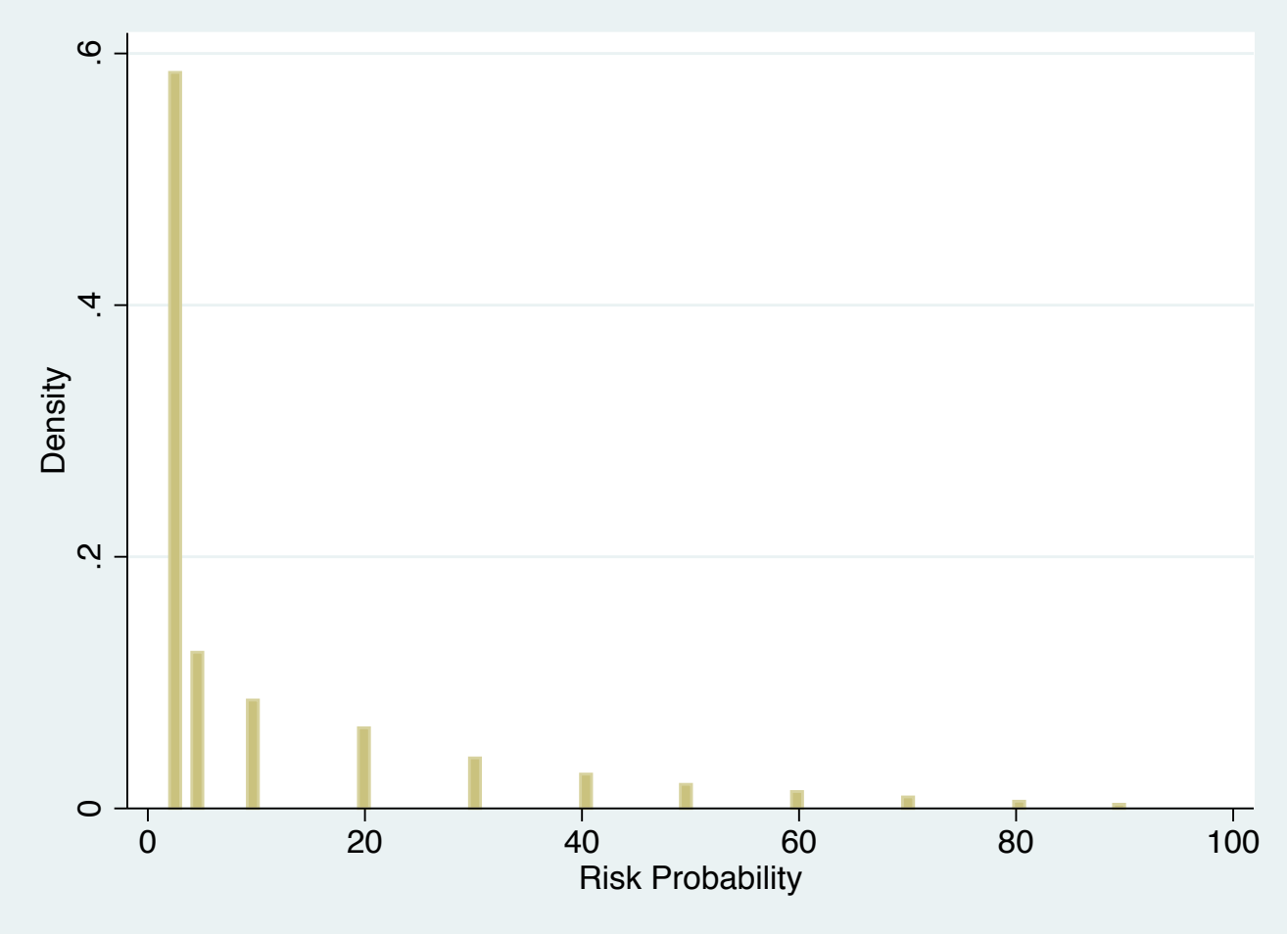


Figure: Distribution of risk probabilities (discretized Gamma).

Go Back

Remember: You can earn up to $10 for this part. The amount you earn depends on the decisions you make, so you should read carefully!

UNCERTAIN DAMAGE RATE: The chance of your machine being damaged is between 3% and 7%. All damage rates in this range are equally likely.

Please move the slider to indicate the maximum amount you are willing to pay for insurance.

Remember, if the amount you are willing to pay is higher than the actual price, then you will pay for insurance at the actual price, whether or not your machine is damaged. Should there be damage, your machine will be replaced and will pay out 100 virtual dollars. If the amount you are willing to pay is less than the actual price, then you will not pay for insurance, but if damage occurs, your machine will not be replaced and will not pay out any money.



If you do not select any price or select a price of 0, we assume you are unwilling to pay for insurance.

<< Back | Next >>

UnderStandingAmericaStudy

You have indicated you are willing to pay **up to 53 virtual dollars** for insurance. If this is correct, please just click 'Next' to continue. Otherwise, please go 'Back' and adjust your answer.

<< Back | Next >>

Go Back

UnderStandingAmericaStudy

Español

Suppose you already bought a used car. After inspecting the car, an independent agency tells you that the chance the car may be defective within the first year is **between 1 and 9%**. All failure rates in this range are equally likely. If the car is defective, your only option will be to fix it and you will need to pay $5,000 to do this.

How much would you pay for an insurance policy that would give you back the full $5,000 to fix the car?

$0 $5,000

Or enter an amount: $ 1755

<< Back Next >>

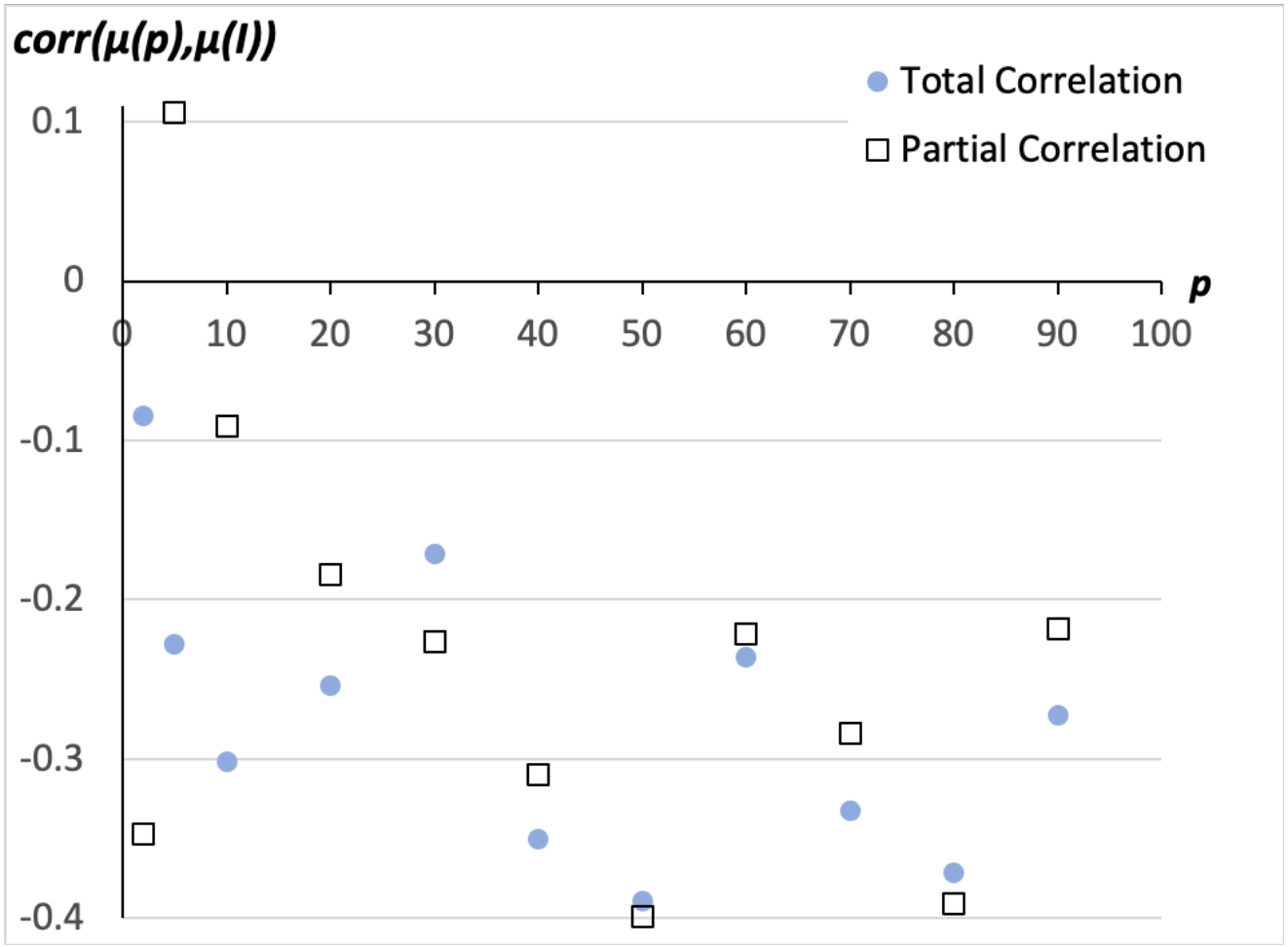
Go Back

Results: Correlation Risk and Info Premium

	Laboratory		UAS	
p	correlation	ORIV correlation	correlation	ORIV correlation
2	-0.197**	-	-0.312***	-
5	-0.120	-0.059	-0.291***	-
10	-0.214**	0.210	-0.276***	-0.310***
20	-0.394***	-0.405***	-0.241***	-0.319***
30	-0.567***	-0.499	-0.329***	-0.324***
40	-0.203**	-0.428*	-0.256***	-0.353***
50	-0.401***	-0.299***	-0.347***	-0.307***
60	-0.240***	-0.289**	-0.284***	-
70	-0.374***	-0.299***	-0.309***	-
80	-0.388***	-0.425***	-0.267***	-
90	-0.459***	-0.529***	-0.276***	-
95	-0.538***	-0.596***	-	-
98	-0.569***	-	-	-

Go Back

Correlation Risk and Info Premium - High Stakes



Go Back

Results: Correlation Risk and Info Premium

Table: Correlation between risk and info premium in existing experiments

p	Study	N	correlation	ORIV correlation
50	Halevy (2007) - $2 treatment	104	-0.557***	-
50	Halevy (2007) - $20 treatment	38	-0.542***	-
8.33	Abdellaoui et al (2015)	115	-0.418***	-
50	Abdellaoui et al (2015)	115	-0.365***	-0.310**
91.67	Abdellaoui et al (2015)	115	-0.518***	-
50	Chew et al (2017)	188	-0.493***	-

Go Back

Market Equilibrium: Risk-based Pricing

	Whole Population	Perfect Competition		Monopoly	
		Simple	Compound	Simple	Compound
Insured Pool					
Share of Population	100%	87.7%	91.0%	23.6%	26.0%
Risk Probability	9.6%	7.8%	7.7%	9.6%	9.5%
Risk Premium	22.1	26.6	25.1	66.3	54.7
Info Premium	2.8		3.43		11.6
Estimation Bias			13.6%		21.3%
Selection Effect			33.4%		79.3%
Consumer Welfare		23.3	22.8	5.4	2.9
Welfare Loss			2.3%		46.4%
Selection Effect			89.3%		95.2%
Corr(risk, coverage)		-0.312	-0.389	0.001	-0.014

Go Back

Market Equilibrium: High Stakes

	Whole Population	Perfect Competition		Monopoly	
		Simple	Compound	Simple	Compound
Insured Pool					
Share of Population	100%	27.0%	27.9%	9.6%	11.5%
Risk Probability	9.6%	13.2%	13%	14.1%	12.4%
Risk Premium	2.8	22.8	20.1	44.1	36.2
Info Premium	1.0		4.8		10.8
Estimation Bias			23.9%		29.8%
Selection Effect			40.7%		56.8%
Consumer Welfare		6.2	5.6	1.8	1.0
Welfare Loss			9.7%		43.9%
Selection Effect			96.0%		88.5%
Corr(risk, coverage)		0.139	0.134	0.095	0.065

Go Back

Covariates of Information Premium

- Cross-section regressions: p, range size, cognitive ability, financial literacy, ability to reduce lotteries, demographics (age, marital status, education, gender ethnicity, income)
  - Risk attitudes account for 10% of variation; all other factors jointly account for 1% of variation
  - No significant association with sociodemographics
  - Sociodemographics associated with risk aversion in line with literature (gender, income, financial literacy, cognitive ability)

regression table

	$\mu(I)$	$\mu(I)$	$\mu(p)$
Risk Probability	-0.06***	-0.14***	-0.41***
	(0.01)	(0.01)	(0.01)
Probability Range	0.11***	0.11***	
	(0.01)	(0.01)	
Ambiguity	0.54	0.50	
	(0.33)	(0.32)	
Financial literacy	-0.15	-0.45	-1.71*
	(0.23)	(0.23)	(0.50)
Average Cognitive Score	0.49	0.30	-1.34*
	(0.24)	(0.23)	(0.48)
Quiz Error	-0.06	0.22	
	(0.09)	(0.09)	
$\mu(p)$		-0.19***	
		(0.01)	
Age	-0.05	-0.04	0.08
	(0.07)	(0.06)	(0.14)
Age$^2/100$	0.04	-0.01	-0.24
	(0.07)	(0.06)	(0.13)
Female	-0.64	0.11	3.90***
	(0.35)	(0.35)	(0.76)

Married	-0.60	-0.73	-0.59
	(0.37)	(0.36)	(0.83)
Some College	0.29	0.01	-1.22
	(0.48)	(0.47)	(1.02)
Bachelor's Degree or Higher	0.28	-0.15	-2.19
	(0.54)	(0.54)	(1.16)
Hh Income: 25k-50k	0.45	0.53	0.21
	(0.54)	(0.53)	(1.16)
Hh Income: 50k-75k	0.38	-0.11	-2.82
	(0.60)	(0.58)	(1.26)
Hh Income: 75k-100k	0.75	0.59	-0.97
	(0.62)	(0.62)	(1.41)
Hh Income: Above 100k	0.29	-0.85	-6.38***
	(0.62)	(0.62)	(1.33)
Non-Hispanic Black	-1.70	-1.21	2.58
	(0.75)	(0.71)	(1.53)
Other Race/Ethnicity	-0.12	0.10	1.23
	(0.66)	(0.63)	(1.24)
Spanish/Hispanic/Latino	0.31	0.30	0.04
	(0.70)	(0.70)	(1.37)
Reverse Order	4.64***	4.13***	-2.51***
	(0.33)	(0.32)	(0.71)

Interpersonal Rankings of WTP for Insurance

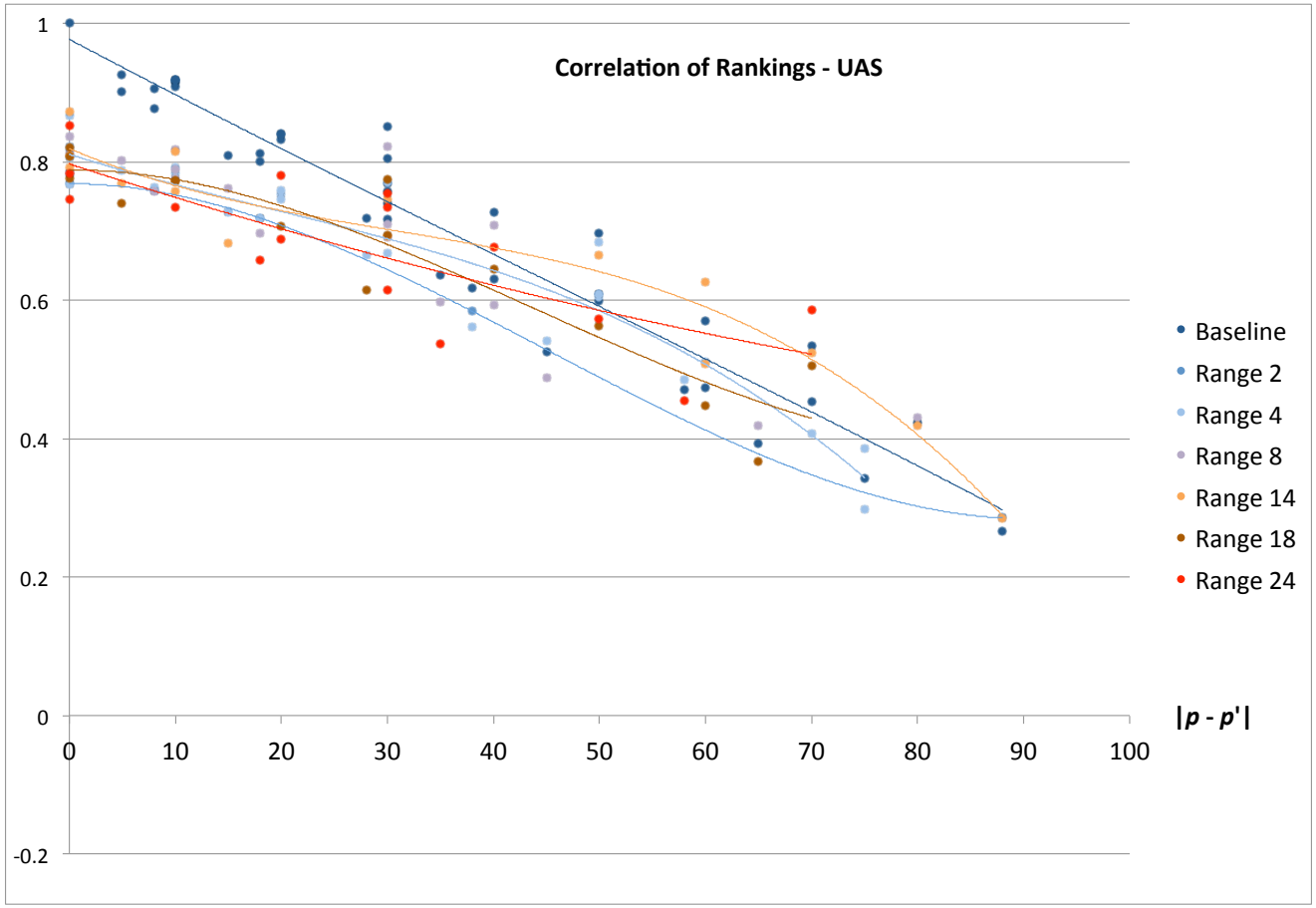


Figure: Correlation of interpersonal rankings of WTP by differences in risk.