Willingness To Say

A Decision-Theoretic Approach to Understanding Survey Response

Who Cares? Measuring Attitude Strength in a Polarized Environment

Optimal Survey Design for Prediction

Charlotte Cavaille, Daniel L. Chen, Ritesh Das, Karine Van der Straeten

A Theory of Surveys

Measurement
- Talk is cheap
  - ▶ Trump, Brexit–all mispredicted
  - ▶ Sophisticated adjustments of polls still failed

Model
- Make costly the expression of moral and ideological beliefs in surveys
- Revealed preference heuristic
  - ▶ Marginal benefit of an additional "vote" scales linearly, so should the marginal cost
  - ▶ Implies quadratic costs $\sum_{i=1}^{N}(v_i^j)^2 = B$

Applications
- Preference curvature, ideal point estimation
- Polls, attitudinal surveys, World Value Survey, GSS
- Decision-making in social & political settings

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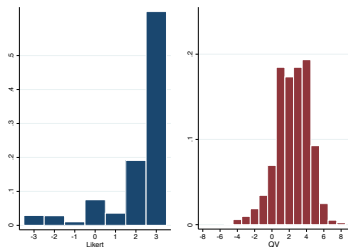 - ▶ Sophisticated adjustments of polls still failed

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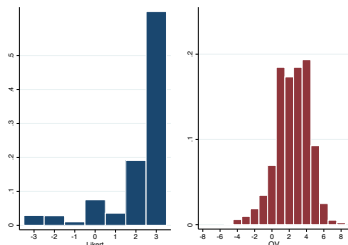
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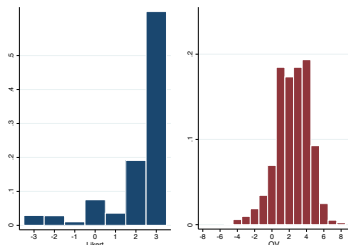
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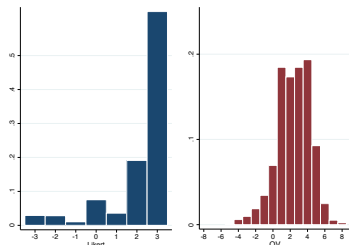
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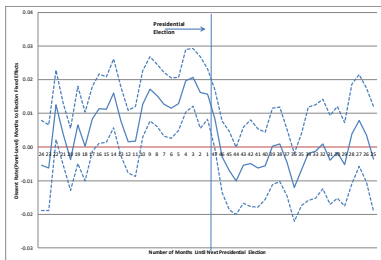
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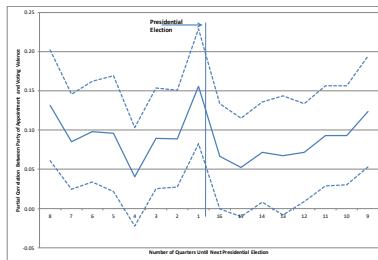   - ▶ surveyor's objective function

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- "sincerity motive" - intrinsic motive to report true preferences
- "partisan motive" - influence policy, signaling, etc.

Figure: Electoral Cycles in U.S. Judicial Dissents and Partisan Voting (JLE 2017)

Dissents

Partisan Precedents

- If highly experienced professionals making common law precedent exhibit such a strong partisan motive
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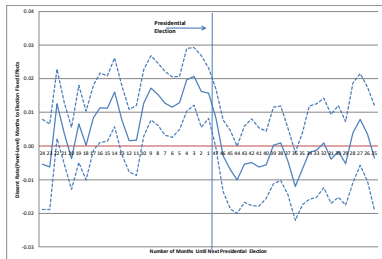

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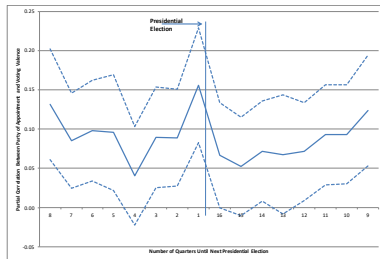- Then lay citizens answering political surveys (a low stake decision) may also be influenced by partisan identity

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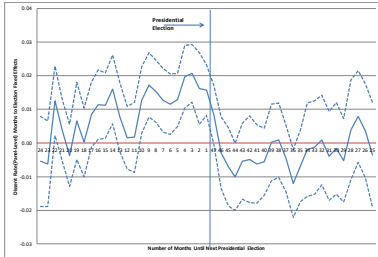

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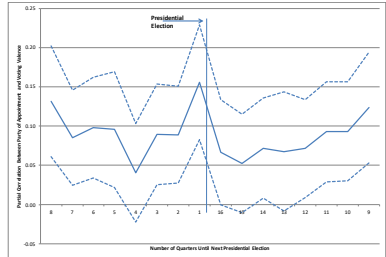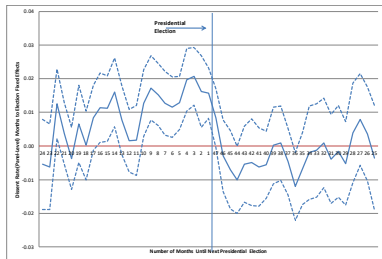
How People Answer Surveys

We assume that, on each issue $k = 1, ..., K$, respondent i is characterized by:

- Her attitude on the issue, denoted by $x_{ik} \in [-1, +1]$
- Her signaling target, denoted by t_{ik}

We denote by $\widehat{x}_{ik}$ her observed survey answer on issue k.

How People Answer Surveys

We assume that utility V from answering the survey depends on $x_i = (x_{i1}, ..., x_{iK})$, $t_i = (t_{i1}, ..., t_{iK})$, and $\hat{x}_i = (\hat{x}_{i1}, ..., \hat{x}_{iK})$ in the following way:

$$V(\hat{x}_i) = \sum_{k=1}^{K} \left[F_{ik}(\hat{x}_{ik}) + G_{ik}(\hat{x}_{ik}) \right], \tag{1}$$

F_{ik} and G_{ik} are single-peaked, max at $\hat{x}_{ik} = x_{ik}$ and $\hat{x}_{ik} = t_{ik}$

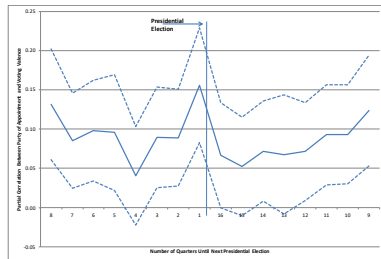- F_{ik} sincerity motive - intrinsic motive to report true preferences
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How People Answer Surveys

- **Concave sub-utility functions:**
  - ▶ In particular, if the functions F_{ik} and G_{ik} are both concave with $F'_{ik}(x_{ik}) = G'_{ik}(t_{ik}) = 0$, there is a strictly interior solution.
  - ▶ **With Likert scales, individuals answer by compromising between their two motives. Answers incorporate information about both x_{ik} and t_{ik}.**

- Convex sub-utility functions:
  - ▶ If the functions F_{ik} and G_{ik} are both convex, then the objective V_i is convex in $\widetilde{x}_{ik}$ and the individual
  - ▶ truthfully reports her true opinion x_{ik} or she caves-in and reports her 'signaling target' t_{ik}.

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Influence Motive

- If the individual wants to **influence** the decisions made by the government on issue k, the target is $t_{ik} = +1$ if $x_{ik} > 0$, and $t_{ik} = -1$ if $x_{ik} < 0$, and there will be a **strategic inflation** in the reported intensity.
    - x_{ik} is utility derived by individual i if reform k is implemented

- Assume that a survey is run to evaluate the total utility that the implementation of each of the K reforms is likely to generate.
    - Now assume that the signaling function has the following form:
    - $G_{ik}(\widehat{x}_{ik}) = x_{ik} S(\widehat{x}_{ik})$ where $S_{ik}(\widehat{x}_{ik})$ is the probability that the reform is implemented if the individual reports $\widehat{x}_{ik}$ (with $S'_{ik} > 0$)

$$F_{ik}(\widehat{x}_{ik}) = -\frac{1}{2}\gamma_{ik}(x_{ik} - \widehat{x}_{ik})^2 \text{ (quadratic sincerity motive),}$$

$$S_{ik}(\widehat{x}_{ik}) = \sigma_{ik} \times \widehat{x}_{ik} \text{ (linear policy influence)}$$

- σ_{ik} captures the <u>marginal impact</u> of $\widehat{x}_{ik}$ on the decision
    - Recall revealed preference heuristic, MB of an additional "vote" scales linearly so should MC

- $\gamma_{ik} \geq 0$ is weight of the **sincerity** versus **signaling** motive

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Optimal responses under Likert

$$\widehat{x}_{ik}^L = sign(x_{ik}) \times \min\left[\left(1 + \frac{\sigma_{ik}}{\gamma_{ik}}\right)|x_{ik}|, 1\right] \tag{2}$$

Exaggeration increases with $\frac{\sigma_{ik}}{\gamma_{ik}}$ (influence motive $>>$ sincerity motive)

- If ratio is large, individuals locate at extremities of the scale

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$$\widehat{x}_{ik}^{QV} = \text{sign}(x_{ik}) \times \min \left[\frac{1}{1 + \frac{2\lambda_i^*}{\gamma_{ik}}} \left(1 + \frac{\sigma_{ik}}{\gamma_{ik}} \right) |x_{ik}|, 1 \right], \tag{3}$$

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- If $\sum_{k=1}^{k=K}\left(\widehat{x}_{ik}^L\right)^2 \leq B$, meaning that optimal answers under Likert are within the QV budget set, then $\widehat{x}_i^{QV} = \widehat{x}_i^L$ and $\lambda_i = 0$.
- If $\sum_{k=1}^{k=K}\left(\widehat{x}_{ik}^L\right)^2 > B$, then optimal answers under Likert are not admissible under QV, and the individual has be less extreme.

If influence motive is weak (i.e. $\frac{\sigma_{ik}}{\gamma_{ik}}$ close to 0), Likert scales are sufficient

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If influence motive is strong, QV decreases bunching at Likert extremes

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Partisan consistency motive

- Another interesting example is a situation where citizens have strong partisan identities (Converse 1964, Zaller 1994, Lenz 2013, Achen et al 2017, ELECTORAL CYCLES)

  - If they disagree with their preferred party's position on a specific issue, they suffer a psychological cost from reporting a divergent opinion.

  - This is consistent with electoral cycles among judges

- Imagine party elites are very polarized, and individuals generally agree with their preferred party regarding the 'direction' of policies, but generally less extreme ($|x_{ik}| \leq |t_{ik}|$ on most issues). (Zaller 2012)

- Under Likert, such an individual, because she wants to look like a 'good Republican' or like a 'good Democrat', will pick more extreme answers than she would if just reporting truthfully her own opinion.

$$V_i(\widehat{x}_i) = -\frac{1}{2}\alpha_{ik}\sum_{k=1}^{k=K}\left[(1-\beta_{ik})(\widehat{x}_{ik}-x_{ik})^2 + \beta_{ik}(\widehat{x}_{ik}-t_{ik})^2\right],$$

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Optimal responses under Likert

$$\hat{x}_{ik}^{L} = (1 - \beta_{ik}) x_{ik} + \beta_{ik} t_{ik}. \tag{4}$$

as soon as $\beta_{ik} > 0$, the individual has the incentive to move away from her true opinion in the direction of the partisan target

- How the individual values her answer to this question compared to others (α_{ik}) does not influence her answers
  - because each question is treated in isolation under Likert
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If the party motive is strong, QV 'shrinks' all answers towards 0

- this 'contraction' can be heterogenous across issues

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Performance of QV vs. Likert at measuring 'true' opinions depends on relationship between α_{ik} (issue importance) and β_{ik} (relative importance of partisan compared to sincerity motive).

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Empirical Criteria of Improvement

1. More predictive of behavior (Meltzer and Richard 1981, Acemoglu and Robinson 2006)

2. More stable over time (Howe and Krosnick 2017: 328)

3. More closely related to self-interest (Howe and Krosnick 2017: 332)

4. Better formed, less affected by contextual cues (i.e. less "spirit of the moment") (Converse 1964, Zaller 1994, Lenz 2013, Achen and Bartels 2017)

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QV interface

Total and Marginal Cost of Voting Under QV

Votes	Total cost	Marginal cost
1	1	1
2	4	3
3	9	5
4	16	7
5	25	9
6	36	11
7	49	13
8	64	15
...	...	...

U.S.-wide field experiment

https://osf.io/cenkg
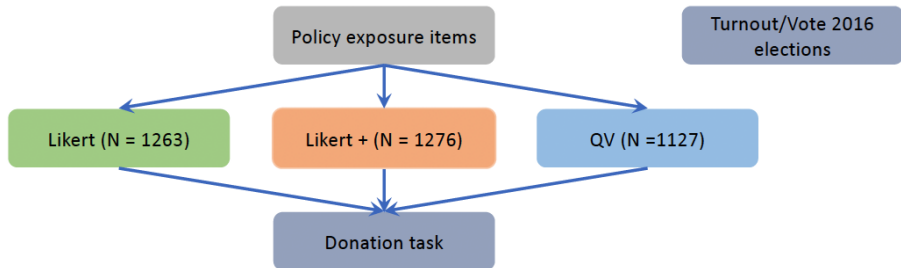
Policy Items

- Giving same sex couples the legal right to adopt a child
- Laws making it more difficult for people to buy a gun
- Building a wall on the US Border with Mexico
- Requiring employers to offer paid leave to parents of new children
- Preferential hiring and promotion of blacks to address past discrimination
- Requiring employers to pay women and men the same amount for the same work
- Raising the minimum wage to $15 an hour over the next 6 years
- A nationwide ban on abortion with only very limited exceptions
- A spending cap that prevents the federal government from spending more than it takes
- The government regulating business to protect the environment

Donation

Please read this important information before you move to the third and last part of the survey:

At the end of the survey, the computer will randomly select **40** people among all the survey participants (40 among roughly 4000 people). Each winner will receive a bonus worth up to **$100**. Winners will be notified in the 10 days following the end of the survey.
In this section of the survey:

- We ask you to imagine that you are among the 40 lucky winners selected by the computer.
- We offer you the opportunity to donate some of the $100 bonus to one non-profit organization. What you do not donate, you can keep for yourself.
- On the next page, we provide you with more information on each organization. We then ask you whether you would like to make a donation.

If you are among the randomly chosen winners, we will pay you the bonus amount, minus your donation, in points credited to your Knowledge Panel™ account ($100 = 100,000 points).

If you would prefer to skip this part of the survey, you can do so below. Please note that respondents who do not complete this last section will not be entered into the drawing for one of the $100 bonuses.
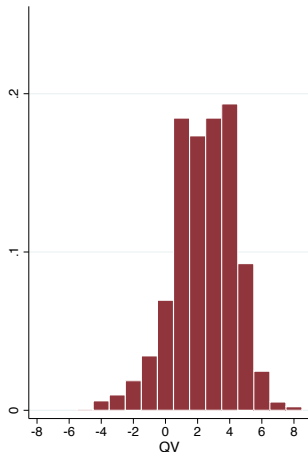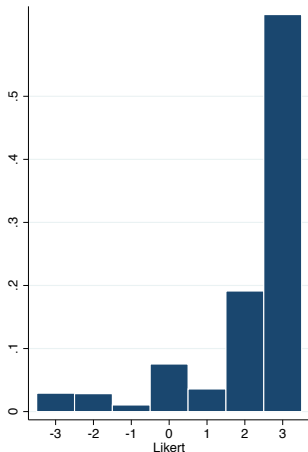
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Gun policy

Gifford Law Center to Prevent Gun Violence : this organization **FAVORS gun control**. Its main activities include lobbying state and federal legislatures in **FAVOR** of **bills** that **regulate the purchase, possession and use of firearms.** This organization also goes to court to defend gun control laws against legal challenges from people who oppose such laws.

You can find more information on this organization by copying and pasting this link into a separate browser tab or window: http://lawcenter.giffords.org/

Institute for Legislative Action: this organization **OPPOSES gun control**. Its mains activities include lobbying state and federal legislatures to **OPPOSE bills** that **regulate the purchase, possession and use of firearms.** This organization also provides voters with information on candidates' position on gun control, encouraging them to vote for candidates that oppose gun control.

You can find more information on this organization by copying and pasting this link into a separate browser tab or window: https://www.nraila.org/
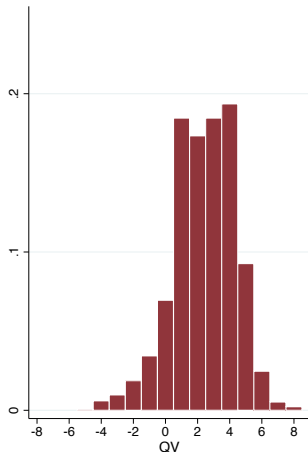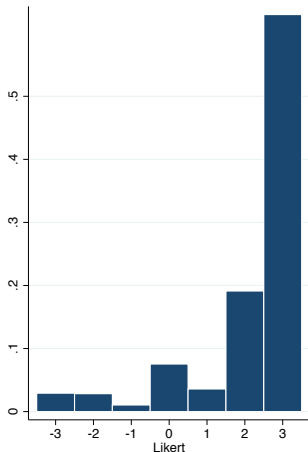
QV vs. Likert: Equal Pay

Do you favor or oppose requiring employers to pay women and men the same amount for the same work?

- With Likert, responses are strongly right-skewed
- With quadratic costs, less so
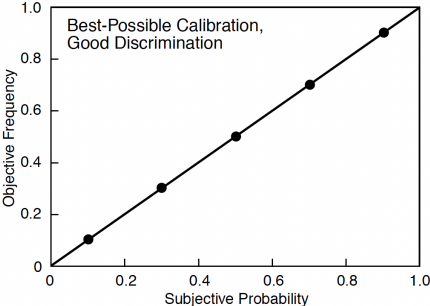
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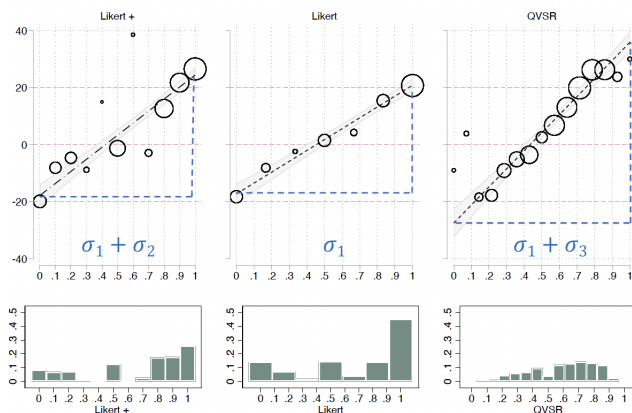
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DOES THE SURVEY DISCRIMINATE BETWEEN INDIVIDUALS AND EXPLAIN GREATER VARIANCE?

Calibration and Discrimination (Tetlock 2006)
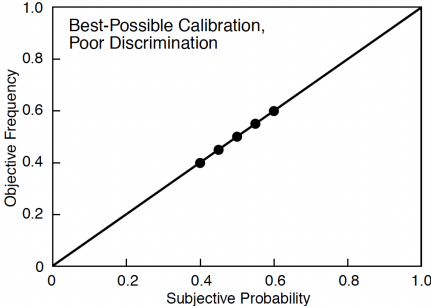
Laws making it more difficult for people to buy a gun

Y-axis: Donation, X-axis: Survey responses (0,1) normalized,

Circles size proportional to observations

- Likert (center) exhibits bunching, i.e. less ability to discriminate
- QVSR (right) exhibits variance in Y, i.e. greater ability to calibrate

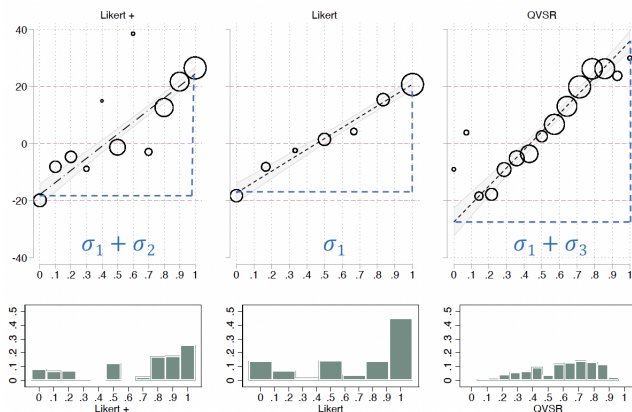# Laws making it more difficult for people to buy a gun
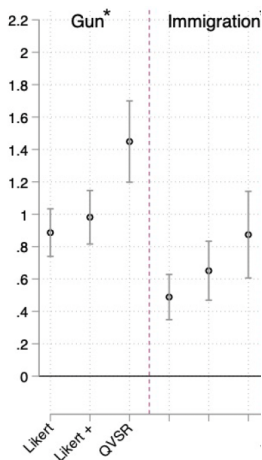

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Calibration

Y-axis: Coefficient of regression of behavioral outcome and survey response,

X-axis: Survey method

- Increase in responses from 0 to 1 is associated with Y standard deviation increase predicted gun / immigration donation.

QVSR IS BETTER AT PREDICTING DONATIONS, WHAT ABOUT REVEALING SELF-INTEREST?

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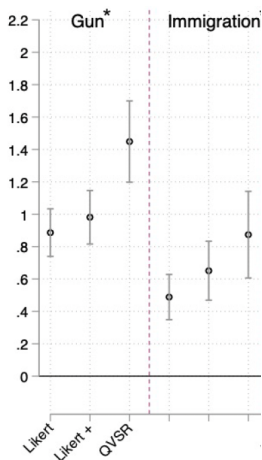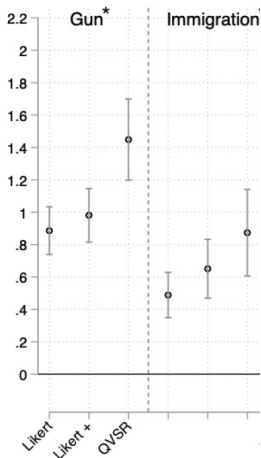
Calibration

Y-axis: Coefficient of regression of behavioral outcome and survey response,

X-axis: Survey method

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Requiring employers to pay women and men the same amount for the same work

Y-axis: Gender (female = 1, 0 otherwise), X-axis: Survey responses (0,1) normalized,

Circles size proportional to observations

- Likert (center) exhibits bunching, i.e. less ability to discriminate
- QVSR (right) exhibits variance, i.e. greater ability to calibrate
- More calibration with quadratic fit in lower panel

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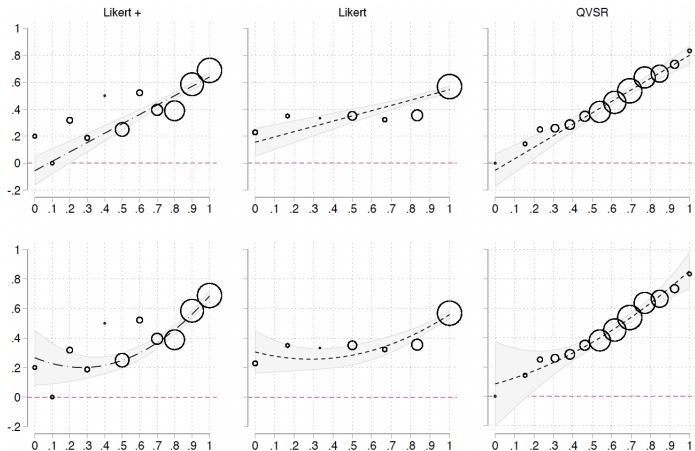

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Requiring employers to offer paid leave to parents of new children

Y-axis: Proximity to Childbirth (= 1 if no young child and no plans to have any in future, = 2 young children but no plans to have more, = 3 if children planned or just had a child), X-axis: Survey responses (0,1) normalized,

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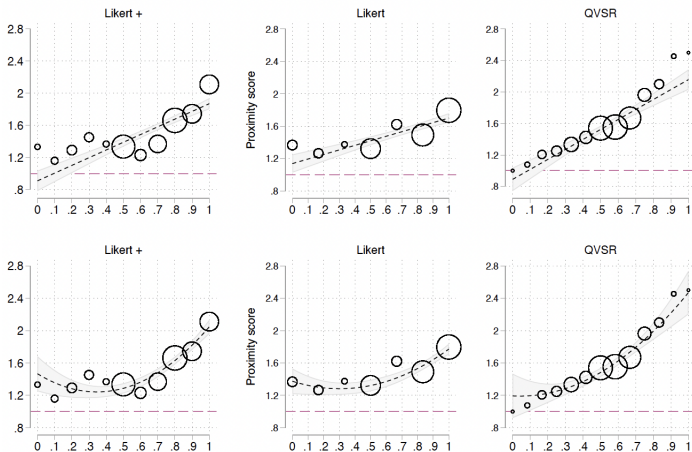
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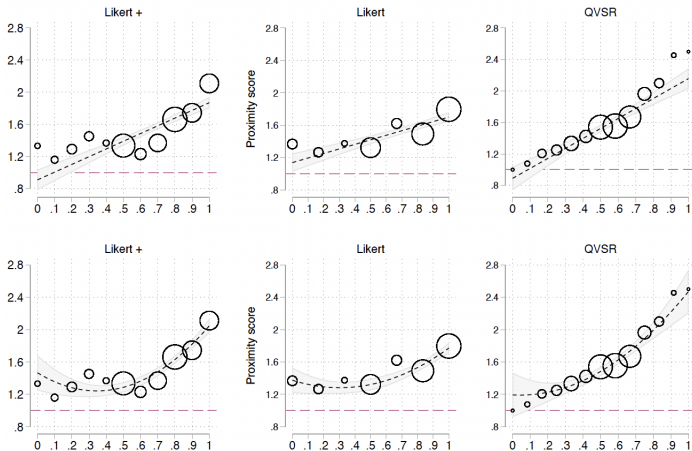# Requiring employers to offer paid leave to parents of new children

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Shannon Entropy

	Likert	Likert +	QVSR
Same sex right to adopt	1.62	2.16	2.24
Make it difficult to buy gun	1.57	2.00	2.40
Wall on the US Border	1.57	2.18	2.52
Paid leave	1.59	2.04	2.03
Preferential hiring of blacks	1.58	1.94	2.27
Pay women and men the same	1.00	1.71	2.02
Minimum wage to $15 an hour	1.67	2.14	2.24
Ban on abortion	1.55	2.13	2.48
Cap on federal spending	1.47	1.98	2.02
Regulation for environment	1.61	1.83	2.10

- doubling the entropy when it comes to questions like gender equity
- where there can be a strong social norm in expected survey response

Seemingly Unrelated Regression - Donations

	QVSR (=1) vs. Likert (=0) b/se	Likert+ vs. Likert b/se	QVSR vs. Likert+ b/se
Gun	0.55*** (0.14)	0.10 (0.10)	0.43** (0.15)
Immigration control	0.45*** (0.13)	0.19 (0.10)	0.25 (0.14)

Coefficients report interaction between survey response and a dummy variable identifying the survey method, e.g., for gun donation, the difference between the coefficient for Likert and that for QVSR is equal to 0.55 in predicting gun donations in standardized units.

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Seemingly Unrelated Regression - Material Self-Interest

	QVSR (=1) vs. Likert (=0) b/se	Likert+ vs. Likert b/se	QVSR vs. Likert+ b/se
Female	0.67***	0.31**	0.30*
	(0.14)	(0.11)	(0.14)
Black	0.24**	0.13*	0.10
	(0.07)	(0.05)	(0.08)
Proximity to Childbirth	0.23**	0.22**	0.03
	(0.09)	(0.07)	(0.09)
Not Born Again	0.20*	-0.05	0.27**
	(0.08)	(0.06)	(0.09)
No Guns at Home	0.31***	0.01	0.29**
	(0.09)	(0.07)	(0.09)
Immigrant Background	-0.04	-0.01	-0.02
	(0.05)	(0.03)	(0.05)
Lesbian/Gay	0.12**	0.01	0.12**
	(0.05)	(0.03)	(0.04)
N	1503	1594	1537
F-test	56.50	13.18	21.73

Coefficients report interaction between survey response and a dummy variable identifying the survey method.
- QVSR outperforms Likert in predicting exposure proxy
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Making costly the expression of moral and ideological beliefs in surveys

1. More predictive of behavior (Meltzer and Richard 1981, Acemoglu and Robinson 2006)

2. More closely related to self-interest (Howe and Krosnick 2017: 332)

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Willingness To Say

- Calibration and discrimination in 1 step via machine learning
- Survey design often approximates a prediction problem: the goal is to select instruments that best predict the value of an unobserved construct or a future outcome.
- Can machine learning help choose among competing instruments?

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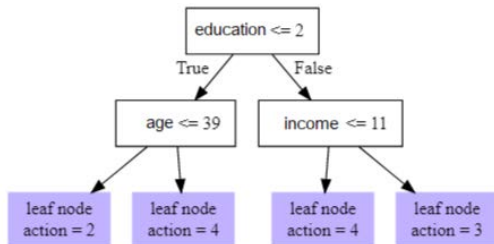 - ▶ Aggregate the treatment assignments across bootstraps

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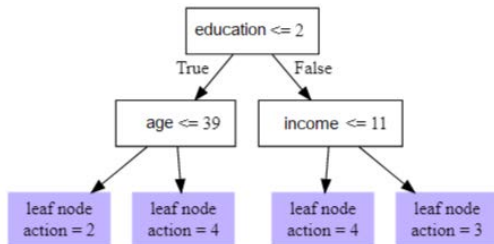
Hypothetical Policy Tree

Decision tree using education and age to assign one of four possible actions: 1 (assign to Likert), 2 (Likert+), 3 (QVSR), and 4 (QVSRN WILLINGNESS TO PAY TO SAY)

- Hypothetically assigns QVSRN (action = 4) to individuals having lower educational qualifications and higher age and also to individuals having higher education and relatively lower income levels.

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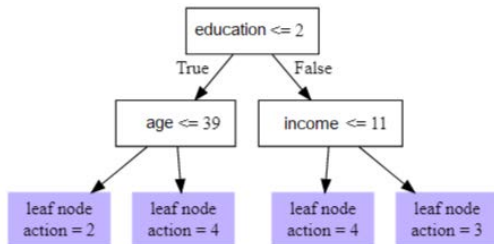
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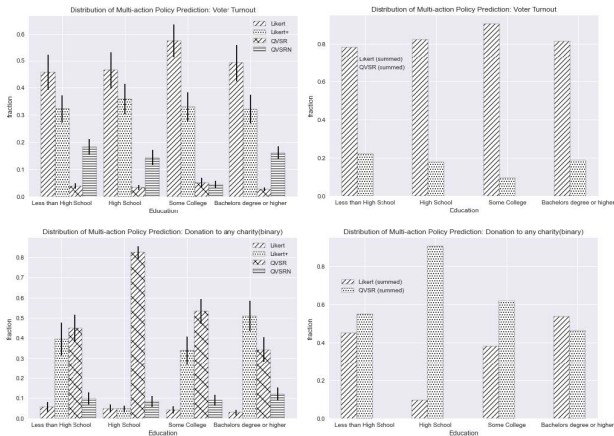
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Optimal Assignment based on Education

Each panel plots, by education level, % of respondents assigned to a given survey method.

Top row is voter turnout and bottom row is donation.

- QVSR outperforms Likert for the majority of respondents in predicting donations, especially for intermediate education levels
- Likert appears better for voter turnout across all education levels
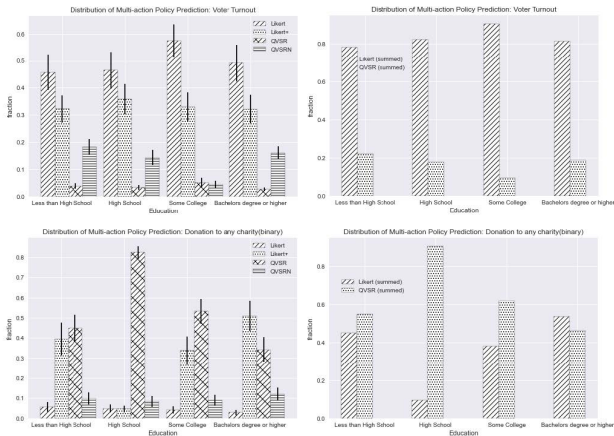
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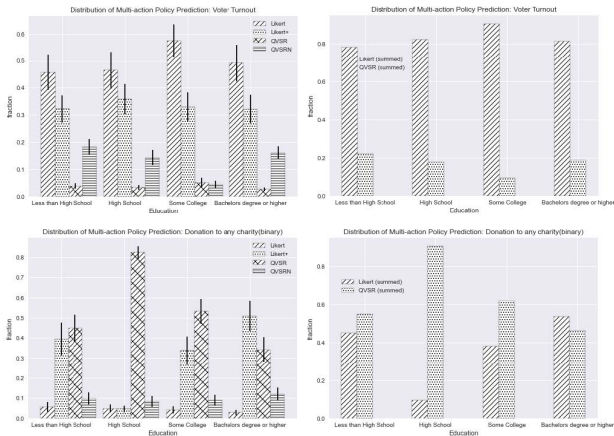
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Taking Stock

- Likert may be sensitive to partisan signaling,
  - which may better predict turnout
- QVSR may be more sensitive to single-issues,
  - which may better predict donations
- Survey design can be a treatment and prediction problem, where the goal is to select "instruments" that best predict offline indicators.
- "Instruments" broadly conceptualized:
  - survey method,
  - questions asked,
  - data merged,
  - information interventions (LIKE THOSE THAT AFFECT TURNOUT), etc.
- Offline indicators can broadly conceptualized
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  - Changes in menu: CONSIDERATION SETS, SLUTSKY MATRIX
  - Affecting policymaking: RESPONSIVENESS
  - Enhancing legitimacy: DIGITAL DEMOCRACY
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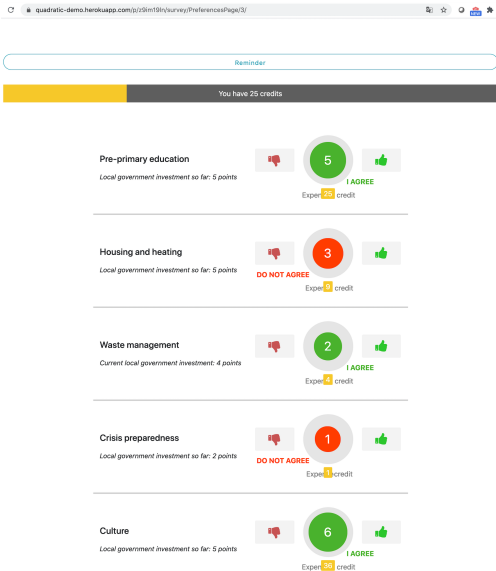 - Civicbase.io and oTree

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Estonian IE of public-facing dashboard for local government accountability
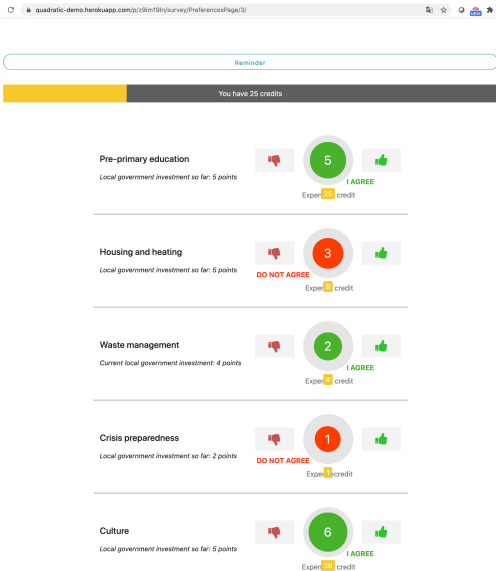
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Self-service Quadratic Voting

Giving civil servants and citizens the ability to ask questions of each other

Civicbase.io (AI Magazine 2023)

Self-service Quadratic Voting

Self-service Quadratic Voting

- Australia: Field Experiment with Policymakers

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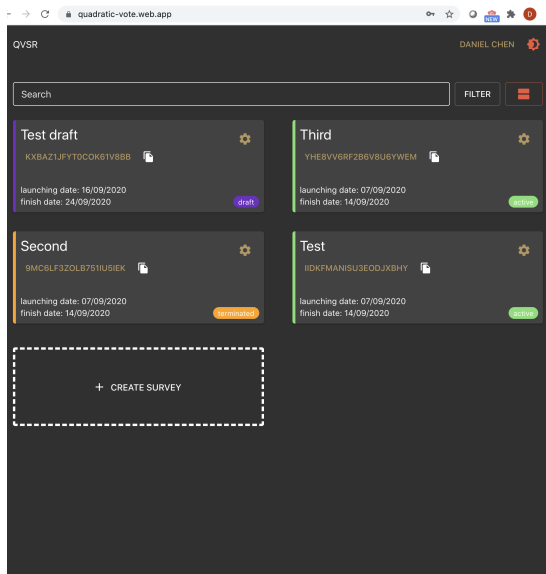
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Some theoretical criteria of improvement

- If the α_{ik} are the same for all issues for an individual, and
- If the partisan targets are more extreme than the respondents' true views ($|t_{ik}| > |x_{ik}|$), QV will move answers in the correct direction
  - ▶ But QV will not "purge" reported answers of the partisan motive: answers will still be a convex combination of the true opinion and the partisan target, with exactly the same relative weights as under Likert.
  - ▶ In that sense, QV will not perform better than Likert.
- If $Cov(\alpha_{ik}, \beta_{ik}) < 0$, more votes on issues with strong sincerity motive
  - ▶ If someone cares strongly about some issues (high α_{ik}), but not others
  - ▶ On the former set of issues, the individual may collect information, invest effort to think about pros and cons, and form a strong, independent opinion.
- Under QV, if budget is binding, she will put her points on the issues with a strong sincerity motive $\Rightarrow$ QV significantly improves over Likert.
- But if $Cov(\alpha_{ik}, \beta_{ik}) > 0$, QV might perform worse than Likert

Some theoretical criteria of improvement

- If the α_{ik} are the same for all issues for an individual, and
- If the partisan targets are more extreme than the respondents' true views ($|t_{ik}| > |x_{ik}|$), QV will move answers in the correct direction
  - ▶ But QV will not "purge" reported answers of the partisan motive: answers will still be a convex combination of the true opinion and the partisan target, with exactly the same relative weights as under Likert.
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  - ▶ If someone cares strongly about some issues (high α_{ik}), but not others
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Changes in the menu

- Consider a set of N propositions and a budget of B. Individuals allocate votes subject to the constraint that

$$\sum_{i=1}^{N}(v_i^j)^2 = B$$

- Changes in the menu
  - ▶ Number of issues
  - ▶ Types of issues (high/low salience, complements/substitutes)
  - ▶ Numeraire (to conjoin separate QV blocks)

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- Consider a subset of issues M, where $M < N$. Each individual j will have allocated a total number of credits to the issues in M:

$$A^j \equiv \sum_{i \varepsilon M}(v_i^j)^2 \leq B$$

- There exists a scaling factor λ^j such that j's votes would have been $\hat{v}_i^j = \lambda^j v_i^j$ solving:

$$\sum_{i \varepsilon M}(\lambda^j v_i^j)^2 = B = \left(\lambda^j\right)^2 \sum_{i \varepsilon M}(v_i^j)^2 = \left(\lambda^j\right)^2 A^j \Rightarrow \lambda^j = \sqrt{\frac{B}{A^j}}$$

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Changes in the menu

- Does removal of 1 item result in this rescaling?
  - ▶ If $\lambda = 1.7$, then 5 votes scales to 8.5 and 3 votes scales to 5
  - ▶ Numerical approximation means weaker statistical tests

Changes in the menu

- Are issues complements or substitutes?

  ▶ Left shoe and right shoe are complements, so the effective price of a pair of shoes is doubled, we should observe half the votes on both

  ▶ Good 1 and Good 1' are substitutes, so the effective price of Good 1 is halved, and we should observe a doubling of votes spent on 1 or 1'

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Curvature of Preferences

- Does doubling the value of a numeraire good lead to reduction of all other votes by one-half?

  ▶ Marginal costs double, so votes should scale down by a half

  ▶ Numeraire good can be a less partisan issue (e.g., campaign spending)

  ▶ Can also be **monetary** (e.g., chances at a 1/100 lottery of winning $5)

    ▶ "**Revealed** expressive preferences" (voting to tell others, duty to say)

    ▶ How much you are willing to pay to express the votes to the surveyor? (DellaVigna, List, Malmendier, Rao 2016)

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- Is cost of deviating from true expression concave or convex?
  - An ideological perfectionist (e.g., deontologist) would have concave costs (i.e., small deviations are costly)
    - For individuals who perceive small deviations as costly, their QV allocation should not change until cost of deviating is high enough to meet the marginal disutility of not expressing their true preference
  - Individuals with concave costs will tend to cave-in on principles if they cannot follow them fully
    - highest % of lies is from reporting max outcome (Gneezy et al. AER 2018)
    - "What-the-hell" effect (Ariely 2012; Baumeister et al. 1996)

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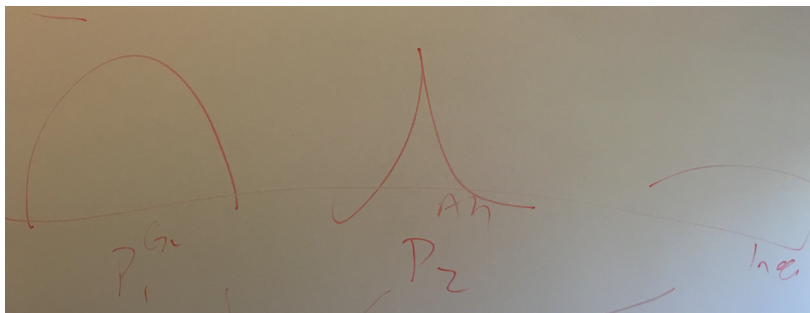   ▶ "What-the-hell" effect (Ariely 2012; Baumeister et al. 1996)

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Identify curvature of costs by **randomly varying the cost of votes**

- If 2x-value numeraire, ↑marginal benefit to not expressing true ⪯'s
  - ▶ Convex costs: if marginal costs to not expressing true preferences are ↗ (Left), people switch to cast 1/2 fewer votes for policy X
  - ▶ Concave costs: If marginal costs to not expressing true preferences are ↘ (Middle), people will not change or cast 0 votes for policy X
- Likert data - cheap talk (Right) - or no preferences until they are 'told' / primed / reminded what their preferences should be

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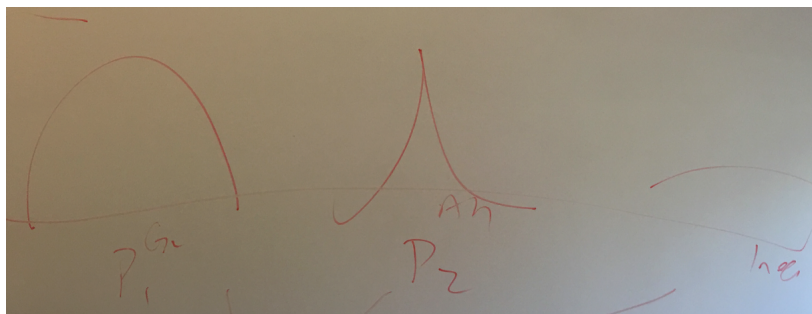
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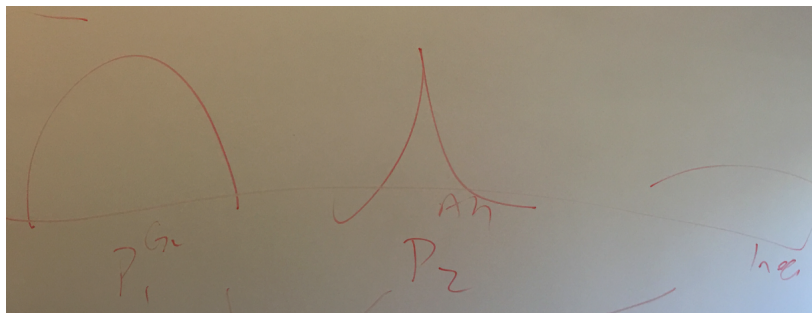
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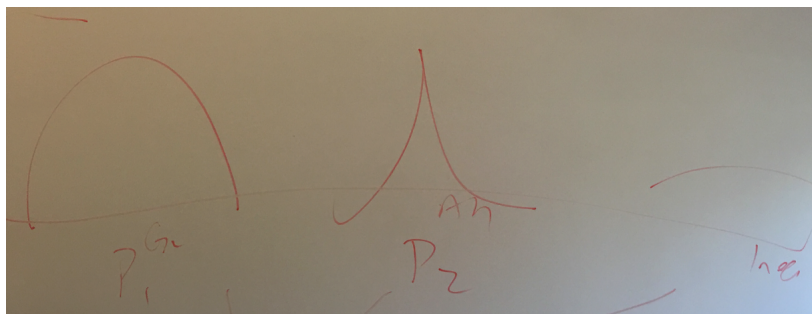
Attitudes

- Are you willing to have public goods for immigrants?
- Information treatment:
  - ▶ Are you willing to have public goods for immigrants type X?
  - ▶ Are you willing to have public goods for immigrants type Y?
- Incentives treatment:
  - ▶ If the budget comes from your taxes?
  - ▶ If the budget comes from philanthropist?

Attitudes

- Consider the following utility:
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$$U_v = \alpha \pi_v + V$$

  ▶ where π_v represents the individual's **beliefs** about 'productivity' of immigrant and V represents **taste** for immigrant apart from the economic consequences
    ▶ α represents stakes

- Individuals will choose immigrant F over M if and only if

$$\alpha\left(\pi_F - \pi_M\right) \geq d$$

  where $d \equiv M - F$ is the relative taste for immigrant M

- Information can be used to update one's beliefs about $\pi_F - \pi_M$
  ▶ Any changes in behavior are <u>due to information</u>
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- Is Likert or QV a better predictor of response to treatment?
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4 usage scenarios

- **Attitudinal Surveys**
  - ▶ World Value Survey, GSS, stated preferences, ANES
- Preference Curvature
  - ▶ for a deontologist, preferences are lexicographic (duty first)
    - ▶ approximately concave
    - ▶ when it comes to moral and ethical issues, individuals perceive a concave cost of deviating from what they believe is right
  - ▶ affects ideal point estimation
- Prediction
  - ▶ behavior, elections, costly acts
- Integration with polls
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    - ▶ when it comes to moral and ethical issues, individuals perceive a concave cost of deviating from what they believe is right
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  - ▶ behavior, elections, costly acts
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4 usage scenarios

- Attitudinal Surveys
  - ▶ World Value Survey, GSS, stated preferences, ANES
- Preference Curvature
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   ▶ Spurious inferences of actual behavior
   ▶ Magnified treatment effects ('leaders lead the public')
   ▶ Different policy actions
      ▶ leaders may be less constrained by public preferences

2. Preference intensity and curvature—has implications for important real-world decision making

   ▶ Complements alternative methods
      ▶ List Method (identifies one at a time, statistically approximate)
      ▶ Bayesian Truth Serum (complex and cognitively demanding)
      ▶ Shredding Criterion (expensive, identifies one particular preference)
   ▶ May be used to explore nature of motivated beliefs / polarization
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