PREFERENCES FOR THE RESOLUTION OF UNCERTAINTY AND THE TIMING OF INFORMATION

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MOTIVATION

- Imagine there's a a genetic test that can reveal to you whether you're at particularly high or low risk of contracting a disease
  - Already exist for breast cancer, Parkinsons, Psoriasis, etc.
- Do you want to take the test and know the results?

MOTIVATION

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  - Already exist for breast cancer, Parkinsons, Psoriasis, etc.
- Do you want to take the test and know the results?
  - Instrumental: treatment decisions, insurance might find out, etc.
  - Non-instrumental: fear, disappointment, anxiety

    $\Rightarrow$ Just don't want to know!

MOTIVATION

- Imagine there's a a genetic test that can reveal to you whether you're at particularly high or low risk of contracting a disease
  - Already exist for breast cancer, Parkinsons, Psoriasis, etc.
- Do you want to take the test and know the results?
  - ~~Instrumental: treatment decisions, insurance might find out, etc.~~
  - Non-instrumental: fear, disappointment, anxiety

    $\Rightarrow$ Just don't want to know!
- **Question:** Do individuals have systematic preferences over the resolution of uncertainty and acquisition of non-instrumental information?

TYPES OF RESOLUTION

- Preferences might depend on the nature of uncertainty
- There are two different kinds of health tests—
  - Resolving uncertainty gives more information about something that will happen in the future
    - Tests for diseases that will develop (Alzheimer's, etc.)
  - Resolving uncertainty gives more information about something that has happened in the past
    - Tests for diseases that have already developed (STDs, etc.)
- Evidence suggests individuals may treat these types of uncertainty differently (Rothbart & Snyder 1970)
- Economists have studied uncertainty resolution without distinguishing between these two environments

INFORMATION VS. UNCERTAINTY RESOLUTION

- We model these two types of uncertainty resolution in different, but isomorphic, ways
  - Future events: compound lotteries
  - Past events: information structures
- There's a one-to-one mapping between information structures and compound lotteries
  - A "signal" determines what your posteriors will be in the second stage of the lottery
  - But there may be some psychological differences between the two environments

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  - Future events: compound lotteries
  - Past events: information structures
- There's a one-to-one mapping between information structures and compound lotteries
  - A "signal" determines what your posteriors will be in the second stage of the lottery
  - But there may be some psychological differences between the two environments
- **Question:** Are uncertainty resolution preferences over compound lotteries and information structures empirically equivalent?

DIMENSIONS OF PREFERENCE

- Early vs. Late
  - Earlier: more informative
  - Grant, Kajii, and Polak (1998), Caplin and Leahy (2001), Köszegi and Rabin (2009)
- One-Shot vs. Gradual
  - One shot: perfectly (un)informative test
  - Palacious-Huerta (1999), Köszegi & Rabin (2009), Dillenberger (2010), Ely, Frankel, Kamenica (2013)
- Positive vs. Negative Skew
  - Positive: eliminates more uncertainty about the good state
  - Masatlioglu et al. (2017)

LITERATURE: EXPERIMENTS

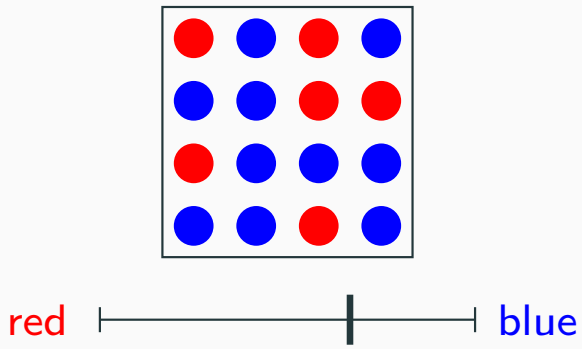
- Incentivized non-instrumental information experiments are sparse and appear somewhat contradictory
- Miao and Zhong (2012)
  - Preference for late over early one-shot resolution
- Zimmermann (2015)
  - Heterogeneous preferences over one-shot vs. gradual resolution
- Falk and Zimmermann (2016)
  - Prefer early resolution about electric shocks, when no distractions are available
- Masatlioglu et al. (2017)
  - Preference for early & positively skewed signals

IN THIS PAPER...

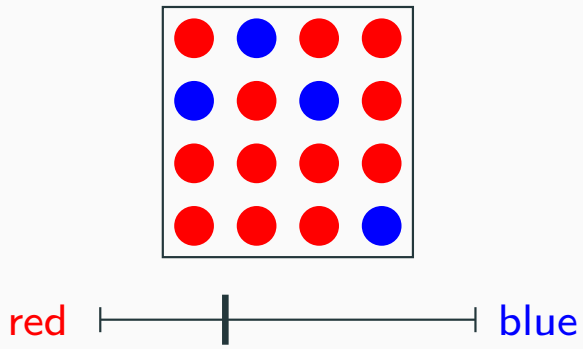
- Run a lab experiment where subjects choose how to resolve uncertainty about a simple lottery
    - Analogous compound lottery and information structure treatments (between-subject)
- Within-subject choices allow us to disentangle one-shot preferences from early/late preference
- Elicit willingness to pay for information to rule out indifference

FRAMEWORK

COMPOUND LOTTERY



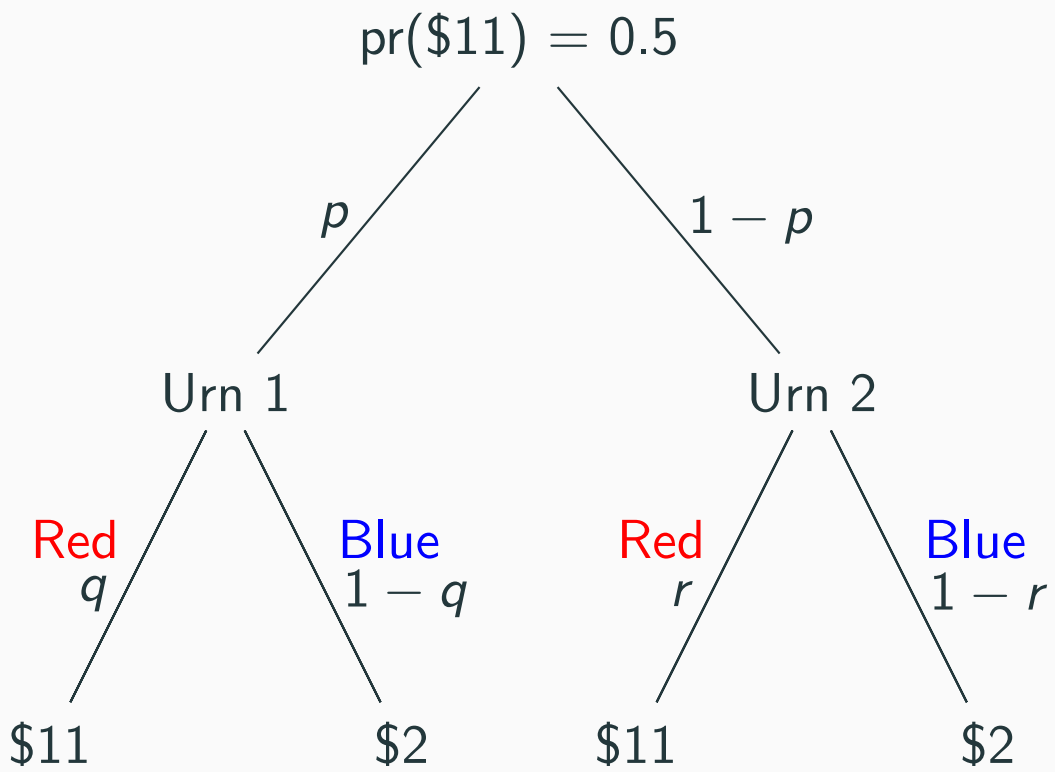
Urn 1



Urn 2

- Lottery outcome revealed in two steps—
  - **Step 1**: Select and reveal either Urn 1 or Urn 2
  - *Wait 30 minutes*
  - **Step 2**: Select a ball from the urn
    - If the ball is red, subject wins the high prize ($11)
    - If the ball is blue, subject wins the low prize ($2)
- Subjects' task is to choose the composition of the urns
  - Restricted to 50% chance of drawing a red ball, 50% chance of blue

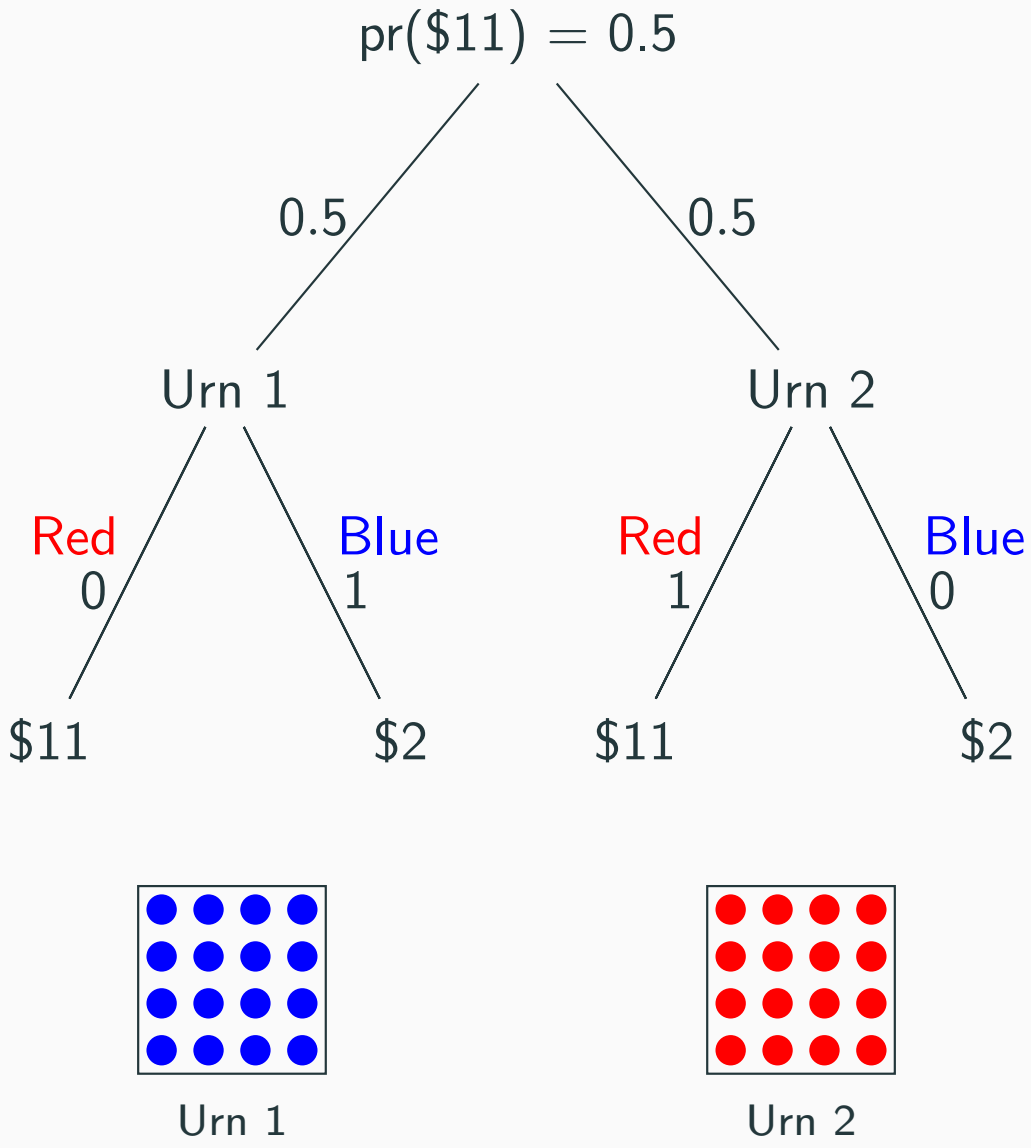
COMPOUND LOTTERY



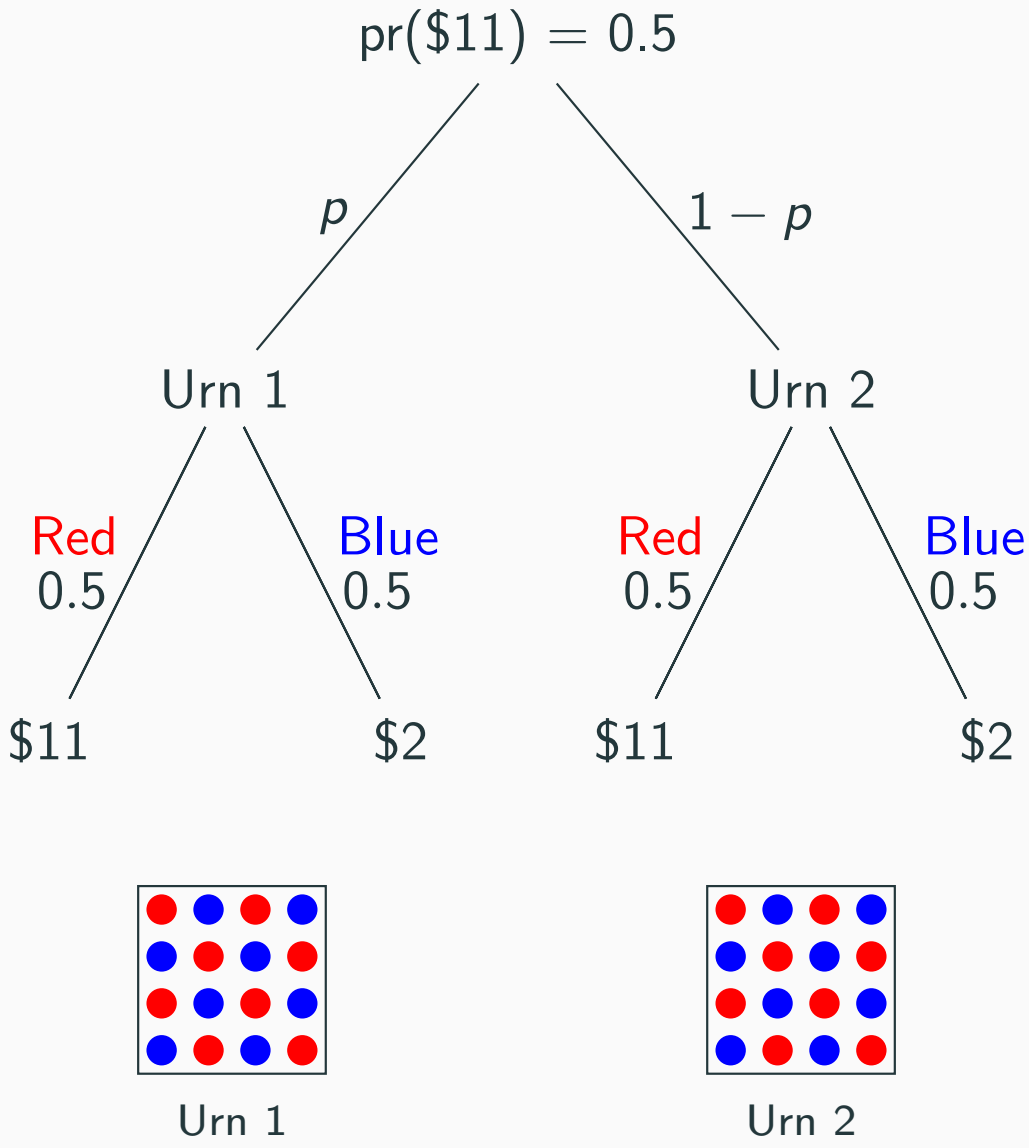
$$pq + (1 - p)r = 0.5$$

$$q \leq 0.5, r \geq 0.5$$

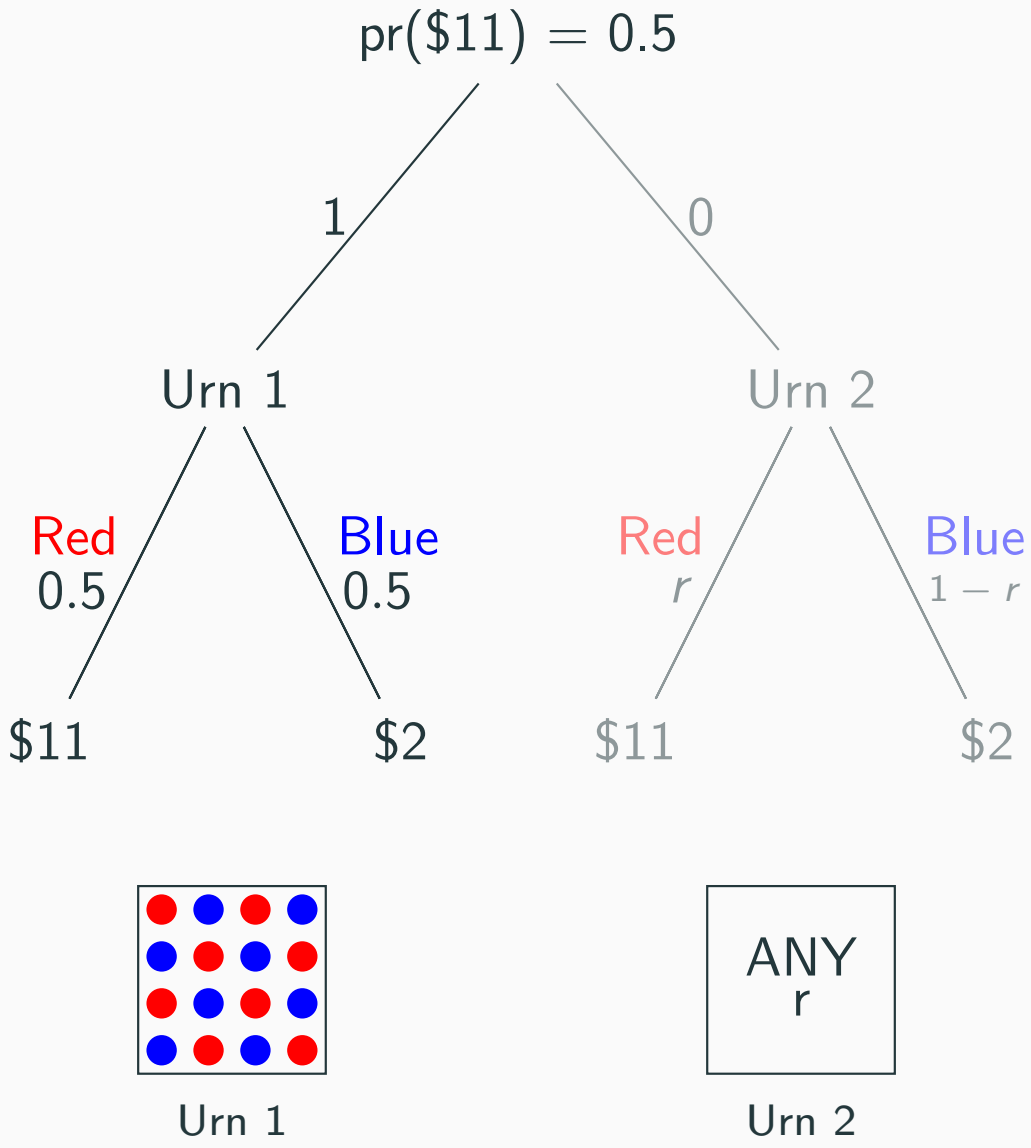
ONE-SHOT EARLY



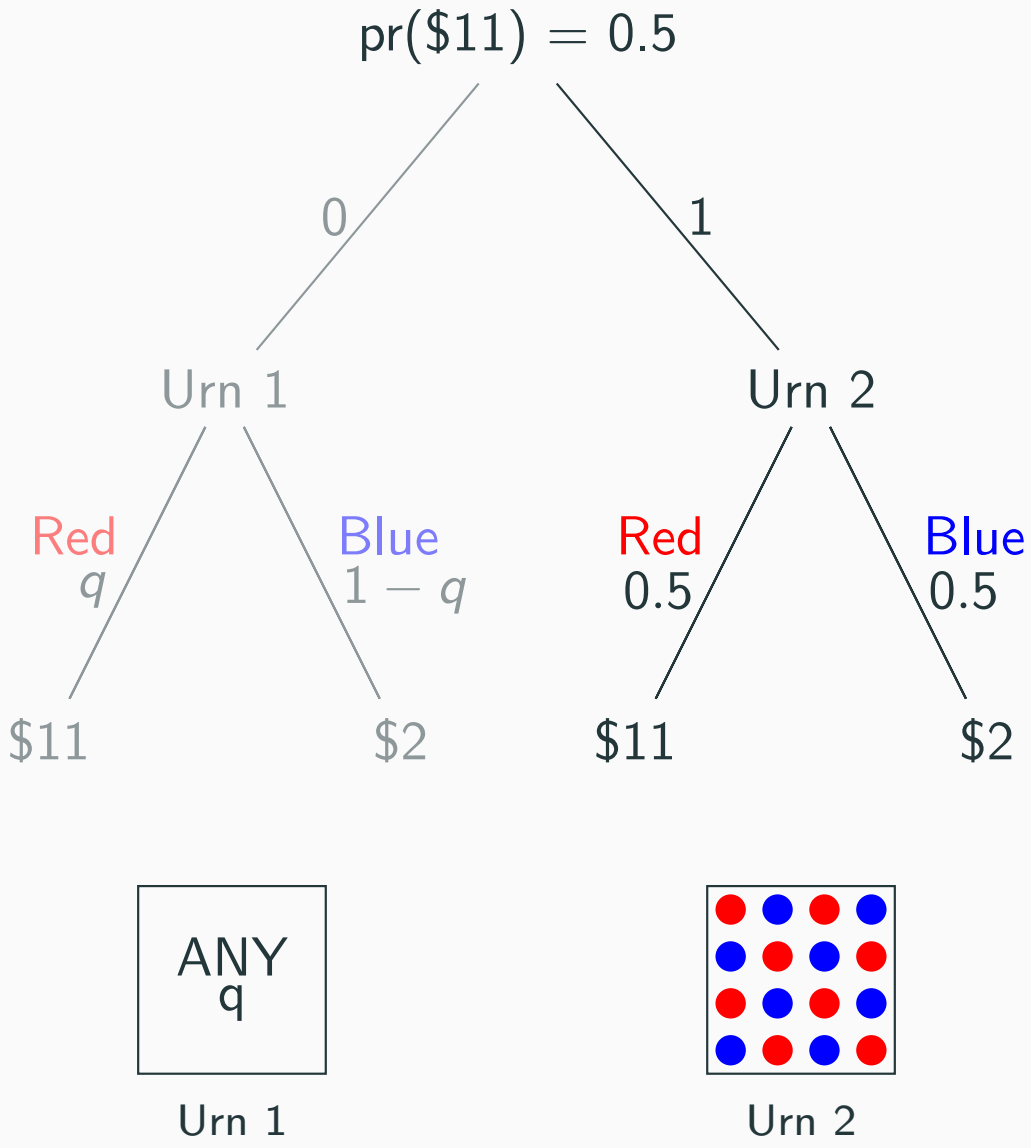
ONE-SHOT LATE



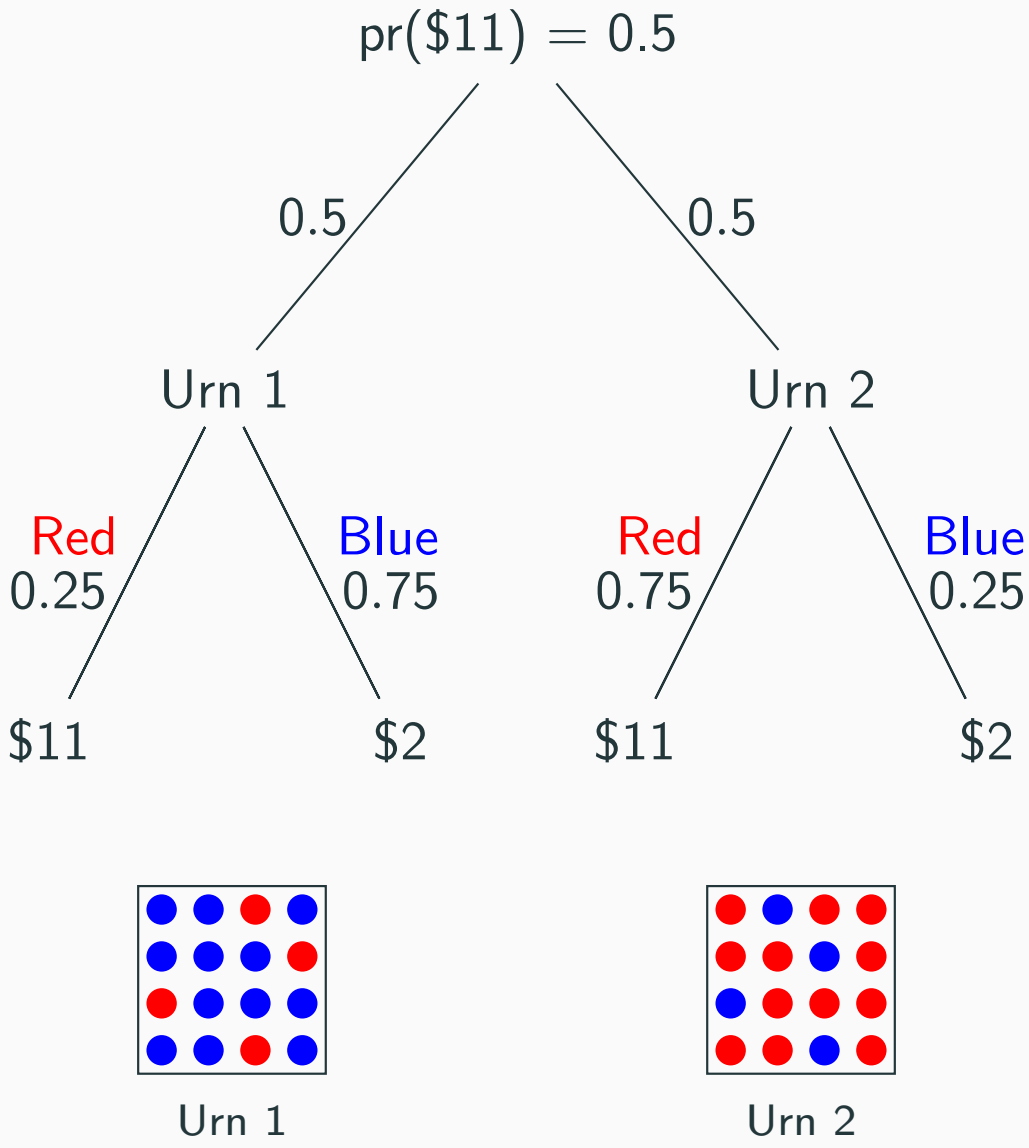
ONE-SHOT LATE



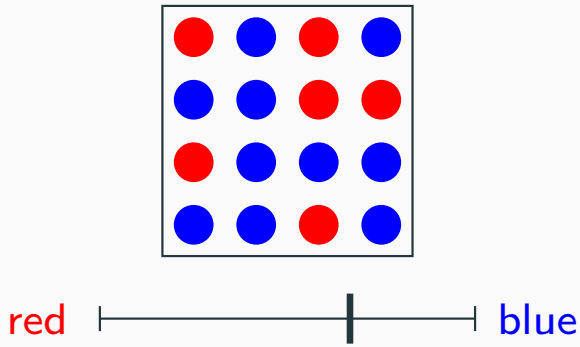
ONE-SHOT LATE



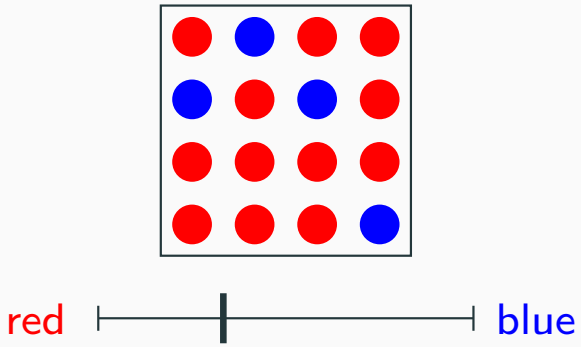
GRADUAL


pr($11) = 0.5
0.5
0.5
Urn 1
Urn 2
Red
0.25
Blue
0.75
Red
0.75
Blue
0.25
$11
$2
$11
$2
Urn 1
Urn 2

INFORMATION STRUCTURE



Urn 1: Low Prize

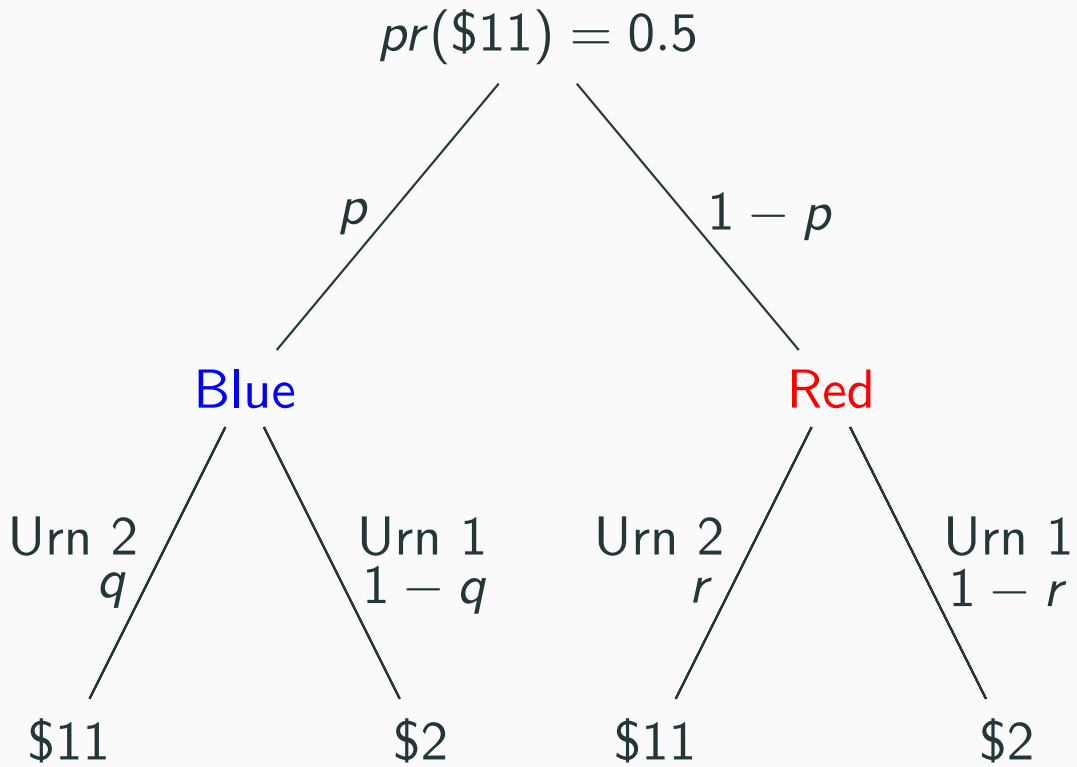


Urn 2: High Prize

- At the beginning of the experiment, computer randomly determines lottery outcome for each subject
  - 50% chance of winning high prize ($11) and 50% chance of winning low prize ($2)
- Lottery outcome revealed in two steps—
  - **Step 1**: If low prize, show ball from Urn 1.
    If high prize, show ball from Urn 2.
  - *Wait 30 minutes*
  - **Step 2**: Reveal urn and prize
- Subjects' task is to choose the information structure

INFORMATION STRUCTURE

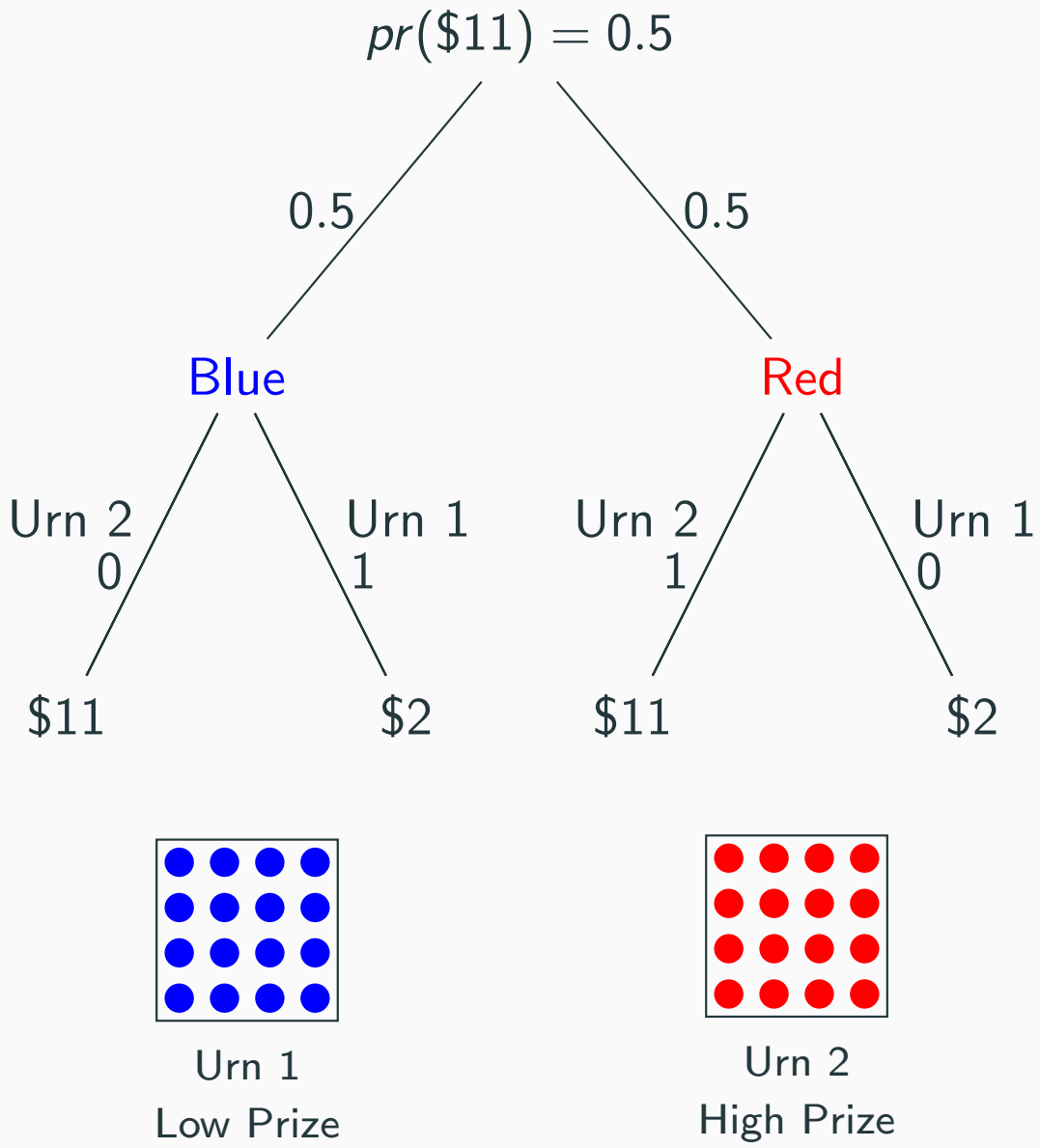
Nature selects Urn 1 or Urn 2.



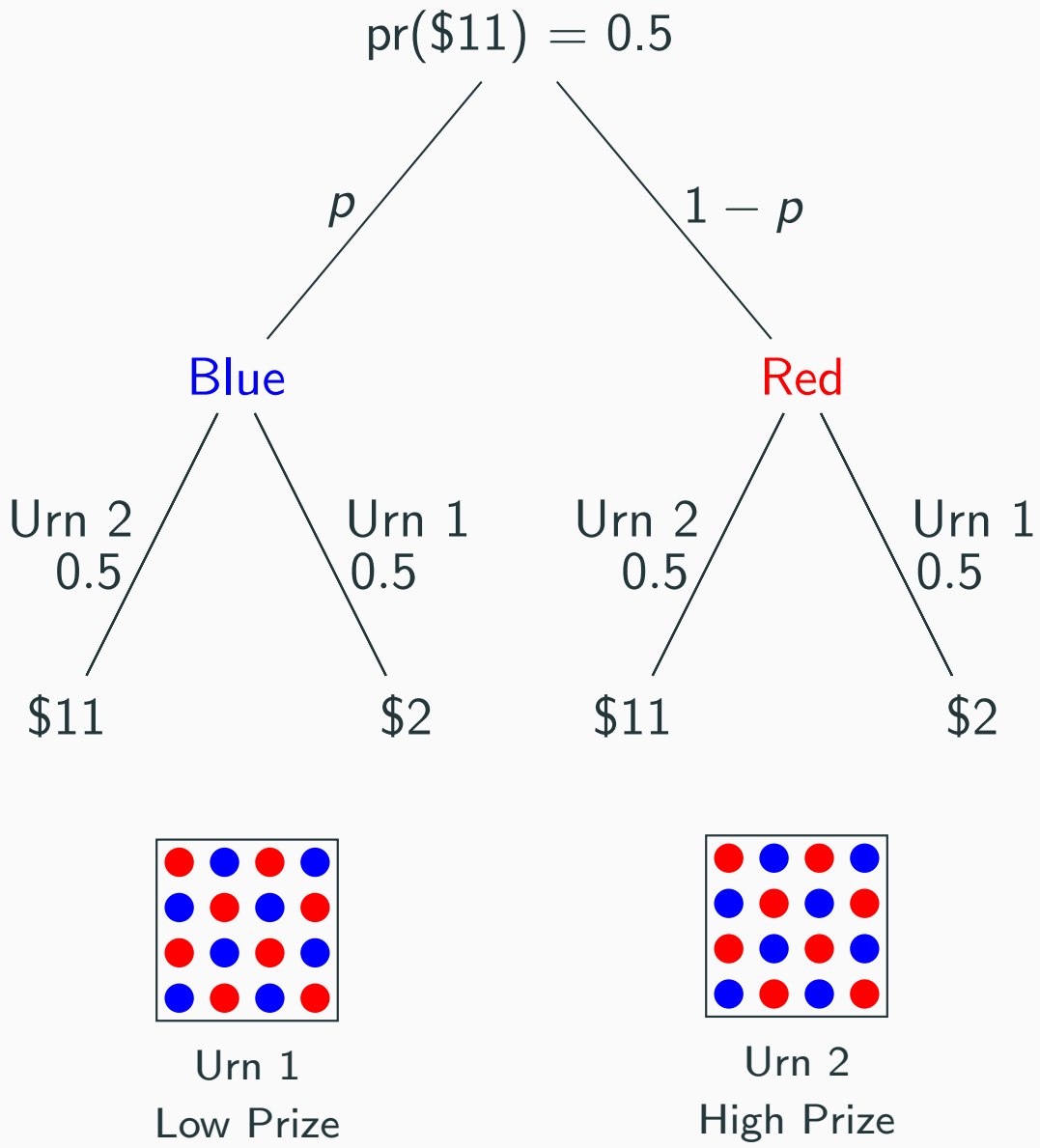
$$pq + (1 - p)r = 0.5$$

$$q \leq 0.5, r \geq 0.5$$

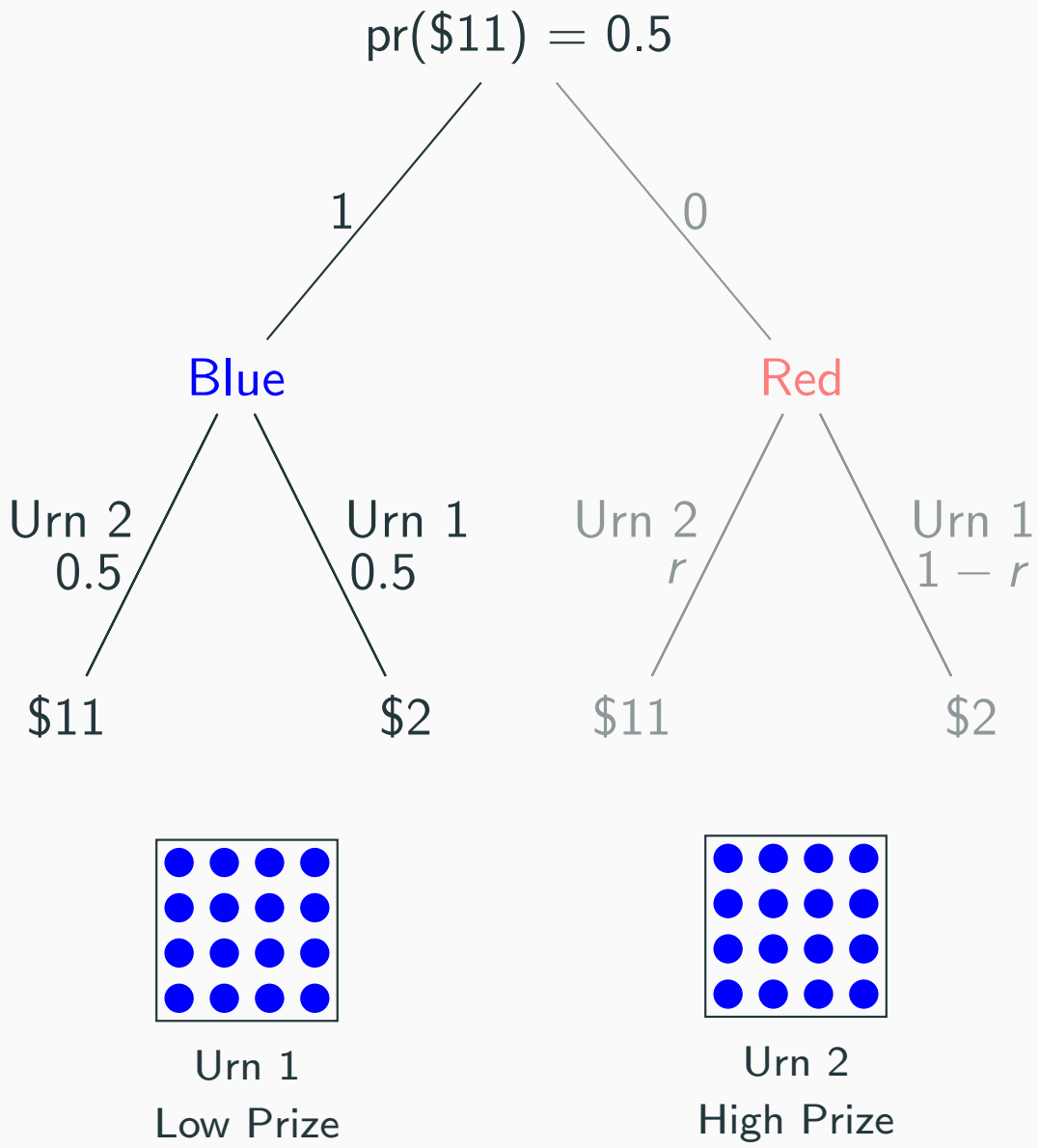
ONE-SHOT EARLY



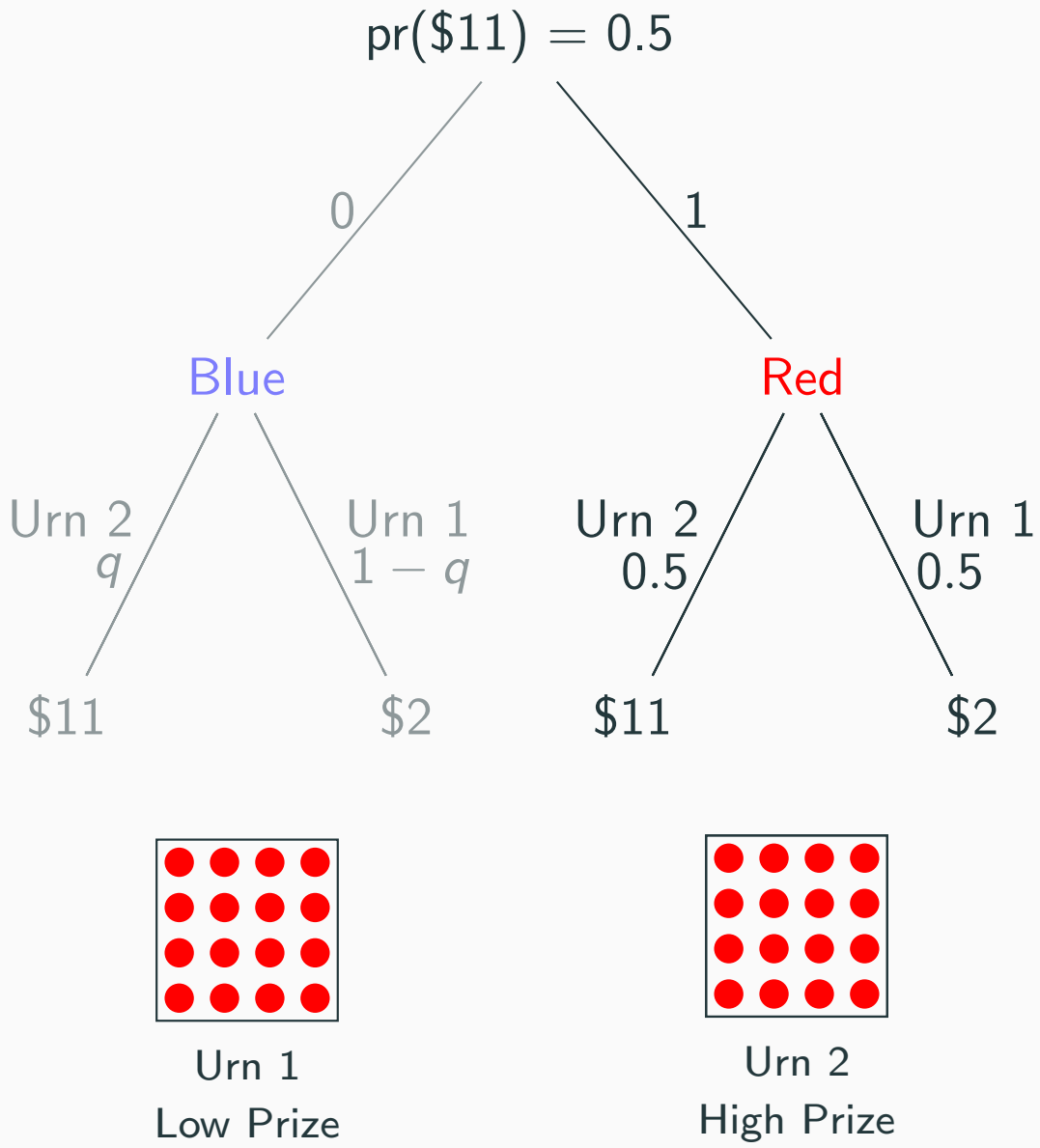
ONE-SHOT LATE



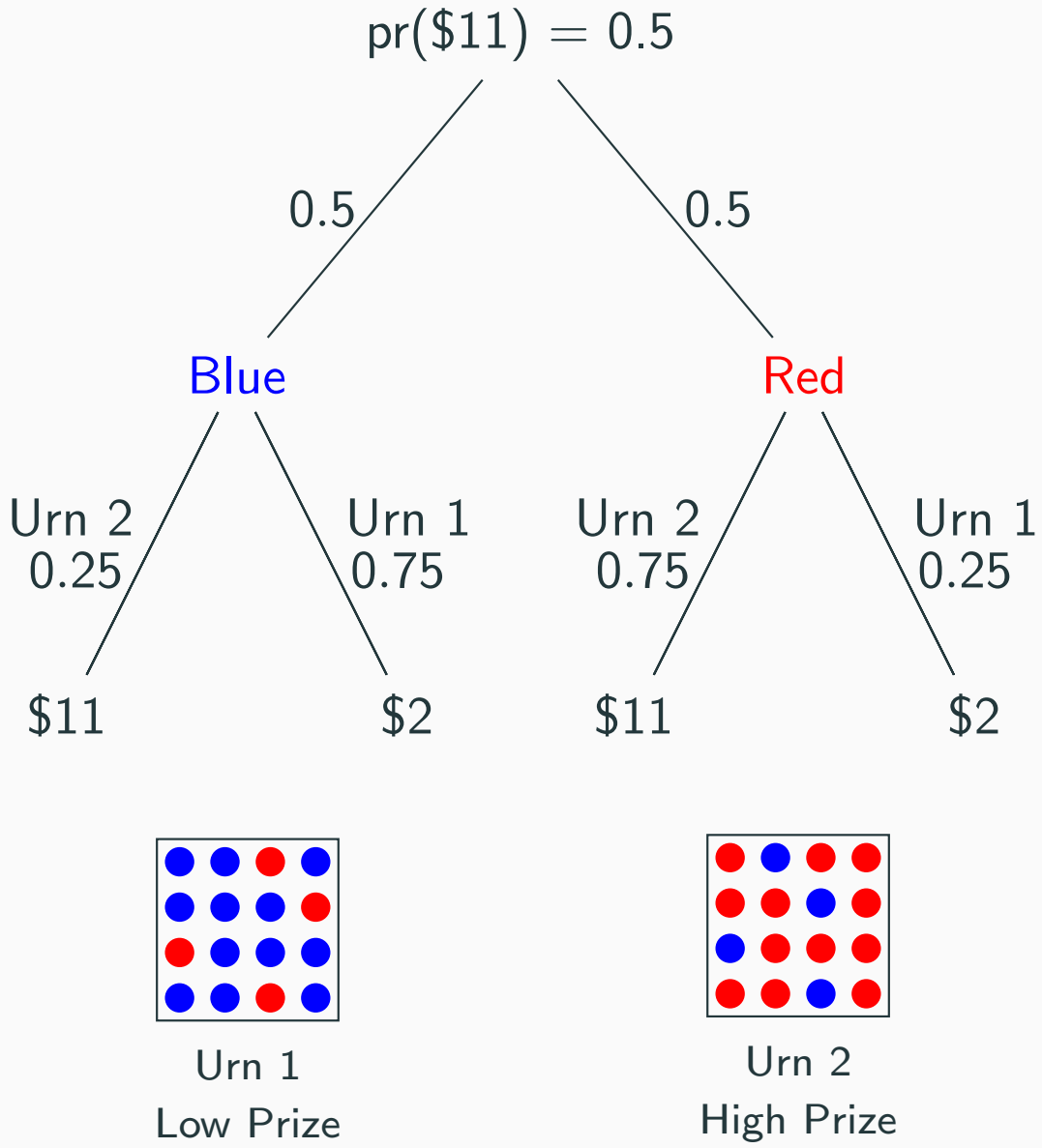
ONE-SHOT LATE



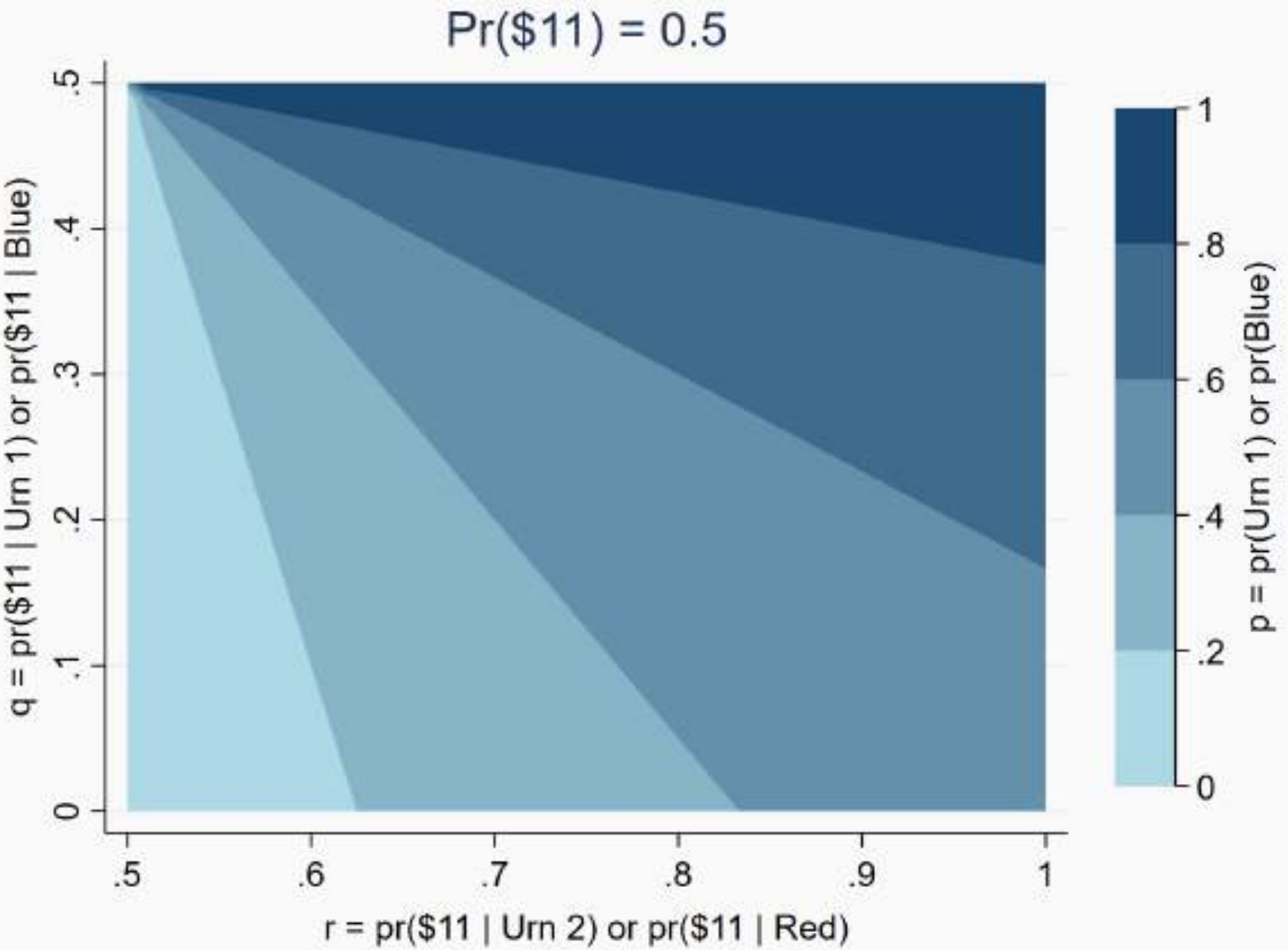
ONE-SHOT LATE



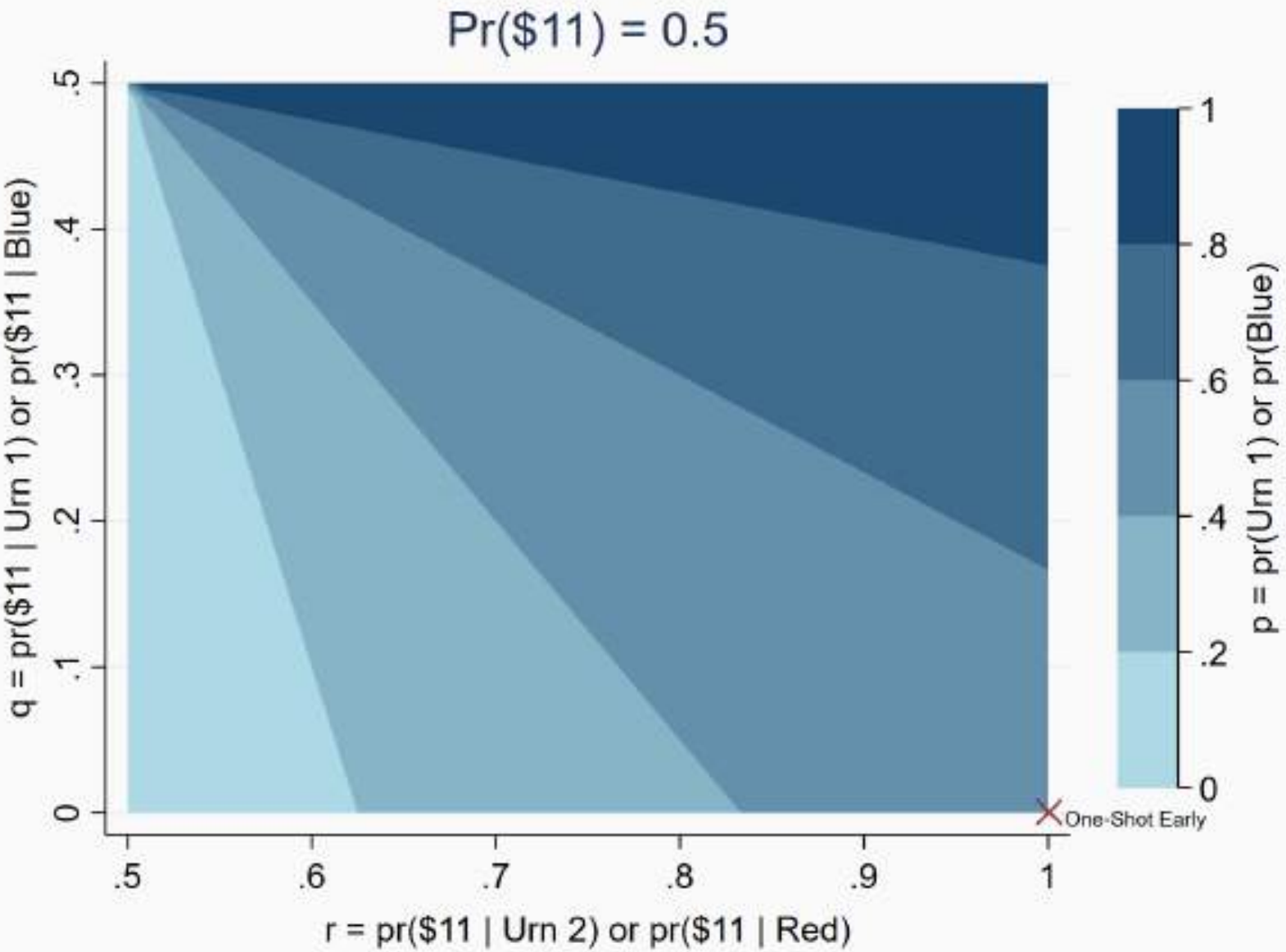
GRADUAL


pr($11) = 0.5
0.5
0.5
Blue
Red
Urn 2
0.25
Urn 1
0.75
Urn 2
0.75
Urn 1
0.25
$11
$2
$11
$2
Urn 1
Low Prize
Urn 2
High Prize

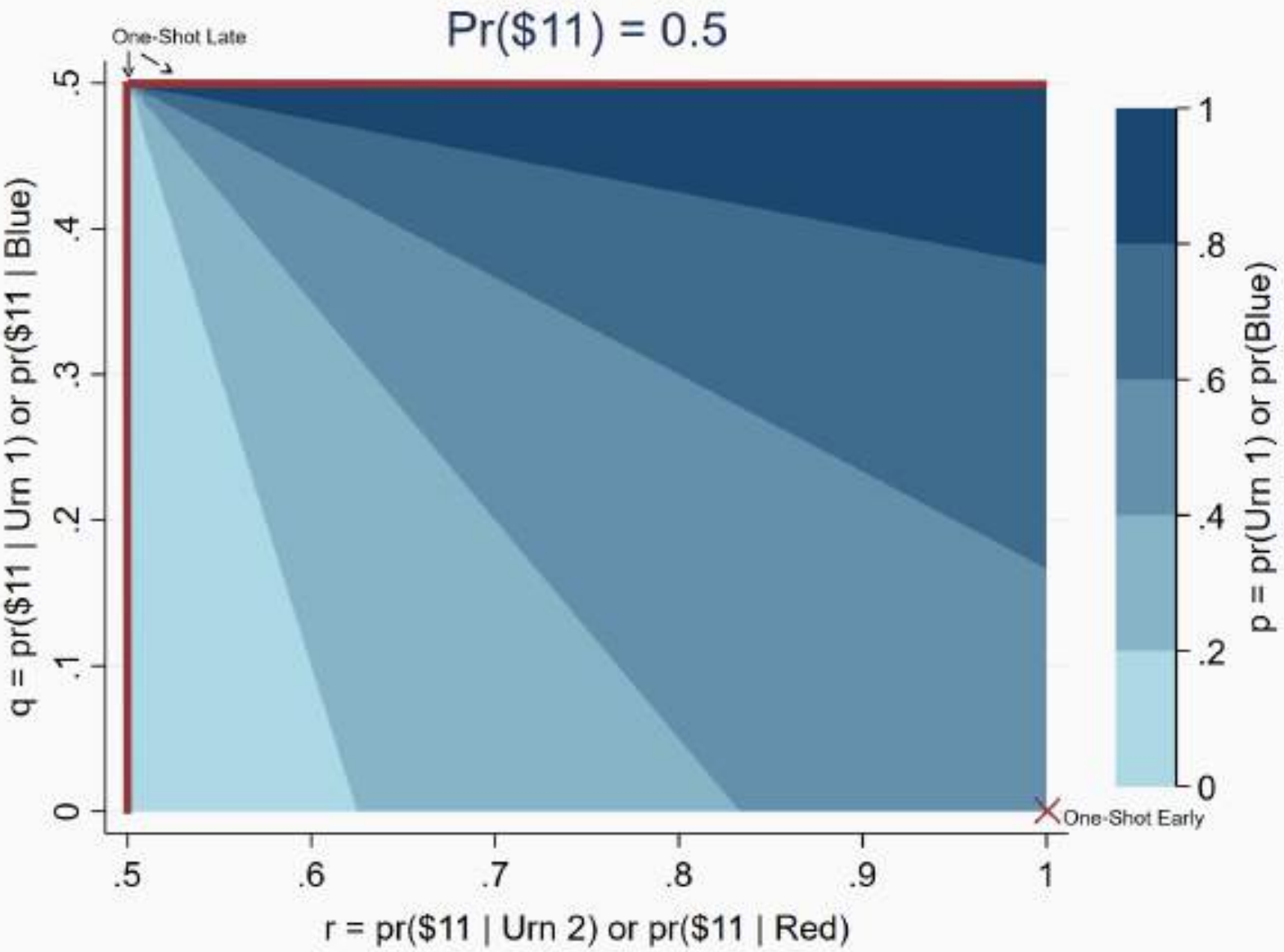
FRAMEWORK


Pr($11) = 0.5
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

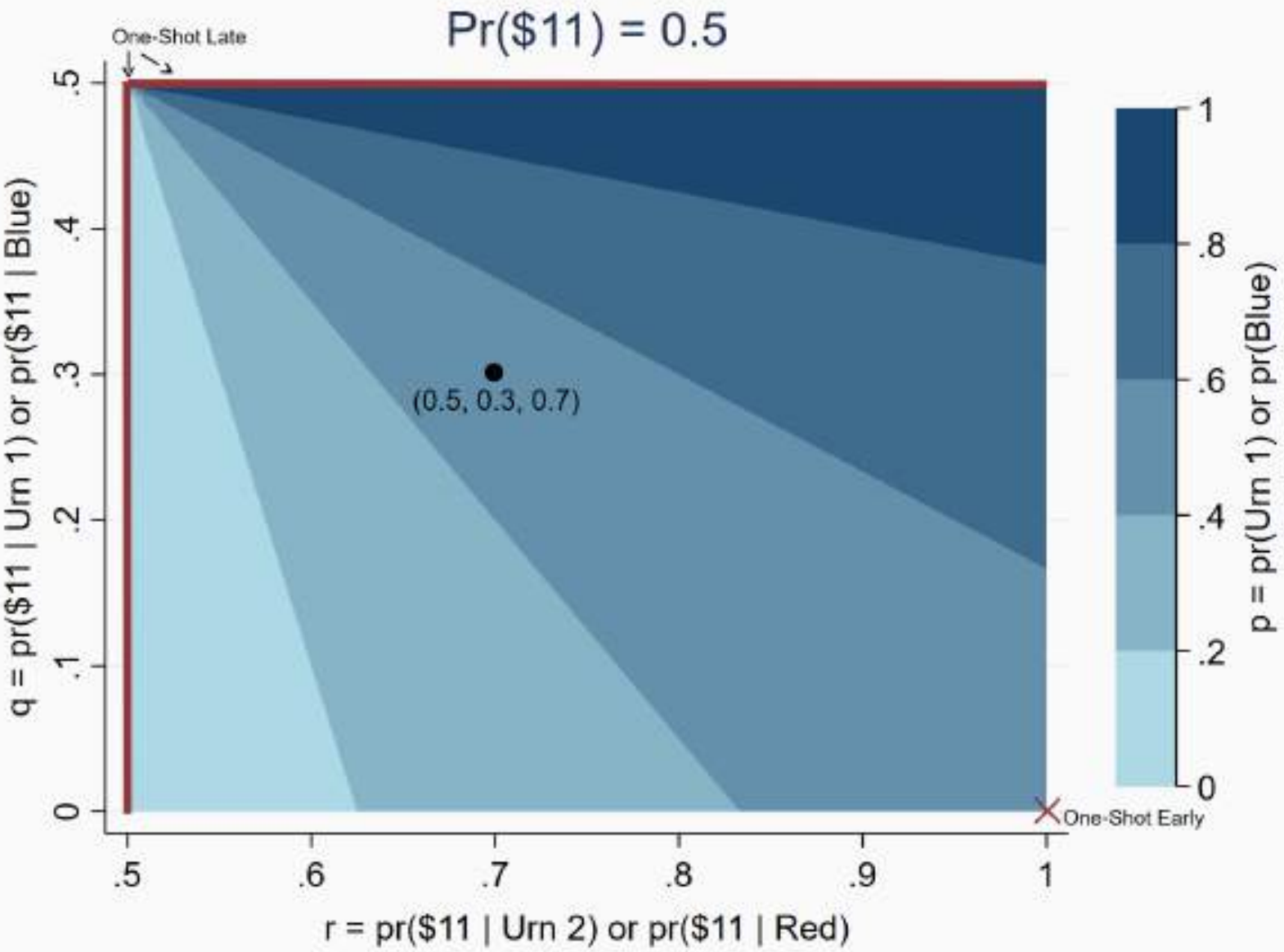
FRAMEWORK


Pr($11) = 0.5
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
One-Shot Early
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

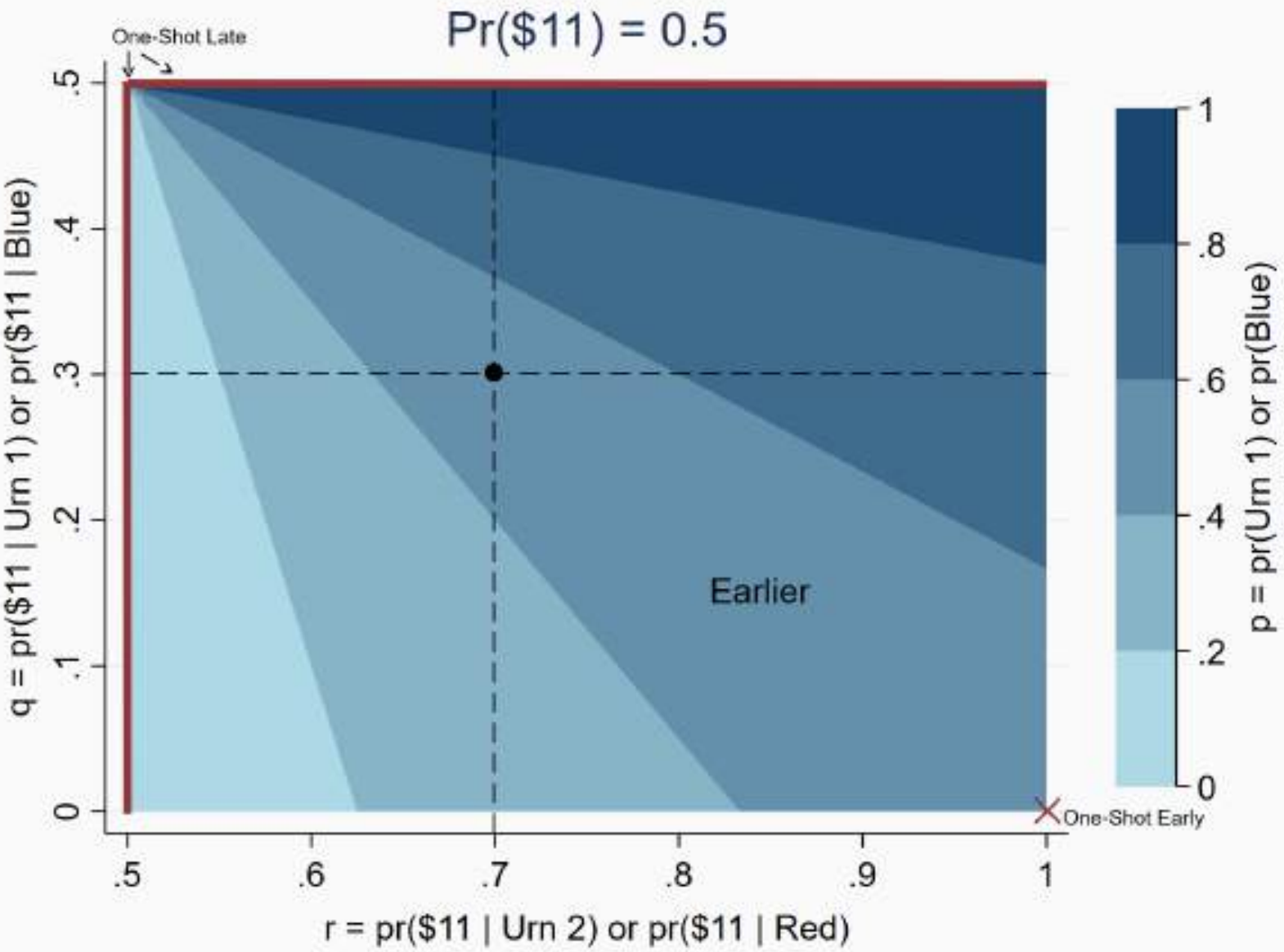
FRAMEWORK


Pr($11) = 0.5
One-Shot Late
One-Shot Early
q = pr($11 | Urn 1) or pr($11 | Blue)
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1

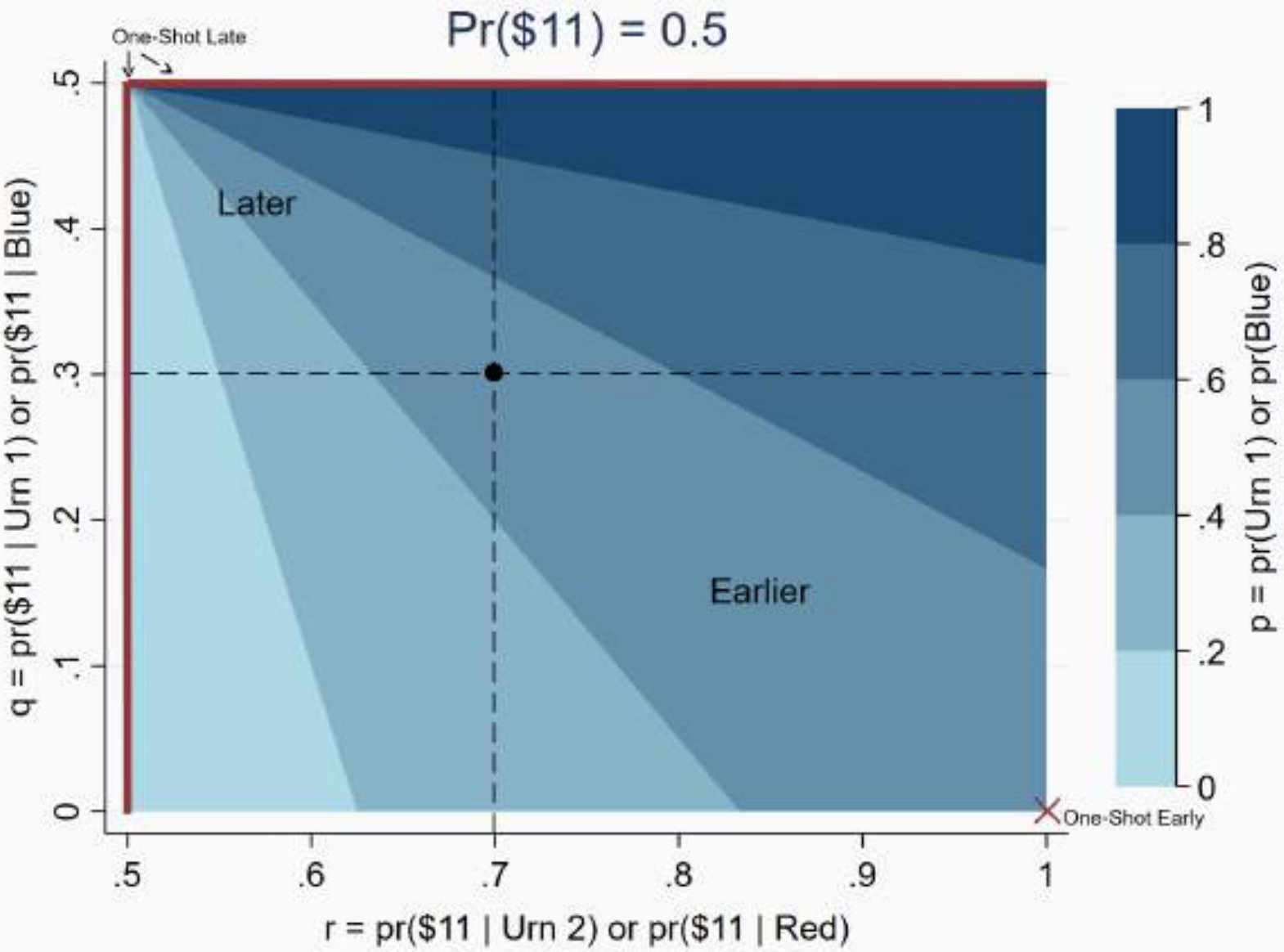
FRAMEWORK


Pr($11) = 0.5
One-Shot Late
(0.5, 0.3, 0.7)
One-Shot Early
q = pr($11 | Urn 1) or pr($11 | Blue)
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1

FRAMEWORK


Pr($11) = 0.5
One-Shot Late
Earlier
One-Shot Early
q = pr($11 | Urn 1) or pr($11 | Blue)
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1

FRAMEWORK

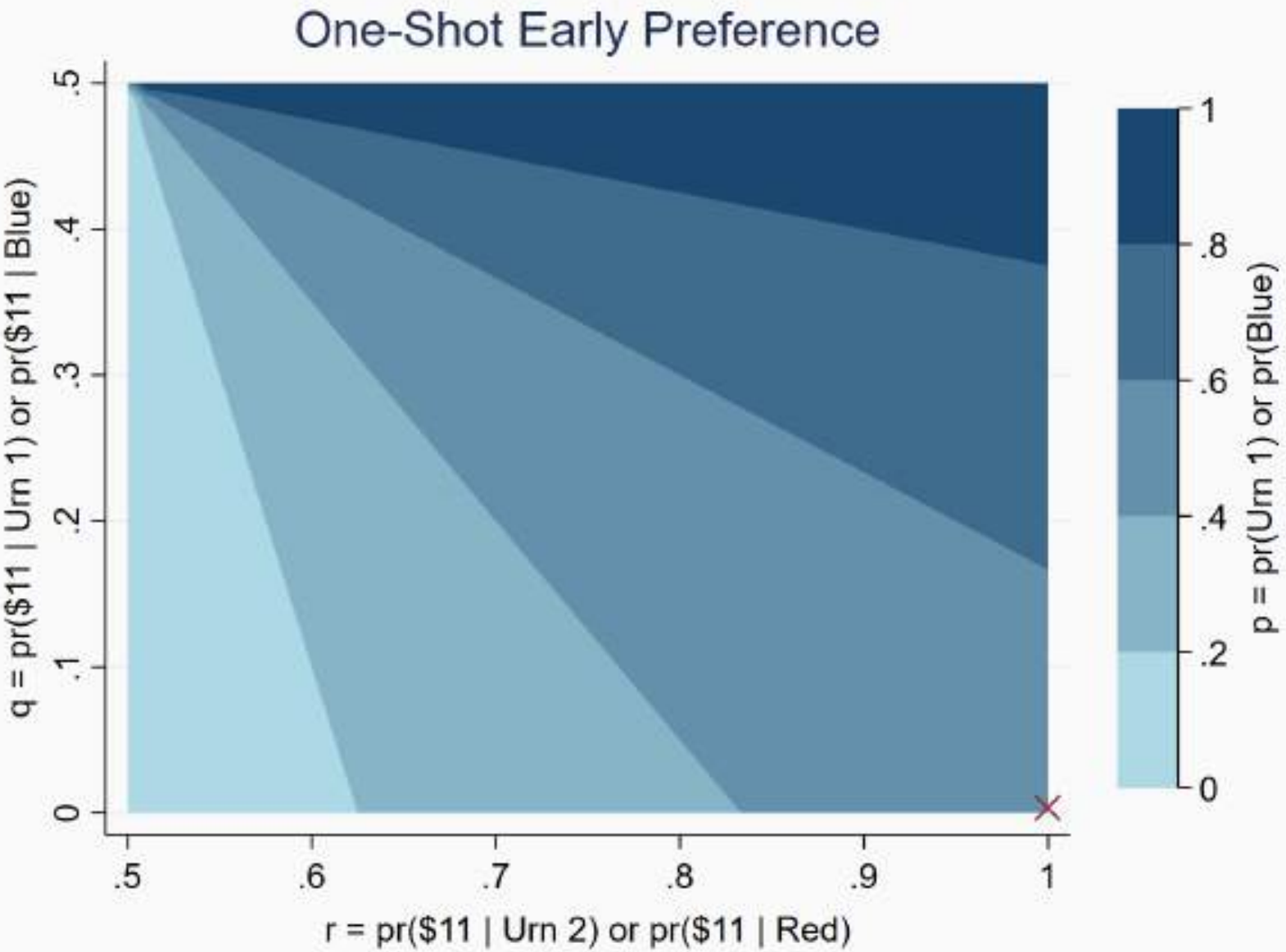

Pr($11) = 0.5
One-Shot Late
Later
Earlier
One-Shot Early
q = pr($11 | Urn 1) or pr($11 | Blue)
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1

DESIGN

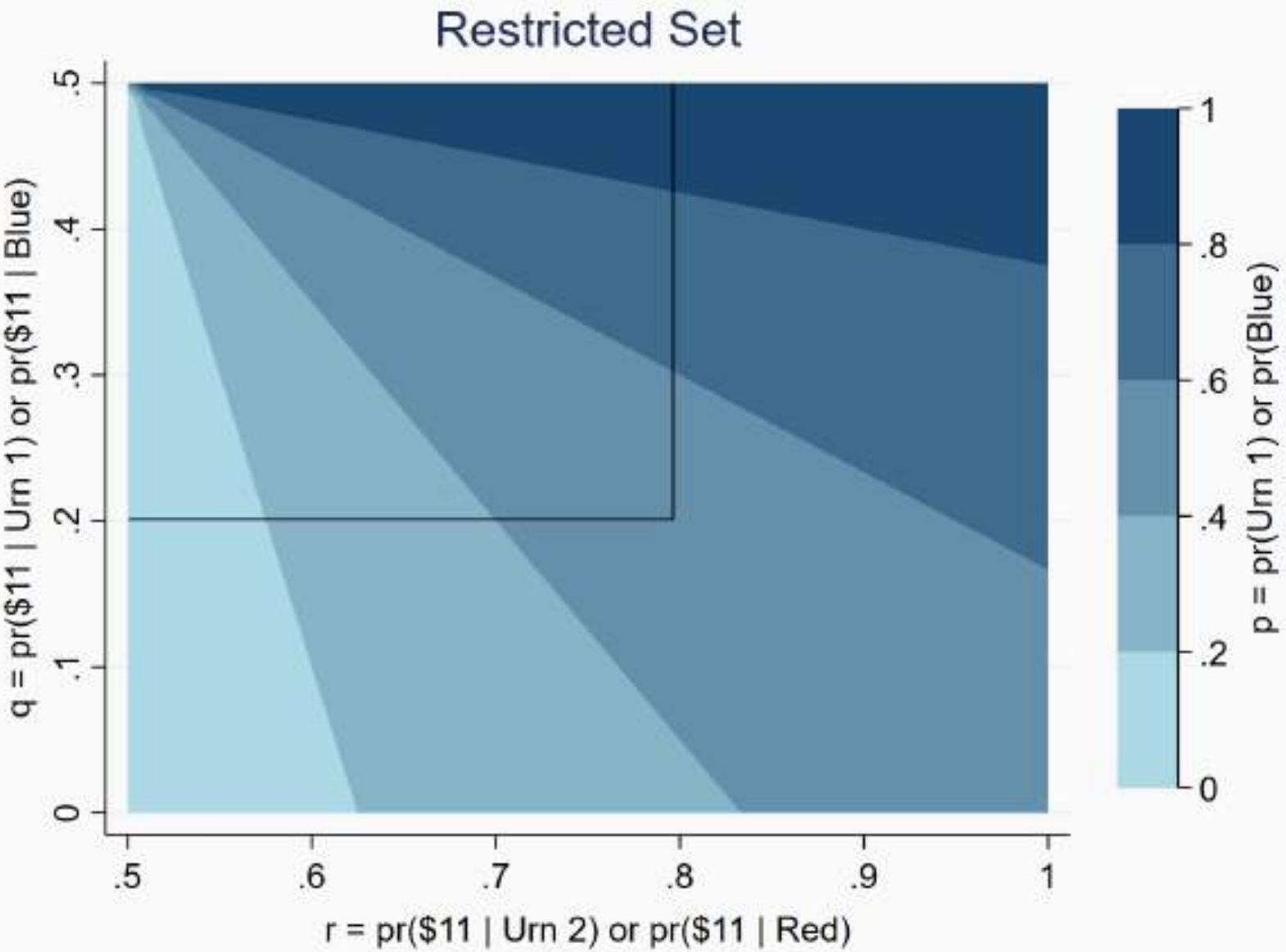
DESIGN

- Subjects choose their most preferred lottery or information structure from convex sets in (p, q, r) space
  - Allows for disentangling preferences for early/late vs. preference for one-shot

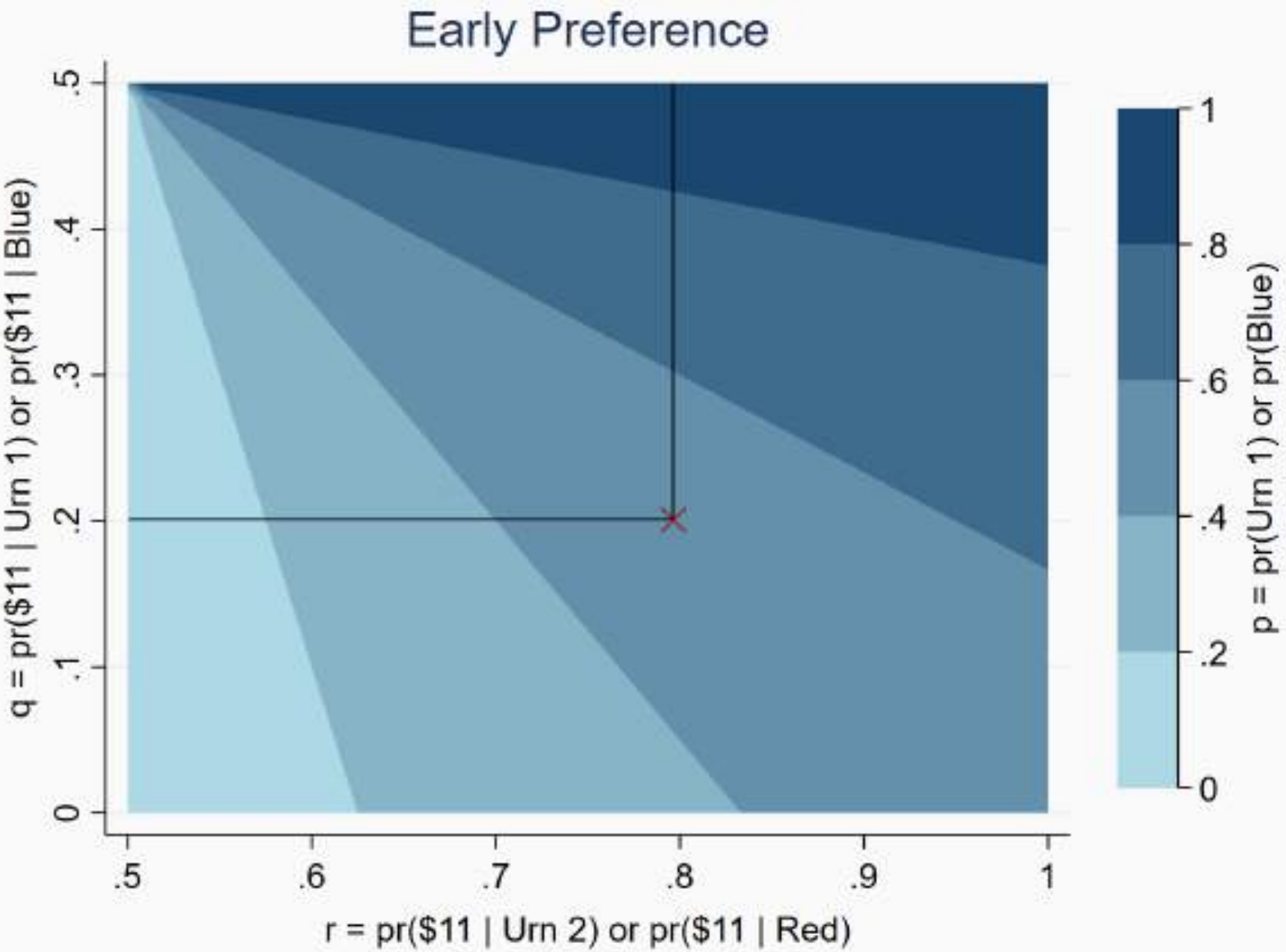
DESIGN


One-Shot Early Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

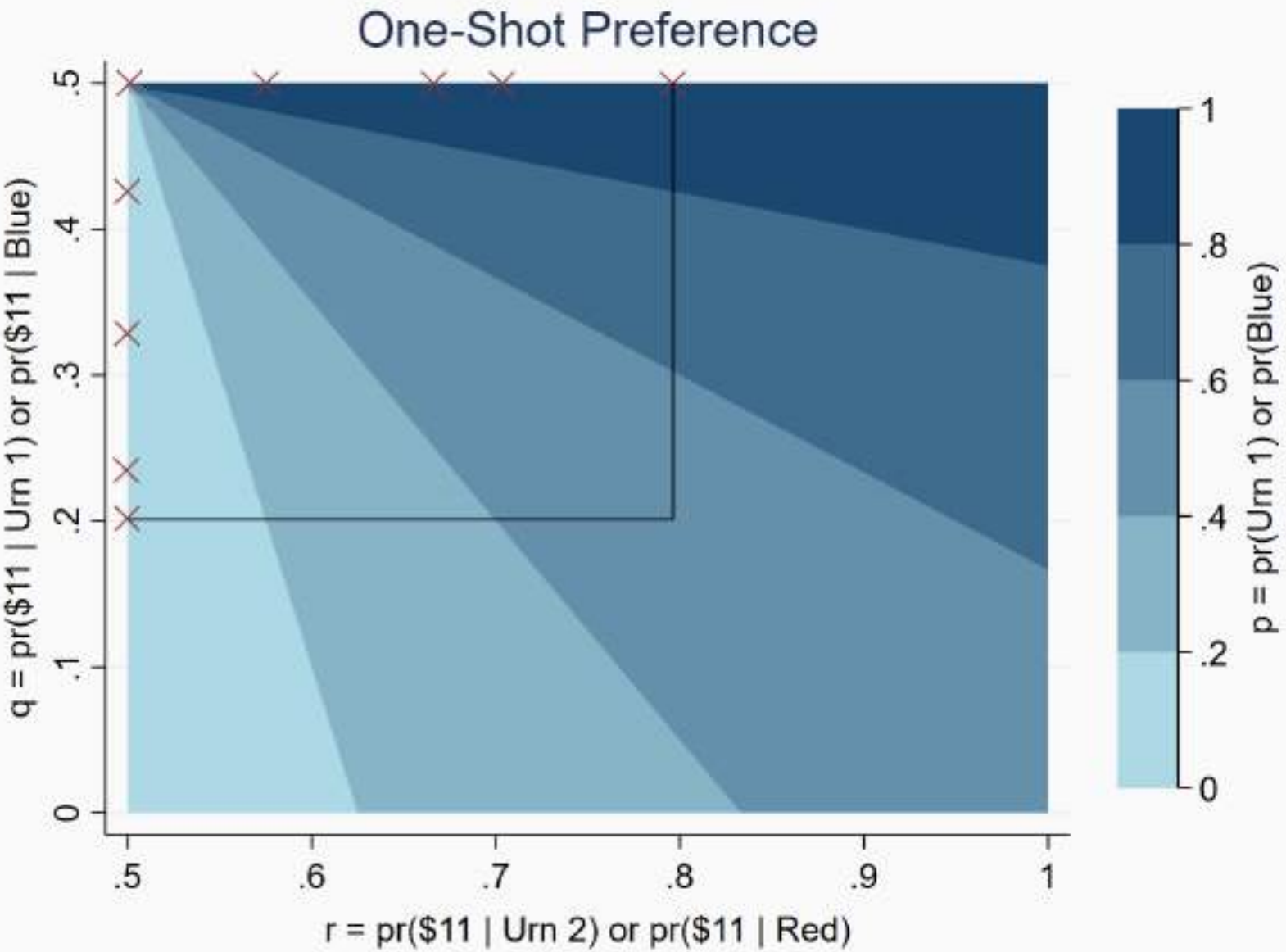
DESIGN


Restricted Set
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

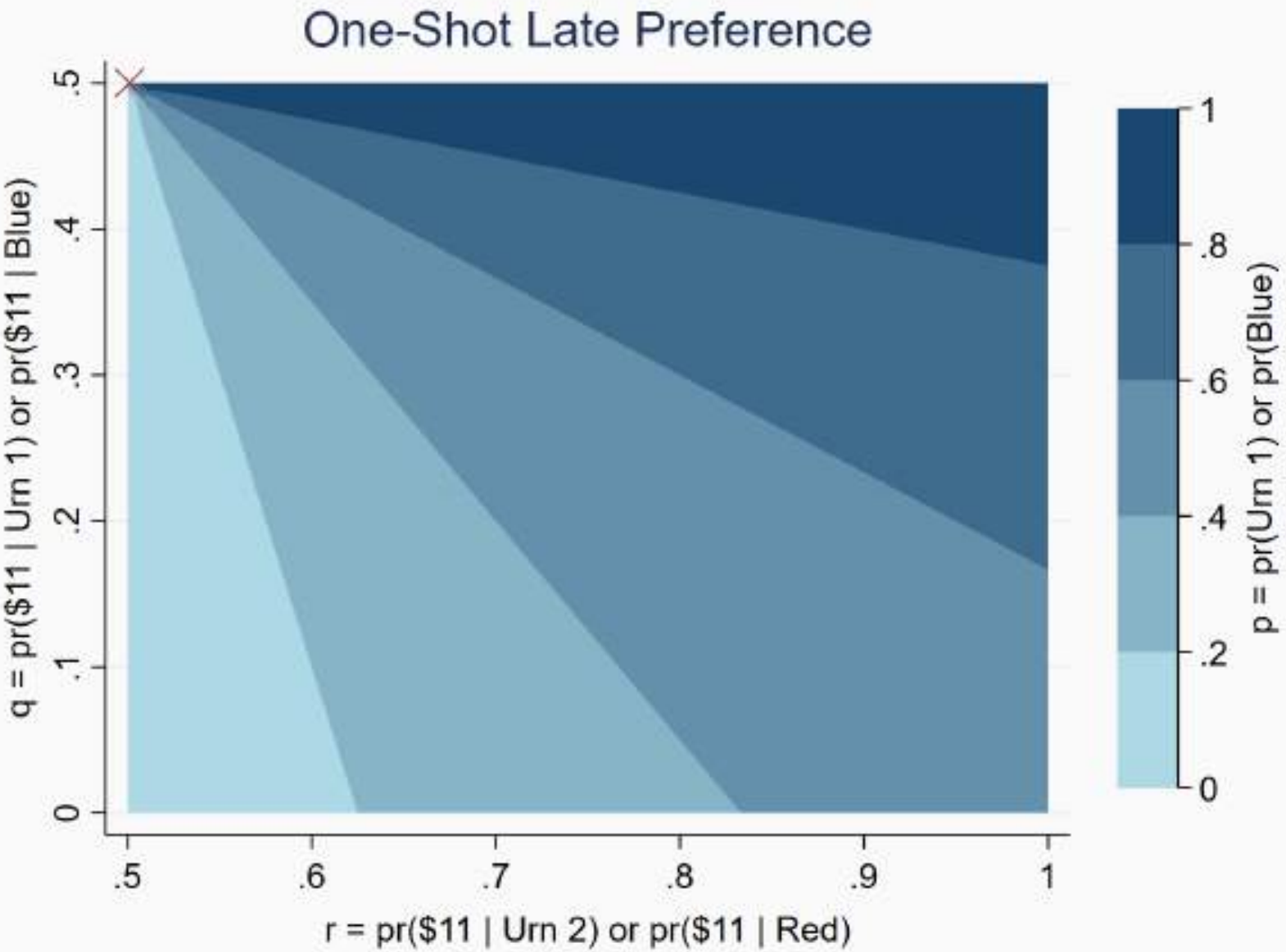
DESIGN


Early Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

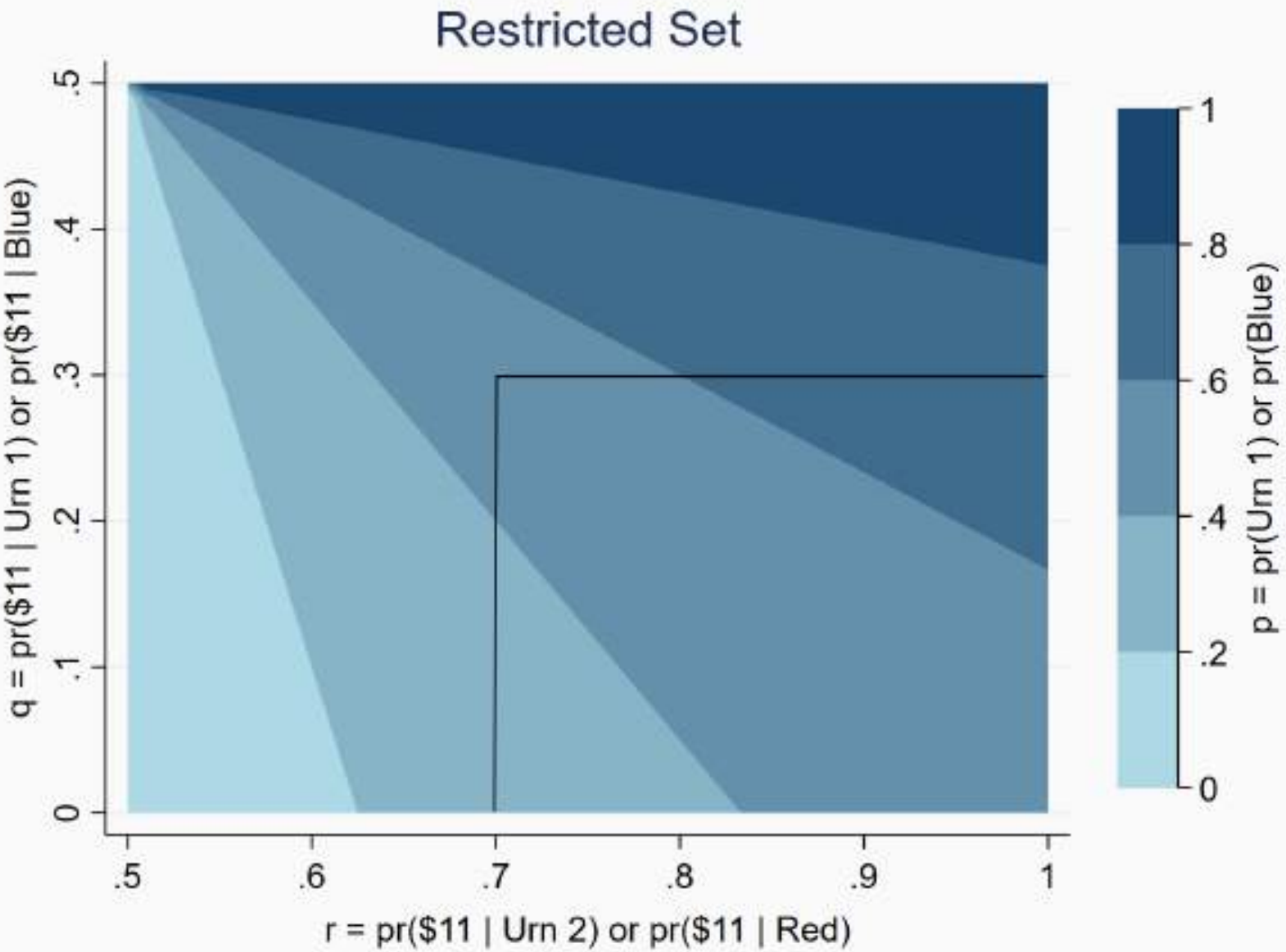
DESIGN


One-Shot Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
r = pr($11 | Urn 2) or pr($11 | Red)
.5
.6
.7
.8
.9
1
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

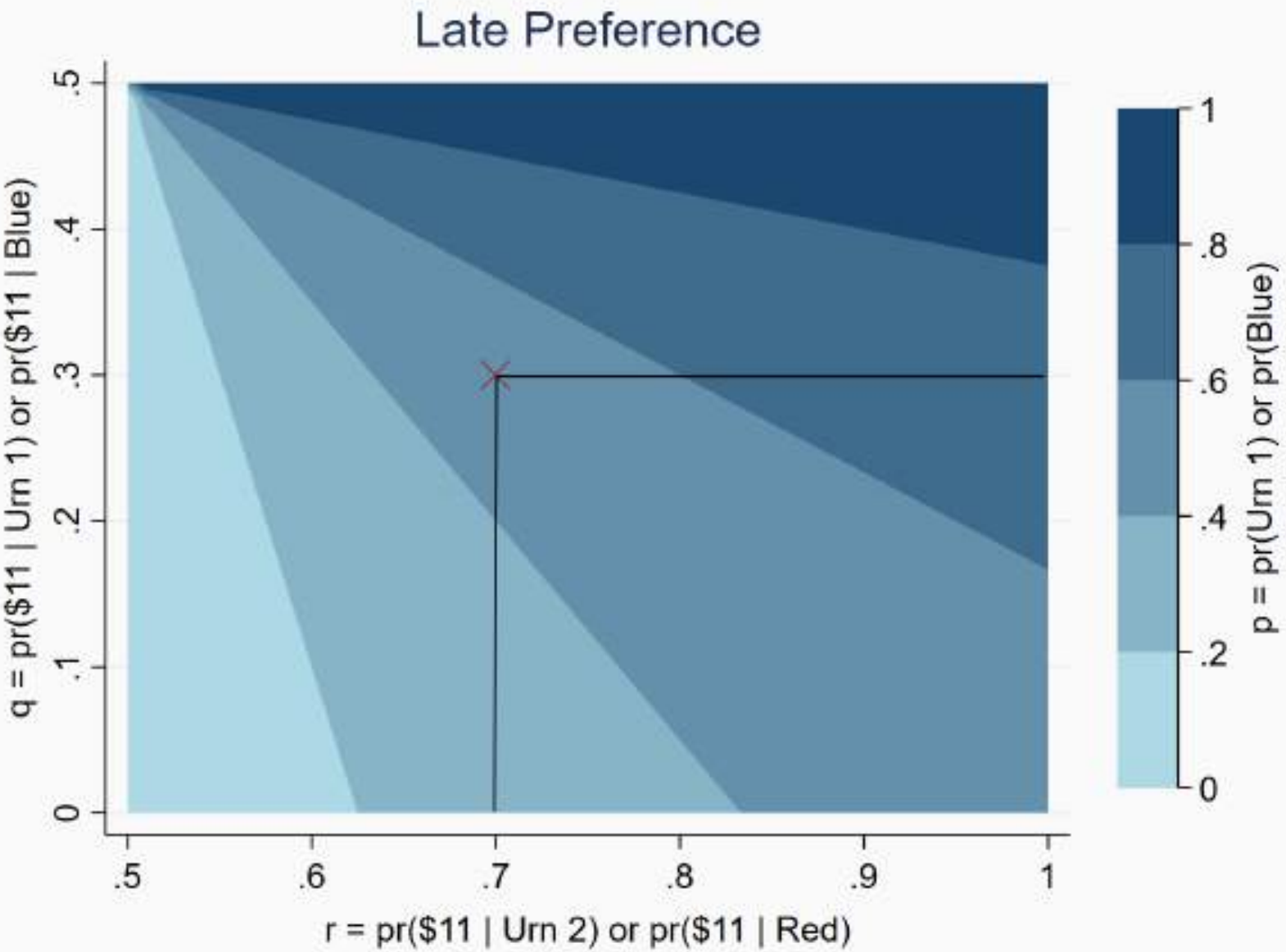
DESIGN


One-Shot Late Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

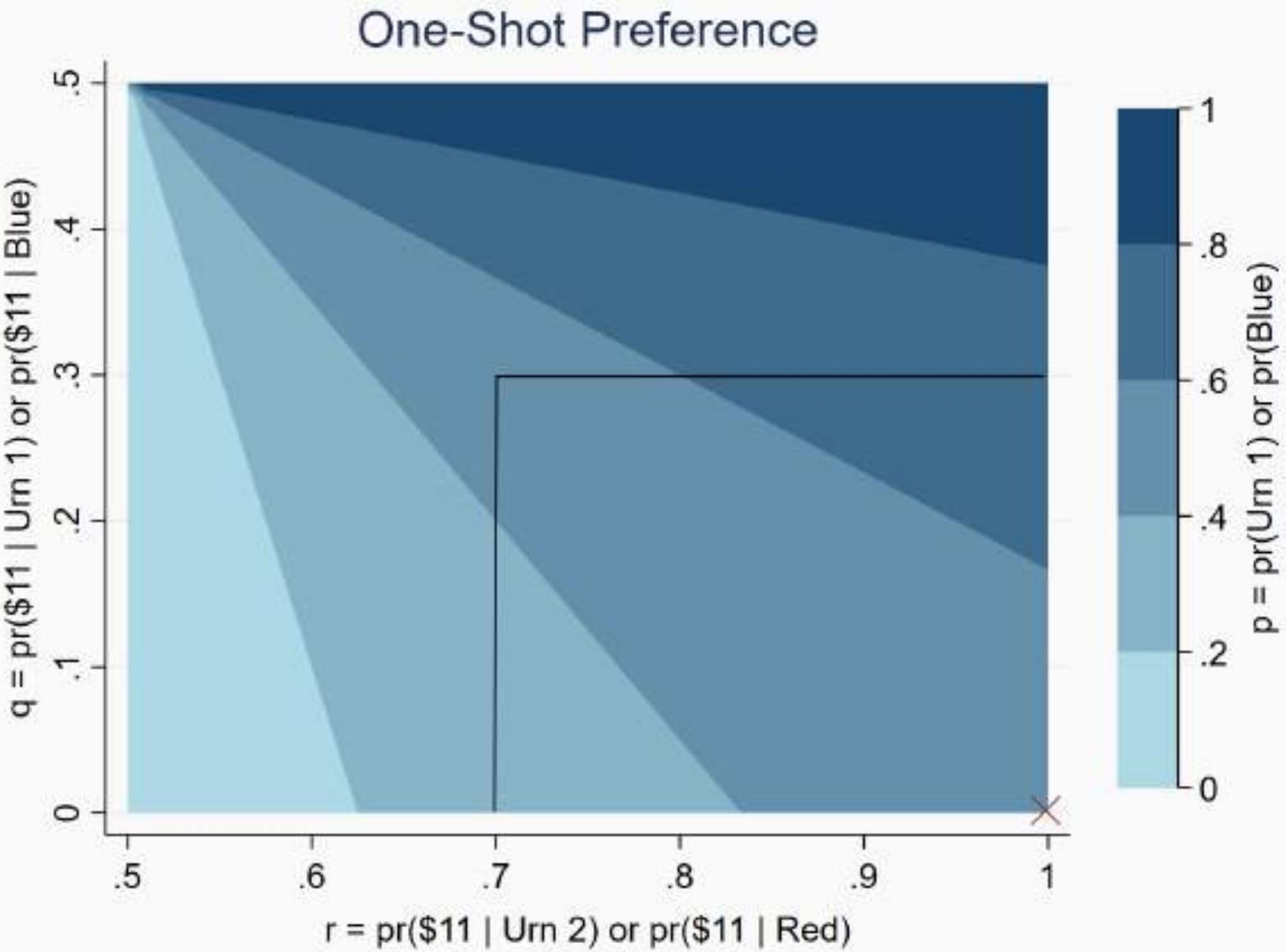
DESIGN


Restricted Set
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

DESIGN


Late Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

DESIGN


One-Shot Preference
q = pr($11 | Urn 1) or pr($11 | Blue)
0
.1
.2
.3
.4
.5
.5
.6
.7
.8
.9
1
r = pr($11 | Urn 2) or pr($11 | Red)
p = pr(Urn 1) or pr(Blue)
0
.2
.4
.6
.8
1

DESIGN

- Timeline:
  1. Subjects make choices in all sets
  2. Show first-stage resolution for one randomly-selected set
  3. Distraction tasks between Stage 1 and Stage 2 resolution (about 30 min)
  4. Show second-stage resolution at the end of the experiment
- **One-Shot Resolution Predictions:** Subjects choosing one-shot early resolution will switch to choosing one-shot late resolution in early-restricted sets, and vice versa

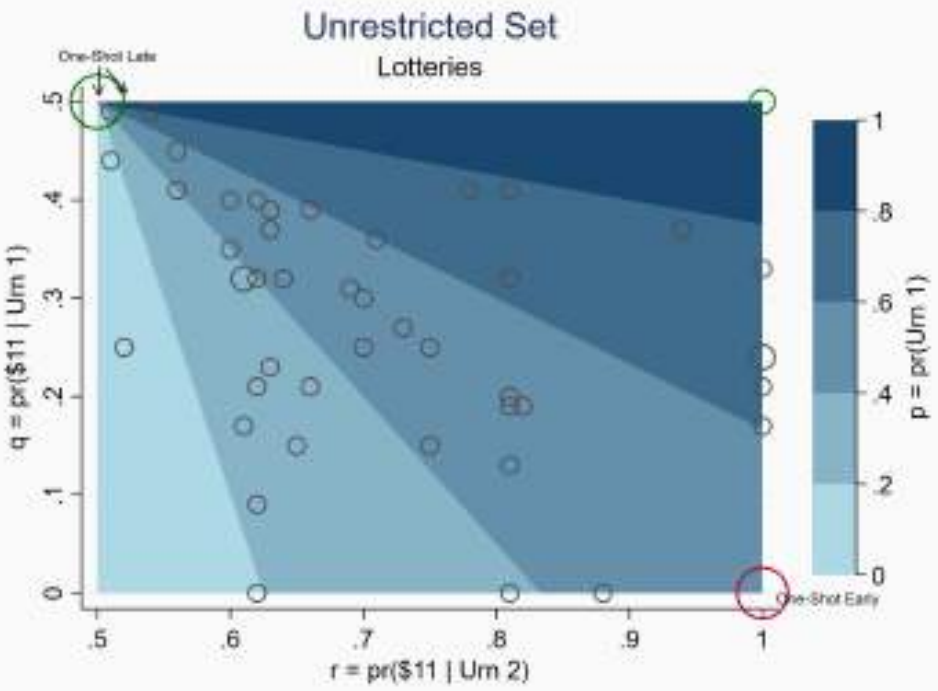
Screenshot

RESULTS

RESULTS PREVIEW

- Majority of subjects choose **gradual** resolution in both treatments
- Among those who don't,
  - Lotteries: prefer **late** resolution
    - But only when choices are restricted
  - Information structures: prefer **early** resolution
    - In all sets
- This is primarily driven by an early/late preference, not one-shot
- These are **strict** preferences

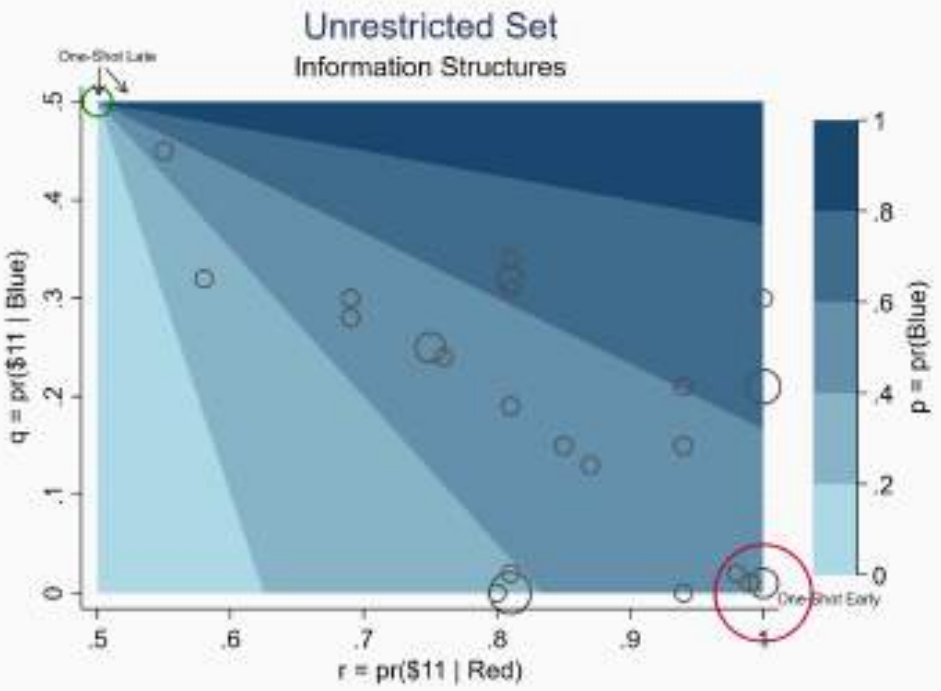
UNRESTRICTED SETS



13.04% Early

17.39% Late

69.57% Gradual

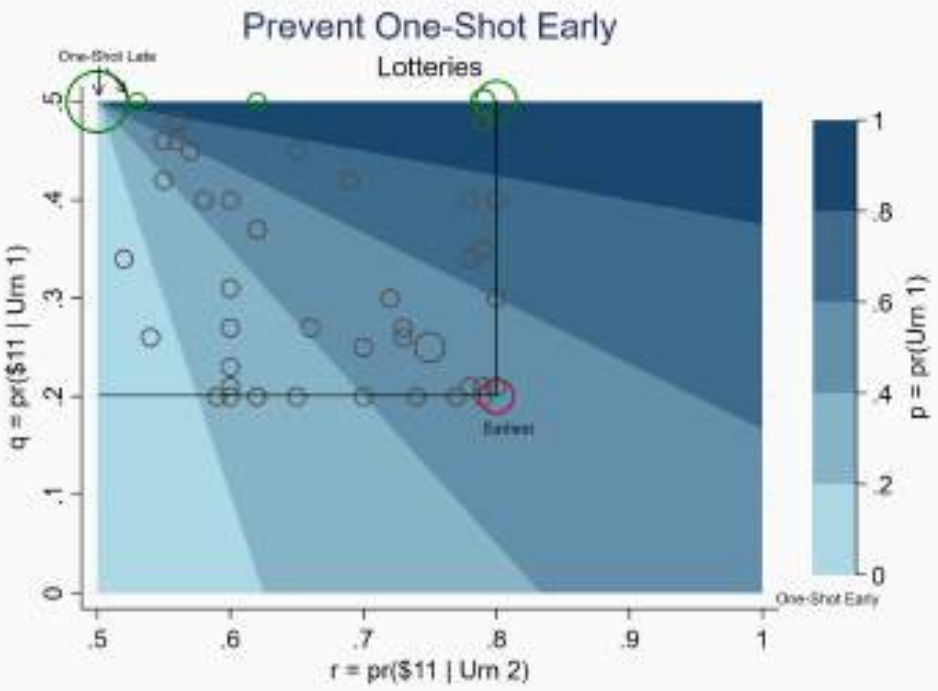


45.21% Early

4.11% Late

50.68% Gradual

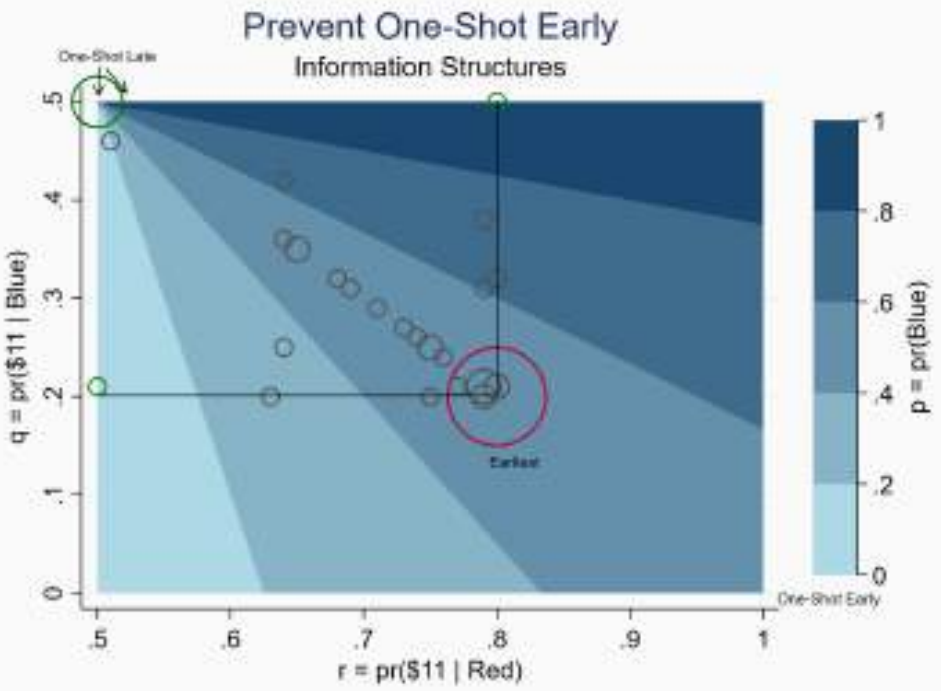
PREVENT ONE-SHOT EARLY



5.80% Early

34.78% Late

59.42% Gradual



46.58% Early

15.07% Late

38.35% Gradual

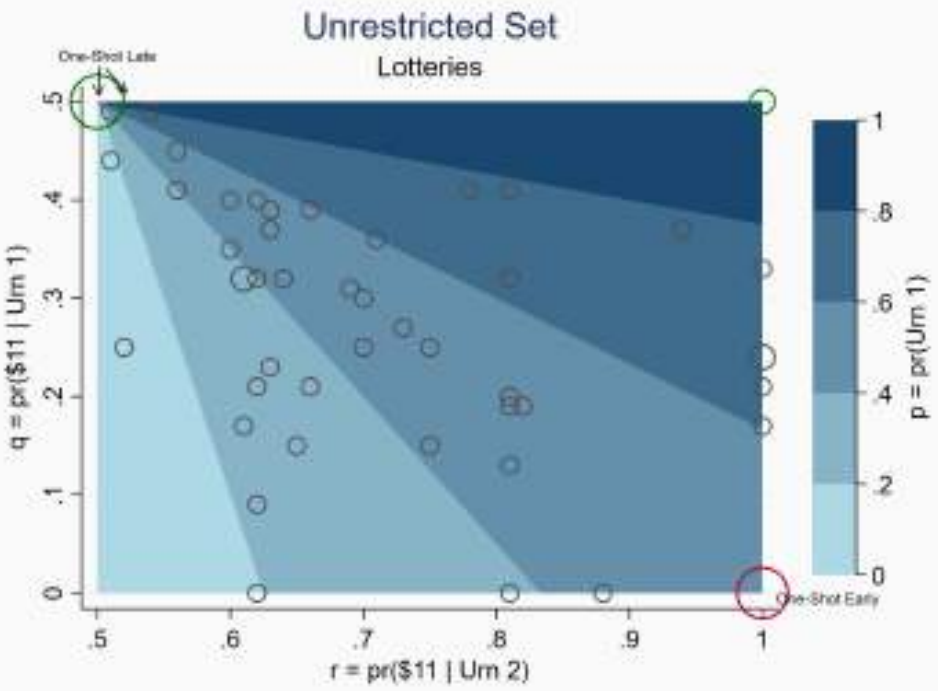
TRANSITION PATTERNS

	Earliest	**Latest**	**Other**	
Prevent OS Early				
Lotteries	44.44%	22.22%	33.33%	n=9
Information	72.73%	9.09%	18.18%	n=33

Choice when one-shot early is unavailable, among those who chose one-shot early in the unrestricted set

Palacious-Huerta (1999), Köszegi & Rabin (2009), Dillenberger (2010)

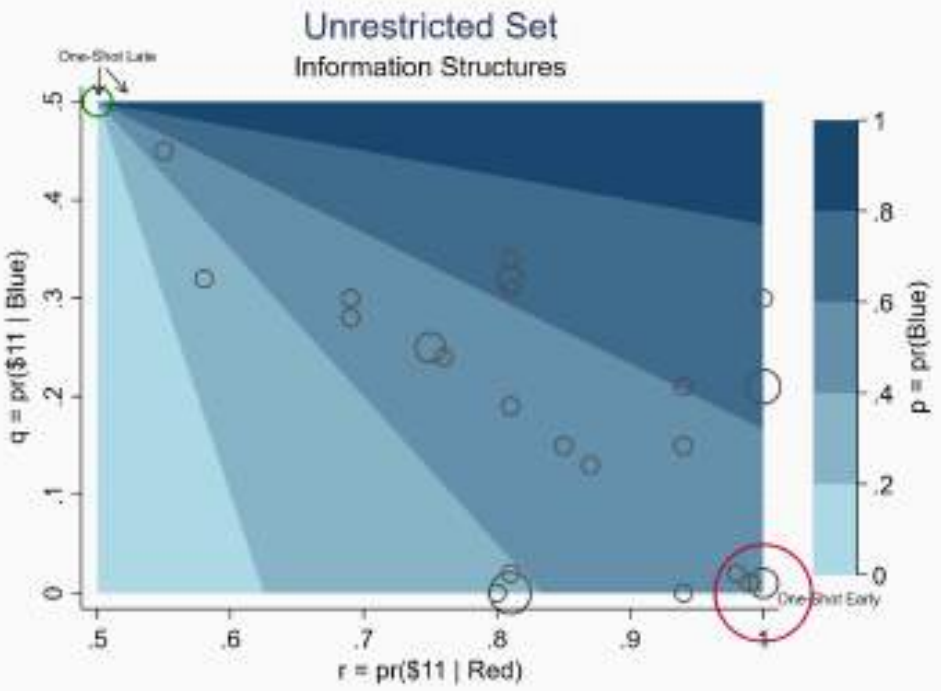
UNRESTRICTED SETS



13.04% Early

17.39% Late

69.57% Gradual

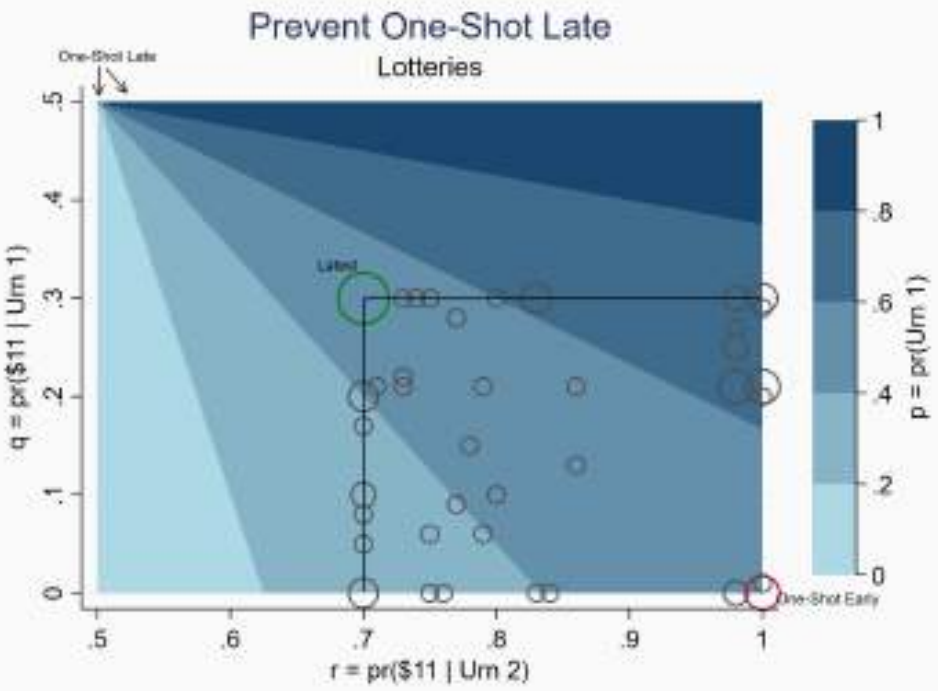


45.21% Early

4.11% Late

50.68% Gradual

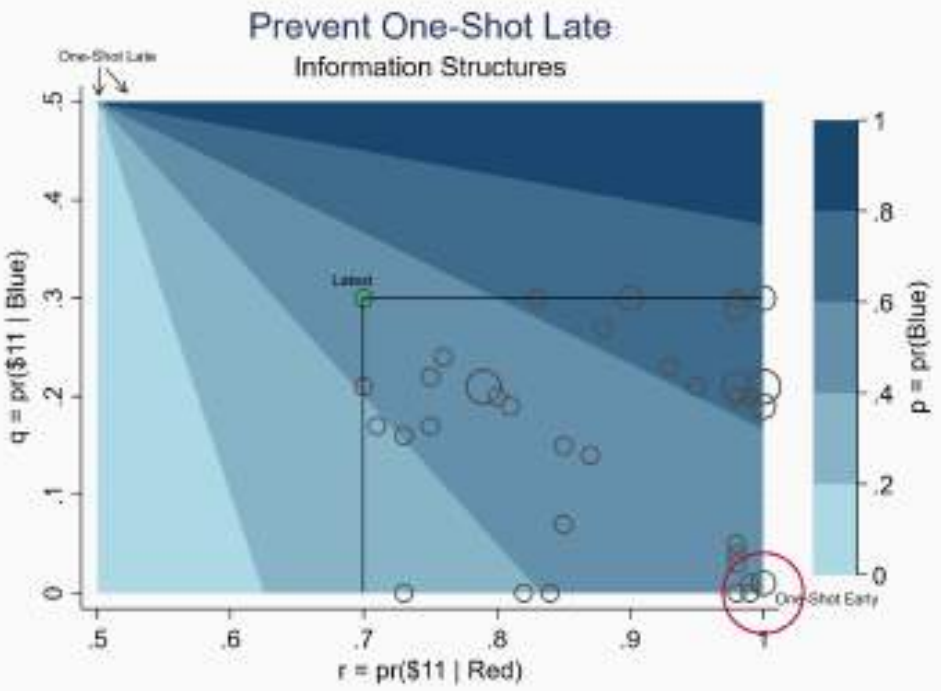
PREVENT ONE-SHOT LATE



5.80% Early

13.04% Late

81.16% Gradual



31.51% Early

1.37% Late

67.12% Gradual

TRANSITION PATTERNS

	Earliest	**Latest**	**Other**	
Prevent OS Late				
Lotteries	0%	25%	75%	n=12
Information	0%	0%	100%	n=3

Choice when one-shot late is unavailable, among those who chose one-shot late in the unrestricted set

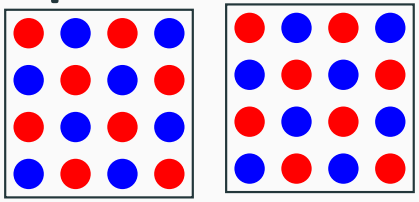
Palacious-Huerta (1999), Köszegi & Rabin (2009), Dillenberger (2010)

INDIFFERENCE

- What about indifference?
  - Subjects also made choices on incentivized price lists, giving them the option to express strength of preference between two lotteries

INDIFFERENCE

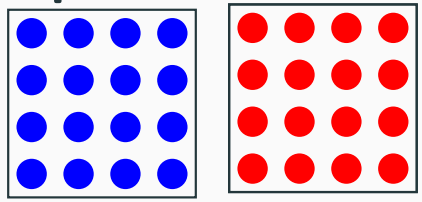
Option 1



Urn 1 Urn 2

Option 1 + \$0.50	OR	Option 2
Option 1 + \$0.45	OR	Option 2
Option 1 + \$0.40	OR	Option 2
⋮	⋮	⋮
Option 1 + \$0.10	OR	Option 2
Option 1 + \$0.05	OR	Option 2
Option 1	OR	Option 2
Option 1	OR	Option 2 +\$0.05
Option 1	OR	Option 2 +\$0.10
⋮	⋮	⋮
Option 1	OR	Option 2 +\$0.40
Option 1	OR	Option 2 +\$0.45
Option 1	OR	Option 2 +\$0.50

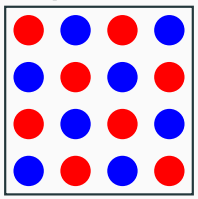
Option 2



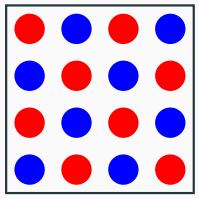
Urn 1 Urn 2

INDIFFERENCE

Option 1



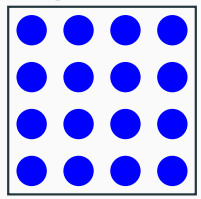
Urn 1



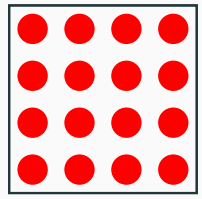
Urn 2

Option 1 + $0.50	OR	Option 2
Option 1 + $0.45	OR	Option 2
Option 1 + $0.40	OR	Option 2
⋮	⋮	⋮
Option 1 + $0.10	OR	Option 2
Option 1 + $0.05	OR	Option 2
Option 1	OR	Option 2
Option 1	OR	**Option 2 +$0.05**
Option 1	OR	**Option 2 +$0.10**
⋮	⋮	⋮
Option 1	OR	**Option 2 +$0.40**
Option 1	OR	**Option 2 +$0.45**
Option 1	OR	**Option 2 +$0.50**

Option 2



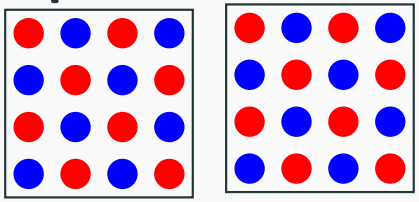
Urn 1



Urn 2

INDIFFERENCE

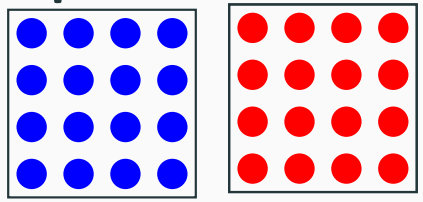
Option 1



Urn 1 Urn 2

Option 1 + \$0.50	OR	**Option 2**
Option 1 + \$0.45	OR	**Option 2**
Option 1 + \$0.40	OR	**Option 2**
⋮	⋮	⋮
Option 1 + \$0.10	OR	**Option 2**
Option 1 + \$0.05	OR	**Option 2**
Option 1	OR	Option 2
Option 1	OR	**Option 2 +\$0.05**
Option 1	OR	**Option 2 +\$0.10**
⋮	⋮	⋮
Option 1	OR	**Option 2 +\$0.40**
Option 1	OR	**Option 2 +\$0.45**
Option 1	OR	**Option 2 +\$0.50**

Option 2

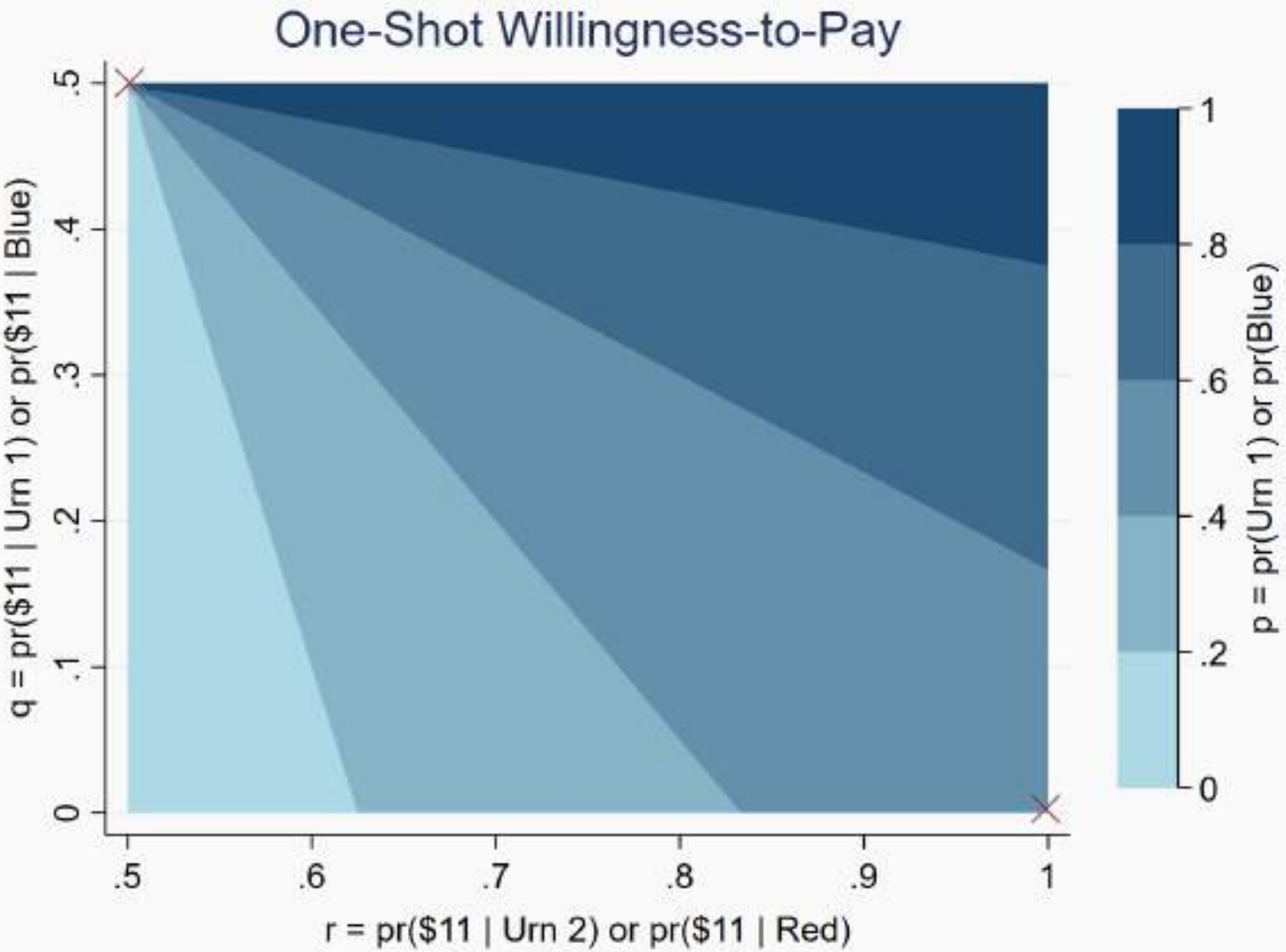


Urn 1 Urn 2

INDIFFERENCE

- Present subjects with 3 different price lists
  - One-shot early vs. one-shot late
  - Gradually resolving earlier vs. later
  - Positive vs. negative skewness
- In both treatments, $\sim$**70%** of subjects report positive willingness-to-pay on at least one price list

INDIFFERENCE

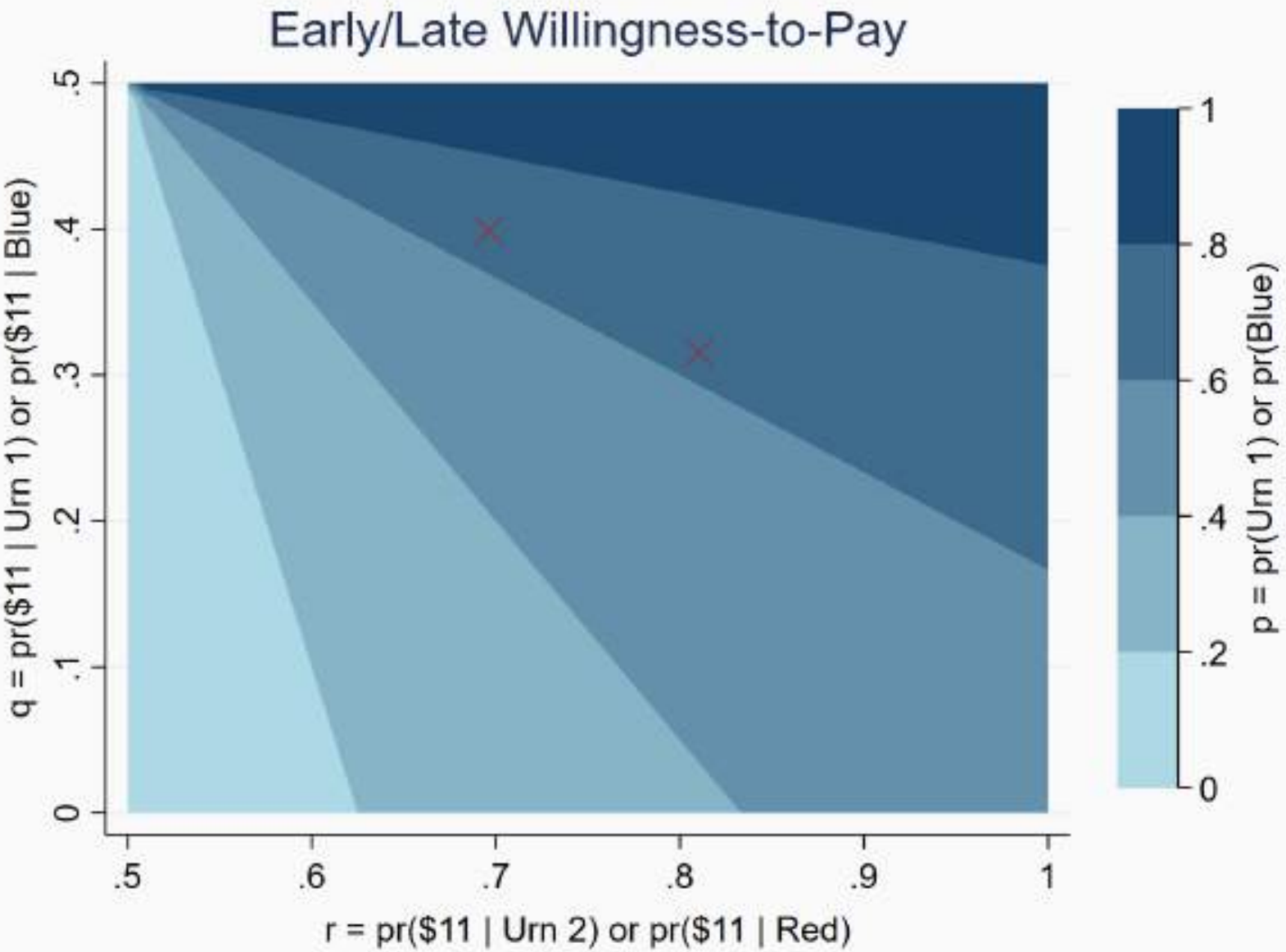


INDIFFERENCE

	One-Shot Early	One-Shot Late	p-value
Lotteries	8.70%	31.88%	0.0025
Information	43.84%	6.85%	0.0000
p-value	0.0025	0.0002	

Percentage of people expressing positive willingness-to-pay for one-shot early vs. one-shot late resolution, by treatment

INDIFFERENCE



INDIFFERENCE

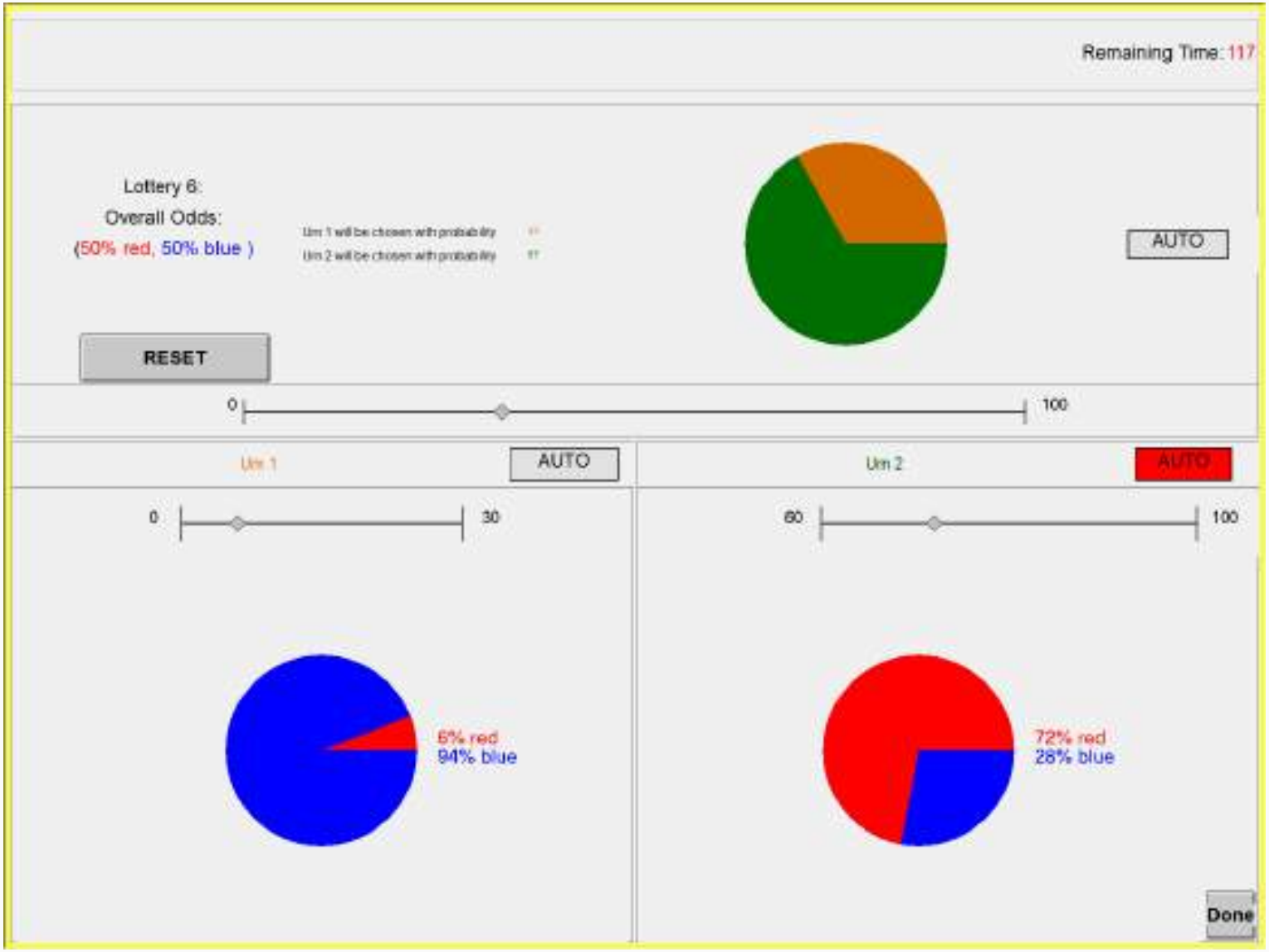
	Early	Late	p-value
Lotteries	11.86%	35.59%	0.0082
Information	57.14%	0.00%	—
p-value	0.0026	—	

Percentage of people expressing positive willingness-to-pay for earlier vs. later resolution, by treatment

RESULTS SUMMARY

- Preferences over uncertainty resolution in lotteries $\neq$ preferences over uncertainty resolution in information structures
  - When choice is unrestricted, most individuals prefer gradual resolution
  - Stronger preference toward late resolution for lotteries
  - Preference toward early resolution for information structures
- Limited evidence of persistent preference for one-shot resolution
  - Contrary to the predictions of Palacious-Huerta (1999), Köszegi & Rabin (2009), and Dillenberger (2010)
- Allows us to identify situations where information avoidance will be most likely
  - Framing of the uncertain event might matter

THE END


Remaining Time: 117
Lottery 6:
Overall Odds:
(50% red, 50% blue)
Urn 1 will be chosen with probability
Urn 2 will be chosen with probability
AUTO
RESET
0
100
Urn 1
AUTO
Urn 2
AUTO
0
30
60
100
6% red
94% blue
72% red
28% blue
Done


Remaining Time: 79
Lottery 1:
Overall Odds:
(50% red, 50% blue)
You will see a blue signal with probability 50
You will see a red signal with probability 50
AUTO
RESET
0
100
Probability you've won if you see a blue signal: 50 %
AUTO
0
50
Probability you've won if you see a red signal: 50 %
AUTO
50
100
Ball drawn from this Urn if you've lost:
50% red
50% blue
Ball drawn from this Urn if you've won:
50% red
50% blue
Done

Back