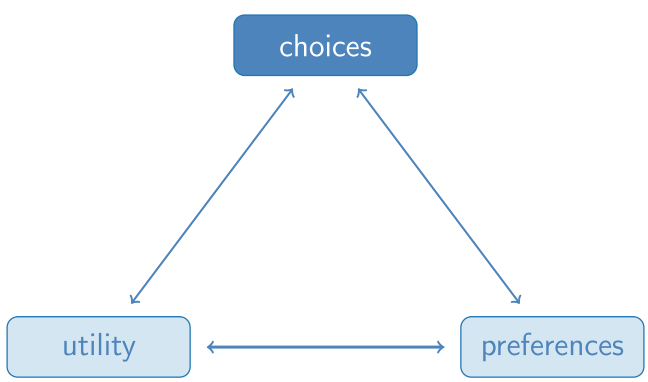
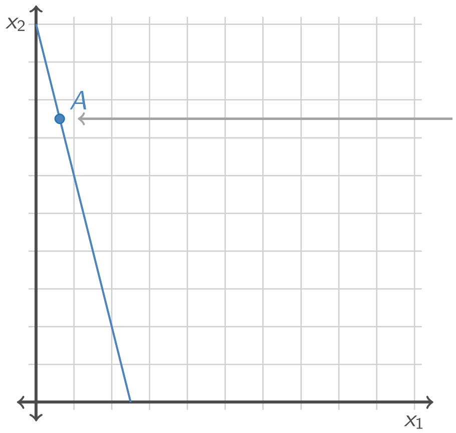
ECON 251: Revealed Preference

From Utility to Choices or From Choices to Utility?



What Can We Learn from a Choice?



What we observe:
a consumer's budget line,
her consumption bundle

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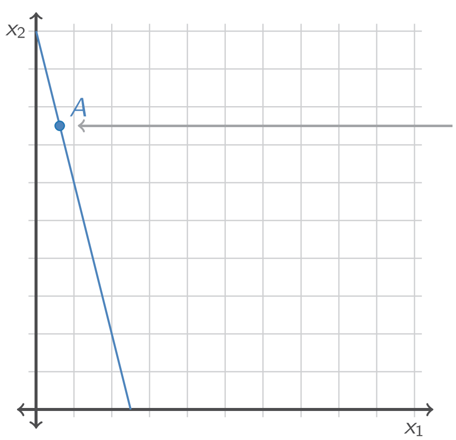

What we observe:
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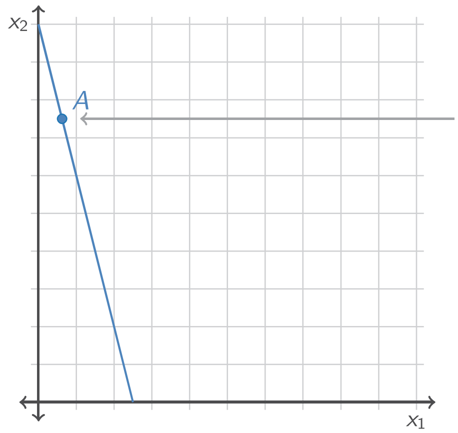
$A = (a_1, a_2)$

What Can We Learn from a Choice?



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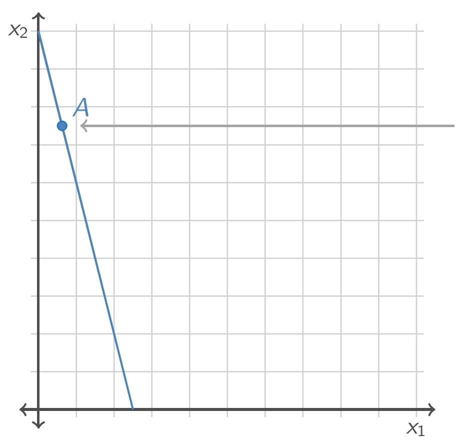
If preferences are convex and monotone, the solution to her UMP is unique

What Can We Learn from a Choice?

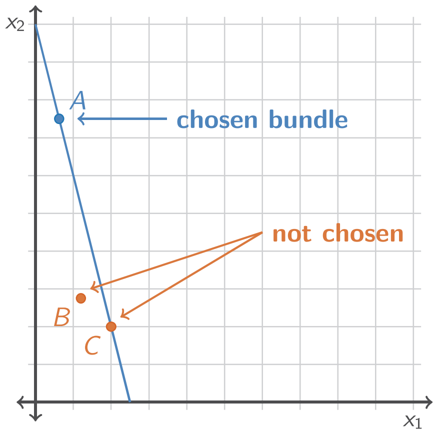


What we observe:
a consumer's budget line,
her consumption bundle

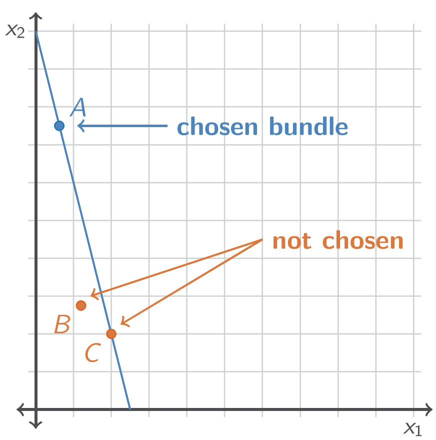
If preferences are convex and monotone, the solution to her UMP is unique

A is strictly preferred to everything else in the consumer's budget set

Revealed Preference



Revealed Preference



We say that:

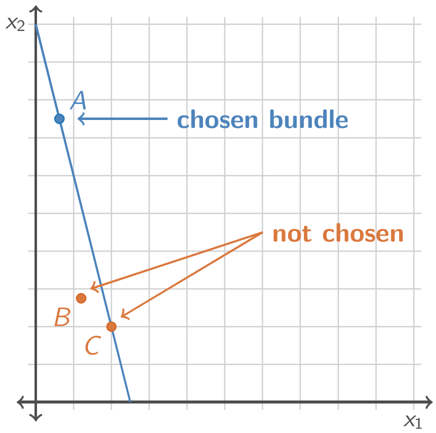
A is revealed preferred to B

We mean that:

the consumer chose A

when B was affordable

Revealed Preference



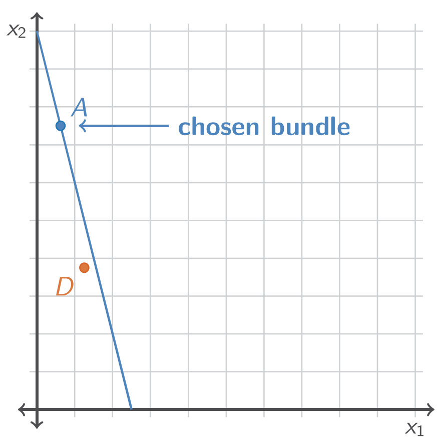
We say that:
A is revealed preferred to B

We mean that:
the consumer chose A
when B was affordable

$\Rightarrow A \succ B$

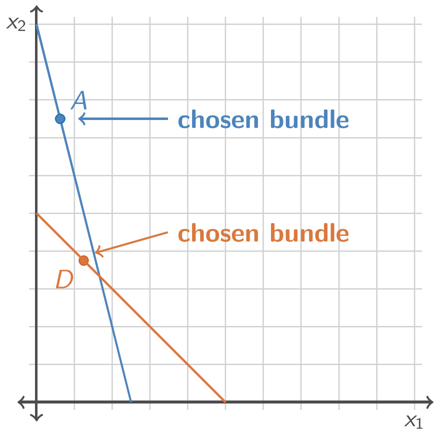
(if preferences are "well-behaved")

Indirectly Revealed Preferred



$A \succ D$
because A was chosen
when D was available

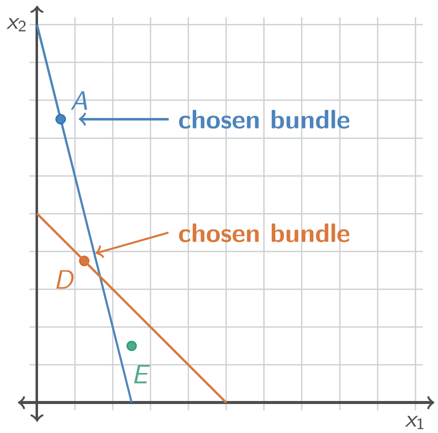
Indirectly Revealed Preferred



$A \succ D$

Suppose D was chosen
from the orange budget line

Indirectly Revealed Preferred



$A \succ D$

Suppose D was chosen
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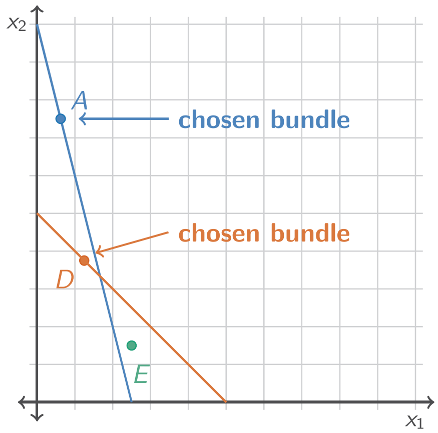
$D \succ E$
"D is revealed preferred to E"

Indirectly Revealed Preferred



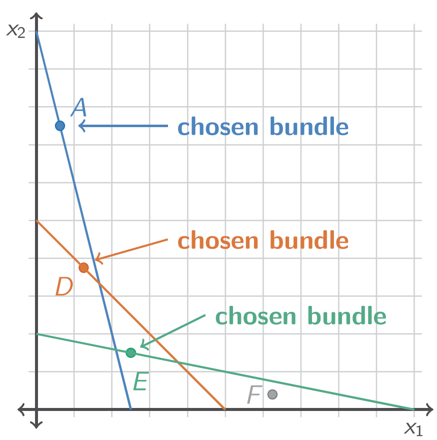
$A \succ D$

Suppose D was chosen from the orange budget line

$D \succ E$
"D is revealed preferred to E"

By transitivity:
$A \succ E$
We say: "A is indirectly revealed preferred to E"

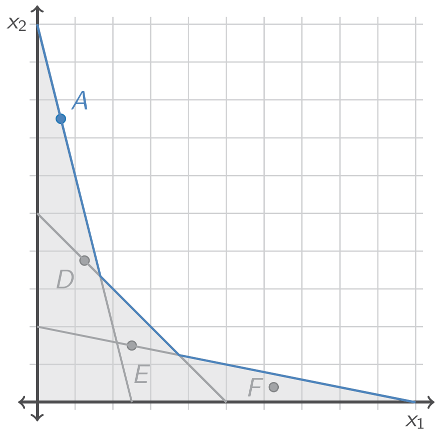
Indirectly Revealed Preferred



$A \succ D \succ E \succ F$

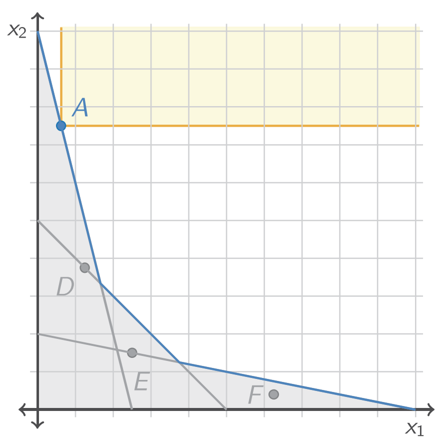
By transitivity:
$A \succ E$, $A \succ F$, and $D \succ F$

Mapping Indifference Curves



By adding budget lines
we can map out the set of
bundles less-preferred than A

Mapping Indifference Curves



By adding budget lines
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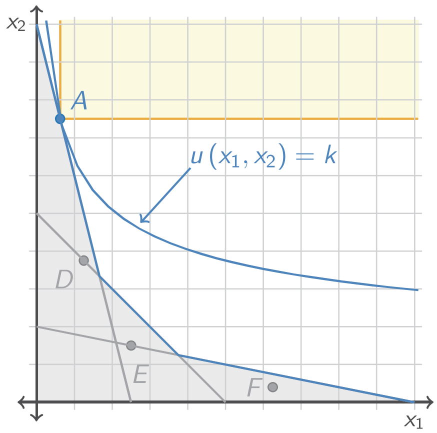
Without knowing preferences,
we know indifference curve
must be above and right of
gray less-preferred region

And below/left of bundles
with more of both goods

Mapping Indifference Curves



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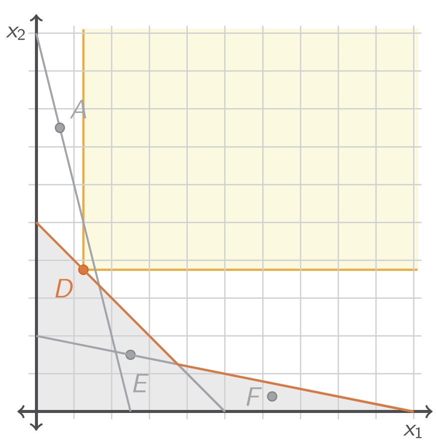
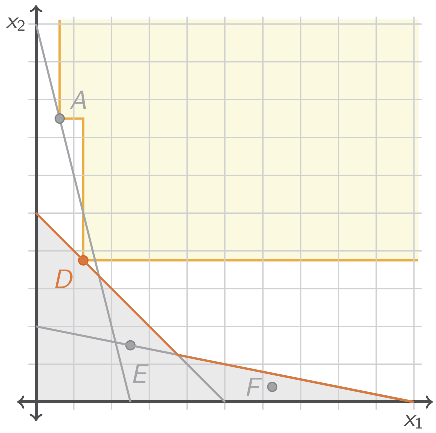


With more preferred bundles, we can do even better at bounding indifference curves

Mapping Indifference Curves

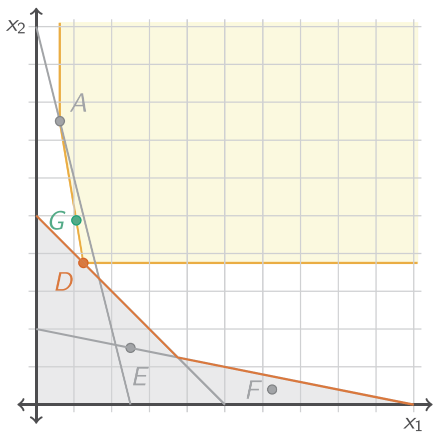


With more preferred bundles, we can do even better at bounding indifference curves

We know: $A \succ D$

So A itself plus any bundles preferred to A are also strictly preferred over D

Mapping Indifference Curves



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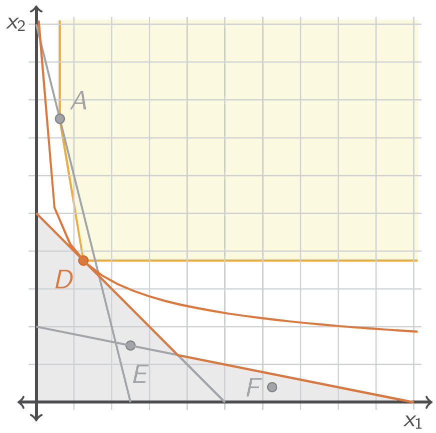

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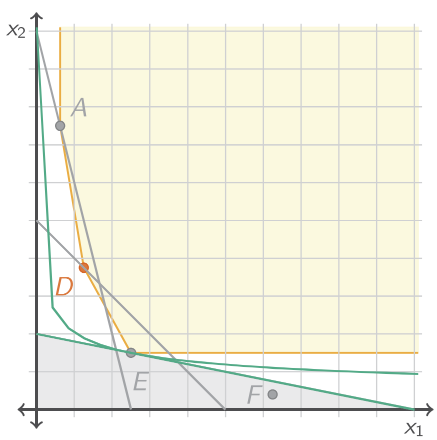
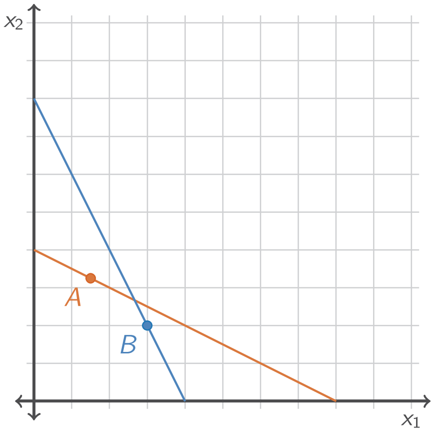


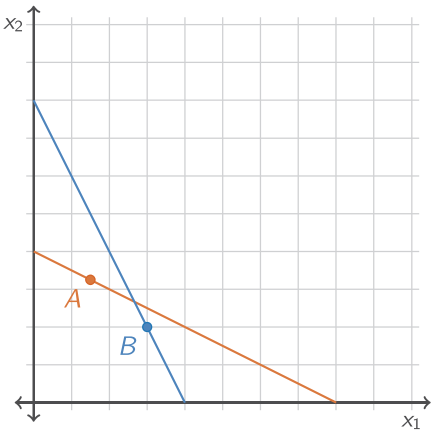
As we observe more choices, we can bound indifference curves more preciesly from both above and below

Inconsistent Choices



Choices suggest that:
$A \succ B$ and $B \succ A$

Inconsistent Choices



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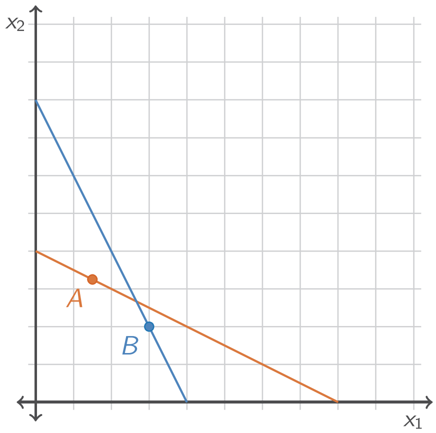
We've been assuming consumer have preferences that are complete, transitive, monotone, convex, etc.

Inconsistent Choices



Choices suggest that:
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We've been assuming consumer have preferences that are complete, transitive, monotone, convex, etc.

Sometimes data on choices tells us that we're wrong

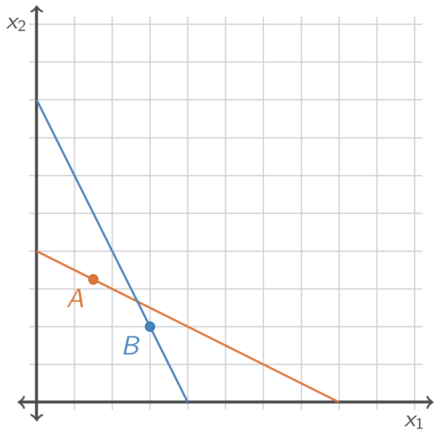
The Weak Axiom of Reveled Preference

The **Weak Axiom of Reveled Preference (WARP):**

If $x = (x_1, x_2)$ is revealed directly preferred to $y = (y_1, y_2)$ then y cannot also be revealed directly preferred to x (unless x and y are the same consumption bundle)

If choices violate WARP, consumer is not maximizing utility

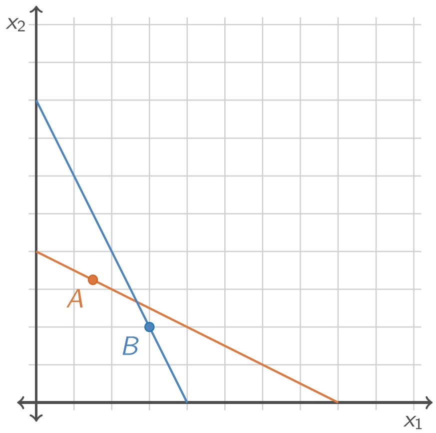
Checking WARP



2 bundles:

$A = (a_1, a_2)$ and $B = (b_1, b_2)$

Checking WARP



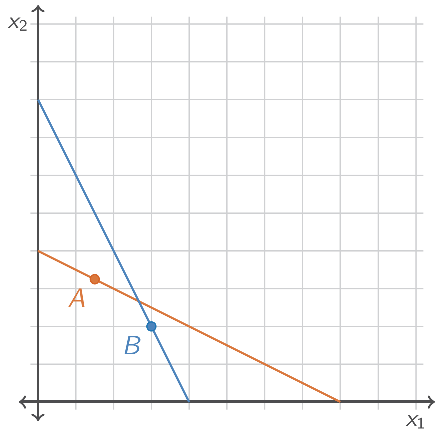
2 bundles:

$A = (a_1, a_2)$ and $B = (b_1, b_2)$

2 sets of prices, budget sizes:

$p^A = (p_1^A, p_2^A), p^B = (p_1^B, p_2^B)$

Checking WARP



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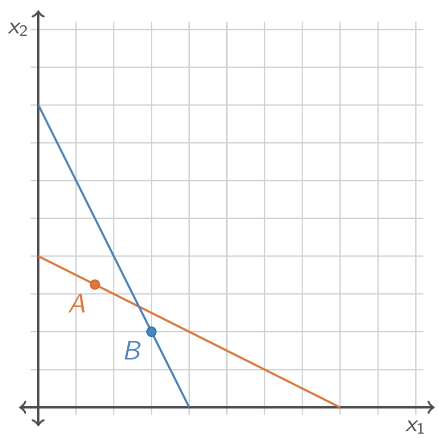
2 sets of prices, budget sizes:
$p^A = (p_1^A, p_2^A), p^B = (p_1^B, p_2^B)$

Bundles on the budget lines:

$p_1^A a_1 + p_2^A a_2 = m^A$

$p_1^B b_1 + p_2^B b_2 = m^B$

Checking WARP



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Bundles on the budget lines:

$p_1^A a_1 + p_2^A a_2 = m^A$

$p_1^B b_1 + p_2^B b_2 = m^B$

Choice violate WARP if:

$p_1^A b_1 + p_2^A b_2 \leq m^A$

$p_1^B a_1 + p_2^B a_2 \leq m^B$

The Generalized Axiom of Reveled Preference

The **Generalized Axiom of Reveled Preference (GARP):**

If $x = (x_1, x_2)$ is **indirectly** revealed preferred to $y = (y_1, y_2)$ then y cannot also be **directly** revealed **strictly** preferred to x

If choices satisfy GARP, then there is a well-behaved utility function that that could explain those choices (through utility maximization)

A Modified Dictator Game

Standard **dictator game**:
Player 1 receives 10 dollars, chooses an amount $x \in [0, 10]$ to allocate to Player 2

→ Can represent game as a budget line:

$$x_{self} + x_{other} = m$$

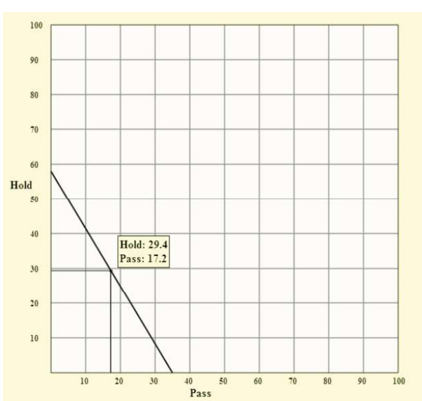
A Modified Dictator Game

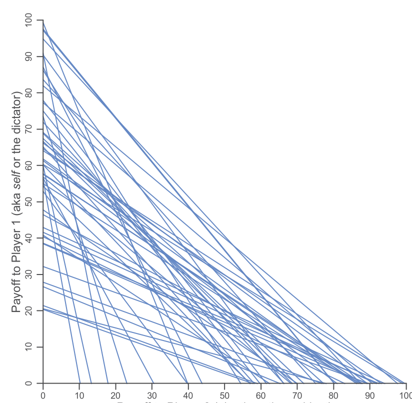
Modified **dictator game**:
Player 1 chooses payoffs $x = (x_{self}, x_{other})$ given "prices of giving" p_{self} and p_{other} and a fixed budget size m

→ Can represent game as a budget line:

$$p_{self}x_{self} + p_{other}x_{other} = m$$

A Modified Dictator Game: Lab Experiment





Graphical interface allows research to collect many decisions per subjects

- Choose (x_{self}, x_{other}) subject to budget constraint $p_{self}x_{self} + p_{other}x_{other} = m$

Experimental Subjects

American Life Panel (ALP):

- 687 American adults complete experiment in 2013 and 2016
- Each matched with ALP respondent not sampled for experiment

Yale Law School (YLS):

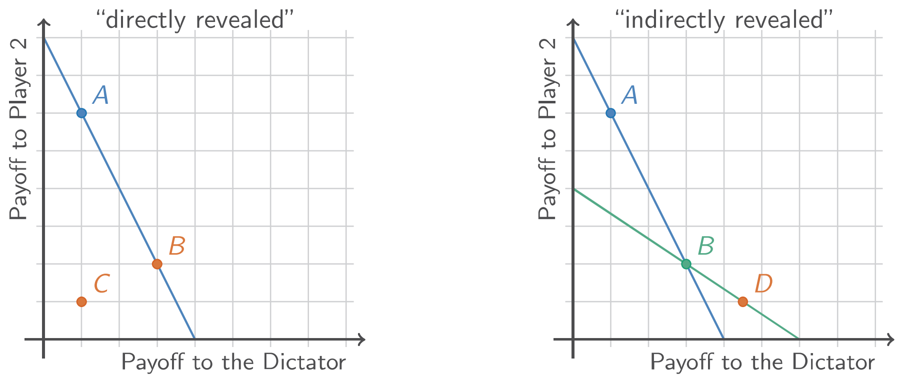
- Three waves of students (2007, 2010, 2013)

Undergraduates at UC Berkeley (UCB):

- Experimental conducted in the Berkeley XLab in 2004 and 2011

Testing Rationality

By choosing an allocation on the budget line, the dictator reveals a preference for it



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A allocation $x = (x_{self}, x_{other})$ is **indirectly revealed preferred** to $y = (y_{self}, y_{other})$ whenever there is some sequence of allocations chosen so that: $x \succ w^1 \succ w^2 \succ \ldots \succ w^n \succ y$

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If preferences are rational, this implies:

$$u(x_{self}, y_{other}) \geq u(a^1_{self}, a^1_{other}) \geq \ldots \geq u(a^n_{self}, a^n_{other}) \geq u(y_{self}, y_{other})$$

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A dictator's preferences over payoffs satisfy GARP if the following is true: if an allocation x is indirectly revealed preferred to y, then y is **not** directly revealed strictly preferred to x

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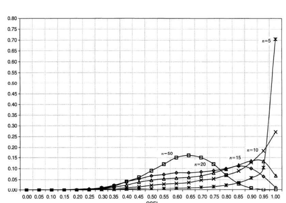
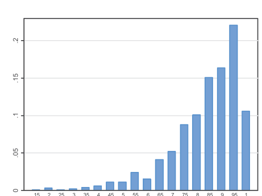
Afriat's Theorem: GARP $\Leftrightarrow$ there is a well-behaved utility function that rationalizes the data

Testing Rationality



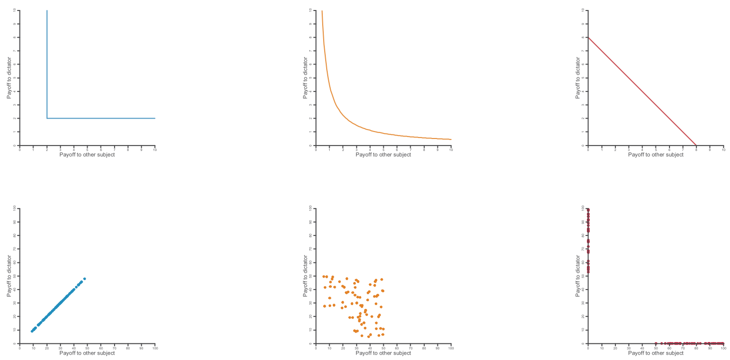


Experimental design also allows us to measure economic rationality

- Almost all subjects violate GARP (more so than students)
- Subjects' choices demonstrate a high degree of consistency

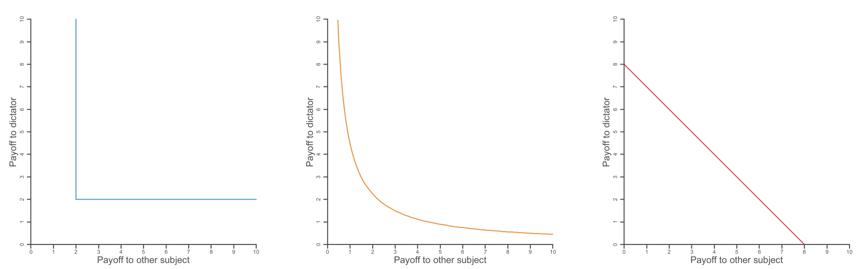
Equality-Efficiency Tradeoffs

Complements	Cobb-Douglas	Substitutes
$u(\pi_s, \pi_o) = \min\{\pi_s, \pi_o\}$	$u(\pi_s, \pi_o) = \ln(\pi_s) + \ln(\pi_o)$	$u(\pi_s, \pi_o) = \pi_s + \pi_o$



Equality-Efficiency Tradeoffs

Rawlsian **Cobb-Douglas** **Utilitarian**



Price changes allow us to characterize equality-efficiency tradeoffs

- Decreasing expenditure on your own payoff when p_{self}/p_{other} increases indicates preferences weighted towards efficiency (in terms of increasing total payoffs)
- Increasing expenditure on your own payoff when p_{self}/p_{other} increases indicates preferences weighted towards equality (in terms of reducing differences in payoffs)

The CES Utility Function

Estimate CES other-regarding utility function at the subject level:

$$u_s(x_{self}, x_{other}) = [\alpha(x_{self})^\rho + (1-\alpha)(x_{other})^\rho]/\rho$$

Generates individual CES parameter estimates for every subject n:

- $\hat{\alpha}_n$: fair-mindedness/selfishness, weight on payoff to *self* vs. *other*
- $\hat{\rho}_n$: curvature of altruistic indifference curves, measures willingness to trade off equality and efficiency (aggregate payoff)

CES utility function spans a range of preference types

- Approaches perfect substitutes indifference curves as $\rho \to 1$
- Approaches perfect complements indifference curves as $\rho \to -\infty$

Estimating Individual CES Parameters

CES expenditure function is given by:

$$\frac{x_s}{m} = \frac{\left(\frac{\alpha}{1-\alpha}\right)^{1/(1-\rho)}}{(p_o)^{\rho/(\rho-1)} + \left(\frac{\alpha}{1-\alpha}\right)^{1/(1-\rho)}}$$

Individual-level econometric specification for each subject n:

$$\frac{x_{s,n,i}}{m_i} = \frac{\left(\frac{\alpha_n}{1-\alpha_n}\right)^{1/(1-\rho_n)}}{(p_{o,n,i})^{\rho_n/(\rho_n-1)} + \left(\frac{\alpha_n}{1-\alpha_n}\right)^{1/(1-\rho_n)}} + \epsilon_{n,i}$$

where $i = 1, ..., 50$ and $\epsilon_{n,i}$ is iid normal with mean zero and variance σ_n^2

Classifying Distributional Preference Types

Fair-mindedness vs. selfishness:

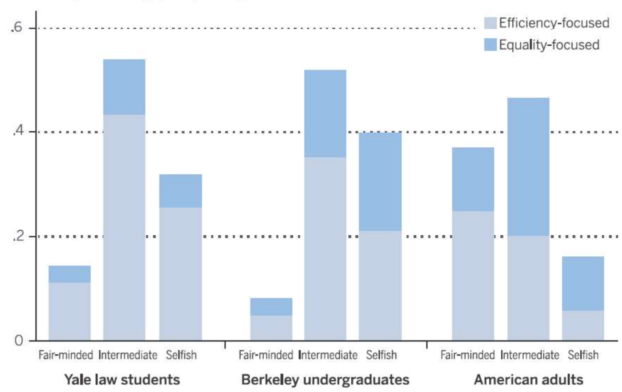
- We classify a subject as **fair-minded** if $0.45 < \hat{\alpha}_n < 0.55$
- We classify a subject as **selfish** if $\hat{\alpha}_n > 0.95$

Equality-efficiency tradeoffs:

- We classify a subject as **efficiency-focused** if $\hat{\rho}_n > 0$
- We classify a subject as **equality-focused** if $\hat{\rho}_n < 0$

Classifying Distributional Preference Types

Classifying subjects' distributional preferences. We classify subjects as either fair-minded, intermediate, or selfish and as either equality-focused or efficiency-focused. The bars show the fraction of subjects in each category of self-interest in the elite YLS, UCB (the intermediate elite), and relatively less elite ALP samples. Each bar is then split into equality-focused and efficiency-focused subgroups, denoted by blue and gray, respectively.



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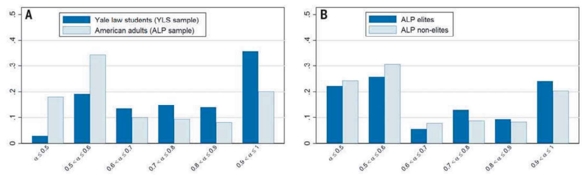


Fig. 3. Estimated $\hat{\alpha}_n$ parameters. (**A** and **B**) Histograms of the $\hat{\alpha}_n$estimates in (A) the YLS and ALP samples and (B) the ALP elite versus nonelite samples. $\hat{\alpha}_n$ indexes fair mindedness: the relative utility weight placed on one's own payoff vis à vis the payoff to other.

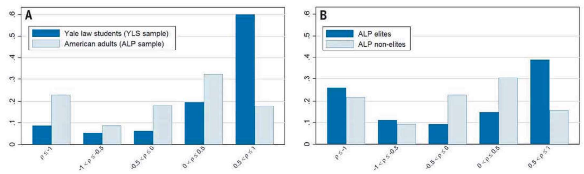


Fig. 4. Estimated $\hat{\rho}_n$ parameters. (**A** and **B**) Histograms of the $\hat{\rho}_n$ estimates in (A) the YLS and ALP samples and (B) the ALP elite versus nonelite samples. $\hat{\rho}_n$ indexes equality efficiency tradeoffs; $\hat{\rho}_n$ values closer to 1 indicate greater efficiency focus.

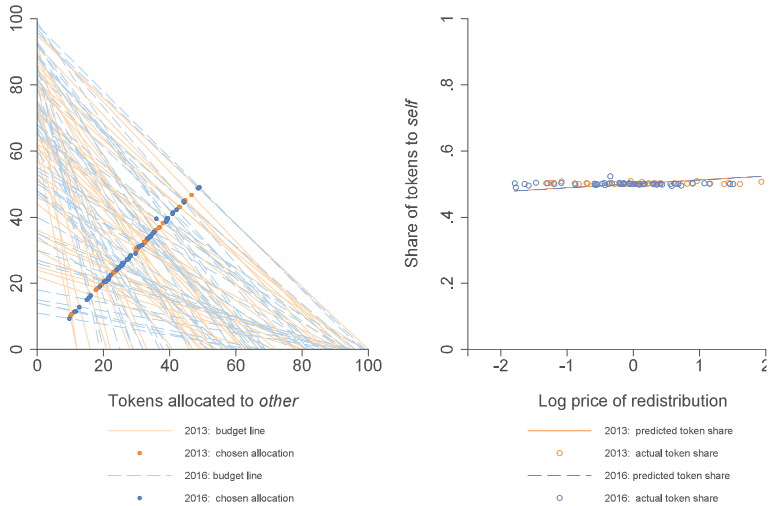
Classifying Distributional Preference Types

Table 3. Ordered logit estimation of YLS subjects' career choices. Standard errors in parentheses. ***, significance at the 99% level; **, significance at the 95% level; *, significance at the 90% level. Dependent variable is equal to 1 for subjects who work in the nonprofit sector, equal to 2 for subjects who work in academia or government, and equal to 3 for subjects who work in the corporate sector. Controls are for age, gender, and year of experimental session.

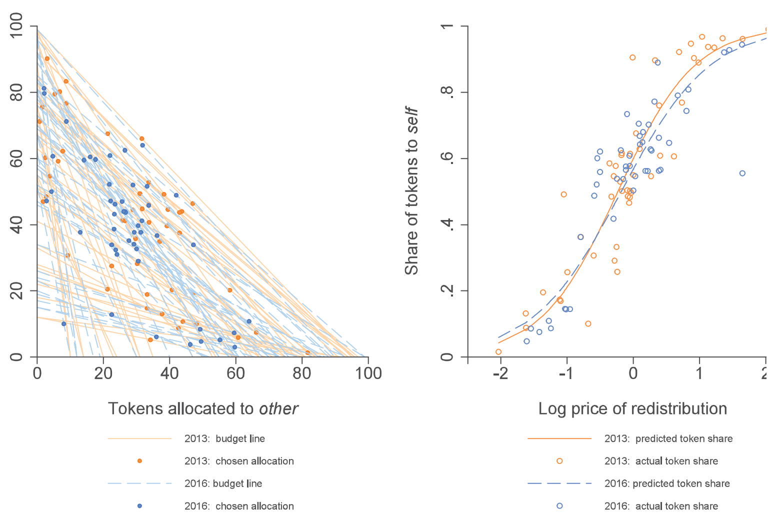
Dependent variable: post-YLS career category

	Without controls	
Above median $\hat{\rho}_n$	1.043***	
	(0.364)	
Decile of estimated $\hat{\rho}_n$		0.157**
		(0.068)
Observations	120	120
	With controls	
Above median $\hat{\rho}_n$	1.035***	
	(0.374)	
Decile of estimated $\hat{\rho}_n$		0.164**
		(0.076)
Observations	118	118

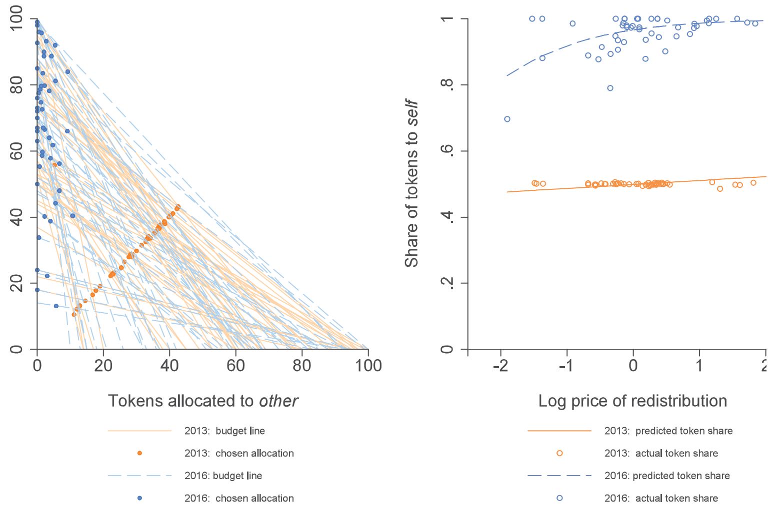
Characterizing Behavior in 2013 and 2016



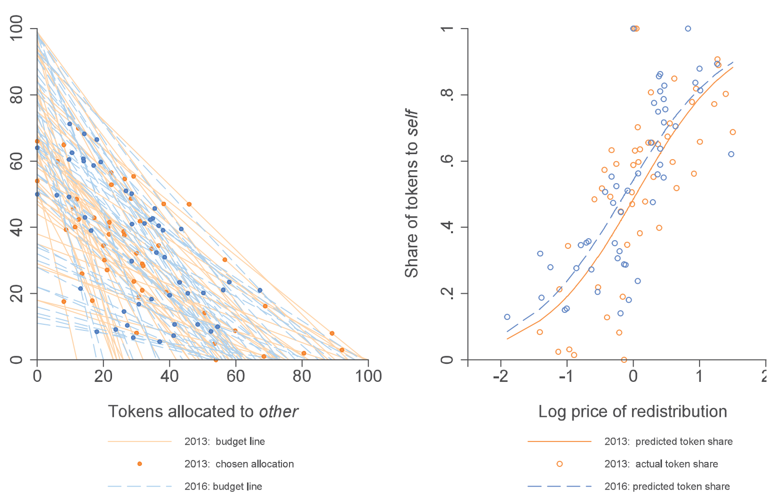
Characterizing Behavior in 2013 and 2016



Characterizing Behavior in 2013 and 2016



Characterizing Behavior in 2013 and 2016



Preference Stability