

Scarcity Frames Value

CS598 Paper Presentation – Tiffany Li

Defining Scarcity

- ◇ Scarcity refers to limitation of resources or commodities
 - ◇ In the market
 - ◇ Of an individual
- ◇ Scarcity mind-set is a different mind-set that people use to make decisions when people are experiencing scarcity, i.e. feel that resources are low relative to needs

(Mani, Mullainathan, Shafir, & Zhao, 2013; Mullainathan & Shafir, 2013; Shah, Mullainathan, & Shafir, 2012)

Pros and Cons of Scarcity Mind-set in Previous Work

Positives

- ◇ The Focus Dividend
 - ◇ on immediate prices and tradeoffs
- (Mullainathan & Shafir, 2013)

Negatives

- ◇ The Tunneling Effect
 - ◇ goal inhibition
- ◇ The Bandwidth Tax
 - ◇ a source of demand on cognitive capacity
- ◇ The Scarcity Trap
 - ◇ a person's behavior contributes to his/her scarcity

(Mullainathan & Shafir, 2013; Mani, Mullainathan, Shafir, & Zhao, 2013)

Current Work: Exploring Another Positive Effect of Scarcity Mind-set

- ◇ Hypothesis: Scarcity reduces or eliminates several kinds of context effects, making people's perceptions of value more stable and bringing decision making closer to normative predictions
- ◇ Focus: Inconsistent valuation problems where people only have a vague sense of what items are worth
- ◇ Predicted Mechanism: Scarcity generates different cues that are highly accessible for deciding value as an internal frame of reference
- ◇ Approach: First examined the original findings in a non-scarcity condition on large enough samples, and then tested if the effects diminished under scarcity

Definition of Context Effects

- ◆ Definition: A context effect is an aspect of cognitive psychology that describes the influence of environmental factors on one's perception of a stimulus
- ◆ Examples:
 - ◆ Framing Effect: people's decisions on the same question vary depending on how the question is framed, e.g. the Asian Disease example (Tversky & Kahneman, 1981)
 - ◆ Mental Accounting (Thaler, 1985)
 - ◆ Mental Arithmetic: based on the Value Function of Prospect Theory (Kahneman & Tversky, 1979), people prefer joint outcomes to be coded differently
 - ◆ Transaction Utility Theory: the total utility from a purchase is the sum of acquisition utility and transaction utility
 - ◆ Temporal and Category Budget Constraint: people optimize locally based on temporal and category budget constraint instead of globally

Study 1a: Trade-off Thinking under Scarcity

- ◇ Question to Answer: Is trade-off thinking more prevalent under scarcity while evaluating an object?
- ◇ Scenario: Beer-on-the-beach scenario (Thaler, 1985)
- ◇ Context Effect Involved: Transaction Utility Theory
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to report the option that most likely influence their decision on a price in the scenario
 - ◇ Compare the response frequency for two of the options, “other things I won’t be able to buy” vs. “where the beer is being purchased”, between higher-income and lower-income participants
- ◇ Model: Binary logistic regression to regress frequency of two responses against income respectively
- ◇ Results:
 - ◇ Higher-income participants respond with context consideration more often
 - ◇ Lower-income participants respond with trade-off consideration more often

Study 1b-1d: Consistent Valuations under Scarcity

- ◇ Question to Answer: Given that trade-off thinking is more prevalent under scarcity, does it help people to be more consistent in their valuations of object?
- ◇ Scenario: Beer-on-the-beach scenario (Thaler, 1985)
- ◇ Context Effect Involved: Transaction Utility Theory
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to report their willingness to pay (WTP) in one of the two scenarios
 - ◇ Compare the WTP in two scenarios between higher-income and lower-income participants
- ◇ Model:
 - ◇ Two sample t-test on sample means in two cases for higher-income and lower-income participants
 - ◇ Binary logistic regression to regress WTP against income and context with their interaction term

Study 1b-1d: Consistent Valuations under Scarcity

◆ Results:

- ◆ Higher-income participants showed classic effect of paying differently based on contextual cue
- ◆ Lower-income participants' WTP didn't differ significantly due to contextual cue
- ◆ Interaction term between income and context was significant in all three studies

◆ Confirmed Conditions:

- ◆ Both lower- and higher-income participants expected the price to be higher at the resort
- ◆ The insignificant change in WTP for lower-income participants was NOT because of the price being out of range of their consideration

◆ Conclusion: Under conditions of scarcity, people base their price not merely on anticipated enjoyment, but also on anticipated trade-offs, which are more consistent guides for valuation

◆ Next Step: In study 1a – 1d, the scenario focuses on valuation of an object. Does the same conclusion hold for valuation of a dollar (money) itself?

Study 2a: Proportional vs. Trade-off Thinking

- ◇ Question to Answer: Is trade-off thinking more prevalent than proportional thinking under scarcity when valuing discount?
- ◇ Scenario: Traveling-for-discount scenario (Tversky & Kahneman, 1981)
- ◇ Context Effect Involved: Framing Effect
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to report the option that most likely influence their decision on whether to travel for the discount in the scenario
 - ◇ Compare the response frequency for two of the options, “other things I won’t be able to buy” vs. “what percentage it is off”, between higher-income and lower-income participants
- ◇ Model: Binary logistic regression to regress frequency of two responses against income respectively
- ◇ Results:
 - ◇ Higher-income participants respond with proportional thinking more often
 - ◇ Lower-income participants respond with trade-off consideration more often

Study 2b-2c: Valuating Discounts under Scarcity

- ◇ Question to Answer: Given that trade-off thinking is more prevalent under scarcity, does it help people to be more consistent in their valuations of discount?
- ◇ Scenario: Traveling-for-discount scenario (Tversky & Kahneman, 1981)
- ◇ Context Effect Involved: Framing Effect
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to report their willingness to travel (WTT) in one of the three scenarios
 - ◇ Compare the WTT in three scenarios between higher-income and lower-income participants
- ◇ Model:
 - ◇ Compare sample means of WTT in three cases for higher-income and lower-income participants
 - ◇ Binary logistic regression to regress WTT against income and context with their interaction term

Study 2b-2c: Valuating Discounts under Scarcity

◇ Results:

- ◇ Higher-income participants showed classic effect of more willing to travel for higher proportional discount
- ◇ Lower-income participants' WTT didn't differ significantly due to contextual cue
- ◇ Interaction term between income and context was significant in both studies
- ◇ Conclusion: Under conditions of scarcity, people value discounts less on proportion but more on trade-offs, which are more consistent guides for valuation
- ◇ Next Step: In study 2a – 2c, the scenario only tested on a discount of \$50. Does the same conclusion hold for a different amount of discounts?

Study 2d: Valuating Discounts

Consistently across Amounts

- ◇ Question to Answer: Does the conclusion from study 2b-2c hold across a range of dollar amounts?
- ◇ Scenario: Modified traveling-for-discount scenario with discount amount of \$10 vs. \$150 (Tversky & Kahneman, 1981)
- ◇ Context Effect Involved: Framing Effect
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to report their willingness to travel (WTT) in one of the two scenarios for each discount amount
 - ◇ Compare the WTT in two scenarios between higher-income and lower-income participants for both discount amount
- ◇ Model:
 - ◇ Compare sample means of WTT in four cases for higher-income and lower-income participants
 - ◇ Binary logistic regression to regress WTT against income, proportional discount and absolute discount, together with their two-way and three-way interaction terms

Study 2d: Valuating Discounts Consistently across Amounts

◆ Results:

- ◆ Higher-income participants showed classic effect of more willing to travel for higher proportional discount for both discount amounts
- ◆ Lower-income participants' WTT didn't differ much due to contextual cue for both discount amounts
- ◆ Two-way interaction term between income and proportional discount was significant, while three-way interaction term with absolute discount was insignificant
- ◆ Conclusion: For moderate amount of discounts, under conditions of scarcity, people value discounts less on proportion but more on trade-offs, which are more consistent guides for valuation
- ◆ Next Step: In study 2a – 2d, the scenario only indirectly tested the valuation of a dollar via discount. Does the same conclusion hold for a direct valuation of a dollar?

Study 3: Valuing a Dollar under Scarcity

- ◇ Question to Answer: Is direct valuation of a dollar more consistent under scarcity?
- ◇ Scenario: Dominance lottery (Slovic, 2002)
- ◇ Context Effect Involved: Preference Reversal
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Ask participants to rate the attractiveness of one of the two gambles on a scale of 20-point
 - ◇ Compare the rating for the two gambles by higher-income and lower-income participants
- ◇ Model:
 - ◇ Two sample t-test on sample means in two gambles for higher-income and lower-income participants
 - ◇ Binary logistic regression to regress rating against income and gamble with their interaction term

Study 3: Valuing a Dollar under Scarcity

◇ Results:

- ◇ Higher-income participants rated the loss gamble as significantly more attractive
- ◇ Lower-income participants' didn't rate the gambles significantly different
- ◇ Two-way interaction term between income and gamble was significant

◇ Conclusion: People are less susceptible to context effects when valuating a dollar if they are under scarcity

◇ Next Step: In study 1a – 1d, 2a – 2d, and 3, the resource under scarcity were all money- or income-related. Does the same conclusion hold for non-monetary forms of scarcity?

Study 4: Consistent Monetary Accounting

- ◇ Question to Answer: Can specific mental-accounting effect be reduced under monetary scarcity?
- ◇ Scenario: Perceived costs under accessible monetary accounts priming manipulation (Morewedge, 2007)
- ◇ Context Effect Involved: Accessible-accounts Effect
- ◇ Resource under Scarcity: Money
- ◇ Design:
 - ◇ Prime participants with small or large accessible monetary accounts
 - ◇ Compare the cost perception in two cases by higher-income and lower-income participants
- ◇ Model:
 - ◇ Two sample t-test on sample means of perception in two cases for higher-income and lower-income participants
 - ◇ Binary logistic regression to regress perception against income and priming condition with their interaction term

Study 4: Consistent Monetary Accounting

◆ Results:

- ◆ Higher-income participants rated the purchase as significantly more expensive when they thought about a small account
- ◆ Lower-income participants' didn't rate the purchase significantly more expensive when they thought about a small account
- ◆ Two-way interaction term between income and account was significant
- ◆ Conclusion: People are less susceptible to accessible-accounts effects in a monetary context when they are under scarcity
- ◆ Next Step: In study 4, we prove that monetary scarcity can reduce accessible-accounts effect. Does the same conclusion hold for non-monetary forms of scarcity?

Study 5: Consistent Non-monetary Accounting with Caloric Scarcity

- ◇ Question to Answer: Can specific mental-accounting effect be reduced under non-monetary scarcity?
- ◇ Scenario: Perceived calorie under accessible caloric accounts priming manipulation (Morewedge, 2007)
- ◇ Context Effect Involved: Accessible-accounts Effect
- ◇ Resource under Scarcity: Calorie
- ◇ Design:
 - ◇ Prime participants with small or large accessible caloric accounts
 - ◇ Compare the cost perception in two cases by dieter and non-dieter participants
- ◇ Model:
 - ◇ Compare sample means of perception in two cases for dieter and non-dieter participants
 - ◇ Binary logistic regression to regress perception against dieting status and priming condition with their interaction term

Study 5: Consistent Non-monetary Accounting with Caloric Scarcity

◆ Results:

- ◆ Non-dieter participants rated the fries as significantly fatter when they thought about a smaller caloric account
- ◆ Dieter participants' didn't rate the fries significantly fatter when they thought about a smaller caloric account
- ◆ Two-way interaction term between dieting status and caloric account was significant
- ◆ Conclusion: People are less susceptible to accessible-accounts effects in a non-monetary context when they are under scarcity
- ◆ Next Step: In all previous studies, we prove that various forms of pre-existing scarcity can reduce specific context effects. Does the same conclusion hold for mentally-induced scarcity?

Study 6: Consistent Non-monetary Accounting with Time Scarcity

- ◇ Question to Answer: Can specific mental-accounting effect be reduced under non-monetary scarcity that does not pre-exist but induced mentally instead?
- ◇ Scenario: Perceived cost under accessible time accounts priming manipulation (Morewedge, 2007; Shah, 2012)
- ◇ Context Effect Involved: Accessible-accounts Effect
- ◇ Resource under Scarcity: Time (not pre-existed)
- ◇ Design:
 - ◇ Create time scarcity for a subset of participants for a game
 - ◇ Prime participants with small or large accessible time accounts
 - ◇ Compare the cost perception in two cases by participants poor and rich in time
- ◇ Model:
 - ◇ Compare sample means of perception in two cases for poor and rich participants
 - ◇ A 2x2 analysis of variance between scarcity condition and account condition on cost perception

Study 6: Consistent Non-monetary Accounting with Time Scarcity

◇ Results:

- ◇ Rich participants rated the loss as significantly more costly when they thought about a smaller account
 - ◇ Poor participants' didn't rate the loss significantly more costly when they thought about a smaller account
 - ◇ Two-way ANOVA between scarcity condition and time account was significant
- ◇ Conclusion: People are less susceptible to accessible-accounts effects in a non-monetary context when they are under mentally-induced scarcity
- ◇ Next Step: Transaction Utility Theory, Framing Effect, Preference Reversal, Accessible-account Effect are proved to be reduced by scarcity. How about other context effects?

Study 7 – 9: Other Context Effects Not Impacted

- ◆ Study 7: Pseudocertainty Effect (Tversky, 1981)
 - ◆ Preferences reverse not because of inconsistent valuation, but because of how probabilities are evaluated
 - ◆ Hence scarcity won't play a role in easing the effect, but the careful-thinking hypothesis would
- ◆ Study 8: Mental Budgeting (Tversky, 1981)
 - ◆ Maybe because mental budgets did not frame perceptions of value but helped participants decide whether to buy an item again after having lost it
- ◆ Study 9: Anchoring Effect (Ariely, 2003)
 - ◆ Perhaps anchoring does not shift the representation of value, but merely distorts the scale used to express it (Frederick & Mochon, 2012)

Contributions and Implications

- ◆ Offers more accessible trade-offs in policymaking for the poor (Dupas, 2009)
 - ◆ E.g. Bed-net, payday loan interest
- ◆ Prime the users with accessible trade-offs in socio-technical systems to assist more rational decisions
 - ◆ E.g. Saving for retirement, time-management
- ◆ Leverage scarcity as incentives in socio-technical systems to facilitate more focus and careful behaviors of users
 - ◆ E.g. Unlimited chances vs. limited chances to submit

Limitations and Future Work

- ◆ Limitation 1: Effect of scarcity on reducing context effects in valuation are only tested to be significant on specific effects
 - ◆ Future work: Clarify when accessible trade-offs can keep valuations from being impacted by context effects
- ◆ Limitation 2: Accessible trade-offs may be one of the many explanations for why scarcity might make valuation more consistent
 - ◆ Future work: Explore different reasons why scarcity has this effect
- ◆ Limitation 3: All participants in the studies were from the U.S., which may not account for cultural differences
 - ◆ Future work: Perform similar studies outside of the U.S.