How robust are scarcity inductions?
Undertaking well-powered replications of a systematic sample of the literature

Ruthe Foushee, on behalf of:
“Reproducibility & Open Science”

graduate seminar ~ 20 students

empirical review of a particular literature

ubiated, replicable procedure
“Reproducibility & Open Science”

graduate seminar ~ 20 students

Psychological Effects of Scarcity

ubiased, replicable procedure
Some Consequences of Having Too Little

Anuj K. Shah,¹,² Sendhil Mullainathan,² Eldar Shafir³

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: It leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (7, 2), fail to enroll in assistance programs (3), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). But simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12–14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

²Department of Economics, Harvard University, Cambridge, MA 02138, USA. ³Department of Psychology and Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08544, USA.

¹To whom correspondence should be addressed. E-mail: anuj.shah@chicagobooth.edu

Shah, Mullainathan, & Shafir (2012)
Some Consequences of Having Too Little
Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (7, 8), fail to enroll in assistance programs (9), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12–14).

But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

1. similar mechanisms across resources

Shah, Mullainathan, & Shafir (2012)
Some Consequences of Having Too Little

Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (1, 2), fail to enroll in assistance programs (3), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as

1. similar mechanisms across resources
2. scarcity shifts attention

Shah, Mullainathan, & Shafir (2012)
1. similar mechanisms across resources

2. scarcity shifts attention

3. scarcity impedes cognitive function

Some Consequences of Having Too Little

Anuj K. Shah,¹ Sendhil Mullainathan,² Eldar Shafir³

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (1, 2), fail to enroll in assistance programs (3), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12–14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

Shah, Mullainathan, & Shafir (2012)
Some Consequences of Having Too Little

Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (1, 2), fail to enroll in assistance programs (3), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12–14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions. To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

Shah, Mullainathan, & Shafir (2012)
Some Consequences of Having Too Little

Anuj K. Shah,1,2 Sendhil Mullainathan,2 Eldad Shafir1

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention; it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (1, 2) fail to enroll in assistance programs (3), save too little (4), and borrow too much (5). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12-14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

1 Booth School of Business, University of Chicago, Chicago, IL 60637, USA.
2 Department of Economics, Harvard University, Cambridge, WA 98138, USA.
* To whom correspondence should be addressed. E-mail: anuj.shah@chicagobooth.edu

Education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12-14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

Education (6), health (7), living conditions (8), political representation (9), and numerous demographic and geographic variables (10, 11). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (12-14). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lin-
which ones do we replicate?
Experimental

Quasiexperimental

BETWEEN-SUBJECTS
e.g., income

WITHIN-SUBJECTS
e.g., pre/post harvest

Experimental

PRIMING
e.g., *think of a time*...

RESOURCE ALLOCATION
e.g., guesses in game
Quasiexperimental

BETWEEN-SUBJECTS
e.g., income

WITHIN-SUBJECTS
e.g., pre/post harvest

Experimental

PRIMING
e.g., think of a time…

RESOURCE ALLOCATION
e.g., guesses in game
Cook & Sadeghein (2017). Effects of perceived scarcity on financial decision making. J Public Policy Mark — Study 3
Lee et al. (2018). Did they earn it? Observing unearned luxury consumption decreases brand attitude when observers value fairness. J Consum Psych — Study 4
Mani et al. (2013). Poverty impedes cognitive function. Science — Study 2
Bickel et al. (2016). Stuck in time: Negative income shock constricts the temporal window of valuation spanning the future and the past. Plos One — Study 1
Chou et al. (2016). Economic insecurity increases physical pain. Psych Science — Study 3
Layous et al. (2018). Reframing the ordinary: Imagining time as scarce increases well-being. J Positive Psych — Study 1
Emery et al. (2015). Knowing who you are and adding to it: Reduced self-concept clarity predicts reduced self-expansion. Soc Psych Pers Sci — Study 3
AS PREDICTED

OSF
data collection

Amazon’s Mechanical Turk, U.S. IP-addresses

2.5x original sample size (Simonsohn, 2017)

Batched by manipulation

1. financial constraints/economic hardship specific to the individual
2. general economic downturn/depression
3. scarcity (explicit manipulation of the perceived availability of non-monetary resources)

20 experiments; > 12,000 total responses
effects of scarcity on...
effects of scarcity on...

- consumer choices
- intrusive thoughts
- self-expansion
- Raven’s matrices
- delay discounting
- sense of meaning in life
- resource allocation
- perception of time
- wellbeing
- cognitive fatigue
- loan amount
- creativity
- planning
- productivity

Are poorer people more likely to spontaneously consider opportunity costs than people who are rich?

Are poorer people more likely to spontaneously consider opportunity costs than people who are rich?

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes.

Are poorer people more likely to spontaneously consider opportunity costs than people who are rich?

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes.

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.
| Opportunity Cost | Control |
Imagine that a new movie came out that is showing tonight. This movie is your preferred genre, with your favorite actor/actress. A movie ticket costs $8.50. What would you do in this situation?
Imagine that a new movie came out that is showing tonight. This movie is your preferred genre, with your favorite actor/actress. A movie ticket costs $8.50. What would you do in this situation?

<table>
<thead>
<tr>
<th>Opportunity Cost</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚫ Buy a movie ticket</td>
<td>⚫ Buy a movie ticket</td>
</tr>
<tr>
<td>⚫ Keep the $8.50 for other purchases</td>
<td>⚫ Not buy a movie ticket</td>
</tr>
</tbody>
</table>
Imagine that a new movie came out that is showing tonight. This movie is your preferred genre, with your favorite actor/actress. A movie ticket costs $8.50. What would you do in this situation?

- Buy a movie ticket
- Keep the $8.50 for other purchases

Which other alternative uses of $8.50 would you consider when making this decision? Please name the alternatives you would consider below, using a separate line for each alternative.

I
Imagine that a new movie came out that is showing tonight. This movie is your preferred genre, with your favorite actor/actress. A movie ticket costs $8.50. What would you do in this situation?

- Buy a movie ticket
- Keep the $8.50 for other purchases

Which other alternative uses of $8.50 would you consider when making this decision? Please name the alternatives you would consider below, using a separate line for each alternative.

How easy or hard was it for you to come up with the alternative uses of the $8.50?

1-Very Easy  2  3  4  5  6  7-Very Hard
1,613 adults (56% female; $M_{\text{age}} = 36.58$, $SD_{\text{age}} = 12.20$).
1613 adults (56% female; $M_{\text{age}}=36.58$, $SD_{\text{age}}=12.20$).

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes.

interaction between condition and income
results

1613 adults (56% female; \(M_{\text{age}} = 36.58, \ SD_{\text{age}} = 12.20\)).

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes.

interaction between condition and income

decision to buy \sim condition + income + condition:income
1613 adults (56% female; $M_{age}=36.58$, $SD_{age}=12.20$).

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes. 

interaction between condition and income

decision to buy $\sim$ condition + income + condition:income

effect of condition: $OR = 0.60 [0.48, 0.75]$ 

effect of income: $OR = 1.01 [0.95, 1.07]$ 

interaction: $OR = 1.02 [0.94, 1.11]$
1613 adults (56% female; $M_{\text{age}} = 36.58$, $SD_{\text{age}} = 12.20$).

H1: The effect of reminding participants of opportunity costs will be smaller for participants with lower incomes.
results

1613 adults (56% female; $M_{age}=36.58$, $SD_{age}=12.20$).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.
results

1613 adults (56% female; $M_{\text{age}}=36.58$, $SD_{\text{age}}=12.20$).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

+ correlation between income and difficulty
results

1613 adults (56% female; $M_{\text{age}}=36.58$, $SD_{\text{age}}=12.20$).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

+ correlation between income and difficulty
- correlation between income and number generated
1613 adults (56% female; $M_{\text{age}}=36.58$, $SD_{\text{age}}=12.20$).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

How easy or hard was it for you to come up with the alternative uses of the $8.50$?

<table>
<thead>
<tr>
<th>1-Very Easy</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7-Very Hard</th>
</tr>
</thead>
</table>
results

1613 adults (56% female; $M_{\text{age}}=36.58$, $SD_{\text{age}}=12.20$).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

How easy or hard was it for you to come up with the alternative uses of the $8.50? 

<table>
<thead>
<tr>
<th>1-Very Easy</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7-Very Hard</th>
</tr>
</thead>
</table>

average subjective difficulty: 2.96 [2.88, 3.05]

average number alternatives: 2.21 [2.11, 2.31]
results

1613 adults (56% female; M\text{age}=36.58, SD\text{age}=12.20).

H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

+ correlation between income and difficulty
- correlation between income and number generated

<table>
<thead>
<tr>
<th>Plantinga et al., Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>easier?</td>
</tr>
<tr>
<td>more?</td>
</tr>
</tbody>
</table>
H2: Participants with lower incomes will find it easier to generate alternative uses of the money.

- + correlation between income and difficulty
- - correlation between income and number generated

<table>
<thead>
<tr>
<th></th>
<th>Plantinga et al., Study 3</th>
<th></th>
<th>Our replication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$r(594)$</td>
<td>$p$</td>
<td>$r$</td>
</tr>
<tr>
<td>easier?</td>
<td>0.09 [.01, .17]</td>
<td>0.035</td>
<td>0.026 [-0.02, 0.08]</td>
</tr>
<tr>
<td>more?</td>
<td>0.05 [-0.03, .13]</td>
<td>0.244</td>
<td>0.025 [-0.02, 0.08]</td>
</tr>
</tbody>
</table>
effects of scarcity on...

- consumer choices
- intrusive thoughts
- self-expansion
- Raven’s matrices
- delay discounting
- sense of meaning in life
- resource allocation
- perception of time
- wellbeing
- cognitive fatigue
- loan amount
- creativity
- planning
- productivity
H1: Imagining a negative income shock will increase people’s subsequent delay discounting, such that they value smaller amounts of money in the present over larger amounts of money in the future.

4 within-subject delay discounting conditions
(Future Gain, Future Loss, Past Gain, Past Loss) X

3 between-subject scenarios
(Negative Income Shock/Positive Income Shock/No Change) X

2 between-subject framing conditions
(Explicit-zero/Non-zero)
Bickel et al. (2016) — Study 1 results

599 participants ($M_{age}=28.61$ years, $SD_{age}=8.41$)
our replication results

1505 participants (M\text{age} = 37.77 \text{ years}, \text{ SD}\text{age} = 12.35)

...no significant effect of scenario on participants’ discounting rate (all ps > 0.10)
comparing effect sizes

<table>
<thead>
<tr>
<th></th>
<th>Bickel et al.</th>
<th>Replication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\eta^2)</td>
<td>lower</td>
</tr>
<tr>
<td>future gain</td>
<td>0.097</td>
<td>0.053</td>
</tr>
<tr>
<td>future loss</td>
<td>0.053</td>
<td>0.021</td>
</tr>
<tr>
<td>past gain</td>
<td>0.091</td>
<td>0.049</td>
</tr>
<tr>
<td>past loss</td>
<td>0.700</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.003</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>-0.002</td>
</tr>
</tbody>
</table>
effects of scarcity on...

- consumer choices
- intrusive thoughts
- self-expansion
- Raven’s matrices
- delay discounting
- sense of meaning in life
- resource allocation
- perception of time
- wellbeing
- cognitive fatigue
- loan amount
- creativity
- planning
- productivity
Some Consequences of Having Too Little

Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention; it leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.
Some Consequences of Having Too Little

Anuj K. Shah,1,4 Sendhil Mullainathan,2 Eldar Shafir3

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for why people are poor emphasize environmental factors and consider how certain behaviors stem simply from how people allocate attention; it leads them to neglecting others. Across several experiments, we show that our results can help to explain behaviors such as overborrowing, and they also explain other puzzles of poverty.

Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015

Colin F. Camerer1,15, Anna Dreber2,15, Felix Holzmeister3,16, Teck-Hua Ho4,16, Jürgen Huber3,16, Magnus Johannesson1,2,16, Michael Kirchler4,5,16, Gideon Nave6,16, Brian A. Nosek1,7,8,16*, Thomas Pfeiffer6,9,16, Adam Altmejd2, Nick Buttrick7,8, Taizan Chan10, Yiling Chen11, Eskil Forsell12, Anup Gampa7,8, Emma Heikensten2, Lily Hummer8, Taisuke Imai1,13, Siri Isaksson2, Dylan Manfredi8, Julia Rose1, Eric-Jan Wagenmakers14 and Hang Wu15
Some Consequences of Having Too Little

Anuj K. Shah,1* Sendhil Mullainathan,2 Eldar Shafir3

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for why people are poor focus on choices that people make. Others emphasize environmental factors that shape choices and, implicitly or explicitly, how people allocate attention: It leads them to avoid things that they need, neglecting others. Across several experiments, we find that attentional factors can help to explain behaviors such as overborrowing or spending more time on social media than on work. Our results also explain other puzzles of poverty.

Evaluating the replicability of social science experiments in *Nature* and *Science* between 2010 and 2015


Anuj K. Shah3,*, Sendhil Mullainathan3, Eldar Shafirb

3 University of Chicago Booth School of Business, United States
b Princeton University, United States
Some Consequences of Having Too Little
Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for the poor consider how certain behaviors stem simply from how people allocate attention; it leads them to neglecting others. Across several experiments, it can help to explain behaviors such as overborrowing, also explain other puzzles of poverty.

Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015
Colin F. Camerer, Magnus Johannesson, Thomas Pfeiffer, Anup Gampa, Eric-Jan Wagenmakers, Julia Rose, Eric-Jan Wagenmakers

Anuj K. Shah, Sendhil Mullainathan, Eldar Shafir

Shah, Mullainathan, & Shafir (2012, Science)

does scarcity increase cognitive fatigue?

<table>
<thead>
<tr>
<th>Rich</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
does scarcity increase cognitive fatigue?

<table>
<thead>
<tr>
<th>Rich</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 guesses (6/puzzle)</td>
<td>280 guesses (20/puzzle)</td>
</tr>
</tbody>
</table>
does scarcity increase cognitive fatigue?

<table>
<thead>
<tr>
<th>Borrow?</th>
<th>Rich</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>84 guesses (6/puzzle)</td>
<td>280 guesses (20/puzzle)</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
does scarcity increase cognitive fatigue?

<table>
<thead>
<tr>
<th>Borrow?</th>
<th>Rich</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>84 guesses (6/puzzle)</td>
<td>280 guesses (20/puzzle)</td>
</tr>
<tr>
<td>Yes</td>
<td>Dots Mixed Attention Task</td>
<td></td>
</tr>
</tbody>
</table>
does scarcity increase cognitive fatigue?

<table>
<thead>
<tr>
<th>Rich</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 guesses</td>
<td>280 guesses</td>
</tr>
<tr>
<td>(6/puzzle)</td>
<td>(20/puzzle)</td>
</tr>
</tbody>
</table>

Dots Mixed Attention Task

Q: +

P:
### Original Results

<table>
<thead>
<tr>
<th>who?</th>
<th>found?</th>
<th>N</th>
<th>M_{\text{rich}} (SD_{\text{rich}})</th>
<th>M_{\text{poor}} (SD_{\text{poor}})</th>
<th>statistic</th>
<th>p</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shat et al.</td>
<td>Scarcity-induced focus leads to cognitive fatigue on subsequent cognitive control task</td>
<td>60</td>
<td>52.93 (12.79)</td>
<td>45.12 (15.87)</td>
<td>F(1, 54) = 4.16</td>
<td>0.046</td>
<td>0.072 [0.001, 0.197]</td>
</tr>
<tr>
<td>who?</td>
<td>found?</td>
<td>$N$</td>
<td>$M_{\text{rich}}$ (SD$_{\text{rich}}$)</td>
<td>$M_{\text{poor}}$ (SD$_{\text{poor}}$)</td>
<td>statistic</td>
<td>$p$</td>
<td>$\eta_p^2$</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----</td>
<td>----------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Shat et al. (2012 - Science)</td>
<td>Scarcity-induced focus leads to cognitive fatigue on subsequent cognitive control task</td>
<td>60</td>
<td>52.93 (12.79)</td>
<td>45.12 (15.87)</td>
<td>F(1, 54) = 4.16</td>
<td>0.046</td>
<td>0.072 [.001, .197]</td>
</tr>
<tr>
<td>Camerer et al. (2018 - Nature HB)</td>
<td>no effect (opposite direction)</td>
<td>278</td>
<td>44.51 (13.84)</td>
<td>46.94 (14.19)</td>
<td>F(1, 276) = 2.09</td>
<td>0.1498</td>
<td></td>
</tr>
</tbody>
</table>
further replications...
<table>
<thead>
<tr>
<th>who?</th>
<th>found?</th>
<th>N</th>
<th>$M_{\text{rich}}$ (SD$_{\text{rich}}$)</th>
<th>$M_{\text{poor}}$ (SD$_{\text{poor}}$)</th>
<th>statistic</th>
<th>$p$</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shat et al. (2012 - Science)</td>
<td>Scarcity-induced focus leads to cognitive fatigue on subsequent cognitive control task</td>
<td>60</td>
<td>52.93 (12.79)</td>
<td>45.12 (15.87)</td>
<td>F(1, 54) = 4.16</td>
<td>0.046</td>
<td>.072 [0.001, 0.197]</td>
</tr>
<tr>
<td>Camerer et al. (2018 - Nature H B)</td>
<td>no effect (opposite direction)</td>
<td>278</td>
<td>44.51 (13.84)</td>
<td>46.94 (14.19)</td>
<td>F(1, 276) = 2.09</td>
<td>0.1498</td>
<td></td>
</tr>
<tr>
<td>Shah et al (in press - J Econ Psych)</td>
<td>effect in opposite direction</td>
<td>996</td>
<td>42.03 (15.38)</td>
<td>44.05 (15.93)</td>
<td>F(1, 995) = 4.15</td>
<td>0.042</td>
<td>.004 [0.000, 0.013]</td>
</tr>
<tr>
<td>Our replication</td>
<td>no effect (same direction as original)</td>
<td>668</td>
<td>42.82 (5.87)</td>
<td>41.56 (16.79)</td>
<td>F(1,666) = .99</td>
<td>0.319</td>
<td></td>
</tr>
</tbody>
</table>

Rachel Jansen

Cook & Sadeghein (2017). Effects of perceived scarcity on financial decision making. J Public Policy Mark — Study 3


Lee et al. (2018). Did they earn it? Observing unearned luxury consumption decreases brand attitude when observers value fairness. J Consum Psych — Study 4


Mani et al. (2013). Poverty impedes cognitive function. Science — Study 2


Bickel et al. (2016). Stuck in time: Negative income shock constricts the temporal window of valuation spanning the future and the past. Plos One — Study 1

Chou et al. (2016). Economic insecurity increases physical pain. Psych Science — Study 3


Layous et al. (2018). Reframing the ordinary: Imagining time as scarce increases well-being. J Positive Psych — Study 1


Emery et al. (2015). Knowing who you are and adding to it: Reduced self-concept clarity predicts reduced self-expansion. Soc Psych Pers Sci — Study 3


Cook & Sadeghein (2017). Effects of perceived scarcity on financial decision making. *J Public Policy Mark — Study 3*


Lee et al. (2018). Did they earn it? Observing unearned luxury consumption decreases brand attitude when observers value fairness. *J Consum Psych — Study 4*


Tully et al. (2015). Seeking lasting enjoyment with limited money: Financial constraints increase preference for material goods over experiences. *J Consum Res — Study 5*

Mani et al. (2013). Poverty impedes cognitive function. *Science — Study 2*

Fernbach et al. (2014). Squeezed: Coping with constraint through efficiency and prioritization. *J Consum Res — Study 2*


...too early to comment on overall results


Layous et al. (2018). Reframing the ordinary: Imagining time as scarce increases well-being. *J Positive Psych — Study 1*

Kristofferson et al. (2017). The dark side of scarcity promotions: How exposure to limited-quantity promotions can induce aggression. *J Consum Res — Study 5*

Mehta & Zhu (2015). Creating when you have less: The impact of resource scarcity on product use creativity. *J Consum Res — Study 5*


Emery et al. (2015). Knowing who you are and adding to it: Reduced self-concept clarity predicts reduced self-expansion. *Soc Psych Pers Sci — Study 3*


what might we expect to find?
**p-curve**: distribution of p-values

- **Observed p-curve**
  - Power estimate: 9%, CI(5%,36%)

- **Null of no effect**
  - Tests for right-skewness: $p_{\text{Full}} = .2369$, $p_{\text{Half}} = .063$

- **Null of 33% power**
  - Tests for flatness: $p_{\text{Full}} = .0635$, $p_{\text{Half}} = .9967$, $p_{\text{Binomial}} = .0118$

Simonsohn, Nelson, & Simmons (2014)

http://www.p-curve.com/app4/
$p$-curve: distribution of $p$-values

False positives, data-mining, selective reporting $=$ left skew

Simonsohn, Nelson, & Simmons (2014)

http://www.p-curve.com/app4/
*$p$-curve*: distribution of $p$-values

false positives, data-mining, selective reporting = left skew

ture effects = right skew
$p$-curve: distribution of $p$-values

false positives, data-mining, selective reporting = left skew
true effects = right skew
null effects = uniform

Simonsohn, Nelson, & Simmons (2014)
http://www.p-curve.com/app4/
based on p-curve

what might we expect to find?
Based on p-curve, what might we expect to find?

* p-values here from a randomly-drawn sample of 16 experiments priming scarcity

Simonsohn, Nelson, & Simmons (2014)  
http://www.p-curve.com/app4/
what might we expect to find?

Based on P-Curve

Observed p-curve
Power estimate: 9%, CI(5%, 36%)

Null of no effect
Tests for right-skewness: \( p_{\text{Full}} = 0.2369, \ p_{\text{Half}} = 0.063 \)

Null of 33% power
Tests for flatness: \( p_{\text{Full}} = 0.0635, \ p_{\text{Half}} = 0.9967, \ p_{\text{Binomial}} = 0.0118 \)

casts some doubt on our measurement, not necessarily our theory

\( \star \) p-values here from a randomly-drawn sample of 16 experiments priming scarcity

Simonsohn, Nelson, & Simmons (2014)

http://www.p-curve.com/app4/
how are we measuring scarcity?
how are we measuring scarcity?

one way is income:

What is the total yearly net income of all persons living in your household?

- $10,000 or less (1)
- $10,001 to $20,000 (2)
- $20,001 to $30,000 (3)
- $30,001 to $40,000 (4)
- $40,001 to $50,000 (5)
- $50,001 to $60,000 (6)
- $60,001 to $70,000 (7)
- $70,001 to $80,000 (8)
- $80,001 to $90,000 (9)
- $90,001 to $100,000 (10)
- $100,001 to $110,000 (11)
- $110,001 to $120,000 (12)
- $120,001 to $130,000 (13)
- $130,001 to $140,000 (14)
- $140,001 to $150,000 (15)
- $150,001 to $160,000 (16)
- More than $160,000 (17)
- I don't know (998)
- I prefer not to answer (999)

“researcher degrees of freedom” (?)

—Simmons, Nelson, & Simonsohn (2011)
how are we analyzing income?

income-to-needs

effective income

“food to mouths”

in/out of poverty

U.S. quintile

high/low income

“wealth”
+ subjective wealth!

Think of this ladder as representing where people stand in the U.S....

How would you describe your current financial situation?

How would you describe your ability to make ends meet?

Do you feel your income adequately fulfills your needs and wants?
Quasiexperimental

**BETWEEN-SUBJECTS**

- **Resource Allocation**
- **Between-Subjects**

**WITHIN-SUBJECTS**

Experimental

**PRIMING**

- **Resource Allocation**
- **Within-Subjects**
Quasiexperimental

- BETWEEN-SUBJECTS
  - $ Plantinga et al., 2018

- WITHIN-SUBJECTS

Experimental

- PRIMING
  - $ Bickel et al., 2013
  - Timer

- RESOURCE ALLOCATION
  - Angry Bird
  - Timer

Shah et al., 2012
### Quasiexperimental

<table>
<thead>
<tr>
<th>BETWEEN-SUBJECTS</th>
<th>WITHIN-SUBJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Money" /></td>
<td><img src="image2" alt="Money" /></td>
</tr>
</tbody>
</table>

*Plantinga et al., 2018*

### Experimental

<table>
<thead>
<tr>
<th>PRIMING</th>
<th>RESOURCE ALLOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Money" /></td>
<td><img src="image4" alt="Angry Bird" /></td>
</tr>
<tr>
<td><img src="image5" alt="Timer" /></td>
<td><img src="image6" alt="Timer" /></td>
</tr>
</tbody>
</table>

*Shah et al., 2012*

*Bickel et al., 2013*
Quasiexperimental

BETWEEN-SUBJECTS

Plantinga et al., 2018

WITHIN-SUBJECTS

Experimental

PRIMING

Bickel et al., 2013

RESOURCE ALLOCATION

Shah et al., 2012

Mani et al. (2013)
Shah et al. (2015)
....
thanks!
<table>
<thead>
<tr>
<th>Narrative Valence</th>
<th>Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>You have just been fired from your job. You will now have to move in with a relative who lives in a part of the country you dislike, and you will have to spend all of your savings to move there. You do not qualify for unemployment, so you will not be making any income until you find another job.</td>
</tr>
<tr>
<td>Neutral</td>
<td>At your job, you have just been transferred to a different department in a location across town. It is a similar distance from where you live so you will not have to move. You will be making 2% more than you previously were.</td>
</tr>
<tr>
<td>Positive</td>
<td>At your job you have just been promoted. You will have the opportunity to move to a part of the country you always wanted to live in OR you may choose to stay where you are. Either way, the company gives you a large amount of money to cover moving expenses, and tells you to keep what you don’t spend. You will be making 100% more than you previously were.</td>
</tr>
</tbody>
</table>

doi:10.1371/journal.pone.0163051.t001

(bickel et al. scenarios)