

Behavioral Economics

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Lecture 9: Poverty under the Lens of Behavioral Economics

Today's Topics

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1. What is Poverty? What causes Poverty?
 - Poverty Traps and Behavioral Poverty Traps

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2. Self-Control and Poverty
 - using quasi-hyperbolic preferences to understand and alleviate poverty.
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 - Poverty Traps and Behavioral Poverty Traps
2. Self-Control and Poverty
 - using quasi-hyperbolic preferences to understand and alleviate poverty.
 - *"Nudging Farmers to Use Fertilizer"* by Duflo et al. (2011).
3. Aspirations and Poverty.
 - using reference dependence to understand and alleviate poverty.
 - *"Poverty and Aspirations Failure"* by Dalton et al. (2016).

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3. Aspirations and Poverty.
 - using reference dependence to understand and alleviate poverty.
 - *"Poverty and Aspirations Failure"* by Dalton et al. (2016).
4. Ambiguity Attitudes and Poverty
 - using weighting functions to understand poverty.
 - *"Are the poor worse at dealing with ambiguity?"* by Chen Li (2017).

What is Poverty?

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- **Poverty:** condition in which a person is fall short of a level of economic welfare deemed to constitute a reasonable minimum either in some absolute sense or by the standards of a specific society (Lipton and Ravallion, 1995).

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- Poverty measured using poverty lines.

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- **Poverty:** condition in which a person is fall short of a level of economic welfare deemed to constitute a reasonable minimum either in some absolute sense or by the standards of a specific society (Lipton and Ravallion, 1995).
- Poverty measured using poverty lines.
 - relative poverty lines \Rightarrow mostly used by developed countries.
 - absolute poverty lines \Rightarrow mostly used by developing countries.

Relative Poverty Line: Germany

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- Germany follows the EU standard definition of a relative poverty line, which is 60% of the population's median income.
 - 1,126 Euros per month.
- In 2021, 17.5 % of Germany's population were at risk of poverty.



Absolute Poverty Line: Nepal

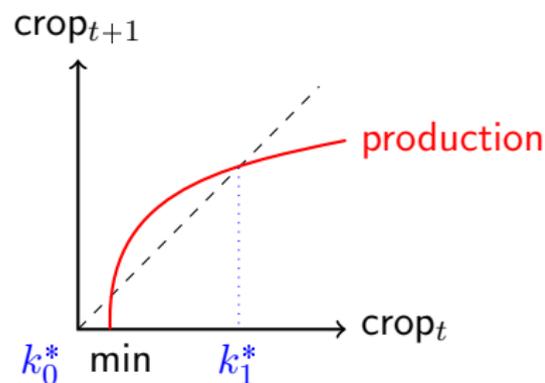
Absolute Poverty Line: Nepal

- Based on the food expenditure needed to fulfill a per capita 2,124 kcal per day, plus a non-food allowance.
 - Rs 19,262 per year.
- Nepal had over 6.8 million poor people (25.2% of its population) in 2021.



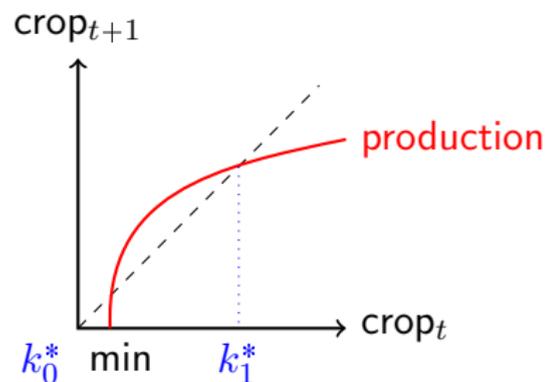
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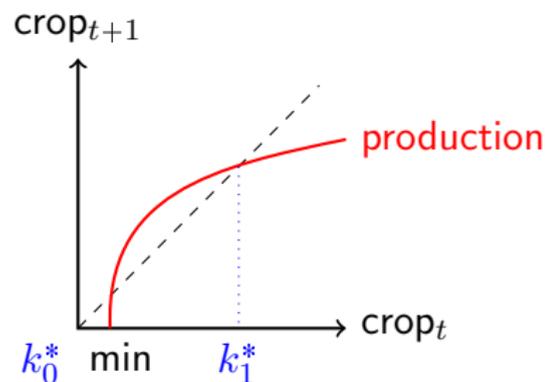
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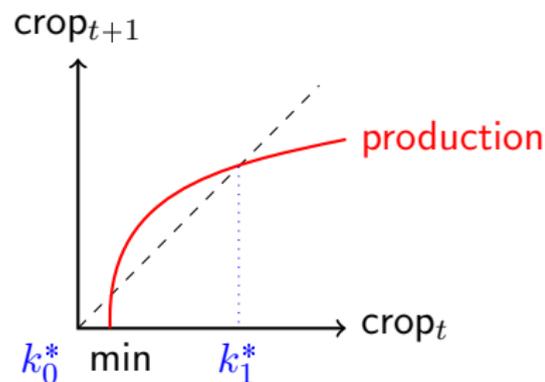
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- A poverty trap
 - self-reinforcing mechanism which causes poverty to persist.

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 - Worse networks/contacts/information/discrimination \Rightarrow Less opportunities.

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- **Constraints become internal** \Rightarrow an additional source of disadvantage
- Today we will study some examples of behavioral poverty traps.

2. Self-control and Poverty.

- using quasi-hyperbolic preferences to understand and alleviate poverty.
- *“Nudging Farmers to Use Fertilizer”* by Duflo et al. (2011).

About Fertilizer. . .

The rest of the world is fed because of the use of good seed and inorganic fertilizer, full stop. This technology has not been used in most of Africa. The only way you can help farmers get access to it is give it away free or subsidize it heavily.

- Stephen Carr, former World Bank specialist

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 - Supplies the soil and plant with nutrients.
- Previous research has shown that fertilizer generates average additional returns of 36% over a season (Duflo et al., 2008).
 - Low investment puzzling; fertilizer is well-known and accessible.
- Possible explanation: farmers would like to purchase fertilizer, but run out of money by the time the new season comes.

Nudging farmers to use fertilizer (Duflo et al., 2011)

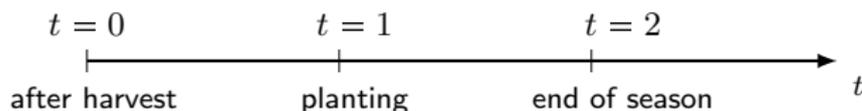
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- Farmers have (β, δ) preferences (Lecture 5).
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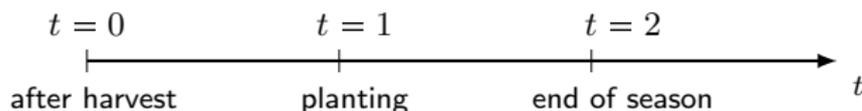
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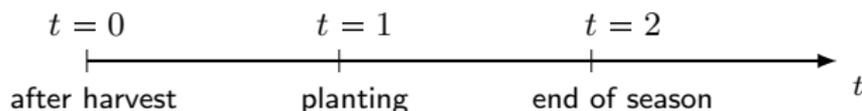
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- Procrastinate buying fertilizer if they are (partially) naive (see Example 3 from Lecture 5).

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- Procrastinate buying fertilizer if they are (partially) naive (see Example 3 from Lecture 5).
 - Subsidies might not be the only way to boost fertilizer usage \Rightarrow **commitment!**

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- Experiment in Western Kenya.

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- Experiment in Western Kenya.
- SAFI Program (Savings and Fertilizer Initiative) \Rightarrow free delivery of fertilizer at harvest (“pre-buying” fertilizer at $t = 0$)
- Two agricultural seasons
 - 877 farmers in the first season, 757 in the second season

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- **Treatments season 2:**

- Basic SAFI – free delivery of fertilizer at full price at $t = 0$
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- SAFI subsidy – half price subsidy at $t = 1$

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- SAFI choice date – choice of free delivery date.

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 - Comparison group (control)
- Season 3: no intervention

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- 2 Delivery at $t = 0$ will increase fertilizer usage more than delivery at $t = 1$.
 - Effect of liquidity and hyperbolic preferences.
- 3 Farmers prefer delivery at $t = 0$ than in $t = 1$.
 - Effect of hyperbolic preferences with (partial) sophistication.

Nudging farmers to use fertilizer (Duflo et al., 2011)

- **Results:**

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- **Results:**
 - 97,7% of farmers reported having the intention to use fertilizer in the next season, but only 36,4% actually did so.
 - Confirms 1st prediction!

Nudging farmers to use fertilizer (Duflo et al., 2011)

	Used fertilizer season 1		Used fertilizer season 2		Used fertilizer season 3	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A. 2004 season 1 treatments</i>						
SAFI season 1	0.114 (0.035)***	0.143 (0.038)***	0.007 (0.041)	0.007 (0.044)	0.006 (0.037)	0.01 (0.041)
Starter kit farmer	0.059 (0.042)	0.080 (0.046)*	0.024 (0.047)	0.005 (0.051)	-0.009 (0.043)	-0.027 (0.048)
Starter kit farmer × demonstration plot school	-0.026 (0.060)	-0.061 (0.066)	0.024 (0.068)	-0.005 (0.075)	0.004 (0.063)	-0.031 (0.070)
Demonstration plot school	0.006 (0.314)	0.441 (0.435)	0.362 (0.460)	0.464 (0.463)	0.362 (0.335)	0.437 (0.465)
Household had used fertilizer prior to season 1	0.369 (0.031)***	0.315 (0.035)***	0.319 (0.035)***	0.284 (0.040)***	0.281 (0.033)***	0.251 (0.037)***
Male		0.012 (0.033)		0.014 (0.037)		0.026 (0.034)
Home has mud walls		-0.193 (0.081)**		-0.183 (0.091)**		-0.021 (0.085)
Education primary respondent		0.004 (0.004)		-0.004 (0.005)		0.015 (0.005)***
Income in past month (in 1,000 Kenyan shillings)		0.004 (0.003)		0.006 (0.003)**		0.002 (0.003)
Mean usage among season 1 comparison	0.244	0.240	0.311	0.328	0.395	0.421
Mean usage among pure comparison group	0.296	0.227	0.182	0.111	0.423	0.381
Observations	876	716	756	626	902	734

Figure: Season 1 treatments

This table shows that SAFI in Season 1 increases fertilizer usage on 14.3 % (see column (2))

Nudging farmers to use fertilizer (Duflo et al., 2011)

	Used fertilizer season 1		Used fertilizer season 2		Used fertilizer season 3	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel B. 2004 season 2 treatments</i>						
SAFI season 2	-0.009 (0.053)	0.042 (0.057)	0.165 (0.061)***	0.181 (0.066)***	-0.024 (0.056)	-0.005 (0.061)
SAFI season 2 with choice on date of return	-0.014 (0.048)	0.030 (0.053)	0.207 (0.055)***	0.216 (0.060)***	-0.027 (0.050)	0.003 (0.056)
Half-price subsidy visit at top dressing	-0.035 (0.052)	-0.039 (0.057)	0.142 (0.059)**	0.127 (0.065)*	0.023 (0.054)	0.041 (0.061)
Full-price and free delivery visit at top dressing	-0.065 (0.052)	-0.034 (0.058)	0.096 (0.059)	0.104 (0.066)	-0.053 (0.054)	-0.031 (0.061)
Bought maize	-0.002 (0.043)	-0.011 (0.048)	-0.042 (0.049)	-0.079 (0.054)	0.002 (0.046)	-0.014 (0.050)
Bought maize × SAFI season 2	-0.048 (0.075)	-0.073 (0.082)	-0.085 (0.087)	-0.057 (0.096)	0.005 (0.080)	-0.011 (0.087)
Household had used fertilizer prior to season 1	0.369 (0.031)***	0.316 (0.035)***	0.325 (0.035)***	0.283 (0.040)***	0.278 (0.033)***	0.248 (0.037)***
Male		0.01 (0.033)		0.014 (0.037)		0.028 (0.035)
Home has mud walls		-0.197 (0.081)**		-0.197 (0.091)**		-0.017 (0.086)
Education primary respondent		0.004 (0.004)		-0.003 (0.005)		0.015 (0.005)***
Income in past month (in 1,000 Kenyan shillings)		0.004 (0.003)		0.006 (0.003)**		0.003 (0.003)
Mean usage among season 2 comparison	0.372	0.329	0.260	0.241	0.479	0.472
Mean usage among pure comparison group	0.296	0.227	0.182	0.111	0.423	0.381
Observations	876	716	756	626	902	734

Figure: Season 2 treatments

This table shows that SAFI in Season 2 increases fertilizer usage on 18.1 % (see column (4))

Nudging farmers to use fertilizer (Duflo et al., 2011)

- **Results:**

- Free delivery at $t = 0$ encourages fertilizer usage as twice as free delivery in $t = 1$.
 - **Confirms 2nd prediction !**
 - (Compare the coefficients of “Full price and free delivery visit at top dressing” and “SAFI season 2” of column (4) of the table in the previous slide)

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 - (Compare the coefficients of “Full price and free delivery visit at top dressing” and “SAFI season 2” of column (4) of the table in the previous slide)
- Half of farmers offered “SAFI choice date” asked the field officer to come back at $t = 0$, and 46 percent of those actually bought fertilizer.
 - **Confirms 3rd prediction!**

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- **Results:**

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 - (Compare the coefficients of “Full price and free delivery visit at top dressing” and “SAFI season 2” of column (4) of the table in the previous slide)
- Half of farmers offered “SAFI choice date” asked the field officer to come back at $t = 0$, and 46 percent of those actually bought fertilizer.
 - **Confirms 3rd prediction!**
- The impact of “SAFI subsidy” is almost as large as the impact of the “Basic SAFI.”
 - (Compare the coefficients of “Half-price subsidy visit at top dressing” and “SAFI season 2” of column (4) of the table in the previous slide)

Nudging farmers to use fertilizer (Duflo et al., 2011)

- Self-control problems can perpetuate poverty.
- **Policy recommendation:** offering commitment alleviates self-control problems and can be more effective than subsidies.
 - letting individuals choose the commitment date is surprisingly effective!

3. Poverty and Aspirations Failure.

- using reference dependence to understand and alleviate poverty.
- *“Poverty and Aspirations Failure”* by Dalton et al. (2016).

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- A **goal** \Rightarrow a desire to **attain** it \Rightarrow **effort** towards realizing it.
- Aspirations \neq expectations.
 - An **aspiration** expresses a **preference** for a “state of the world” where the relevant goal is achieved.
 - An **expectation** comes from the **probability** attached to a “state of the world” being reached.

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 - E How important is it for you to achieve that level of sales?
 - F How likely do you think you are to achieve this level?

Evidence of Poverty and Aspirations

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- Poor adults aspire low:
 - Rural Ethiopia (Frankerberger et al., 2007; Bernard et al. 2011)
 - Youths in Jamaica (Walker, 1997)
 - Low-income urban neighborhoods in America (MacLeod, 1995) and the UK (Cabinet Office, 2008)

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- 60 % of Americans think that the poor “are lazy or lack willpower” (World Values Survey, Alesina et al., 2001).

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 - Low-income urban neighborhoods in America (MacLeod, 1995) and the UK (Cabinet Office, 2008)
- 60 % of Americans think that the poor “are lazy or lack willpower” (World Values Survey, Alesina et al., 2001).
- Poor kids want high:
 - 75% of the 14 year-old poor Ethiopians said they want to go to college. Only 3% go.

Lack of aspirations – Cause or Consequence of Poverty?

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- is it that people become and remain poor because they lack aspirations and motivation to pull themselves out of poverty?

Lack of aspirations – Cause or Consequence of Poverty?

- is it that people become and remain poor because they lack aspirations and motivation to pull themselves out of poverty?

OR...

Lack of aspirations – Cause or Consequence of Poverty?

- is it that people become and remain poor because they lack aspirations and motivation to pull themselves out of poverty?

OR...

- is it that the conditions of poverty, themselves, stifle dreams and aspirations?

Poverty and aspirations failure (Dalton et al., 2016)

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- Individual has initial wealth $\theta_0 > 0$.

Poverty and aspirations failure (Dalton et al., 2016)

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- Has an aspiration level (or goal) g for final wealth.

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 - **loss aversion:** run harder to avoid the falling short of the goal.
 - **diminishing sensitivity for outcomes:** run harder the goal is approached.
- Low goals do not take advantage of the above motivational effects \Rightarrow runner does not realize his/her full potential.

Poverty and aspirations failure (Dalton et al., 2016)

- Utility is given by:

$$U(e, g) = \theta^{1/2} - \left(\frac{\theta - g}{\theta} \right)^2 - c(e)$$

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 - $-\left(\frac{\theta - g}{\theta}\right)^2$ represents the S-shaped utility with respect to g
 - $c(e)$ is the cost of effort and exhibits $c(e) = \begin{cases} c & \text{if } e = 1 \\ 0 & \text{if } e = 0. \end{cases}$

What determines individual aspirations?

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“Every ceiling, when reached, becomes a floor”— Aldous Huxley

How Dalton et al. (2016) model aspirations

- Aspirations as **consistent (self-fulfilling)** reference points.

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- Aspirations as **consistent (self-fulfilling)** reference points.
Formally: (e, g) is consistent whenever

$$g = \theta = (1 + e)\theta_0$$

- Yes, everyone can reach their aspirations (and they do so in equilibrium)! BUT...
- Reaching aspirations does not necessarily imply, aspiring optimally.
 - people may be able to reach their potential and yet, they may aspire lower.

Poverty and aspirations failure (Dalton et al., 2016)

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 - The poorer the (rational) person, the lower the net benefit of exerting effort (h).

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- **Option 2:** The (behavioral) individual does not internalize that $g = \theta = (1 + e)\theta_0$, and takes g as **exogenous** (call it \hat{g}).

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- the S-shaped function is relevant.
 - The lower \hat{g} the lower the benefit of exerting effort. proof
- Just like for the rational person, the poorer the person, the lower the net benefit of exerting effort.

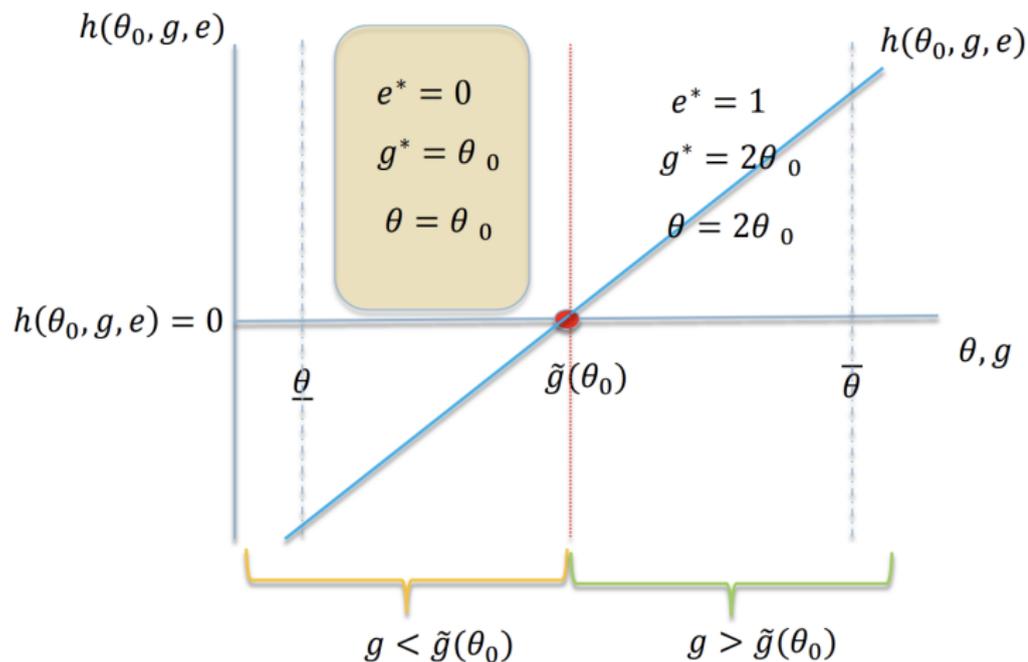
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- There is an aspiration level $\tilde{g}(\theta_0)$ such that the individual is indifferent between $e = 1$ and $e = 0$. proof

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- There is an aspiration level $\tilde{g}(\theta_0)$ such that the individual is indifferent between $e = 1$ and $e = 0$. proof
 - when $g < \tilde{g}(\theta_0)$ the behavioral individual does not exert effort, even though if she were rational she would exert effort (if $g = \theta$, then $h > 0$).
- Setting a low g could make the behavioral individual constrained.

Poverty and aspirations failure (Dalton et al., 2016)



ASPIRATIONS FAILURE: Low effort is sub-optimal

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- Poverty stifles aspirations:
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- The poorer the behavioral individual is, the more likely she is to exhibit aspirations failure (set too low aspirations given her potential θ_0).

Poverty and aspirations failure (Dalton et al., 2016)

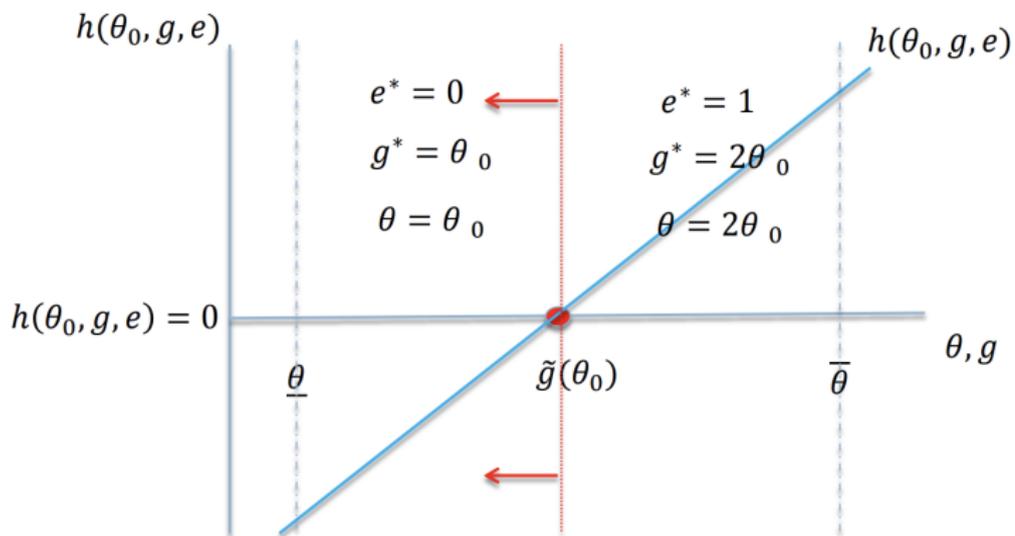
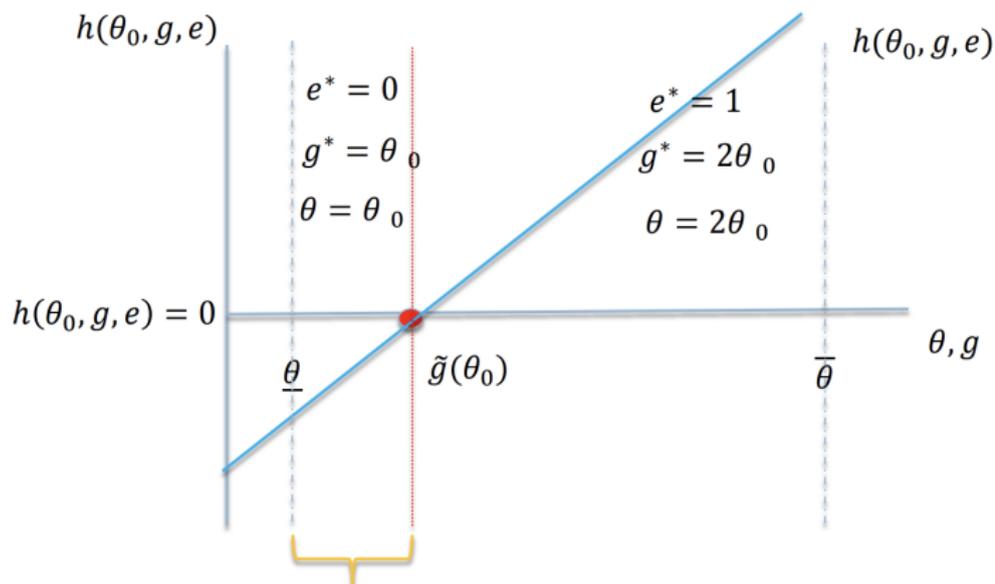


Figure: Releasing External Constraints (higher θ_0)

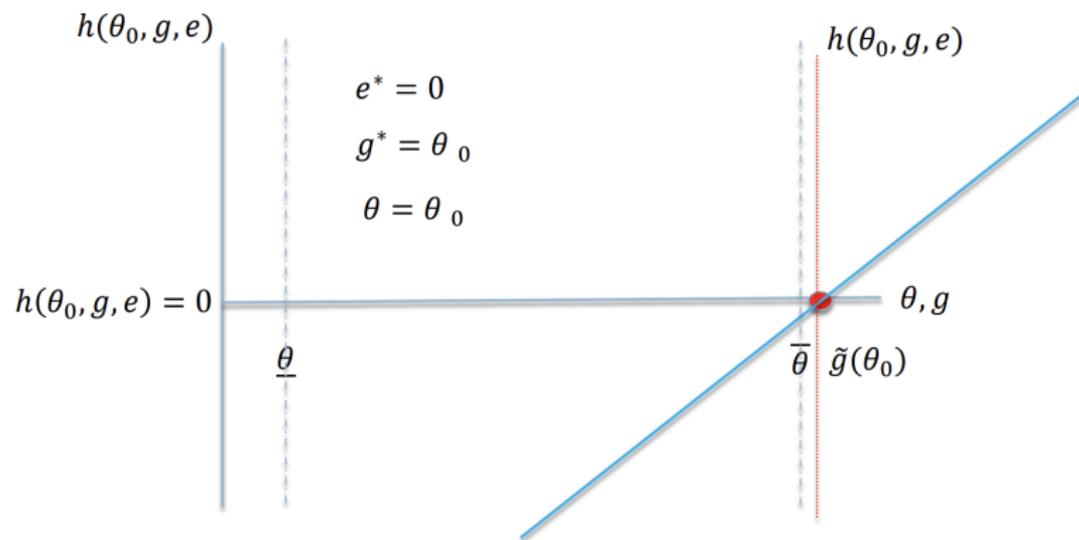
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For a given g , the probability of an aspirations failure is lower the richer is the person.

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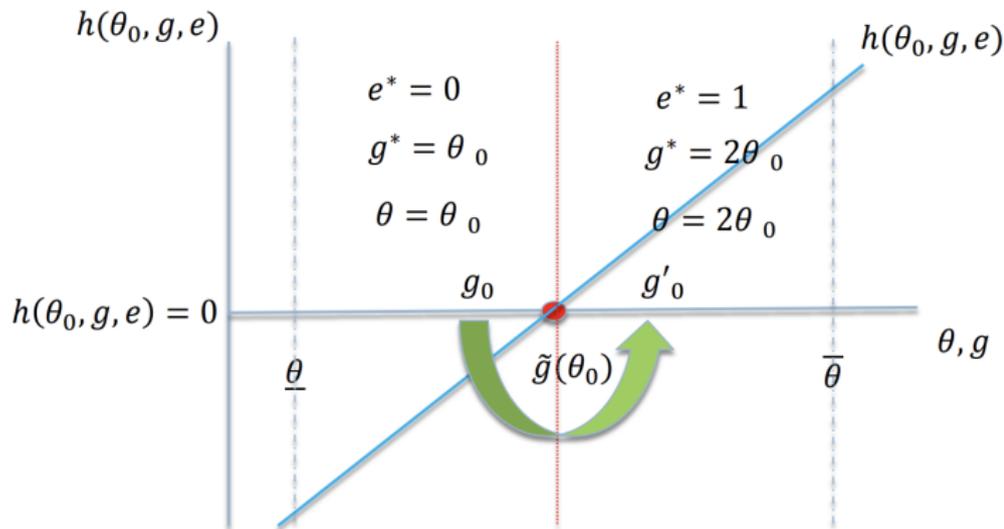
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The conditions of poverty are so stringent, that aspirations don't act as a constraint. Low effort is optimal.

Figure: Wealth Based Poverty trap

Poverty and aspirations failure (Dalton et al., 2016)



For a given θ_0 , the probability of an aspirations failure is lower the higher are the aspirations.

Figure: Releasing Internal Constraints (higher g)

Poverty and aspirations failure (Dalton et al., 2016)

- **Result:** Poverty exacerbates the likelihood that an aspirations failure arises (higher \tilde{g}). Poor people are more likely to aspire below their potential.

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- **Result:** Poverty exacerbates the likelihood that an aspirations failure arises (higher \tilde{g}). Poor people are more likely to aspire below their potential.
 - Initial external constraints make more likely that the poor end up holding low aspirations and do not realize their full potential.
 - The 60 % of Americans who think that poor are poor because they are “lazy” are likely to be drawing biased inference from an equilibrium outcome caused by poverty. itself.

Poverty and aspirations failure (Dalton et al., 2016)

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- **Implication 3:** Helping to internalize the feedback from effort, achievement, aspirations (e.g. via psychotherapy) will reduce the possibility of an aspirations failure.

García, Harker, Cuartas (2016)

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- One year later: the Conditional Cash Transfer program increased educational aspirations of both, parents and children.
- The effect was larger for the most vulnerable households.

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- Nine years after the law:
 - Increase in career aspirations of adolescent girls
 - better educational attainment
 - girls spent less time on household chores.

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- Six months later
 - Increase individuals aspirations.
 - change in future-oriented behavior (higher savings, use of credit, children's school enrollment and spending on children's schooling).
- Five years later:
 - Results on aspirations and schooling remained
 - Higher stock of assets and spend more on durables and crop inputs (e.g. fertilizers)

4. Ambiguity Attitudes and Poverty.

- Using weighting functions to understand poverty.

Are the poor worse at dealing with ambiguity? (Chen Li, 2017)

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“Thus they will remain poor, with processes of capital investment and innovation being confined to those people who are economically secure and in possession of sufficient defence against risk to be willing to invest and innovate” (Weeks, 1970).

- Stronger ambiguity aversion among the poor makes things worse for the poor.

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- **Are the poor worse at dealing with ambiguity?**
- Experiment in China (Wuhan and Wuding).
 - Two groups of Chinese adolescents (rural and urban).
 - rural adolescents are 10 times poorer than their urban counterparts
- Linguistic ambiguity is measured
 - Relevant decisions, such as whether to enter a business contract, are made without all linguistic ambiguities resolved.

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- Sentences in Dutch, Japanese, Korean, English, Shanghai Dialect of Chinese, and Beijing Dialect of Chinese.
- Sources of uncertainty: meaning of the phrases in each language.

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- Subjective probabilities elicited using “matching probabilities” (see lecture 3).

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- What is the meaning of the above sentence in Dutch?
 - a pay attention.
 - b upward.
 - c give up.
- State the probability p that makes you indifferent between $A = (E, 40 \text{ yuan}; E^c, 0)$ and $B = (p, 40 \text{ yuan}; 1 - p, 0)$.
 - E is the event that **Let op** means “pay attention” and E^c the event that it means “upward” or “give up”.

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- **Result 1:** rural adolescents exhibited more ambiguity aversion than their urban counterparts.

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- **Result 1:** rural adolescents exhibited more ambiguity aversion than their urban counterparts.
 - The poor are more pessimistic about the “bad” state of the world.

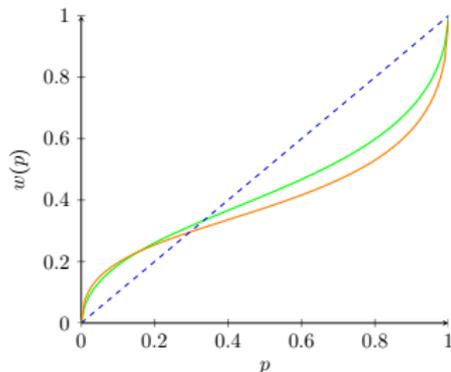


Figure: the poor (orange weighting function) are more pessimistic

Are the poor worse at dealing with ambiguity? (Chen Li, 2017)

- **Result 2:** rural adolescents exhibited higher diminishing sensitivity than their urban counterparts.

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- **Result 2:** rural adolescents exhibited higher diminishing sensitivity than their urban counterparts.
 - The poor are worse at quantifying probabilities (too much sensitivity given to extreme outcomes).

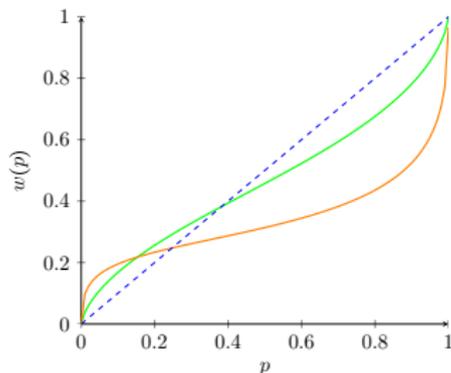


Figure: the poor (orange weighting function) have more sensitivity

Are the poor worse at dealing with ambiguity? (Chen Li, 2017)

- Suggests poverty can worsen ambiguity aversion and diminishing sensitivity \Rightarrow which in turn worsens poverty.
- **Policy recommendation** More information about new technologies and better education to improve probability quantifications.

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- Use US and Colombian data to corroborate these predictions.

The End!

Appendix Slides

- Proofs

Poverty and aspirations failure (Dalton et al., 2016)

- The behavioral individual sets effort if

$$(2\theta_0)^{1/2} - \left(\frac{2\theta_0 - g}{2\theta_0}\right)^2 - c - (\theta_0)^{1/2} + \left(\frac{\theta_0 - g}{\theta_0}\right)^2 \geq 0 \quad (1)$$

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- The net benefit of exerting effort is increasing in aspirations g .

Poverty and aspirations failure (Dalton et al., 2016)

- Proof that “the net benefit of exerting effort is increasing in aspirations g ”
- First, expand and simplify (1) to get:

$$(\sqrt{2} - 1)\theta_0^{\frac{1}{2}} - \frac{g}{\theta_0} + \frac{3g^2}{4\theta_0^2} - c = h - \frac{g}{\theta_0} + \frac{3g^2}{4\theta_0^2} \quad (2)$$

- The derivative of (2) wrt to g gives:

$$-\frac{1}{\theta_0} + \frac{3g}{2\theta_0^2}.$$

- Assuming that the above expression is positive implies $g > \frac{2}{3}\theta_0$.
- Note that $g \geq \theta_0$ which immediately $g > \frac{2}{3}\theta_0$.

back

Poverty and aspirations failure (Dalton et al., 2016)

- There is an aspiration level $\tilde{g}(\theta_0)$ such that the individual is indifferent between setting effort or not.
 - Using (2) obtain

$$-\frac{g}{\theta_0} + \frac{3g^2}{4\theta_0^2} + h = 0. \quad (3)$$

- The solution to (3) is given by

$$\tilde{g}(\theta_0) = \frac{2}{3} \left(\theta_0 - \sqrt{\theta_0^2 - 3\theta_0^2 h} \right),$$

and

$$\tilde{g}(\theta_0) = \frac{2}{3} \left(\theta_0 + \sqrt{\theta_0^2 - 3\theta_0^2 h} \right)$$

where, as before, $h = \sqrt{\theta_0}(\sqrt{2} - 1) - c$.

back

Poverty and aspirations failure (Dalton et al., 2016)

- To prove that “ $\tilde{g}(\theta_0)$ decreases in initial wealth θ_0 ”, rearrange (3) as follows:

$$h = \frac{\tilde{g}(\theta_0)}{\theta_0} - \frac{3}{4} \frac{\tilde{g}^2(\theta_0)}{\theta_0^2} \quad (4)$$

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- We already established that $\frac{dh}{d\theta_0} > 0$ so the left-hand side of (4) increases with changes of wealth.

Poverty and aspirations failure (Dalton et al., 2016)

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$$h = \frac{\tilde{g}(\theta_0)}{\theta_0} - \frac{3}{4} \frac{\tilde{g}^2(\theta_0)}{\theta_0^2} \quad (4)$$

- We already established that $\frac{dh}{d\theta_0} > 0$ so the left-hand side of (4) increases with changes of wealth.
- To maintain the equality, the right-hand of (4) should also increase with θ_0 .

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- We already established that $\frac{dh}{d\theta_0} > 0$ so the left-hand side of (4) increases with changes of wealth.
- To maintain the equality, the right-hand of (4) should also increase with θ_0 .
- The implicit derivative of the right-hand side with respect to θ_0 is

$$\frac{\frac{d\tilde{g}(\theta_0)}{d\theta_0}}{\theta_0} - \frac{\tilde{g}(\theta_0)}{\theta_0^2} - \frac{3}{2} \frac{\tilde{g}(\theta_0) \frac{d\tilde{g}(\theta_0)}{d\theta_0}}{\theta_0^2} + \frac{3}{2} \frac{\tilde{g}^2(\theta_0)}{\theta_0^3} \quad (5)$$

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- rearranging (5), we get

$$\frac{1}{\theta_0} \left(\frac{d\tilde{g}(\theta_0)}{d\theta_0} - \frac{\tilde{g}(\theta_0)}{\theta_0} \right) \left(1 - \frac{3}{2} \frac{\tilde{g}(\theta_0)}{\theta_0} \right)$$

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- Since $\frac{2\theta_0}{3} < \tilde{g}(\theta_0)$, a sufficient condition for the right-hand side to increase in θ_0 is $\frac{d\tilde{g}(\theta_0)}{d\theta_0} < 0$. [back](#)