

Poverty traps and the identification problem

Econ 1910 – Poverty and distribution in developing countries

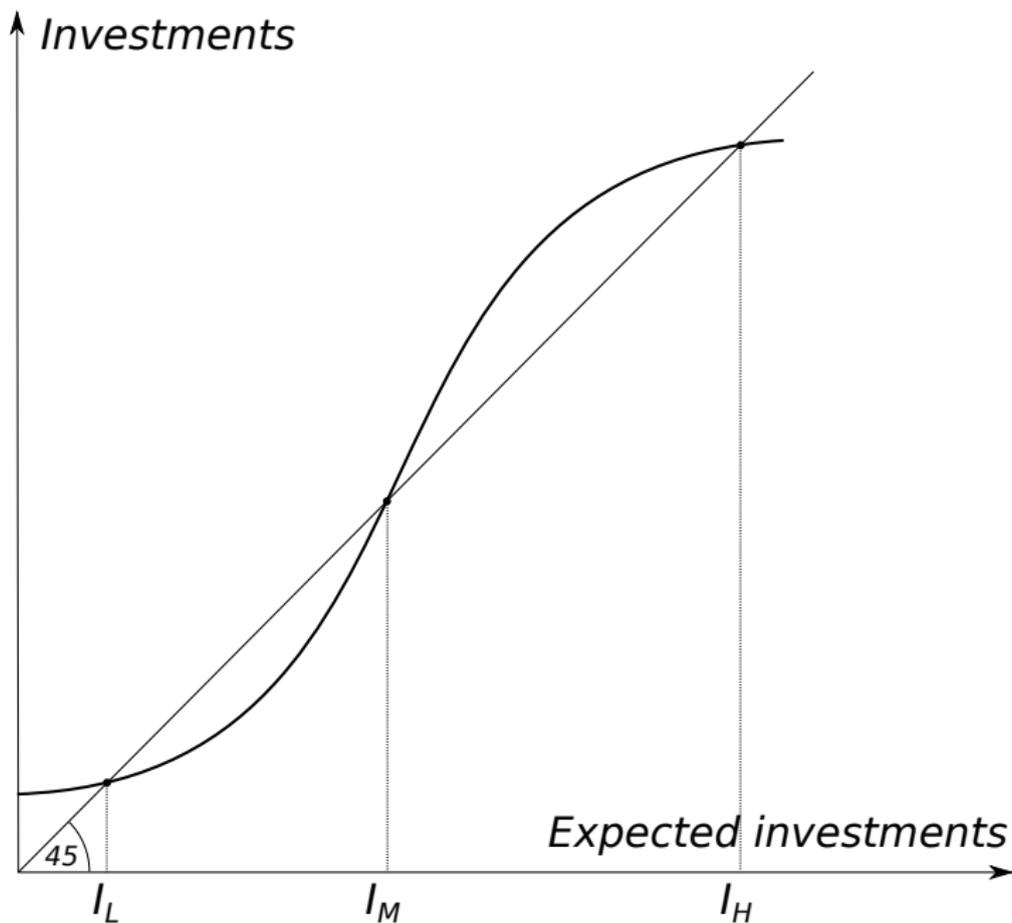
Tarjei Havnes

Recap: Externalities – Uncoordinated investments

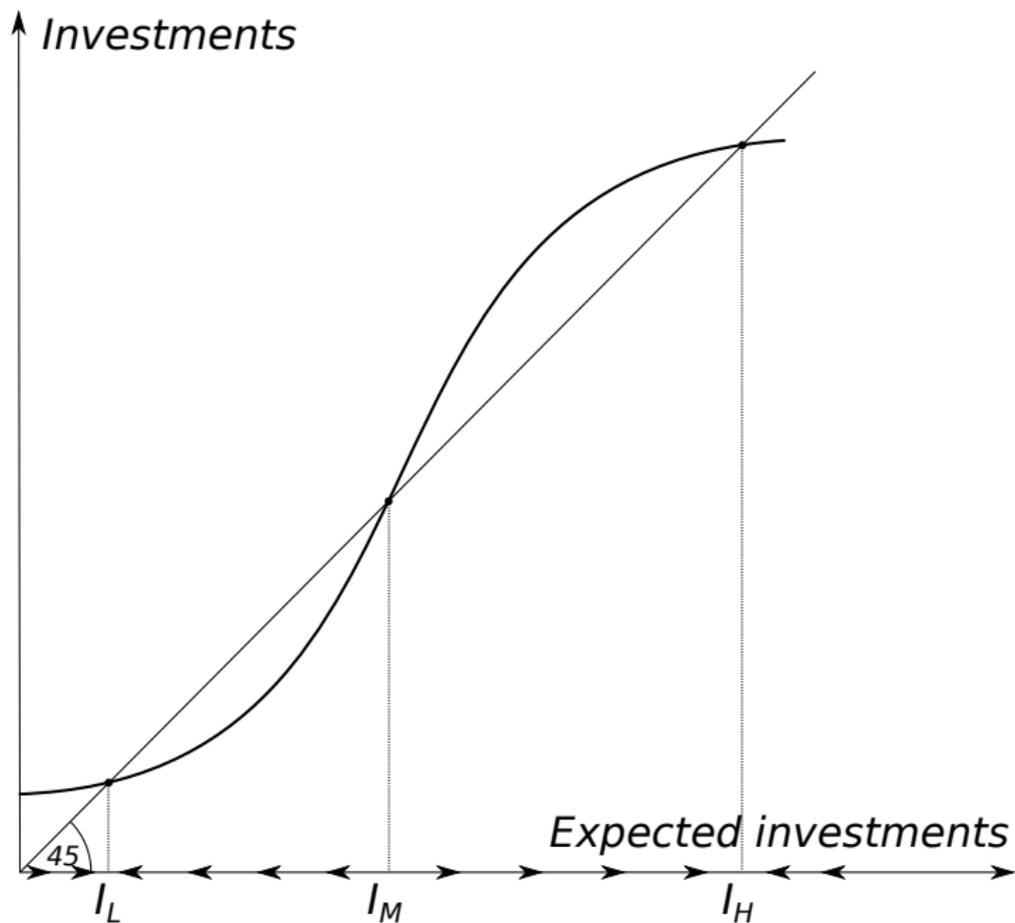
Last time, we talked about growth

- ▶ We ended our discussion by allowing for positive externalities
- ▶ This could trap a country permanently in a state of low growth

Recap: Externalities – Uncoordinated investments



Recap: Externalities – Uncoordinated investments



Plan for today

Today, we will discuss

- ▶ several alternative formulations of such a *poverty trap*
- ▶ how to do empirical evaluations
 - ▶ and how not to...
- ▶ the case of whether staples are Giffen goods
 - ▶ application to China

Putting a face on poverty: Pak Solhin

Banerjee and Duflo met Pak Solhin in a small village in Indonesia, in the summer of 2008

- ▶ All alone at home
- ▶ The older child, a 13 year old, worked as a construction worker in the nearby city
- ▶ His wife was also in the city, as a live-in maid
- ▶ The other two children were staying with their grand-parents
- ▶ His house did not have a single item of furniture, no water, no electricity

Putting a face on poverty: Pak Solhin

Until that summer, Pak Solhin was a farm laborer

- ▶ Owns no land (with 13 siblings, his parents cut the land in many small pieces to build homes).
- ▶ An increase in fertilizer and oil prices, made farmers stop hiring, rather working the farm themselves.

Why did they not cut wages instead?

- ▶ Pak Solhin could not accept a lower wage, because of food prices
 - ▶ at a lower wage, he would not have enough strength to work
- ▶ He cannot work in construction
 - ▶ too weak for basic jobs, too unskilled for better jobs, and too old to be an apprentice.

Putting a face on poverty: Pak Solhin

- ▶ No money for food, so his wife and older kid went to the city.
 - ▶ Still, he cannot pay for food for the younger ones and himself.
 - ▶ Nobody can lend him money; but grandparent took two children.
 - ▶ Older child dropped out of school to work in construction.
- ▶ He eats about once a day, when he gets subsidized rice, or he catches a fish on the bank of the river
 - ▶ He can't swim, so he can't properly fish.
- ▶ He is very depressed, and negative about the future.

Putting a face on poverty: Pak Solhin

1. What are the striking/puzzling aspects of this story?
2. What is unique in the case of Pak Solhin?
3. What do you think is representative of the lives of many of the poor?

A nutrition-based poverty trap: The capacity curve

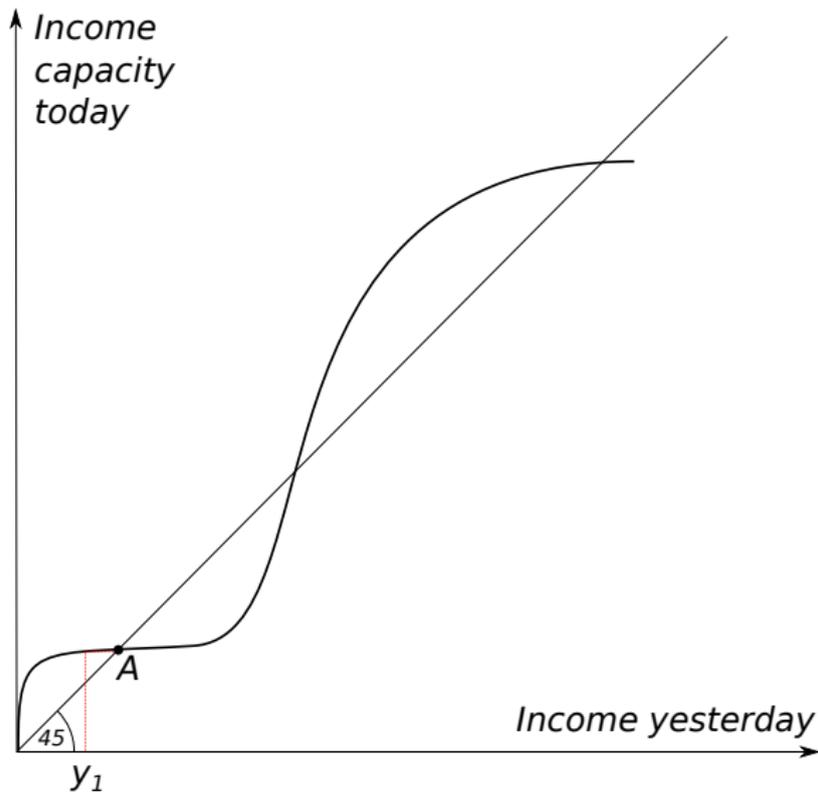
An important feature that Pak Solhin describes is that lack of food impedes his productivity.

- ▶ The first few calories are used by your body just to survive: they don't make you strong
- ▶ When you start eating enough to survive, the next calories start giving you strength
- ▶ Someone who is very poor like Pak Solhin may not have enough to eat to be very productive
 - ▶ but could he eat more, he would.

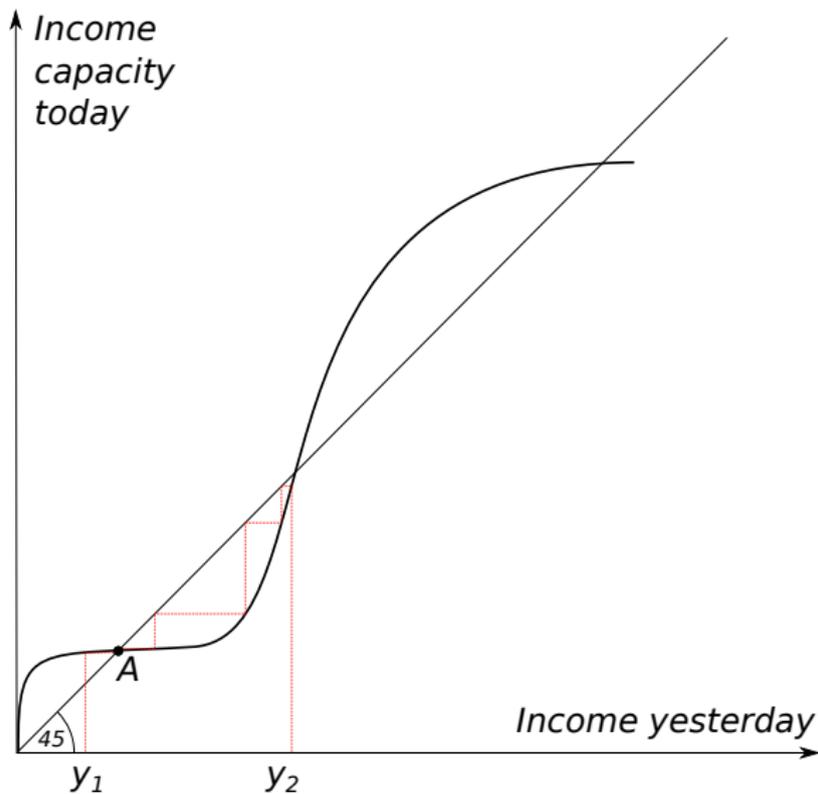
A nutrition-based poverty trap: The capacity curve



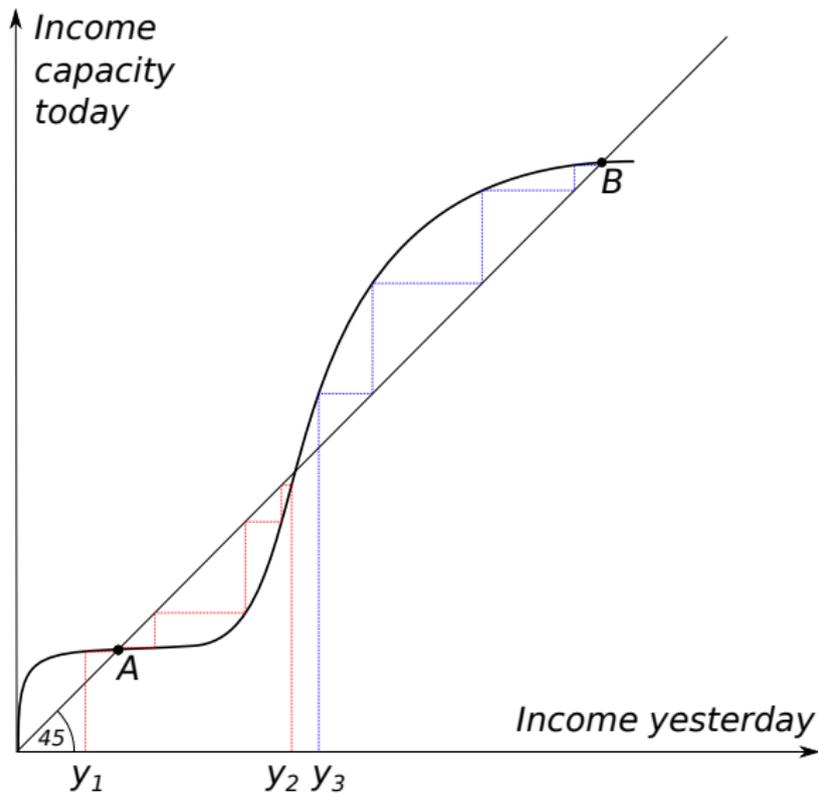
A nutrition-based poverty trap: The capacity curve



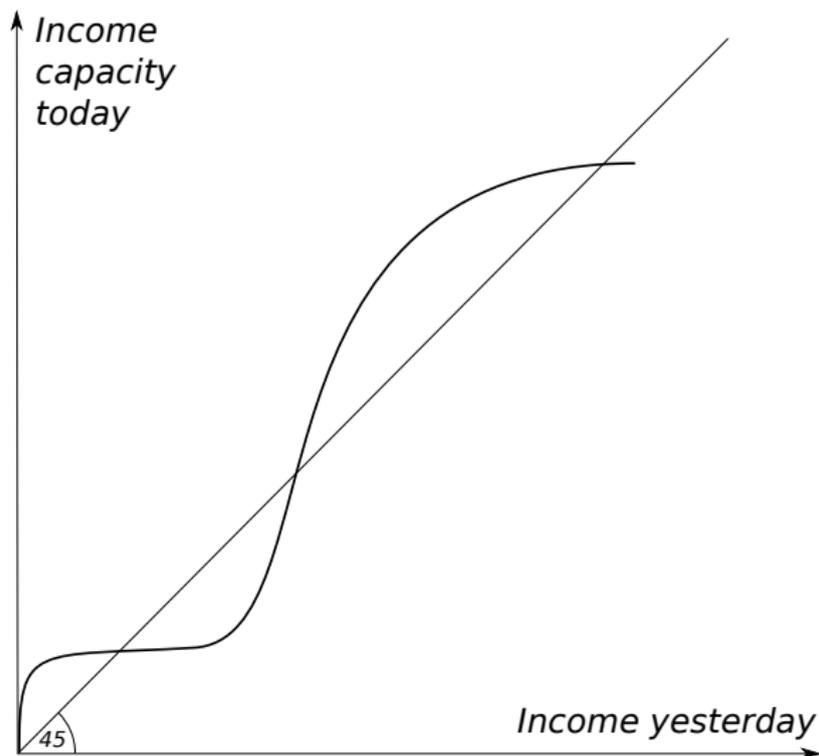
A nutrition-based poverty trap: The capacity curve



A nutrition-based poverty trap: The capacity curve



When is there no poverty trap?



When is there no poverty trap? – No increasing returns



When is there no poverty trap? – No “bad” equilibrium



When is there no poverty trap? – No “good” equilibrium



The requirements of a poverty trap

Comparing curves, in the case of a poverty trap:

- ▶ the S-Shaped curve intersects the 45 degree line from below:
 - ▶ For the poor, income grows slowly
 - ▶ so slowly that *income tomorrow is below income today*
 - ▶ the poor become poorer (over a region)
 - ▶ For the less poor, income grows less slowly:
 - ▶ *income tomorrow is above income today*
 - ▶ the middle class become rich
 - ▶ the rich stay rich

The requirements of a poverty trap

Remember the Sachs/Jolie-video from the first class

- ▶ Did they talk about any poverty traps?
- ▶ Do you think that they are poverty traps?
- ▶ Can you think of other examples of poverty traps?

The policy implications of a poverty trap

It is important to know whether there is a poverty trap or not

- ▶ If so, then we may simply need a “big push”
 - ▶ Health (e.g. free bednets)
 - ▶ Agriculture (e.g. free fertilizer one season)
- ▶ If not, then helping the poor may be just redistribution
 - ▶ with no efficiency gains
 - ▶ with potentially negative side effects

Is there a nutrition-based poverty trap?



S-shape made by two relations:

1. The relationship between wage and nutrition
 - ▶ how much more do you eat if your income improves?
2. The relationship between nutrition and productivity
 - ▶ how much stronger do you get if you eat a bit more?
 - ▶ how much more can you then produce?

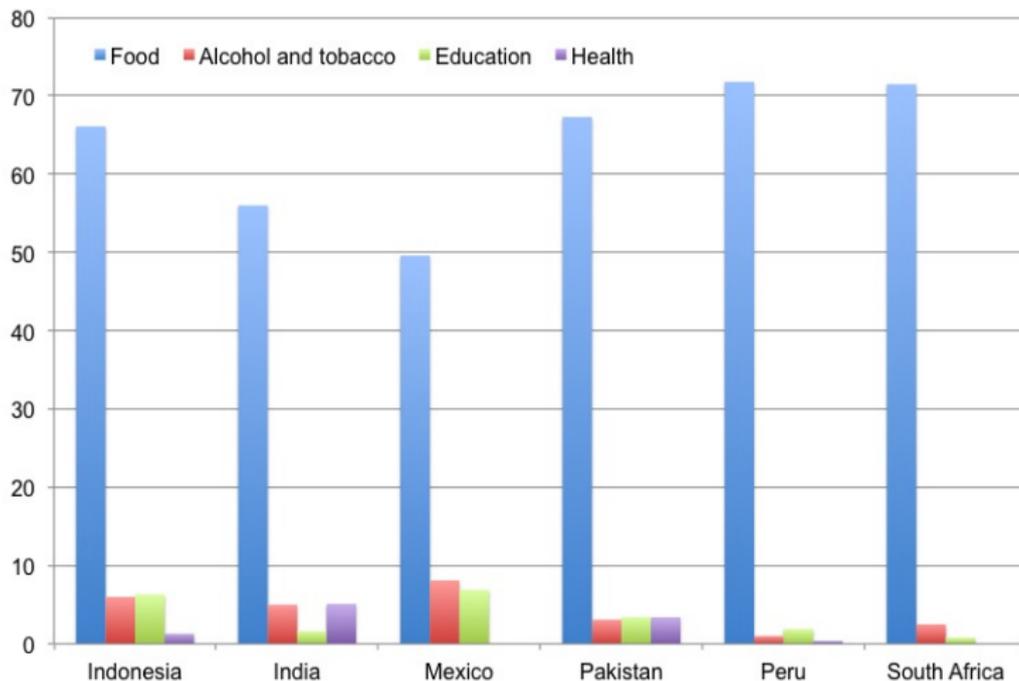
Is there a nutrition-based poverty trap?

If the curve is S-shaped, the poor should eat as much as they can:

- ▶ The share of food in their budget would be very high
- ▶ Some unavoidable expenses \Rightarrow food expenditure increases more than proportionally, then less than proportionally
 - ▶ E.g.:

Budget	Rent and clothes	Food	Movies
20 rps	5 rps	15 rps	–
30 rps	5 rps	25 rps	–
50 rps	10 rps	30 rps	10 rps

Budget share of food among the rural poor



Source: Banerjee and Duflo (2007)

Is there a nutrition-based poverty trap?

While the share of food in the budget is fairly high, the poor have two margins to increase their consumption

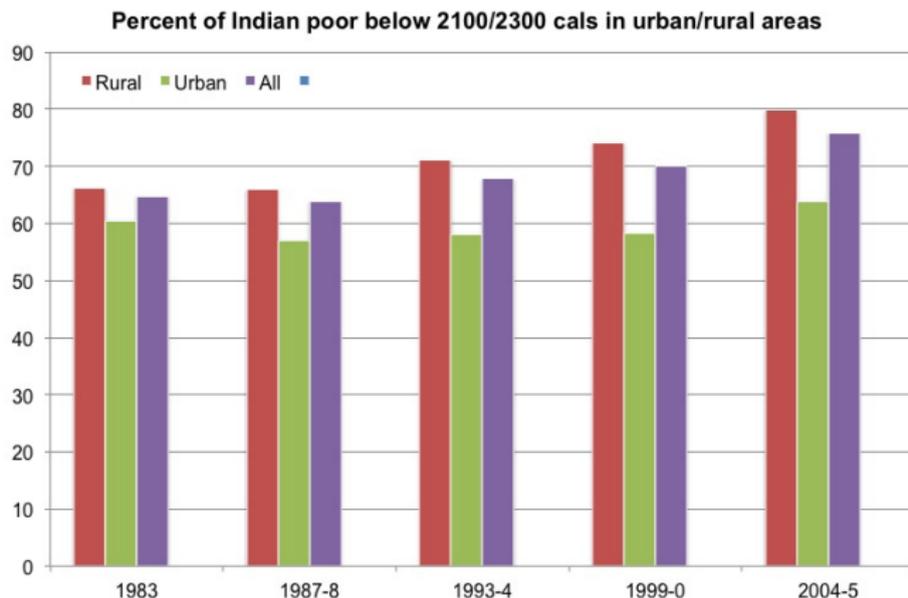
- ▶ spend more on food
 - ▶ e.g. less alcohol, tobacco, etc.
- ▶ spend their food budget differently
 - ▶ more calories per dollar, e.g. less meat, more beans

So are calories increasing very rapidly with income for the very poor?

Calorie consumption over time

Over the last 25 years, Indian GDP has tripled.

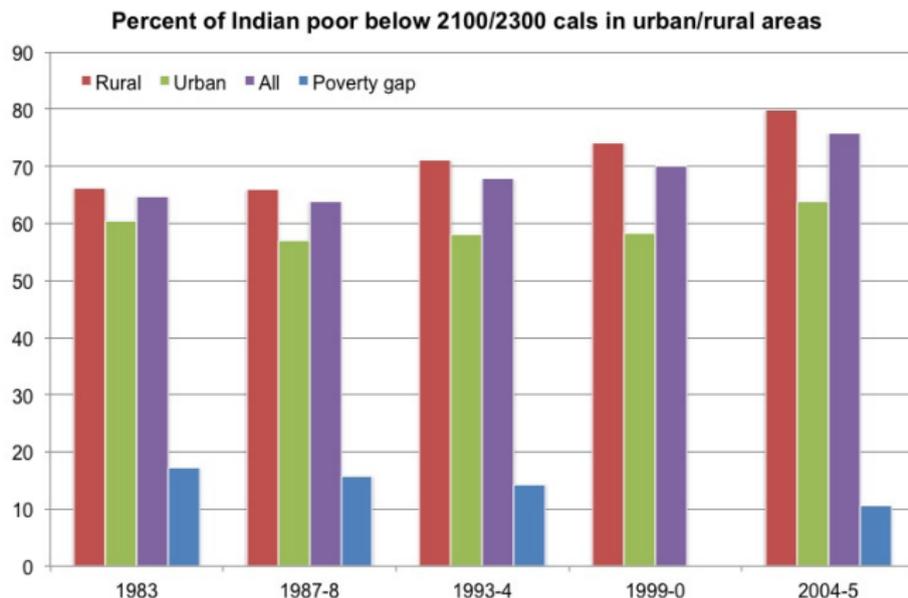
- ▶ Yet, the consumption of calories (and other nutrients) has fallen.



Calorie consumption over time

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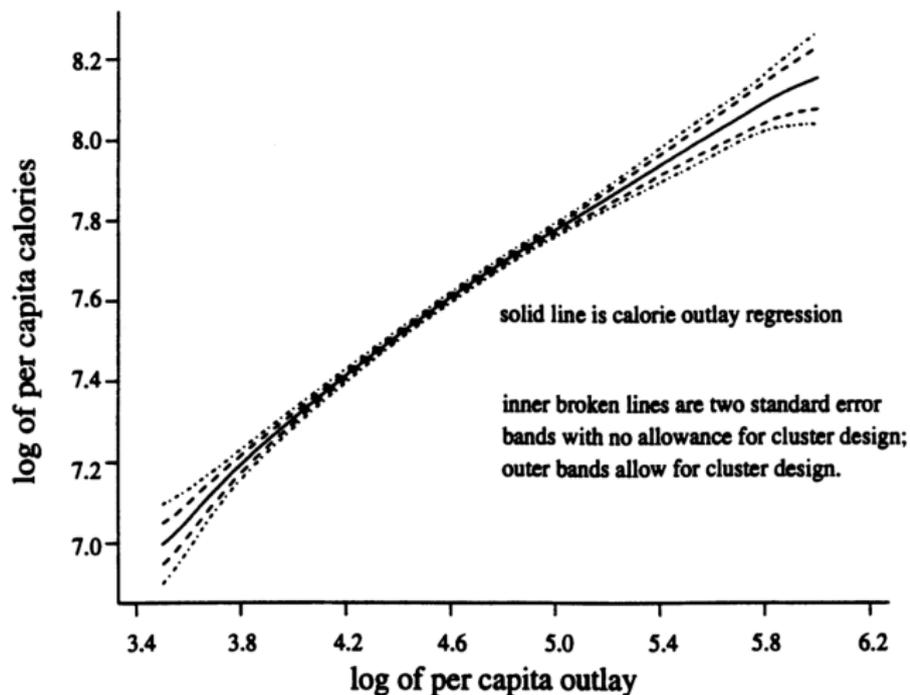
- ▶ Yet, the consumption of calories (and other nutrients) has fallen.



Source: BD and World Bank

Calorie consumption and income

Maharashtra, India



Source: Deaton and Subramanian (1996)

Calorie consumption and income

Maharashtra, India

The slope of this curve is about $\beta = 0.35$.

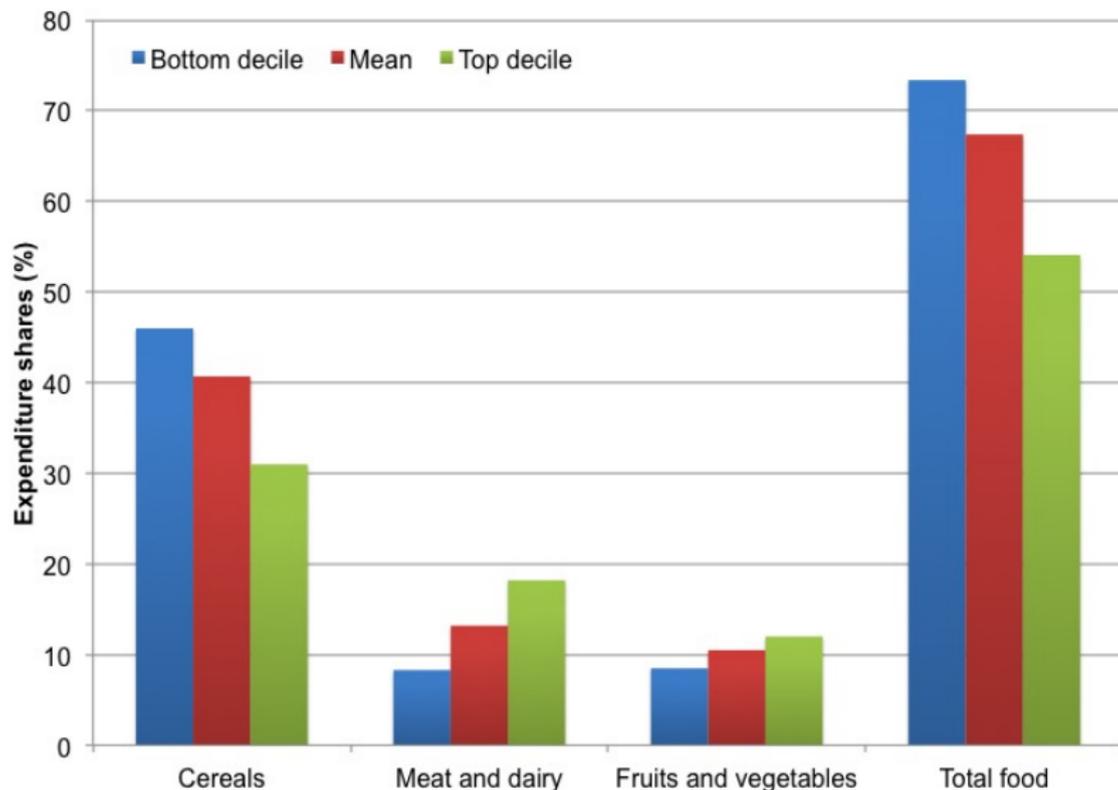
$$\ln(\text{calories}) = \alpha + \beta \ln(\text{income}) + \epsilon$$

- ▶ How do you interpret this? 
- ▶ 1 % increase in total expenditure per capita
⇒ 0.35 % increase in calorie consumption
- ▶ $\beta = \textit{elasticity}$ of calories wrt income
- ▶ This is a version of the *Engel Curve*

Why does it not increase one-to-one?

Calorie consumption and income

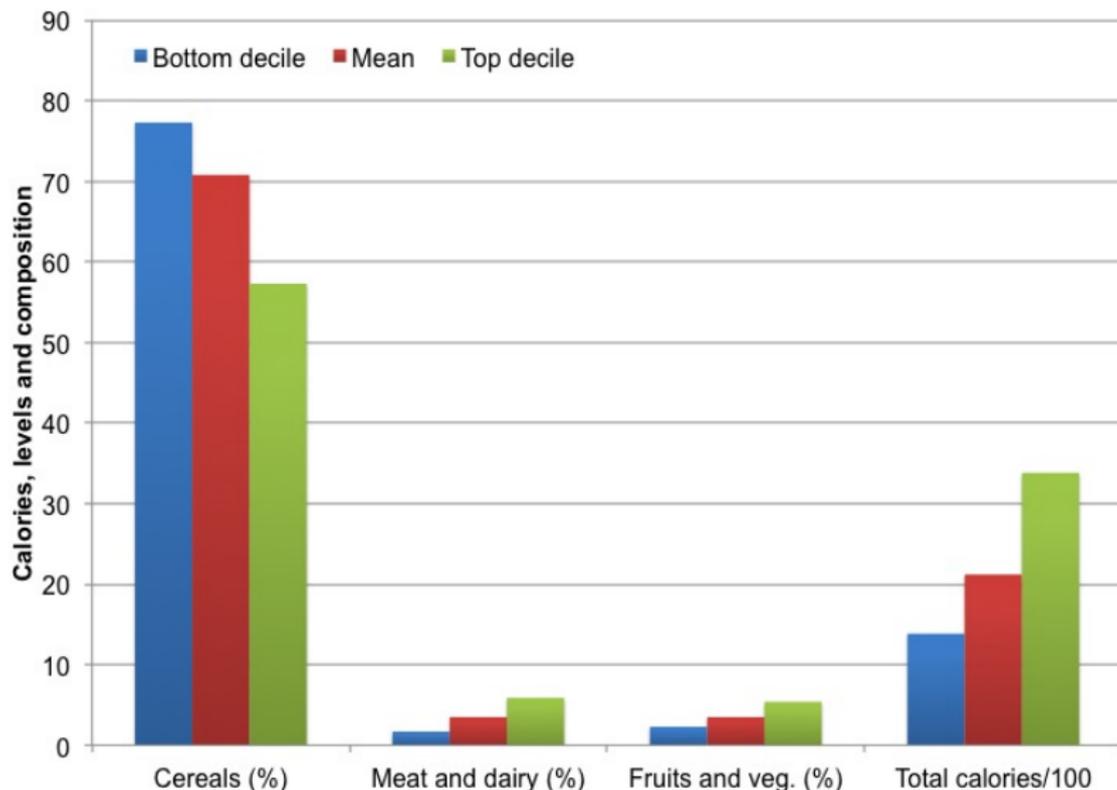
Maharashtra, India



Source: Deaton and Subramanian (1996)

Calorie consumption and income

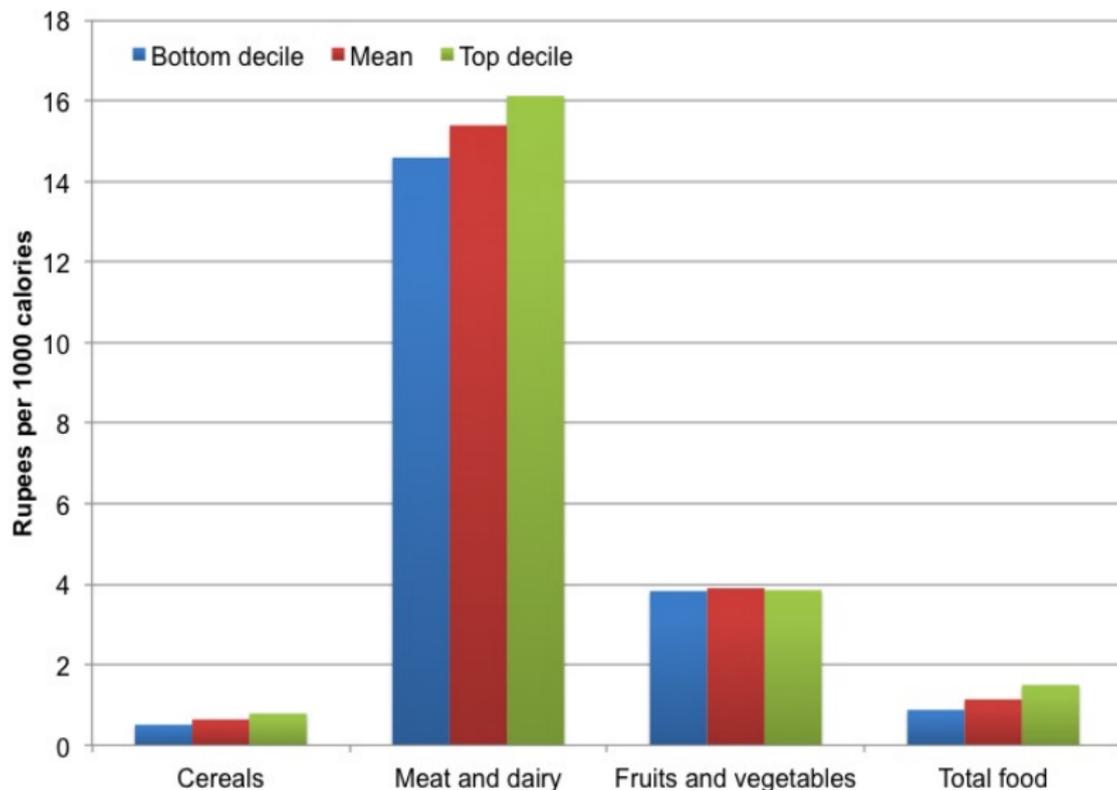
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Source: Deaton and Subramanian (1996)

Calorie consumption and income

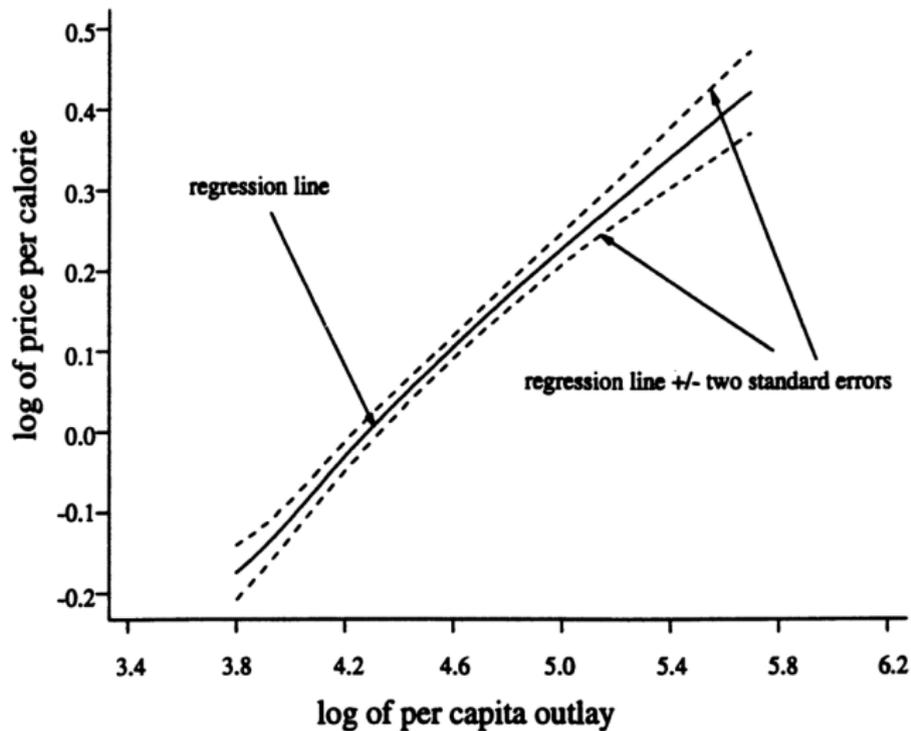
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Source: Deaton and Subramanian (1996)

Calorie consumption and income

Maharashtra, India



Source: Deaton and Subramanian (1996)

Calorie consumption and income

Maharashtra, India

In summary:

- ▶ 10% increase in income \Rightarrow 7 % increase in food expenditure
 - ▶ half to get more calories,
 - ▶ half to get more expensive calories.

Calorie consumption, price subsidies and Giffen goods

Staple foods may even potentially be *Giffen goods*

- ▶ when price goes up, consumption goes up!
- ▶ higher price of staples imply lower real income
 - ▶ luxury consumption goes down
 - ▶ staple consumption goes up
 - ▶ ie. *income effect* dominates *substitution effect*
- ▶ so subsidizing a staple may have little or even negative impact on calorie consumption

Giffen goods and the identification problem

How might we reveal whether a food item is a Giffen good?

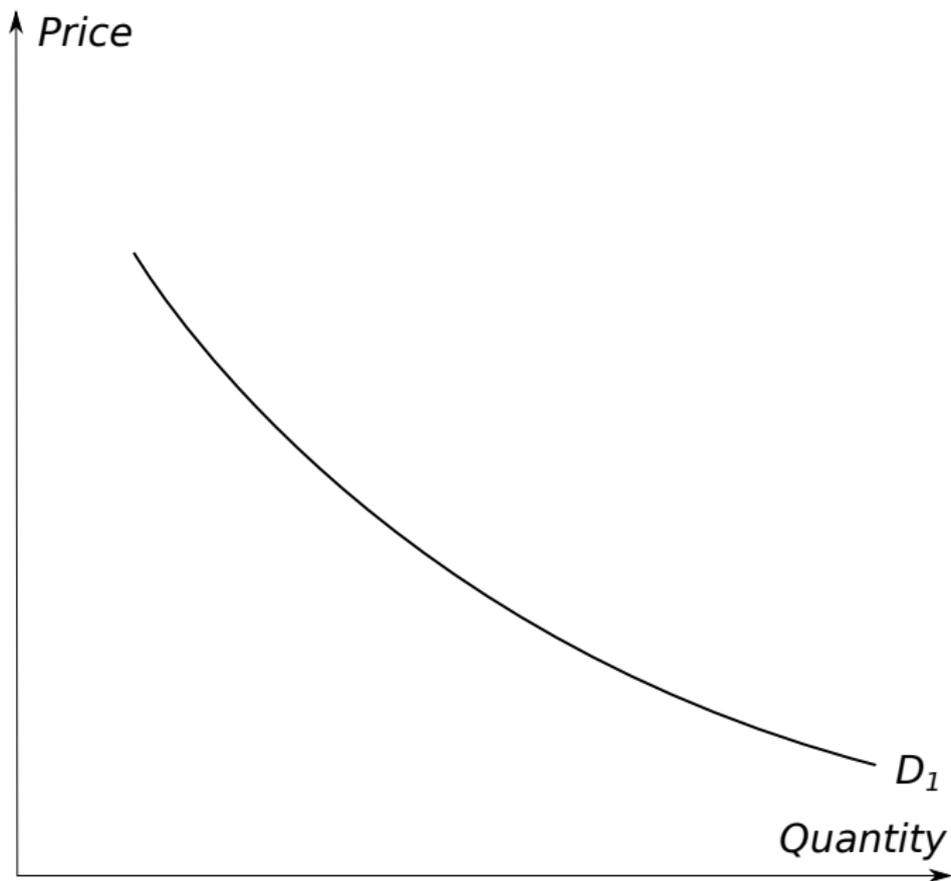
1. Compare different cities or regions

- ▶ In China, where the price of rice is high, the consumption is high
- ▶ Why do you think this evidence might be false?
 - ▶ High demand drives the price
 - ▶ High-price regions may be different

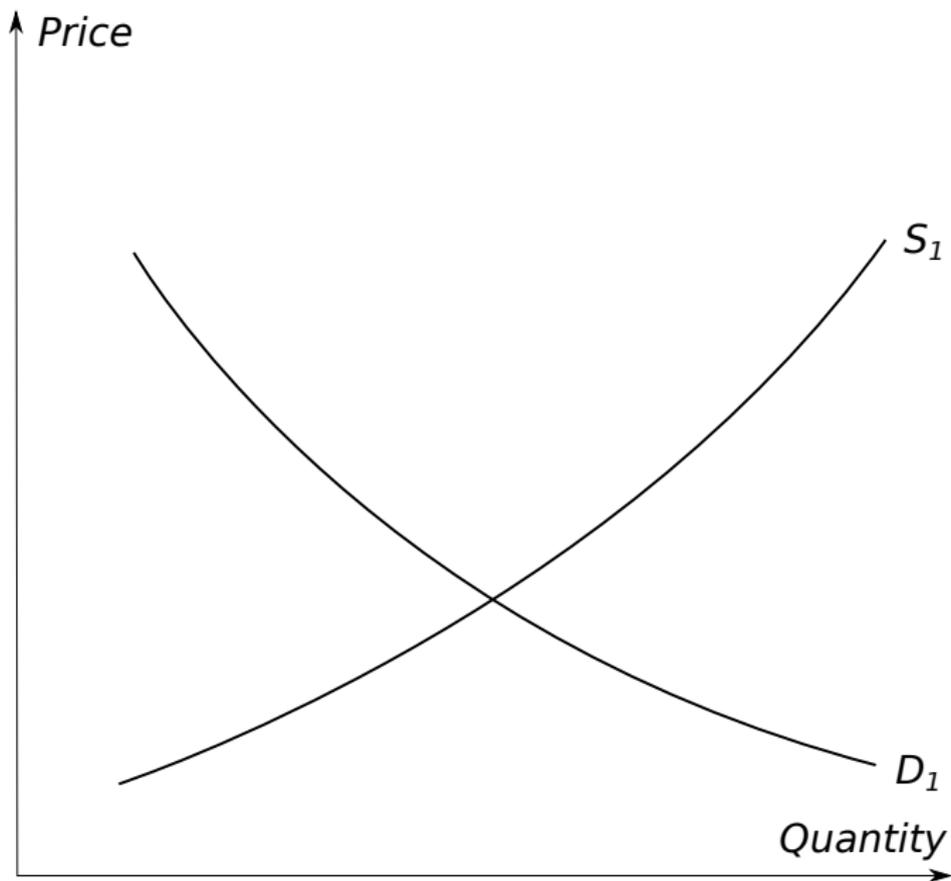
This is an example of the fundamental *identification problem* in empirical studies

- ▶ correlation \neq causation

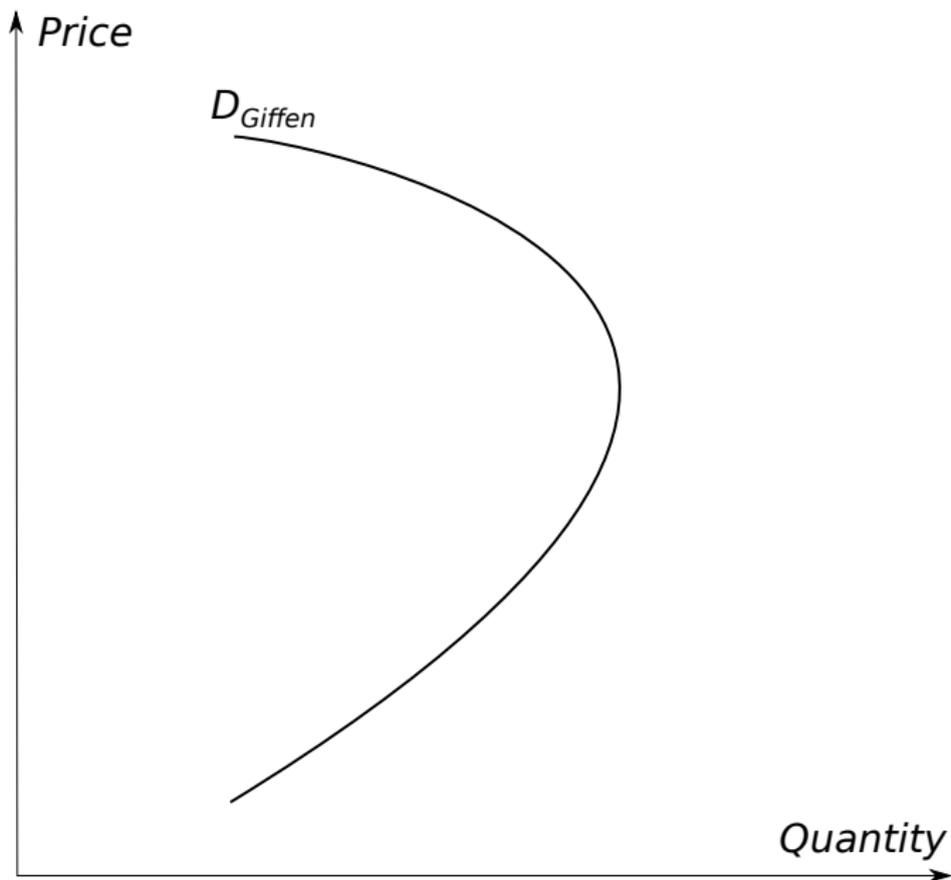
Giffen goods and the identification problem



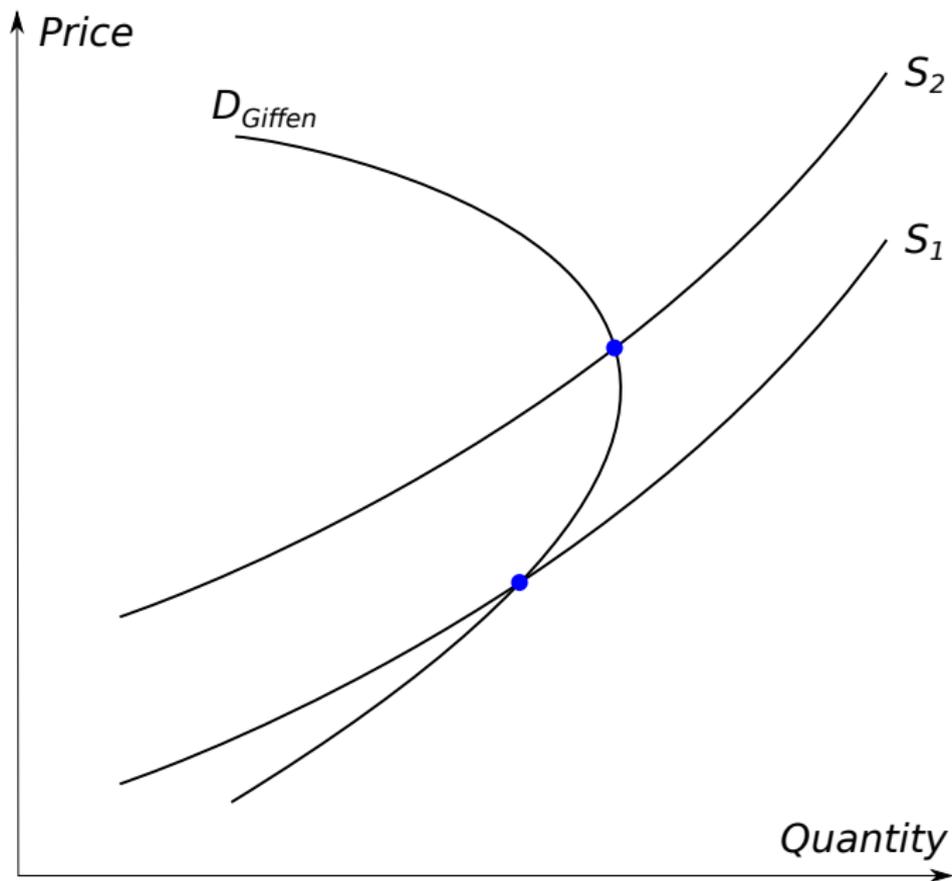
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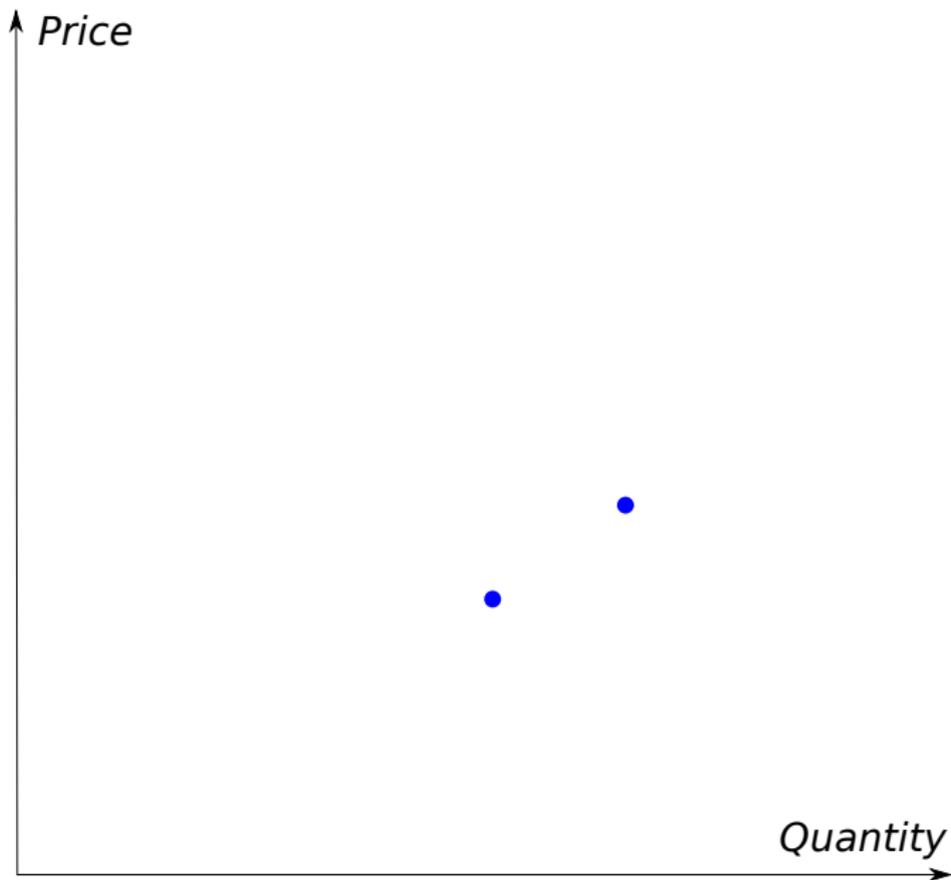
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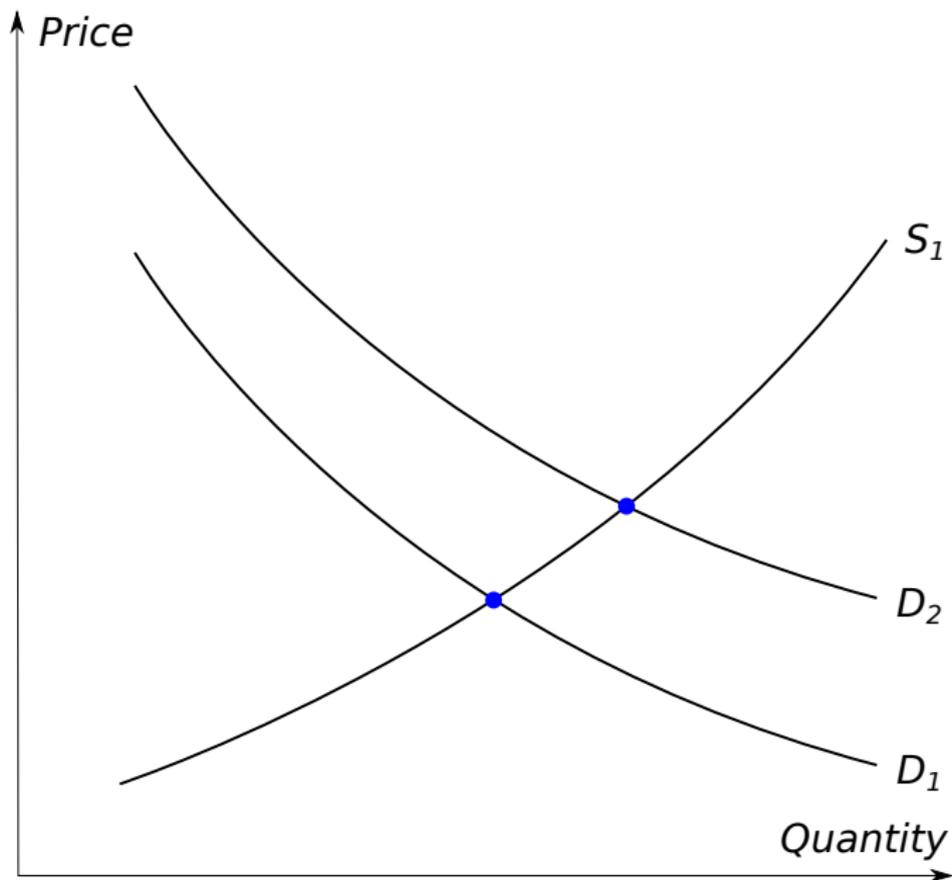
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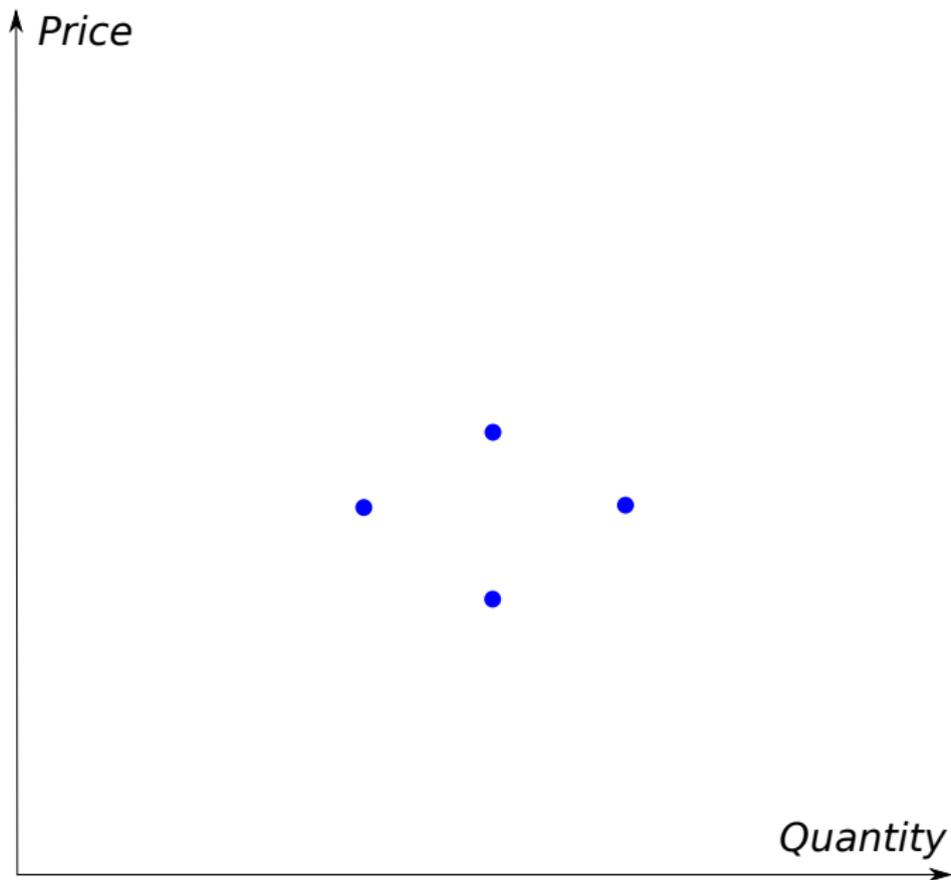
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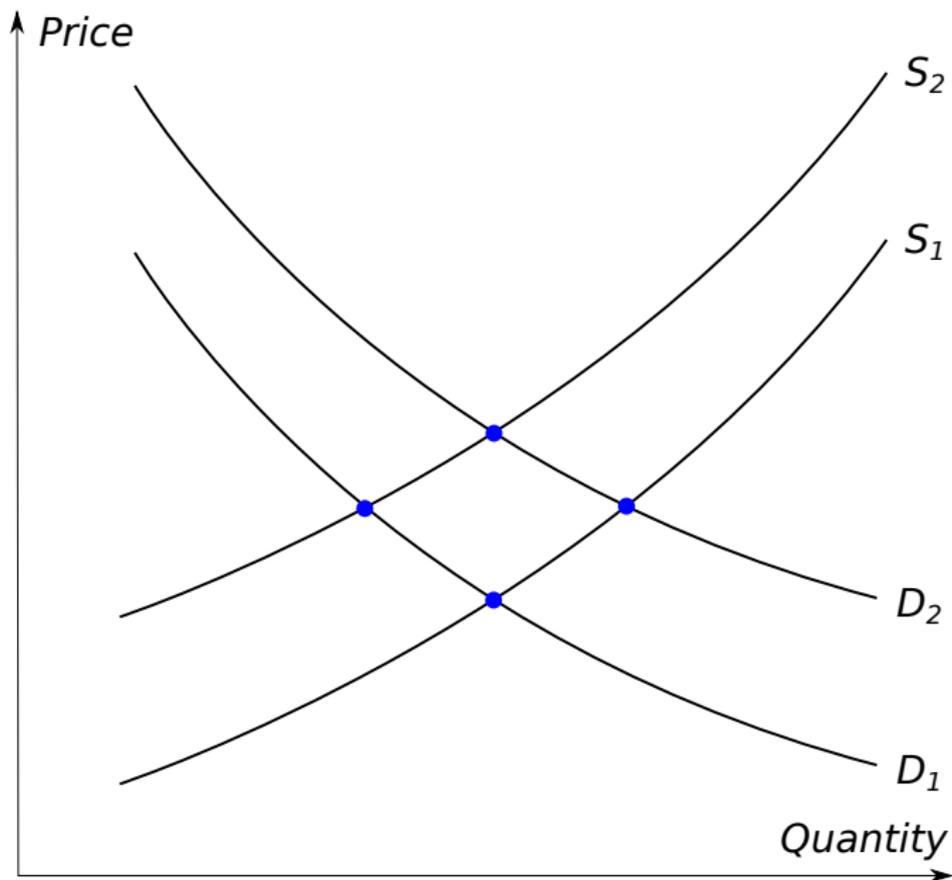
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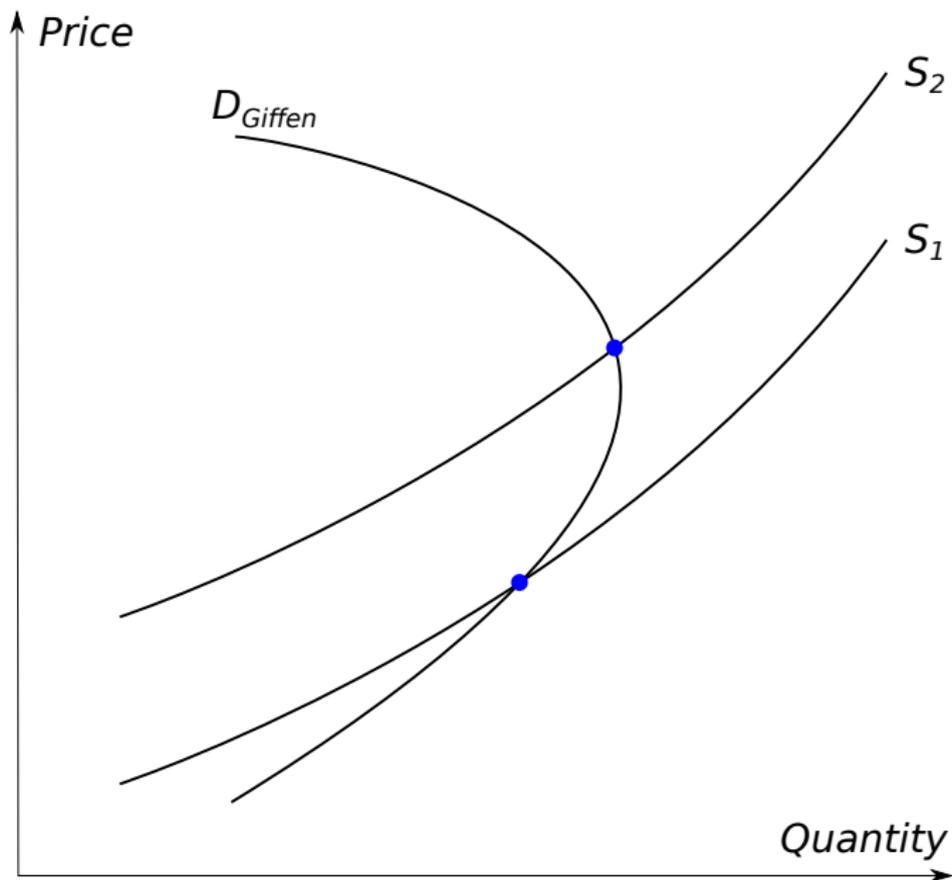
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Giffen goods and the identification problem

How might we reveal whether a food item is a Giffen good?

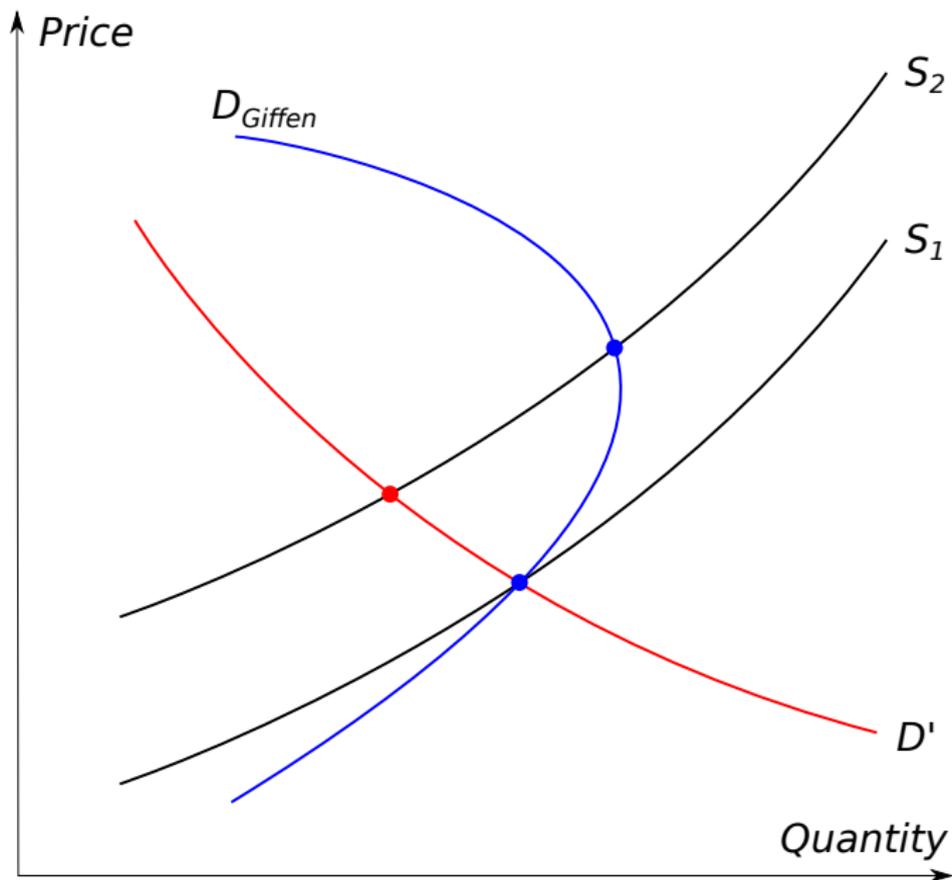
1. Compare different cities or regions
2. Exploit an *exogenous* shift in the supply curve
 - ▶ Do a randomized experiment, giving lower prices to some households
 - ▶ Find a plausibly exogenous shift in the supply curve, using e.g. policy changes, or swings in local production conditions
 - ▶ an important subset of these are often called *natural experiments* or *quasi-experiments*

Are staples Giffen goods in China?

Jensen and Miller (2008) start with a sample of households in two provinces in China

- ▶ distribute vouchers to a random subset for reduced price of
 - ▶ rice in Hunan
 - ▶ wheat in Gansu
- ▶ households should not exchange or trade them
 - ▶ a pure income transfer would imply no substitution
- ▶ after a period, check consumption of rice, wheat, and other items
 - ▶ 6 months in the study

Are staples Giffen goods in China?



Are staples Giffen goods in China?

	(1)	(2)
% Δ Price(rice)	0.224 (0.149)	0.235* (0.140)
% Δ Earned		0.043*** (0.014)
% Δ Unearned		-0.044* (0.025)
% Δ People		0.89*** (0.08)
Constant		4.1*** (1.0)
Observations	1,258	1,258
R^2	0.08	0.19

(a) Hunan

	(1)
% Δ Price(wheat)	-0.353 (0.258)
% Δ Earned	0.079** (0.036)
% Δ Unearned	-0.017 (0.092)
% Δ People	0.58*** (0.22)
Constant	-26.1*** (2.3)
Observations	1269
R^2	0.08

(b) Gansu

Source: Jensen and Miller (2008)

Are staples Giffen goods in China?

Hunan :

- ▶ 10 % decrease in price of rice
⇒ 2.5 % decrease in rice consumption
⇒ elasticity = -0.25 .
- ▶ Elasticity is negative ⇒ Giffen good!

Guansu :

- ▶ 10 % decrease in price of wheat
⇒ 3.5 % increase in wheat consumption
⇒ elasticity = 0.35 .
- ▶ Elasticity is positive ⇒ Not a Giffen good!

Is there a nutrition-based poverty trap?

The evidence seems to suggest not, that is, in the classical sense of a capacity curve. But how about

- ▶ nutrition in childhood?
- ▶ nutrition in utero?
- ▶ micronutrients (iodine, iron)?

A poverty trap in childhood nutrition?

Baird et al. 2012

Worms effectively reduce your calorie intake

- ▶ conditional on how many you eat.

75 of 89 primary schools in rural western Kenya, random assignment to deworming drugs and health education

1. in 1998–2003
 2. in 1999–2003
 3. in 2001–2003
- ▶ Compare children in primary school during the deworming period
 - ▶ group 1 and 2 = treatment
 - ▶ group 3 = control
 - ▶ measured in 2007–2009

A poverty trap in childhood nutrition?

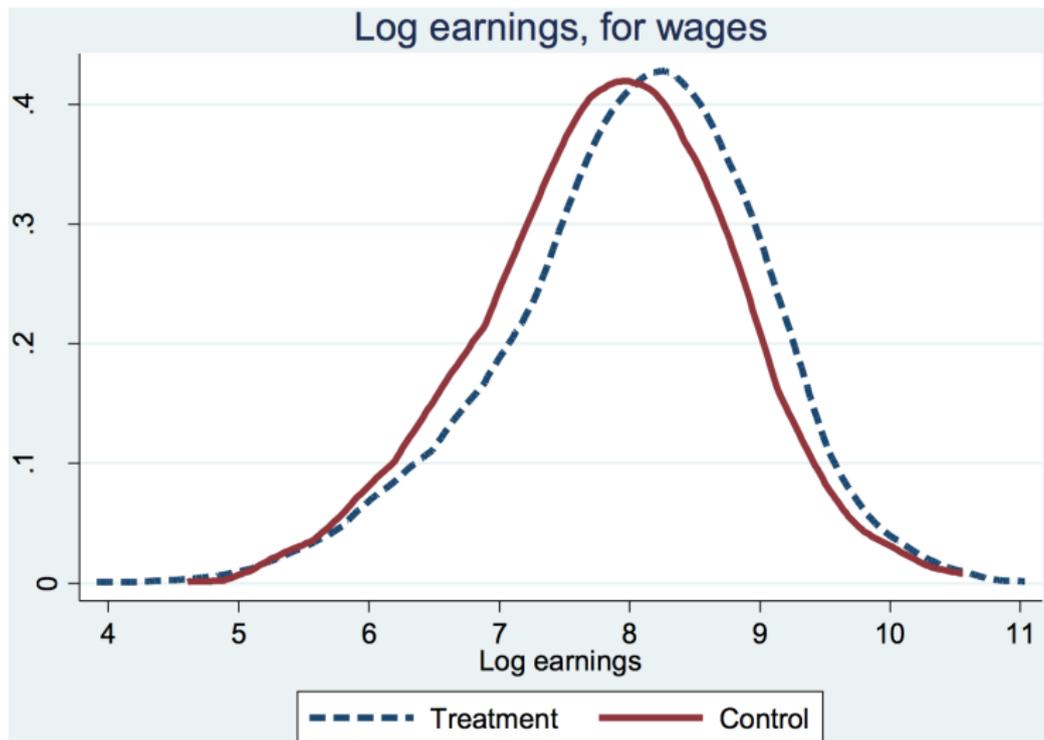
Baird et al. 2012

Effects are very large

- ▶ 20% increase in wage, 30% increase in labor earnings
- ▶ at a cost of \$0.65 per head...

A poverty trap in childhood nutrition?

Baird et al. 2012



Conclusion

We have seen that poverty traps can come in different forms

- ▶ nutrition, education, investment, health
- ▶ requirement:
 - ▶ increasing returns over some region
 - ▶ crossing from below

The poor do not seem to be maxing out on calorie expenditure

- ▶ non-food spending is not trivial
- ▶ food spending is not optimal for calories
- ▶ calorie consumption is not always increasing in income
- ▶ So is there a poverty trap in nutrition?

Conclusion

We then considered whether staples are Giffen goods

- ▶ i.e. price $\uparrow \Rightarrow$ consumption \uparrow

This introduced the question of empirical identification

- ▶ separating correlation from causality
- ▶ requires finding plausibly exogenous variation
 - ▶ randomized experiments
 - ▶ natural experiments

We concluded that

1. rice seemed to be a Giffen good in Hunan, but that
2. wheat did not seem to be a Giffen good in Gansu

References and supplementary reading

- ▶ *The Economist*, Feb 18th 2012: “The nutrition puzzle” – <http://www.economist.com/node/21547771>
- ▶ *The Economist*, May 12th 2012: “Hope springs a trap” – <http://www.economist.com/node/21554506>
- ▶ Baird, Sarah, Joan Hamory Hicks, and Edward Miguel. 2012. “Worms at Work: Long-run Impacts of Child Health Gains.” *Mimeo*.
- ▶ Banerjee, Abhijit V., and Esther Duflo. 2007. “The Economic Lives of the Poor.” *Journal of Economic Perspectives*, 21(1): 141–168. (Appendix is at the end here.)
- ▶ Jensen, Robert T., and Nolan H. Miller. 2008. “Giffen Behavior and Subsistence Consumption.” *American Economic Review*, 98(4): 1553–77.
- ▶ Subramanian, Shankar and Angus Deaton, 1996: “The Demand for Food and Calories.” *Journal of Political Economy*, 104(1): 133–162.

Interpreting β

$$\begin{aligned} \ln(\text{calories}) &= \alpha + \beta \ln(\text{income}) + \epsilon \\ \beta &= \frac{\partial \ln(\text{calories})}{\partial \ln(\text{income})} \\ \frac{\beta}{\text{income}} &= \frac{\partial \ln(\text{calories})}{\partial \text{income}} \\ \frac{\beta}{\text{income}} &= \frac{1}{\text{calories}} \cdot \frac{\partial \text{calories}}{\partial \text{income}} \\ \iff \beta &= \frac{\partial \text{calories}}{\partial \text{income}} / \frac{\text{calories}}{\text{income}} \\ &\equiv El_{\text{income}}(\text{calories}) \end{aligned}$$