

14.03 Microeconomic Theory & Public Policy Fall 2022

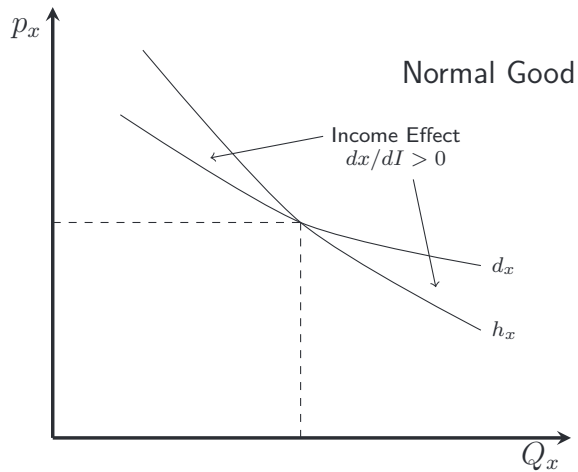
Lecture 8. Giffen Goods and Subsistence Consumption

David Autor (Prof), MIT Economics and NBER

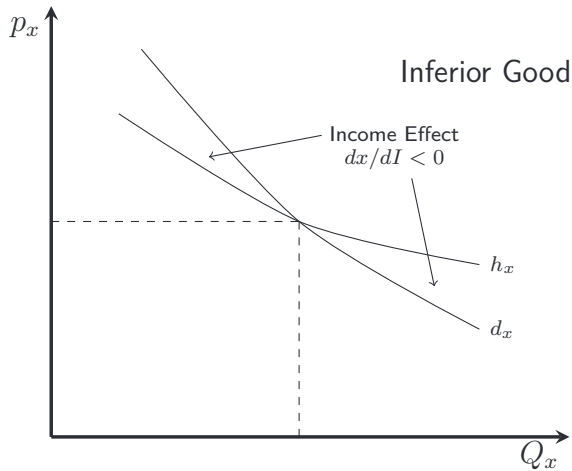
Jonathan Cohen (TA), MIT Economics

The Missing Link between Compensated and Uncompensated Demand

Case of a normal good



Case of an inferior good



Reminder: Shephard's Lemma

- Recall the expenditure function

$$E_0 = E(p_x, p_y, U_0) = p_x \cdot h_x^*(p_x, p_y, U_0) + p_y \cdot h_y^*(p_x, p_y, U_0)$$

Reminder: Shephard's Lemma

- Recall the expenditure function

$$E_0 = E(p_x, p_y, U_0) = p_x \cdot h_x^*(p_x, p_y, U_0) + p_y \cdot h_y^*(p_x, p_y, U_0)$$

- Differentiating the expenditure function with respect to the price of a good yields

$$\frac{\partial E(p_x, p_y, U_0)}{\partial p_x} = h_x(p_x, p_y, U_0)$$

Reminder: Shephard's Lemma

- Recall the expenditure function

$$E_0 = E(p_x, p_y, U_0) = p_x \cdot h_x^*(p_x, p_y, U_0) + p_y \cdot h_y^*(p_x, p_y, U_0)$$

- Differentiating the expenditure function with respect to the price of a good yields

$$\frac{\partial E(p_x, p_y, U_0)}{\partial p_x} = h_x(p_x, p_y, U_0)$$

- This equation is known as **Shephard's Lemma**

Reminder: Shephard's Lemma

- Recall the expenditure function

$$E_0 = E(p_x, p_y, U_0) = p_x \cdot h_x^*(p_x, p_y, U_0) + p_y \cdot h_y^*(p_x, p_y, U_0)$$

- Differentiating the expenditure function with respect to the price of a good yields

$$\frac{\partial E(p_x, p_y, U_0)}{\partial p_x} = h_x(p_x, p_y, U_0)$$

- This equation is known as **Shephard's Lemma**
 - To hold utility constant given an infinitesimal price change, your expenditures must rise by ∂p times the initial level of consumption
 - If you buy 2 cups of coffee a day and the price of coffee rises by 0.01 per cup, how much more income do you need to hold utility constant? To a first approx, 0.02
 - Shephard's lemma holds for *small price changes*. For larger price change, consumer would re-optimize bundle to re-equate MRS with new price ratio

Relationship btwn compensated & uncompensated demand

Start with the following identity

$$h_x(p_x, p_y, U) = d_x(p_x, p_y, E(p_x, p_y, U))$$

Relationship btwn compensated & uncompensated demand

Start with the following identity

$$h_x(p_x, p_y, U) = d_x(p_x, p_y, E(p_x, p_y, U))$$

Differentiate this equality

$$\frac{\partial h_x}{\partial p_x} = \frac{\partial d_x}{\partial p_x} + \frac{\partial d_x}{\partial I} \frac{\partial E}{\partial p_x}$$

Relationship btwn compensated & uncompensated demand

Start with the following identity

$$h_x(p_x, p_y, U) = d_x(p_x, p_y, E(p_x, p_y, U))$$

Differentiate this equality

$$\frac{\partial h_x}{\partial p_x} = \frac{\partial d_x}{\partial p_x} + \frac{\partial d_x}{\partial I} \frac{\partial E}{\partial p_x}$$

Rearrange

$$\frac{\partial d_x}{\partial p_x} = \frac{\partial h_x}{\partial p_x} - \frac{\partial d_x}{\partial I} \frac{\partial E}{\partial p_x}$$

Relationship btwn compensated & uncompensated demand

Start with the following identity

$$h_x(p_x, p_y, U) = d_x(p_x, p_y, E(p_x, p_y, U))$$

Differentiate this equality

$$\frac{\partial h_x}{\partial p_x} = \frac{\partial d_x}{\partial p_x} + \frac{\partial d_x}{\partial I} \frac{\partial E}{\partial p_x}$$

Rearrange

$$\frac{\partial d_x}{\partial p_x} = \frac{\partial h_x}{\partial p_x} - \frac{\partial d_x}{\partial I} \frac{\partial E}{\partial p_x}$$

Finally, apply Shephard's Lemma

$$\frac{\partial d_x}{\partial p_x} = \frac{\partial h_x}{\partial p_x} - \frac{\partial d_x}{\partial I} h_x$$

(This identity is called the **Slutsky equation**)

Slutsky equation

$$\frac{\partial d_x}{\partial p_x} = \frac{\partial h_x}{\partial p_x} - \frac{\partial d_x}{\partial I} h_x$$

- The difference between the uncompensated demand response to a price change (the left-hand side, $\partial d_x / \partial p_x$) is equal to the compensated demand response ($\partial h_x / \partial p_x$) minus the income effect scaled by the effective change in income due to the price change.

How Marshallian (*uncomp*) demand responds to price increases

1. **Normal good:** Income effect **and** Substitution effect both reduce demand

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} < 0} \times h_x < 0$$

How Marshallian (*uncomp*) demand responds to price increases

1. **Normal good:** Income effect **and** Substitution effect both reduce demand

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} < 0} \times h_x < 0$$

2. **Weakly inferior good:** Income effect increases demand, Substitution effect reduces demand **and** dominant

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} > 0} \times h_x < 0$$

How Marshallian (*uncomp*) demand responds to price increases

1. **Normal good:** Income effect **and** Substitution effect both reduce demand

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} < 0} \times h_x < 0$$

2. **Weakly inferior good:** Income effect increases demand, Substitution effect reduces demand **and** dominant

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} > 0} \times h_x < 0$$

3. **Strongly inferior (Giffen) good:** Income effect increases demand **and** dominant, Substitution effect reduces demand

$$\frac{\partial d_x}{\partial p_x} = \underbrace{\frac{\partial h_x}{\partial p_x}}_{\text{Subst effect} < 0} - \underbrace{\frac{\partial d_x}{\partial I}}_{\text{Inc effect} \gg 0} \times h_x > 0$$

Do Giffen Goods Exist? Evidence from China

Jensen and Miller 2008

Do Giffen goods exist?

- Economists have been looking for evidence of Giffen goods for at least nine decades
- But really, why should we care?

Do Giffen goods exist?

- Economists have been looking for evidence of Giffen goods for at least nine decades
- But really, why should we care?
 1. Might illustrate the fundamental power of the theory: From five behavior axioms to a strongly counterintuitive behavioral prediction that might just be correct
 2. Might illuminate something important about decision-making among the truly poor

When can Giffen goods arise?

- Households are poor enough that they face subsistence nutrition concerns
- Households consume a very simple diet, including a basic (staple) and a fancy good.
- The basic good is...
 - ...the cheapest source of calories available.
 - ...comprises a large part of the diet/budget.
 - ...has no ready substitute.

Giffen goods and nutritional subsistence

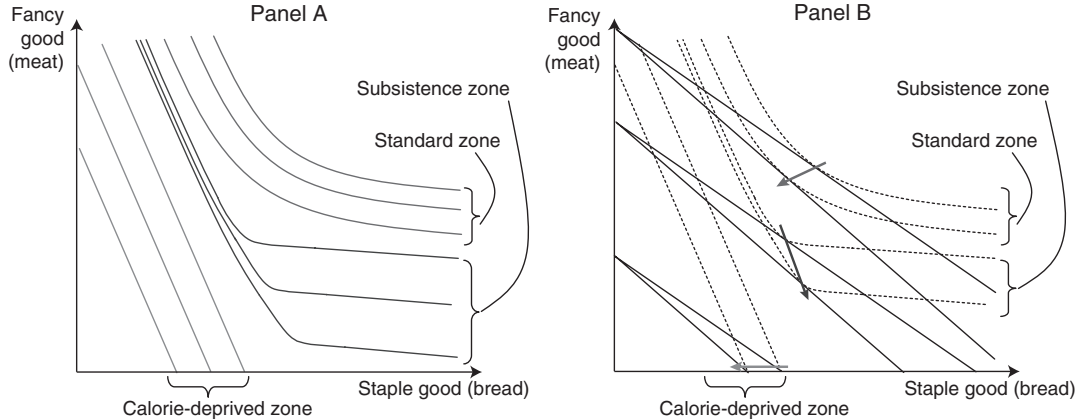
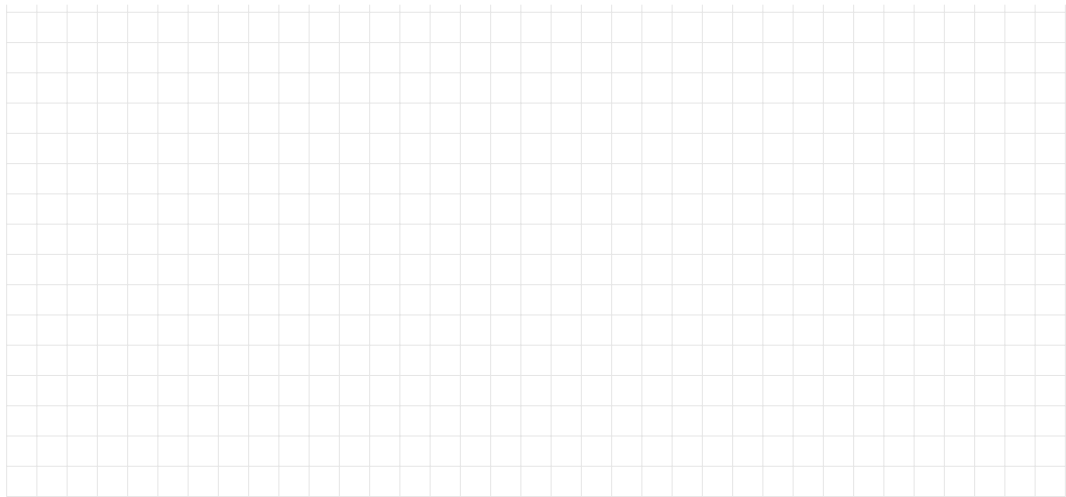


FIGURE 1. ZONES OF CONSUMER PREFERENCES

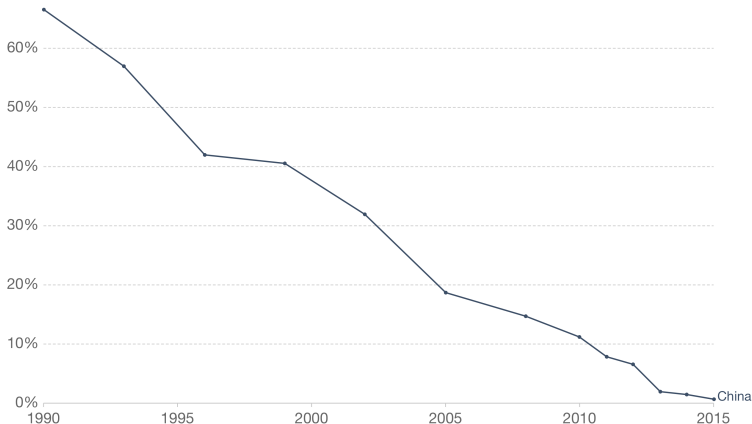
Giffen goods and nutritional subsistence



Incredible progress in poverty reduction in China, 1990–2015

Share of the population living in extreme poverty, 1990 to 2015

The share of individuals living below the 'International Poverty Line' of \$1.90 per day.

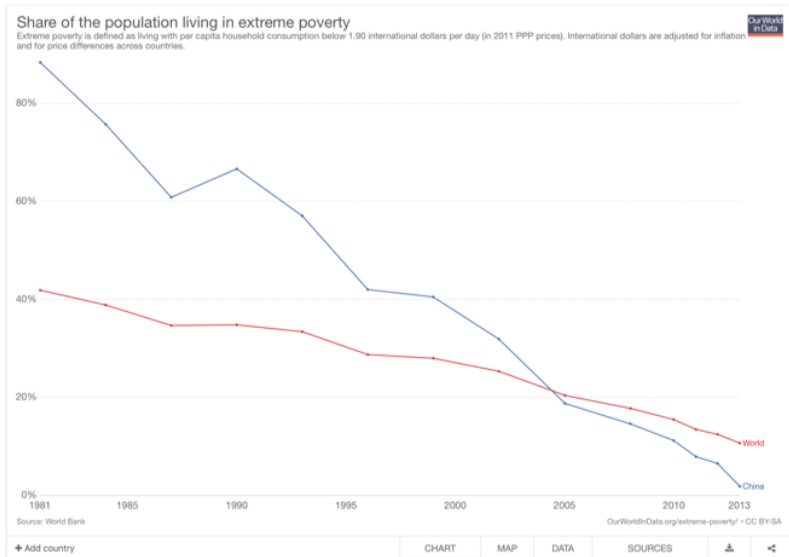


Source: World Bank

OurWorldInData.org/extreme-poverty/ • CC BY

Note: Depending on the country and year, the poverty rate relates to either income or consumption. Figures are given in international-\$. This means they are adjusted for price differences between countries and adjusted for inflation to allow comparisons between countries and over time. Income/consumption is measured at the household level, and is assumed to be divided equally among all household members.

Much of world progress in poverty reduction is China's progress



Understanding subsistence poverty in China in the early 2000s

- The experimental sample included 644 randomly selected urban poor households in Hunan province (about 1,800 people) in the early 2000s
- Urban poor households had incomes averaging \$0.41 to \$0.82 per person per day
- At the time of the study, about 90 million Chinese households met this definition of poverty
- The diet among the poor is very simple, consisting mostly of rice, plus some pork and other meat
- Most consumers in the sample obtained 70% of total calories from rice alone

Poor households in Hunan province get most calories from rice

	HUNAN	
	Consumption (g)	Calorie Share
Rice	330 [125.4]	0.64 [0.17]
Wheat	42 [60.2]	0.08 [0.12]
Other Cereals	1.5 [21.3]	0.00 [0.022]
Vegetables and fruit	341 [194.6]	0.05 [0.044]
Meat (incl. eggs)	47 [68.6]	0.07 [0.11]
Pulses	62 [102.3]	0.02 [0.043]
Dairy	1 [7.4]	0.00 [0.0031]
Fats	26 [20.4]	0.13 [0.095]
Calories	1805 [591.7]	--
Observations	644	644

Notes: Standard deviations in brackets. All consumption figures are in grams per capita. Calorie share is the percent of total calories attributable to the particular food category.

Does subsidizing p_r cause HH's to eat less rice?

- Households randomly assigned to a control group *or* one of three treatment groups
- HH's in the treatment group were given printed vouchers entitling them to price reductions of 0.10, 0.20 or 0.30 yuan off the price of each 500g (1 jin) of rice, the staple good. **This is a price subsidy**
- Treated households received vouchers for 5 months. Vouchers distributed at the beginning of each month, valid till the end of the experiment
- The vouchers were for **large** quantities, amounting to 750g (1.6Lb) per person per day for each month of treatment. Households unlikely to use their full quotas
- As far as the household is concerned, voucher is equivalent to a price reduction in the staple good with no quantity constraint

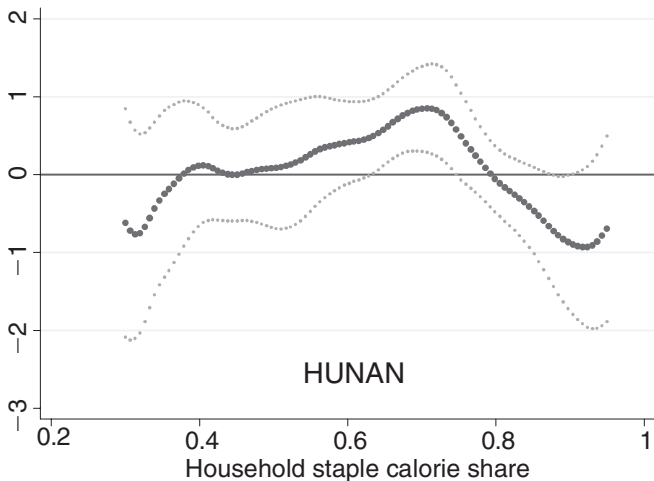
Experimental estimates of rice subsidy: Effect of Δp_r on ΔQ_r

Dependent variable: % Δ Rice consumption

	Full sample	Full sample	ISCS ≤ 0.80	ISCS ≤ 0.80	ISCS > 0.80	ISCS > 0.80	ISCS 0.60–0.80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
% Δ Price(rice)	0.224 (0.149)	0.235* (0.140)	0.451*** (0.170)	0.466*** (0.159)	−0.61** (0.296)	−0.585** (0.262)	0.640*** (0.192)
% Δ Earned		0.043*** (0.014)		0.047*** (0.016)		0.024 (0.023)	0.030 (0.019)
% Δ Unearned		−0.044* (0.025)		−0.038 (0.030)		−0.058 (0.049)	−0.053* (0.030)
% Δ People		0.89*** (0.08)		0.83*** (0.09)		1.16*** (0.15)	0.79*** (0.14)
Constant		4.1*** (1.0)		5.7*** (1.1)		−1.8 (1.7)	0.8 (1.3)
Observations	1,258	1,258	997	997	261	261	513
R^2	0.08	0.19	0.09	0.20	0.15	0.33	0.24

Household demand for rice in Hunan province: $\partial Q_r / \partial p_r$

Notice 'Giffen region' $\approx (0.4, 0.75)$ where demand is upward sloping



Poorest households on right, poor household in middle, non-poor households on left