

## Lecture 6.2 - Applications: Giffen Goods

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### 1 The Irish Potato Famine (Dwyer and Lindsay)

In the 1800s, the potato was the staple food of Irish peasants—who were the majority of Irish.

- It contains protein, carbohydrates and vitamin C.
- Combined with milk, the potato supplied basically a complete diet.
- The average adult needed 3 kilos (6.5 pounds) of potatoes per day for a healthy diet.
- The rare luxury food was pork.
- Almost all other food crops were exported to England, which owned most of the land and taxed it quite heavily.

In the 1840s, the Irish potato crop was decimated by a fungus, *Phytophthora Infestans*.

- 1845: The fungus destroyed 40% of the crop.
- 1846: Destroyed 90 - 100%.
- 1847: Not as serious, but the 'seed' potatoes were eaten due to the ongoing shortage.
- 1848: As bad a blight as 1846.
- 1845 - 1851: 1.1 million of 9 million inhabitants died of starvation and related disease.
- 1 million more fled the country by ship.

## 1.1 Were potatoes a Giffen good during the famine?

The Irish Potato Famine has often been suggested as a possible ‘natural experiment’ for studying Giffen goods.

Q: Why would it be a potentially good example? A: A single staple occupies a dominant place in the consumer’s budget. Price changes will therefore have strong income effects.

Q: Why do we need income effects? A: For a good to be Giffen, the income effect must dominate the substitution effect. Recall from the Slutsky equation that the size of the income effect is the product of  $\frac{\partial X}{\partial I}$  and  $X$ , the initial quantity consumed. If expenditures on  $X$  are not large relative to the consumer’s overall budget, the income effect is likely to be relatively modest (in the limit, if expenditures on  $X$  are zero, there is no income effect).

The question that Dwyer and Lindsay want to address is: Were potatoes a Giffen good during the famine?

To think about this problem correctly we need to have in mind the individual demand curve, the market demand curve, and the supply curve.

At the individual level, Giffen behavior implies that

$$\frac{\partial d_p(P_p, P_e, I)}{\partial P_p} > 0,$$

uncompensated demand for potatoes *increases* with the price of potatoes (note:  $P_e$  is the price of everything else) over some range.

We cannot observe individual level behavior in Ireland in the 1840’s, but we can imagine that there are 9 million peasants with roughly the same individual demand functions for potatoes. Hence, we can simply get the market demand as the sum of individual demand:

$$D_p = \sum_{i=1}^{9 \times 10^6} d_p^i(P_p, P_e, I).$$

So, in our ideal ‘experiment,’ the price of potatoes rises and the quantity consumed goes up. See Figure 1 of the hand drawing.

Q: Assuming this was the experiment, what *else* might you want to draw a valid inference? A: A control country or group of countries that did not experience the blight (e.g., like Pennsylvania in the Card-Krueger study). These would provide a counter-factual comparison for changes in prices and consumption of potatoes during the same time period. This is not likely to be available, but perhaps it is not fatal...

## 1.2 The ‘experiment.’

Look carefully at the diagram of upward sloping demand. This predicts a rise in the price due to the famine followed by a rise in the quantity demanded. Q: Is this actually what occurred?

No. This is not a valid description of events. The exogenous result of the famine was to *reduce supply* by destroying crops. So, we had an initial movement in *quantity, not prices*. (See hand drawn Figure 2.)

The implication: if demand is Giffen, a reduction in supply should reduce prices. Hence, in this experiment, the price of potatoes should have *fallen* during the famine!

We don't have any data on the price of potatoes during the famine. Q: What other data could we examine?

- Price of close substitutes such as grain. The price of grain rose *substantially* during the famine. It's hard to believe that the price of potatoes were falling as the price of the nearest substitute was rising.
- Behavior of famine relief agencies. Relief agencies would obviously want to provide the cheapest nutrition possible. They did *not* provide potatoes. If potatoes had indeed gotten cheaper, they probably would have.

### 1.3 Other considerations

- Thought experiment. Potatoes were extremely nourishing. Starving people *should want to buy them*. It's hard to believe that their price would fall during a period of starvation.
- For a good to be Giffen, it must displace some other normal good as the price of the Giffen good rises. Q: Why is this true? [Non-satiation, budget exhaustion.]

What could this normal good have been? People ate exclusively potatoes and milk. What could they have substituted away from?

- A good must be normal *at some income level* to eventually become inferior. [Why? Can't substitute away from something unless you are first consuming it.] Potatoes were not likely to be inferior at low incomes.

Consider the Engel curve for potatoes as the cheapest source of nutrition available. At low incomes, peasants would probably mostly consume potatoes and as incomes rose, they would substitute towards meat.

Since most peasants were farmers and hence growers of potatoes, the death of the potato crops also meant that they were now desperately poor. This would be almost certain to bring them into the income range where potatoes were a normal good.

- What would be the right experiment?

Perhaps a country where the staple food was a large part of the household budget (like Ireland).

Moreover, that staple was inelastically supplied at a world market price.

Shocks to world prices could therefore induce Giffen behavior by changing prices without restricting supply.

## 2 Giffen goods in China (Jensen and Miller)

### 2.1 Context

- In China, over 30% of the population survives on less than one dollar per day.
- The diet is very simple, consisting mostly of rice and noodles, plus some pork and other meat.
- Most consumers get 70% of total calories from rice and meat alone.
- Importantly for the study, regional preferences for rice versus noodles vary considerably (Table 1a).  
In the South, rice is the staple.  
In the North, noodles are the staple.
- Meat is generally preferred to rice or noodles, but it is considerably more expensive. Meat typically provides only one-third the calories or protein per Yuan as rice or noodles (Table 2).

### 2.2 The ‘experiment’

Jensen and Miller (J&M) have extremely detailed data from the China Health and Nutrition Survey (CHNS) for 1989, 1991, 1993. These data contain:

- Food diaries on complete food intake over 3 day periods.
- The market prices of all major food items *in the local community*.

They then make the following assumptions:

- Food prices at the community level vary *exogenously*. Sometimes up, sometimes down.
- This variation could be due to any combination of supply and demand factors. Does this matter? [Not necessarily, unless household tastes are correlated with it.]
- Households are *price-takers* so they simply face the market price.

The idea then is to look at household responses to price variation. Because J&M have panel data (i.e., same households, different points in time), they can presumably hold individual tastes constant. So the idea is:

- Same person
- Same tastes
- Different prices
- Research question: What happens to consumption.

What are the key predictions?

- What's the basic Giffen prediction for the change in quantity demanded for a change in price?
- What's the control group?

	Time 1	Time 2
Household in Community 1	$P_1^1, Q_1^1$	$P_2^1, Q_2^1$
Household in Community 2	$P_1^2, Q_1^2$	$P_1^2, Q_2^2$

Each household provides its own pre-post comparison. The variation in prices across communities provides the control group. In the simplest case, prices rise in community 1, stay the same in community 2.

- Would you have different Giffen predictions in South versus North?  
Yes. You would only expect the staple food to be Giffen since only foods that compose a large part of the budget share could have large income effects on consumption (recall the Slutsky equation).  
South–Rice could be Giffen  
North–Noodles could be Giffen
- Would you expect different behavior for low and high income households?  
Yes. Staples foods are probably not large enough as a budget share for high income households to induce Giffen behavior. You might expect Giffen behavior for low income but not high income households.
- So, we have many contrasts here:
  - Pre-post within households.
  - Cross-community variation in price changes.
  - Different regional tastes for goods, giving a North-South prediction on which goods should be Giffen.
  - Within-community, cross-income level variation in predictions. Only the poor should have Giffen demand.

Having *four types of contrasts* makes for a potentially compelling experiment.

### 2.3 What they find

All of the key results are found in Table 3:

1. In both the South and North, rice and noodles are inferior (see row 4 of each panel), whereas pork is a normal good.
2. Looking along the diagonals for poor households in the South, both noodles and pork have downward sloping demand. *But rice has upward sloping demand.*
3. Looking along the diagonals for poor households in the North, both rice and pork have downward sloping demand. *But noodles have upward sloping demand.*
4. For not poor households in both North and South, all goods have downward sloping demand.

These results seem to provide compelling evidence of Giffen behavior. Alternative interpretations?