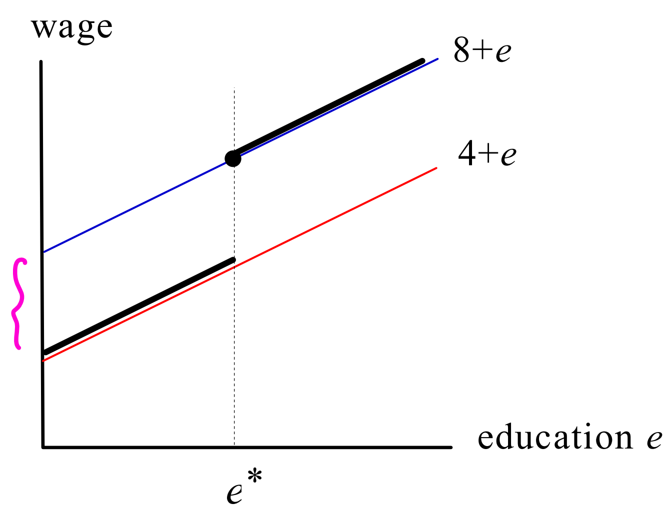
Example of a signaling equilibrium when education does increase productivity

Type *L*: $\begin{cases} \text{productivity: } 4+e \\ \text{cost: } C_L(e)=4e \end{cases}$ and **Type *H***: $\begin{cases} \text{productivity: } 8+e \\ \text{cost: } C_H(e)=2e \end{cases}$



For a signaling equilibrium we need:

for Type L:

for Type H:

Suppose that 50% of the population is Type L and 50% is Type H.

Consider a signaling equilibrium with $e^* = 3$.

Then Type L have a net wage of

Type H a net wage of

Force everybody to choose $e = 0$ and force employers to pay everybody w = average productivity:

An example with three types

Type A: productivity 10, cost $C_A(y) = ay$

Type B: productivity 15, cost $C_B(y) = by$

Type C: productivity 20, cost $C_C(y) = cy$

$$0 < c < b < a$$

$$\text{Wage offer}: \begin{cases} 10 & \text{if } y < y_1 \\ 15 & \text{if } y_1 \leq y < y_2 \\ 20 & \text{if } y_2 \leq y \end{cases}$$

For a separating signaling equilibrium we need:

Type A to choose

Type B to choose

Type C to choose

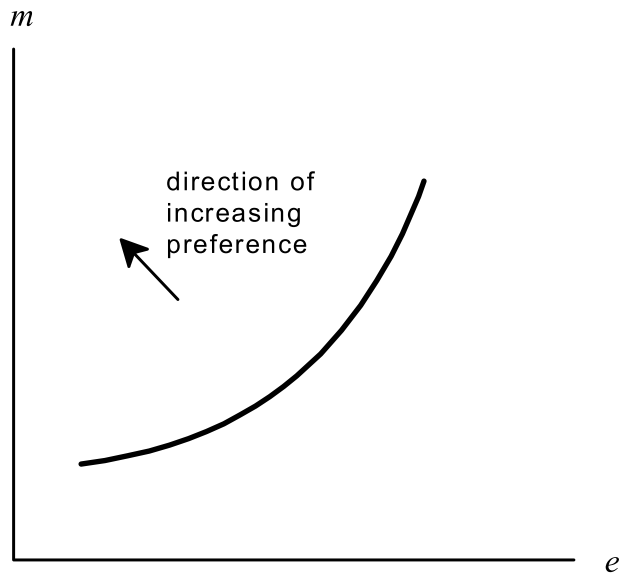
Necessary conditions for Type A:

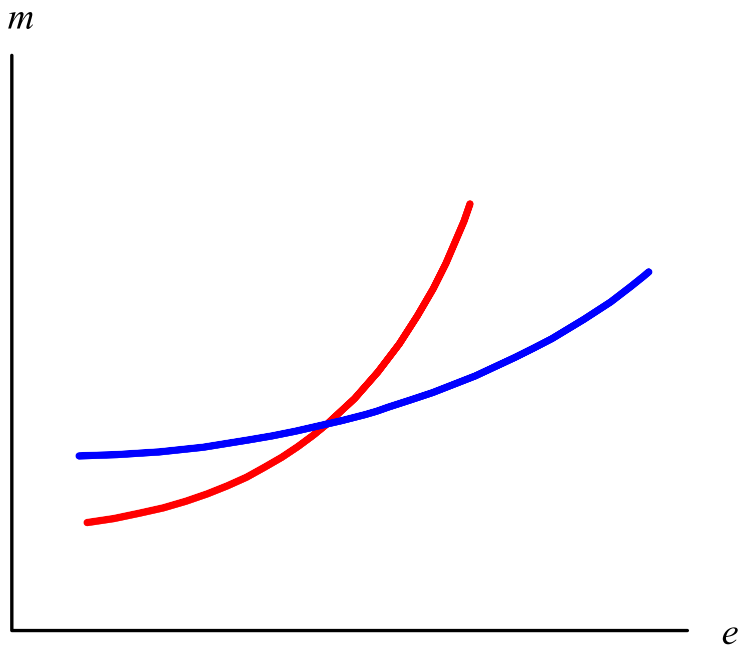
Necessary conditions for Type B:

Necessary conditions for Type C:

Psychological costs of education

$U(m, e)$




m
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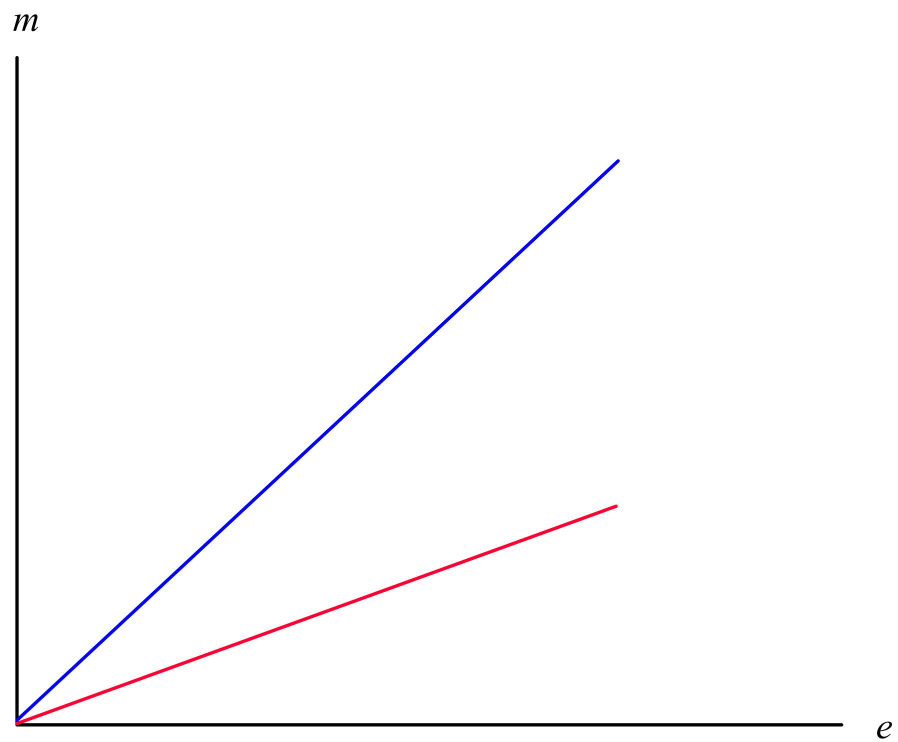
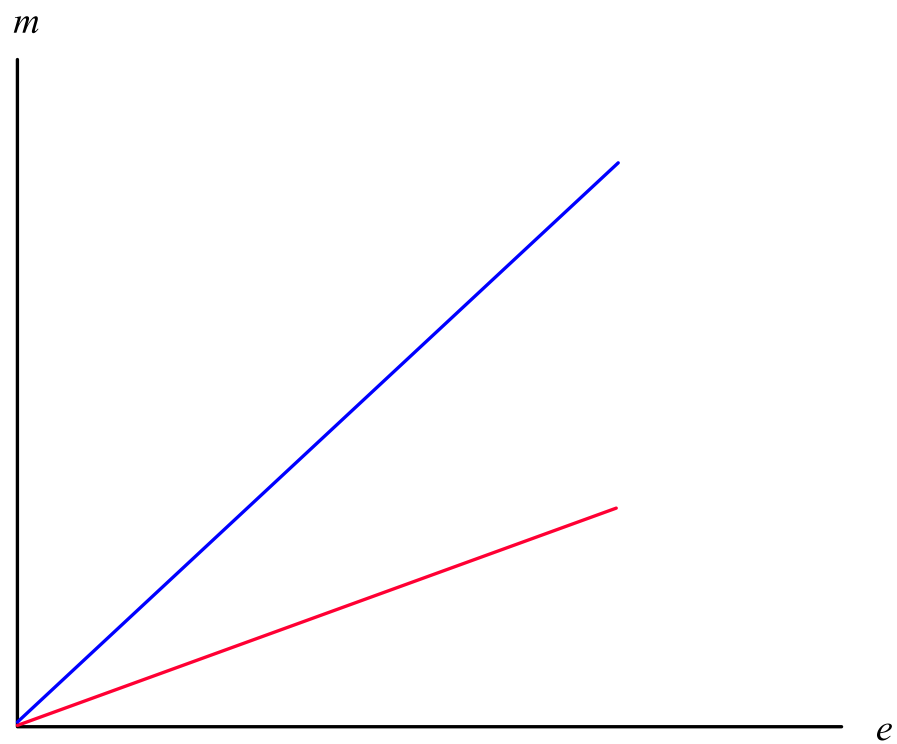
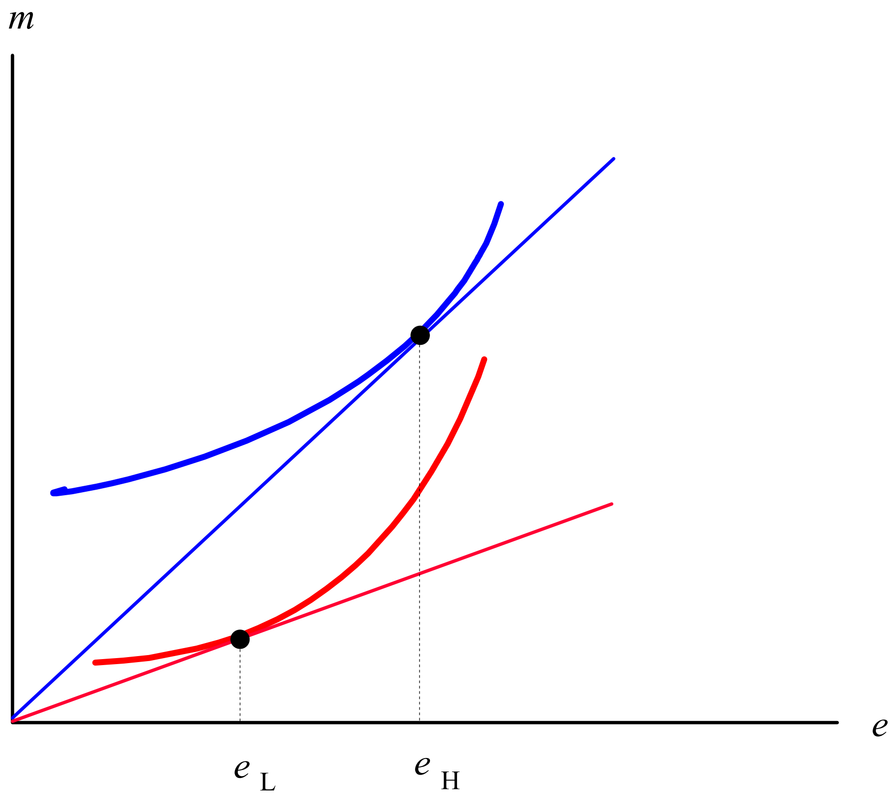
Productivity of Type H: He Productivity of Type L: Le

$$0 < L < H$$



When types can be identified





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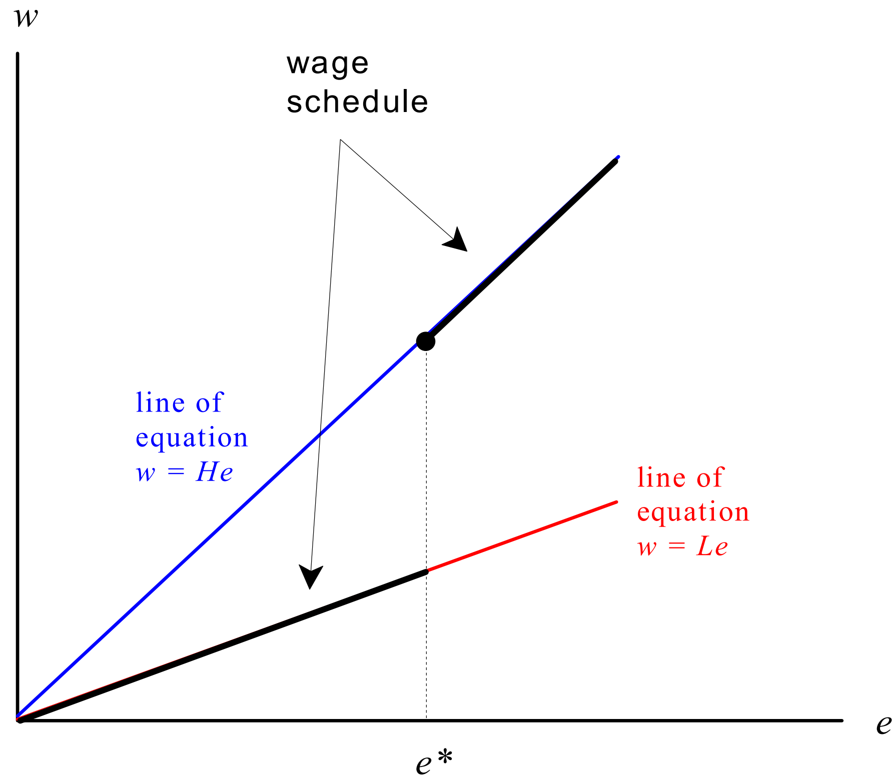
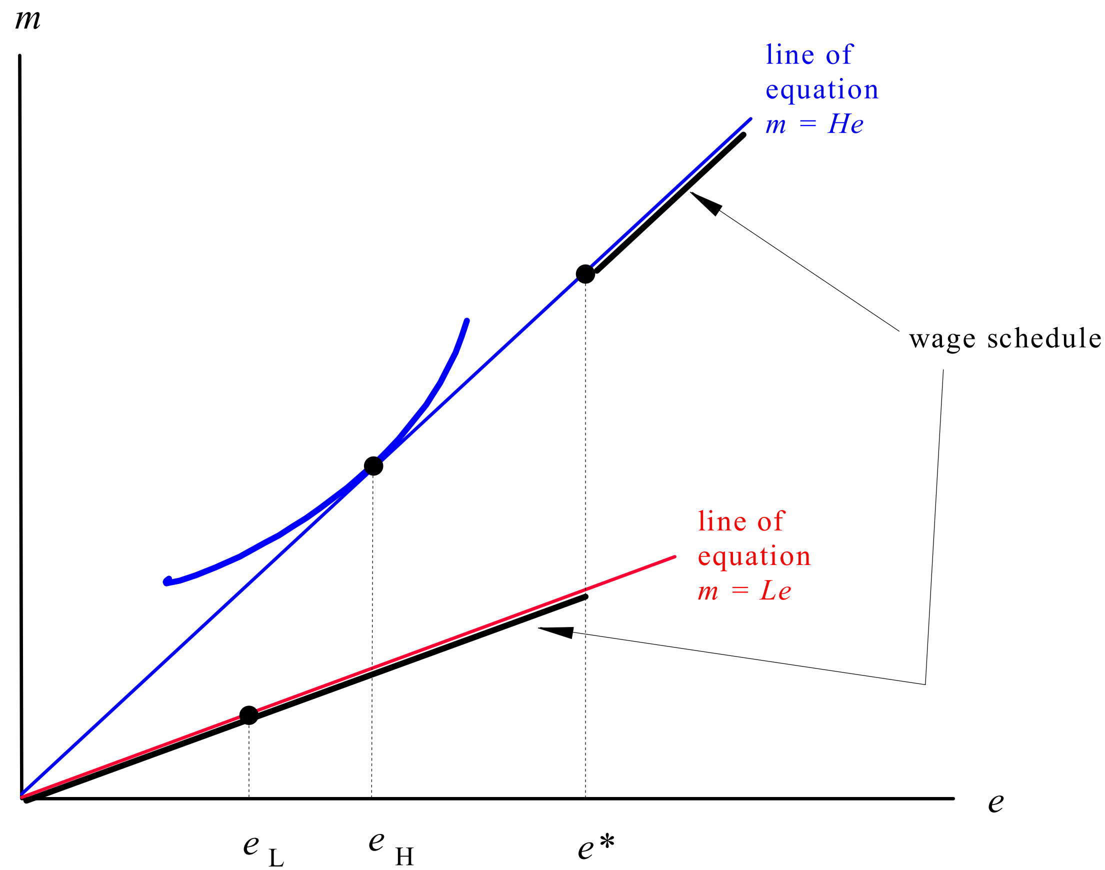
Asymmetric information





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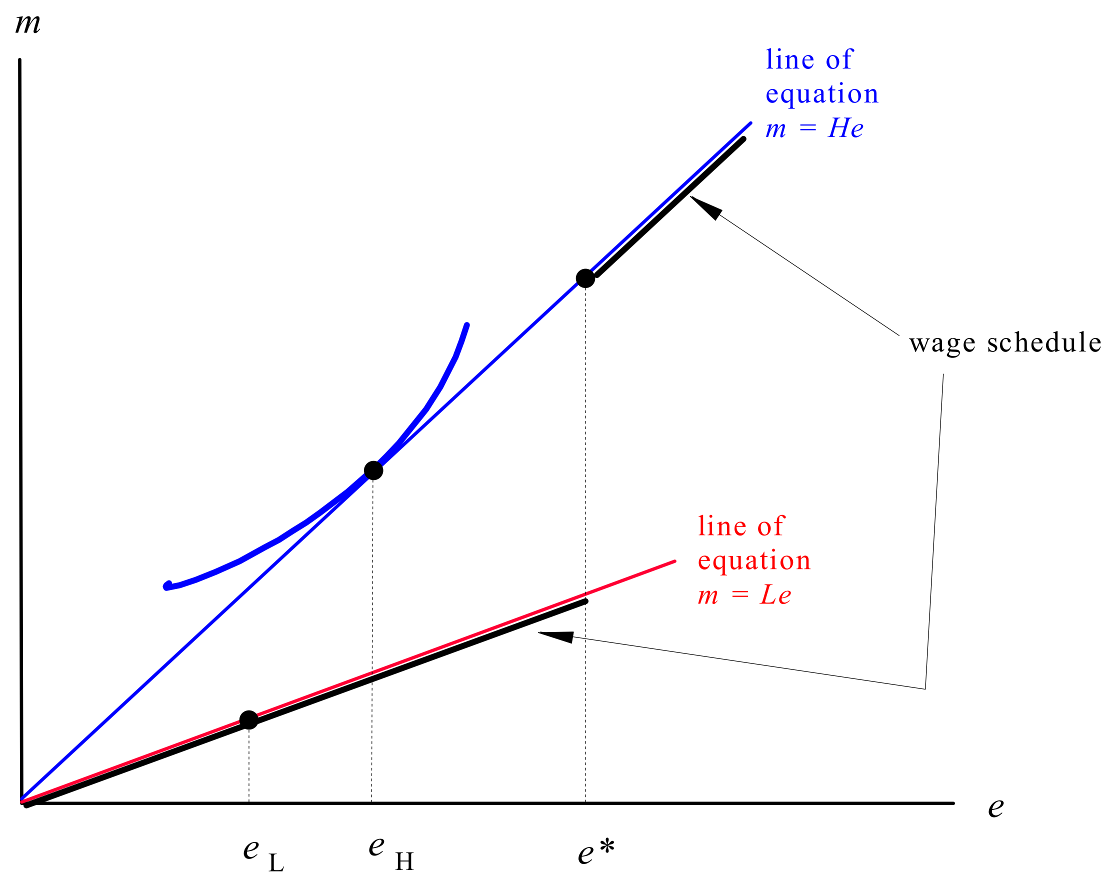

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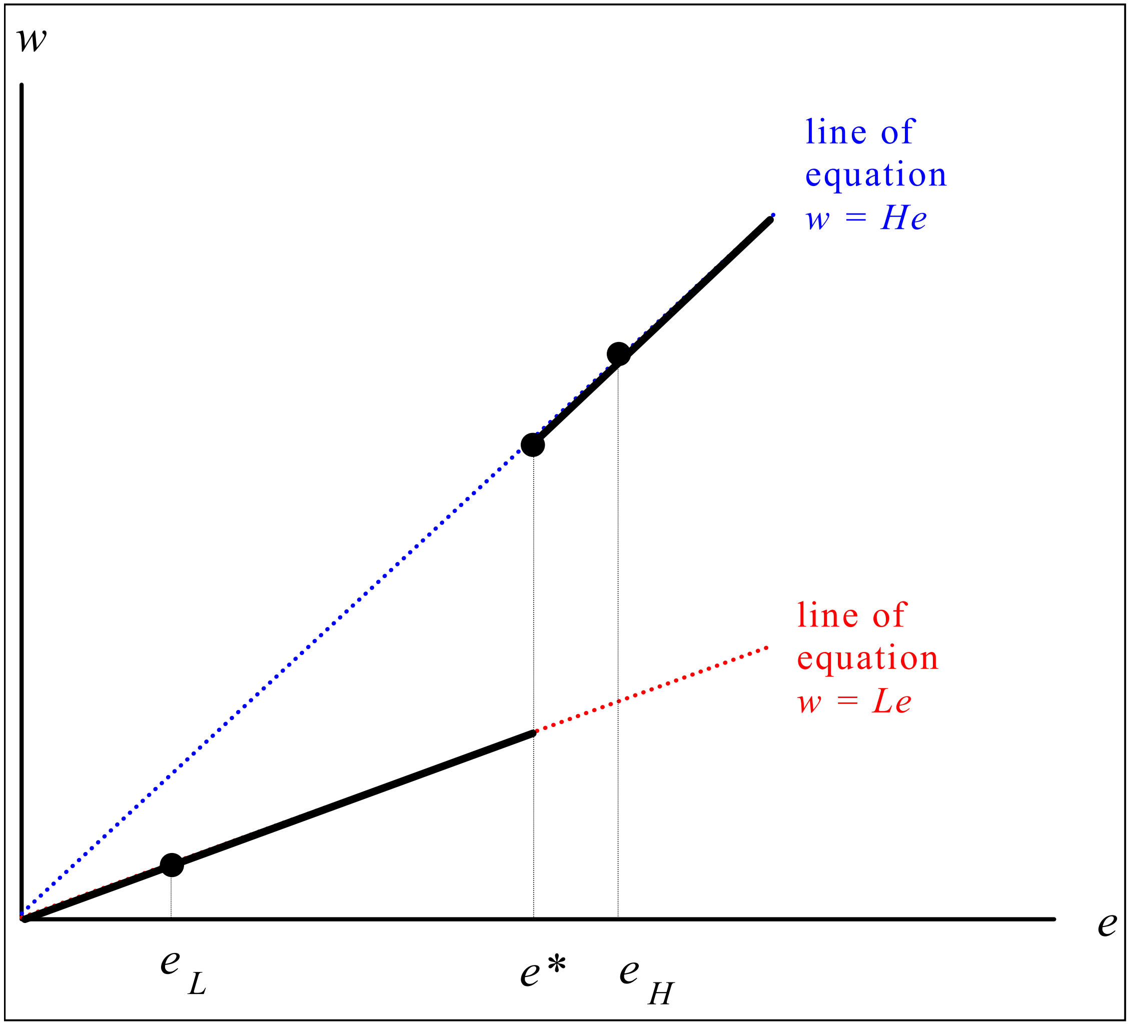
When $e_L < e^* < e_H$ and e^* close to e_H possible to have efficiency:



Adverse Selection

You have just opened an all-you-can-eat buffet restaurant. The capacity of your restaurant is $K = 100$. Not quite sure how much you can charge. It costs \$2 to provide one standard-size serving of food. **You are risk neutral**.

Day	Price	More than 50 people show up (= excess demand)?	Total profits
1	\$6	Yes	\$150
2	\$6.50	Yes	\$160
3	\$7	Yes	\$104

What happened? Revenue:

price	revenue
\$6	$\$(6 \times 100) = \$600$
\$6.50	$\$(6.50 \times 100) = \$650$
\$7	$\$(7 \times 100) = \$700$

N = 1,200 potential customers. Each can be described by a pair (r, c) where r is the reservation price and c is the amount of food he/she consumes.

Customer type	$(6,1)$	$(6,1.5)$	$(6.50,1.5)$	$(6.50,2.2)$	$(7,2.2)$	$(7,3.5)$
Number	100	100	200	300	200	300
Fraction	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{2}{12}$	$\frac{3}{12}$

- If you charge \$6:

consumption	1	1.5	2.2	3.5
probability				

- If you charge \$6.50:

Customer type	$\cancel{(6,1)}$	$\cancel{(6,1.5)}$	$(6.50,1.5)$	$(6.50,2.2)$	$(7,2.2)$	$(7,3.5)$
Fraction	$\cancel{\frac{1}{12}}$	$\cancel{\frac{1}{12}}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{2}{12}$	$\frac{3}{12}$

consumption	1	1.5	2.2	3.5
probability				

- If you charge \$7:

Customer type	~~(6,1)~~	~~(6,1.5)~~	~~(6.50,1.5)~~	~~(6.50,2.2)~~	$(7, 2.2)$	$(7, 3.5)$
Fraction	$\cancel{\frac{1}{12}}$	$\cancel{\frac{1}{12}}$	$\cancel{\frac{2}{12}}$	$\cancel{\frac{3}{12}}$	$\frac{2}{12}$	$\frac{3}{12}$

consumption	1	1.5	2.2	3.5
probability				

Akerlof: market for second-hand cars

Quality	A	B	C	D	E	F	
Number of cars	10	20	10	40	30	10	Total: 120
fraction	$p_A = \frac{10}{120} = \frac{1}{12}$	$p_B = \frac{2}{12}$	$p_C = \frac{1}{12}$	$p_D = \frac{4}{12}$	$p_E = \frac{3}{12}$	$p_F = \frac{1}{12}$	
Buyer's value	\$6,000	\$5,000	\$4,000	\$3,000	\$2,000	\$1,000	
Seller's value	\$5,400	\$4,500	\$3,600	\$2,700	\$1,800	\$900	

ADVERSE SELECTION
Akerlof on market for second-hand cars

Utility-of-money of a potential seller who owns of a car of quality q:

$$U(m) = \begin{cases} m + u(q) & \text{if does not sell the car} \\ m & \text{if sells the car} \end{cases}$$

Thus, if her initial wealth is W_0 she will sell the car a price p only if:

Utility-of-money of a potential buyer who does not own a car:

$$V(m) = \begin{cases} \mathrm{m} & \text{if does not buy a car} \\ m + v(q) & \text{if becomes owner of a car of quality } q \end{cases}$$

Thus, if his initial wealth is W_0 he will but a car of quality q at price p only if:

Assume that, for every quality q, $v(q) > u(q) > 0$

What if there is **asymmetric information**: only the owner knows the quality q?

Publicly available information:

Quality q	best: A	B	C	D	E	worst: F	
Number of cars	120	200	100	240	320	140	Total: 1,120
Proportion							
$v(q)$ (seller)	720	630	540	450	360	270	
$u(q)$ (buyer)	800	700	600	500	400	300	

Buyer: if a car is offered to me at price p should I buy it?

Suppose p = 460

Quality q	best: A	B	C	D	E	worst: F
$v(q)$ (seller)	720	630	540	450	360	270

Back to previous example. Suppose that p = 460. Then only qualities D, E, F offered

Step 1: convert probabilities to a common denominator:

Quality q	best: A	B	C	D	E	worst: F
Proportion	$p_A = \frac{3}{28}$	$p_B = \frac{5}{28}$	$p_C = \frac{5}{56}$	$p_D = \frac{3}{14}$	$p_E = \frac{2}{7}$	$p_F = \frac{1}{8}$

Step 2: condition on {D, E, F}

Quality q	best: A	B	C	D	E	worst: F
Proportion						

Suppose p = 380

Quality q	best: A	B	C	D	E	worst: F
$v(q)$ (seller)	720	630	540	450	360	270