Industrial Organization 2, Problem Set 4: Insurance

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1 Estimate

Estimate linear $D(p)$, $AIC_L(p)$, $AIC_H(p)$, and quadratic $TC_S(p)$ curves. Calculate intercept and slope of $MC_H(p)$, $MC_L(p)$, and $MC_S(p)$. In a table, report point estimates and standard errors for estimates.

Computations done in R, with code in an attached file.

Estimates and Standard Errors

	Intercept	Coef_1	Coef_2
Demand	**2.546**	**-0.003**	**NA**
SE_Demand	0.000	0.000	NA
AICH	**361.355**	**0.532**	**NA**
SE_AICH	11.799	0.019	NA
AICL	**186.252**	**0.509**	**NA**
SE_AICL	14.620	0.020	NA
TCS	**10899.895**	**-0.008**	**-0.001**
SE_TCS	1370.403	4.044	0.003
MCH	**-120.924**	**1.064**	**NA**
MCL	**-275.307**	**1.018**	**NA**
MCS	**3.006**	**0.977**	**NA**

Estimates are bolded with standard errors underneath

2 Plot

Replicate Figure V, by plotting $D(p)$, $AIC_H(p)$, $MC_H(p)$, and data points. Is there adverse selection or advantageous selection? Assume there is no moral hazard: Indicate the efficient point and the competitive equilibrium point. In a competitive market would there be overprovision or underprovision of the high coverage plan? What area on the plot corresponds to deadweight loss?

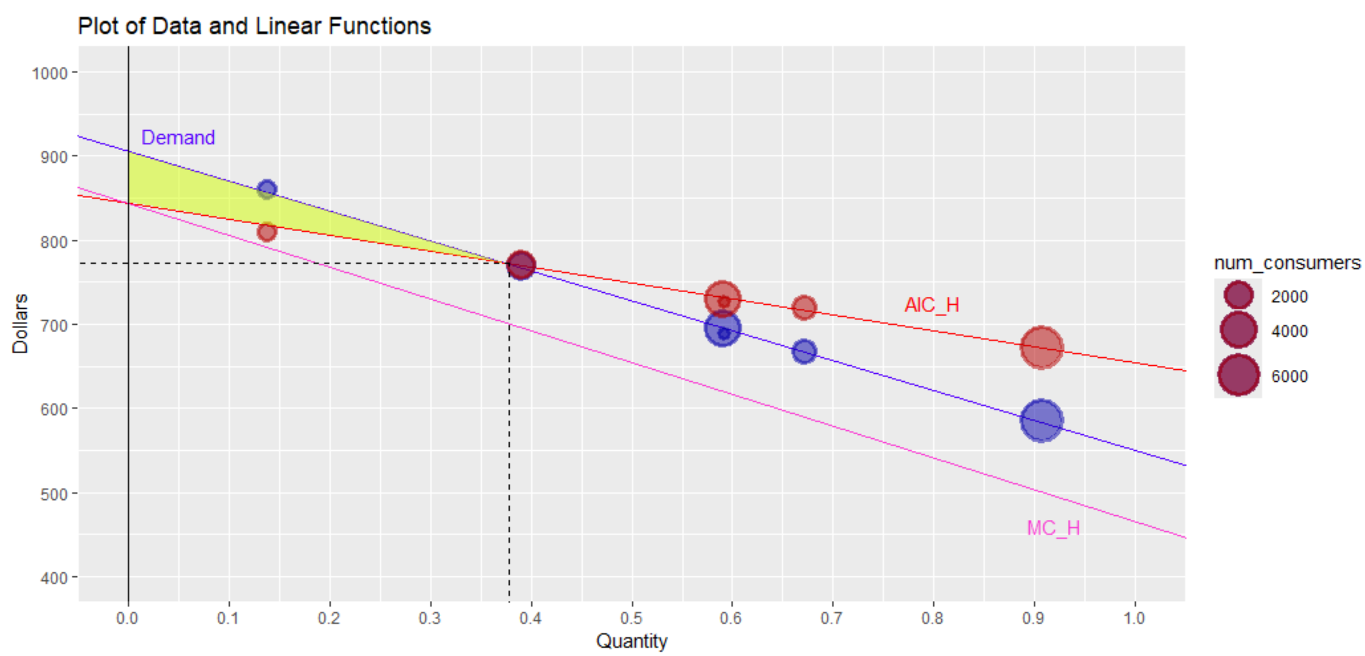

Figure 1

- There is adverse selection in this market, which is indicated by the decreasing marginal cost curve. The people who are the most eager to buy insurance are the riskiest (and most costly) people, and lower-risk people don't join until lower prices are offered.

- The efficient equilibrium is at the intersection of Demand and MC_H, which is what would happen under perfect information. In this case, the efficient equilibrium is at $(q_H, p_H) = (-2.764, 1890.69)$, which isn't possible in the real world. Maybe one could interpret this result as showing that the market is uninsurable, and the best-case outcome would be for insurance companies to buy plans from consumers at $p_H = 1890.69$, and for consumers to make payments to insurance companies when they get into accidents.

- The competitive equilibrium point is at the intersection of Demand and AIC_H rather than the usual Demand and MC_H, because the firm can't observe consumers' risk characteristics. This is $(q_H, p_H) = (0.378, 772.09)$

- $q_H^{\text{comp}} = 0.378 > -2.764 = q_H^{\text{effnt}}$, so there's massive overprovision of the high coverage plan in the competitive market. In the paper EFC (2010), the demand curve is steeper than the MC curve and they intersect in a reasonable location (where $0 < q_H < 1$). But MC is steeper than demand in our case, which means that the spread in cost-of-coverage between high-risk and low-risk people is very high. Equilibrium at the AIC_H/Demand intersection means that low-risk people excessively subsidize high-risk people. It turns out that high-risk people are so risky (and low-risk people are so safe) that the best social outcome is for no insurance at all.
- The yellow region represents the deadweight loss.

3 Add MC_L

Figure V.2: Add the $MC_L(p)$ curve. How does it compare to $MC_H(p)$. What does this tell us about moral hazard?

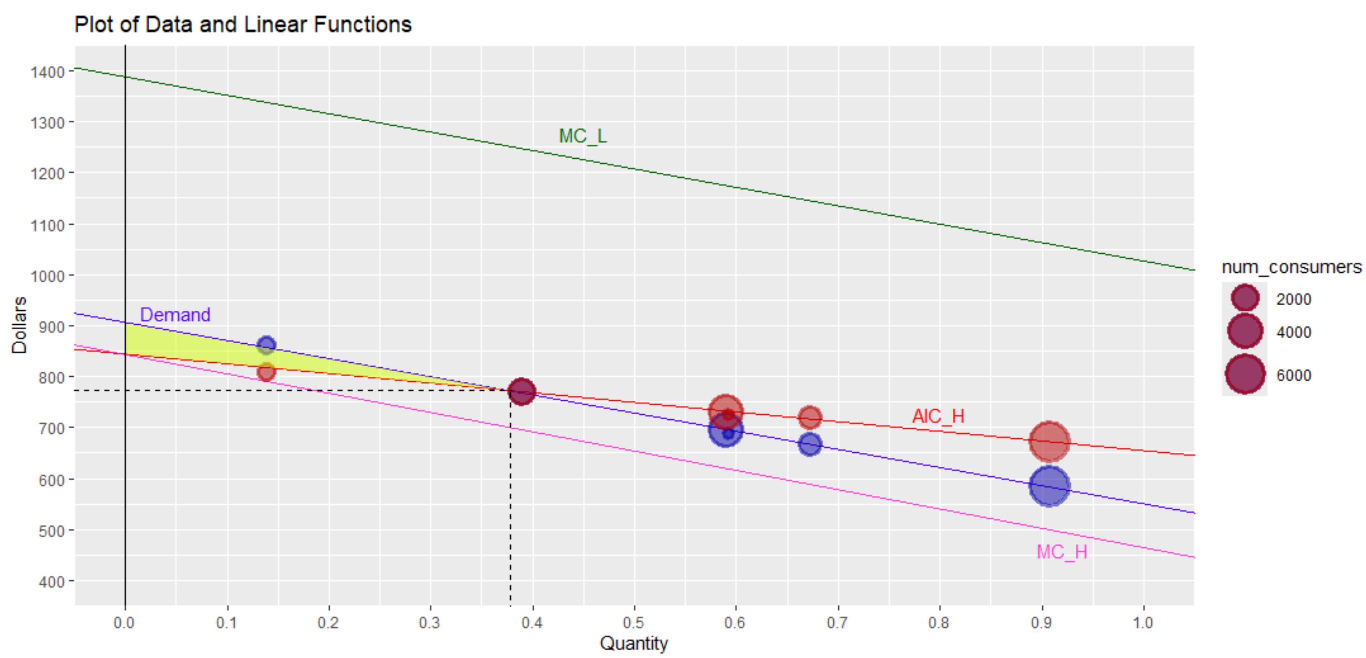

Figure 2: Note the addition of the green MC_L curve.

- For reference,

$$MC_L(p) = c_H(m_{Li}) - c_L(m_{Li})$$
$$MC_H(p) = c_H(m_{Hi}) - c_L(m_{Hi})$$

- MC_L is the difference in cost between the high contract and the low contract if the consumer had purchased the low contract, and MC_H is the same difference if the consumer had purchased the high contract. If we observe that $MC_L > MC_H$, then $m_{Li} > m_{Hi}$, so consumers alter their levels of engagement in risky behavior according to the insurance plan that they have. This is moral hazard.
- The problem is that $m_{Li} > m_{Hi}$ implies that people take greater risk when they have *worse* coverage, which makes no sense. Not sure what to do with this. Is it still evidence of moral hazard if the hazard is going the wrong way?

4 Add MC_S

Figure V.3: Leave out $MC_L(p)$ to avoid clutter, but add $MC_S(p)$. How does it compare to $MC_H(p)$? What does this tell us about moral hazard? Indicate the efficient point, and equilibrium point. In a competitive market would there be overprovision or underprovision of the high coverage plan? What area on the plot corresponds to deadweight loss? Is there adverse selection or advantageous selection? How do your answers compare to those in part (2)?

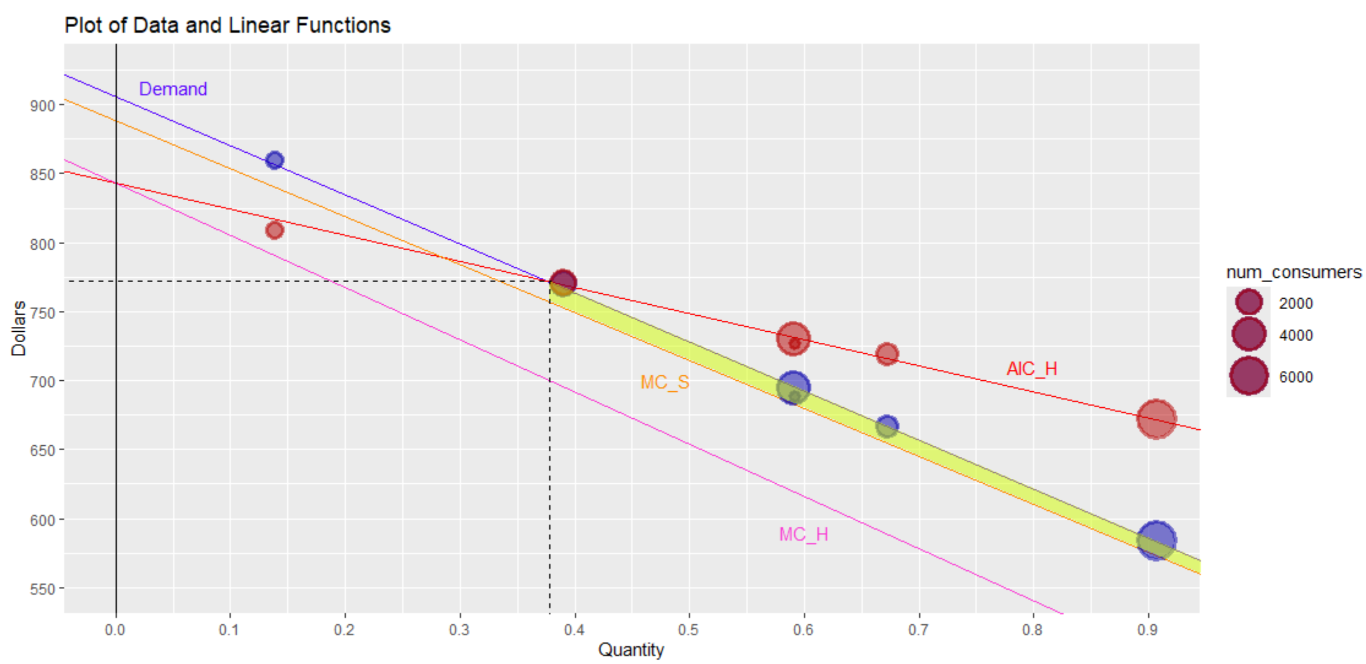

Figure 3: Note the addition of the orange MC_S curve.

- We have a small difference between, MC_H and MC_S, but it's a strong indicator of the presence of moral hazard. Without moral hazard, we'd see

$$MC_S = c_H(m_{Hi}) - c_L(m_{Hi}) = MC_H$$

But since $MC_{Si} > MC_{Hi}$ for all i in our graph, it must be that

$$\begin{aligned} MC_S &= c_H(m_{Hi}) - c_L(m_{Li}) \\ &> c_H(m_{Hi}) - c_L(m_{Hi}) = MC_H \end{aligned}$$

Which implies that $m_{Hi} > m_{Li}$.

- This indicates moral hazard because it shows that people take on riskier behavior when they have stronger insurance coverage.
- The efficient point is now calculated using the MC_S curve, which is a more accurate supply curve than MC_H in the presence of moral hazard. The intersection of MC_S and Demand is still in impossible quantity territory, at $(q_H, p_H) = (2.176,\ 131.68)$
- The equilibrium point remains at the intersection of Demand and AIC_H, $(0.378,\ 772.09)$
- Now we have drastic *under*provision of the high coverage plan. When we consider the total social marginal cost instead of the firm's marginal cost, we account for moral hazard, which apparently distorts the system so much that the competitive equilibrium is far below the efficient level.
- The yellow region on the plot represents deadweight loss. Now the marginal cost curve is steeper than the demand curve, so the DWL triangle is to the right of the equilibrium price.
- There is still adverse selection, since MC_S is negatively sloped. As long as marginal cost is downward-sloping, high-cost consumers are the first to sign up for insurance.
- In part (2), we based our efficiency point on the intersection of MC_H and Demand, which was far to the left of the competitive equilibrium, because MC_H is steeper than Demand. By using MC_S instead, we can account for moral hazard, which causes MC_S to be flatter than Demand. The resulting efficient equilibrium is thus far to the right of the competitive equilibrium.
- The conclusion I draw from this exercise is that EFC's omittance of moral hazard as a potentially important mechanism could make their results pretty unreliable. At least with this cooked up dataset, moral hazard completely flips the result from the case in which moral hazard is ignored.