

Industrial Organization 2, Problem Set 4: Insurance

Joe Wilske

March 2024

Assignment

- Problem set based on EFC: Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. "Estimating Welfare in Insurance Markets Using Variation in Prices." *The Quarterly Journal of Economics* 125 (3):877-921. doi: 10.1162/qjec.2010.125.3.877.
- Use artificial data set `insdata.csv`. Each row corresponds to an individual, with id number in column 1. Column 2, "p" is the incremental price of the high coverage insurance plan. Column 3, "d", is zero if they chose the low coverage plan and one if they chose the high coverage plan. Column 4, "m" is the medical expenditure.
- Contract L pays 90% of health expenses, so $c_L(m_i) = 0.90m_i$. Contract H pays 96% of health expenses, so $c_H(m_i) = 0.96m_i$. EFC define the incremental cost of contract H to be $c_i = c_H(m_i) - c_L(m_i)$, which in this case is $c_i = 0.06m_i$. A first step will be to calculate these three values.

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 file attached.

Estimates and Standard Errors

	Intercept	Coef_1	Coef_2
Demand	2.546	-0.003	NA
SE_Demand	0.028	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	-94.035	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?

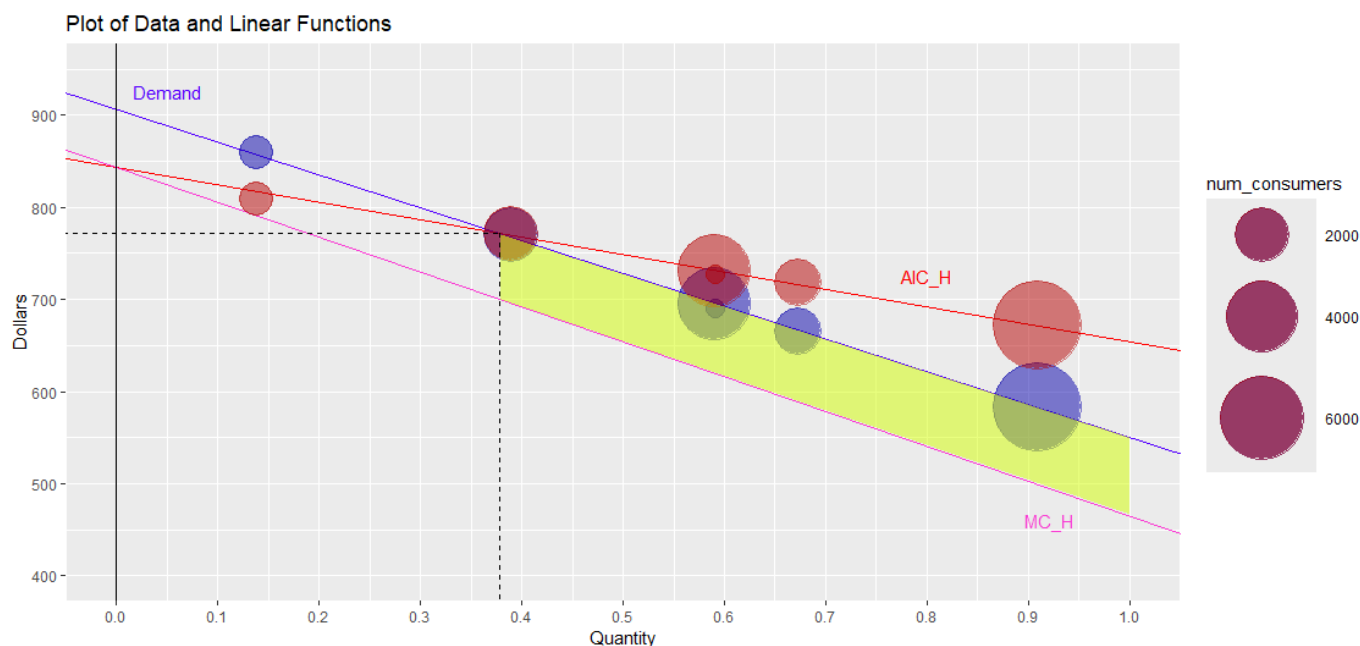


Figure 1

- 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.
- Since the Demand is above MC_H for all $q \in [0, 1]$, the efficient equilibrium is all the way over at $q = 1$. For any $q < 1$, there are people willing to pay a price higher than marginal cost.
- The competitive equilibrium point is at the intersection of Demand and AIC_H because the firm can't observe consumers' risk characteristics. This is $(q_H, p_H) = (0.378, 772.09)$
- $q_H^{\text{comp}} = 0.378 < 1 = q_H^{\text{effnt}}$, so there's underprovision of insurance in equilibrium. Adverse selection prevents the market from providing the efficient level of insurance.
- The yellow region represents the deadweight loss. The area bounded above by consumer's willingness to pay and below by the marginal cost of insuring them, between the competitive and efficient quantities.

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?

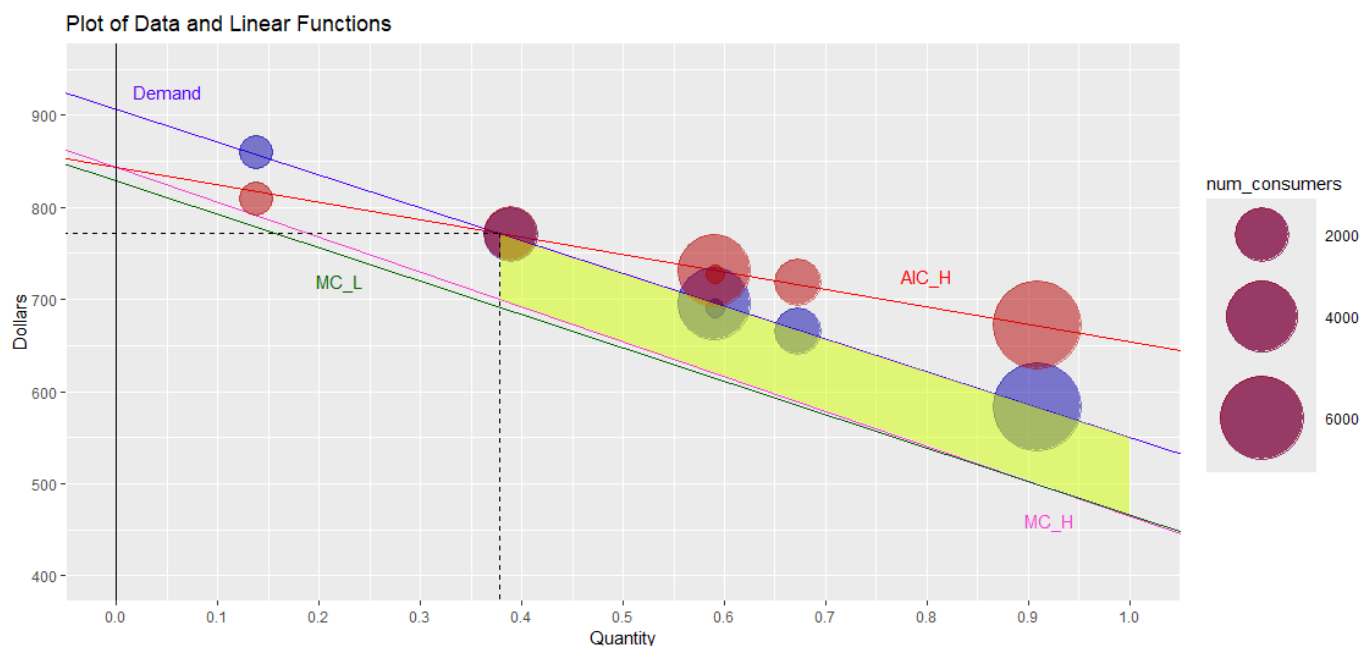


Figure 2: Note the addition of the green MC_L curve.

- 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 observed $MC_H > MC_L$, then we would know that consumers act riskier under higher insurance coverage, which is moral hazard. Since we don't observe a clear difference between MC_H and MC_L , we can't be sure whether or not moral hazard is present.

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)?

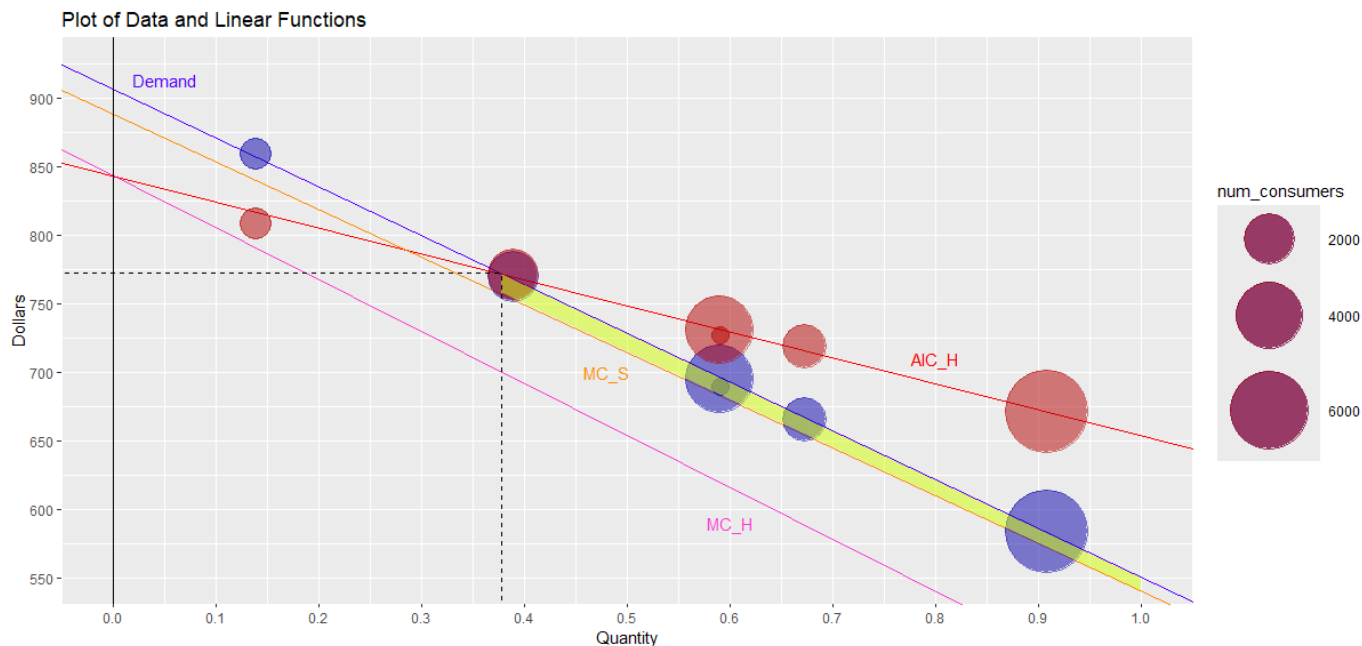


Figure 3: Note the addition of the orange MC_S curve.

- The Difference between MC_H and MC_S is 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 determined by the MC_S curve, which includes moral hazard (consumers changing behavior according to their coverage) in its calculation. Demand is greater than MC_S for all q , so the efficient level of coverage is still at $q = 1$.
- The actual equilibrium point remains at the intersection of Demand and AIC_H , at $(q, p) = (0.378, 772.09)$.
- The competitive and efficient equilibrium points haven't changed, so we have under-provision of insurance by the same quantity as in part (2).
- The yellow region on the plot represents deadweight loss. The consideration of moral hazard reveals a marginal *social* cost that's greater than the *firm's* marginal

cost. Calculating DWL using this higher MC curve closes the gap between the demand curve and the supply curve, shrinking deadweight loss relative to part (2). In other words, the revelation that marginal costs are higher than we thought shows us that inefficiency due to adverse selection isn't as serious as it previously appeared.

- 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.
- The conclusion I draw from this exercise is that EFC's omission of moral hazard as a potentially important factor implies that their calculations probably overstate the loss of efficiency due to adverse selection. In their case, the efficient point isn't an edge solution, so considering moral hazard would raise the MC curve and shift the efficient q closer toward the actual q . It would also shrink the DWL region.