1. Henry Ford’s five dollar day In 1914 Henry Ford made a much-publicized decision to raise the wage of his auto workers to $5 a day, considerably above the level needed to attract them. This pay hike occurred without pressure from the workers, who were non-unionized. Why did Ford do it?

2. Sharecropping Consider the following example of the prototypical moral hazard model of class, with 2 outcomes and 2 actions:

\[ y_1 \equiv y_F = 10, \quad y_2 \equiv y_S = \alpha > 10 \]
\[ c_0 = 0, \quad c_1 = 40 \]
\[ \phi^0 = (.9, .1), \quad \phi^1 = (.5, .5), \]
\[ U = 8. \]

Interpret the Principal as an (absentee) landlord and the Agent as a farmer. The asymmetric information is about A’s effort: if the farmer works hard then the value of the crop is more likely to be \( \alpha \). Throughout assume that \( \alpha \) is such that

\[ g(e_1) > g(e_0). \]

**a. Benchmark analysis** Suppose first that there is no asymmetric information: P can observe \( e \). Explain how P can guarantee himself an expected profit of \( g(e_1) \) using an appropriate wage contract—whether the agent is risk neutral or risk averse.

**b.** For the remainder of the question, suppose P cannot observe \( e \) and he faces no nonnegativity constraint on wages (i.e., he can set \( w_F < 0 \)). Explain why, if P implements either effort level \( e \) in the least cost way, he will use an incentive contract in which the agent’s IR constraint is binding.

**c.** If the principal wants to implement \( e_1 \), what are the IR and IC constraints his incentive contract \((w_F, w_S)\) must satisfy? Putting \( v(w_F) \) on the horizontal axis and \( v(w_S) \) on the vertical axis, shade in the points \((v(w_F), v(w_S))\) that satisfy the IR constraint, the points that satisfy the IC constraint, and the points that satisfy both constraints.

Now suppose the agent is risk neutral with \( v(w) = w \).

**d.** Calculate \( g(e_0) \) and \( g(e_1) \) as functions of \( \alpha \). For what values of \( \alpha \) is \( g(e_1) > g(e_0) \)?

**e.** Suppose \( P \) wants to implement \( e_1 \). Find the equation of \( P \)'s isocost lines, and graphically show the set of incentive contracts that minimize \( P \)'s cost of implementing high effort. (This involves using your shaded areas from part c.) Explain geometrically why, to implement \( e_1 \) in the least cost way, IC need not be binding (although it is binding in one of the cost-minimizing incentive contracts.)

**f.** Why is it profit maximizing for \( P \) to simply rent his land to A? Calculate the rent that \( P \) will be able to charge A. Write the residual claimant contract that is equivalent—both for the agent and the principal—to renting the land. Explain why renting the land—or, equivalently, using a residual claimant contract—leads to a socially efficient outcome (please explain in terms of full appropriation).
Now assume instead that the agent is risk averse, with
\[ v(w) = 20\sqrt{w} - 22. \]

g. Calculate \( g(e_1) \) and \( g(e_0) \) as functions of \( \alpha \). For what values of \( \alpha \) is \( g(e_1) > g(e_0) \)?

h. Argue that, to implement \( e_1 \) in the least-cost manner, P will now use a contract in which both the IR and IC constraints are binding.

i. For each effort level \( e \), find the wage contract that minimizes P’s expected cost of implementing \( e \). Also calculate \( c(e) \) for each \( e \). The contract P uses to implement \( e_1 \) can be interpreted as a sharecropping contract. Explain why.

j. For what values of \( \alpha \) will P implement \( e_1 \)? Explain why the outcome is not Pareto optimal for these values of \( \alpha \). What is the source of the deadweight loss?\(^1\) Compare P’s expected profit in this case with his first-best outcome. Why is it no longer profit maximizing for P to simply rent his land to A when A is risk averse?

k. For what values of \( \alpha \) will P implement \( e_0 \) even though \( g(e_1) > g(e_0) \)? Explain why the outcome is not Pareto optimal for these values of \( \alpha \). What is the source of the deadweight loss?

3. **Good jobs and bad jobs** Consider again the Example in Question 2, but now interpret the principal as a firm, and interpret the agent as a manager who is hired by the principal from a pool of identical competing workers, each of whom achieves utility \( U \) at her current job. Any agent he hires is risk neutral with \( v(w) = w \) (and he only hires one person from the pool). Unlike question 2, now suppose whoever P hires has no non-labor wealth, so P’s incentive contract also must satisfy the nonnegativity constraints \( w_F \geq 0 \) and \( w_S \geq 0 \).

a. Find the contract \( (w_F^*, w_S^*) \) that implements \( e_1 \) in the least-cost way, and calculate \( c(e_1) \). Explain why IR is not binding in the contract, hence why there will be an “excess demand” for the manager job. Also explain why, in spite of the excess demand, P will not be tempted to reduce \( w_S \) below \( w_S^* \) when an applicant who did not get the job pleads: “Give me the job instead. I am just as able and I will work hard even if you pay me less than \( w_S^* \) if I succeed.”

b. For what values of \( \alpha \) will P implement \( e_1 \)? If P implements \( e_1 \), is the outcome efficient? Does P fully appropriate his social contribution? That is, is \( PB_P(e_1) = SB_P(e_1) \), where the principal’s Private Benefit from implementing any effort level \( e \) is given by

\[ PB_P(e) = \pi_P(C_e^*, e) \equiv E\theta(e) - c(e), \]

while the Social Benefit he contributes from implementing \( e \) is

\[ SB_P(e) \equiv GFT_{\text{with him}} - GFT_{\text{without him}} = g(e). \]

The Appropriation and efficiency Since P does not fully appropriate in implementing \( e_1 \), you may be suspicious about the efficiency conclusion from part b. After all, from an appropriation perspective, when \( PB \neq SB \) we typically expect inefficiency. Not to disappoint, for what values of \( \alpha \) will P implement \( e_0 \) even though \( g(e_1) > g(e_0) \)? Explain the inefficiency in terms of an appropriation failure (i.e., \( PB \neq SB \)).

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\(^1\)It may help you to think of the deadweight loss from the incentive contract implementing \( e_1 \) as the cost of buying a 100% theft-proof burglar alarm: it prevents A from “stealing” some of the GFT by delivering \( e_0 \).

\(^2\)P is responsible for all the GFT because without him there would be no manager job! Also notice “\( GFT_{\text{with him}} \)” should more correctly be labeled “\( GFT_{\text{with him}} \) when he implements \( e \).”