

Lecture V: Understanding Firms

Charles B. Moss

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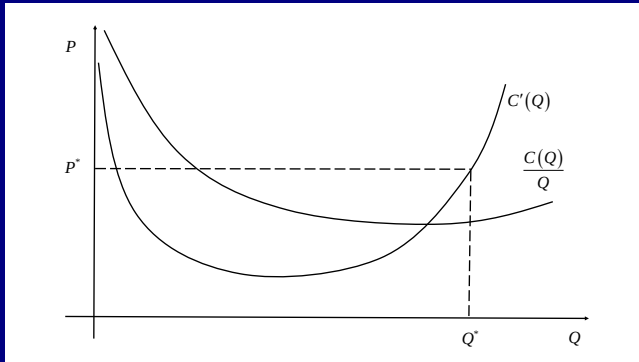
Models of the Firm

Principle Agent Model

Neoclassical Theory

- ▶ Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure* Oxford University Press.
- ▶ The neoclassical model of the firm is our traditional treatment of the firm that produces a single produce using n inputs.
- ▶ "It is supposed that the firm is run by a selfless manager, M , who chooses input and output levels to maximize profit. This in turn implies the manager minimizes costs (Hart p. 15)."
- ▶ Following the classical concepts from microeconomic theory, the neoclassical firm operates where the marginal cost of production equals the price of the output.

Neoclassical Firm



- ▶] Following our development in production economics we implicitly have three stages of production: (1) Stage I is the region where the average variable cost is falling ending where the average variable cost is equal to the marginal cost. (2) Stage II is the region where the average variable cost is increasing before the vertical asymptote of the marginal cost (in this region marginal cost is also increasing). (3) Stage III is actually the quantities after the marginal cost reaches its horizontal asymptote.
- ▶ Hart also introduces the concept of fixed cost – "There are some fixed costs of production (plant, machines, buildings) that must be incurred whatever level of output. As output increases, variable costs increase, but fixed costs do not."
- c. He closes the loop of the discussion with the concept that eventually the manager's abilities or time becomes a limiting factor.

- ▶ Is this model of the firm good?
 - ▶ "On the positive side, the theory is surely right to stress the role of technology in general, and returns to scale in particular, as important determinants of the size of the firm (Hart p.16)."
 - ▶ Chandler, Alred D. 1994. *Scale and Scope: The Dynamics of Industrial Capitalism*. Harvard University Press.
 - ▶ The model focuses on the optimal behavior of the firm in the choice of input and output levels in the face of input and output prices.
 - ▶ "First, it completely ignores incentive problems *within* the firm. The firm is treated as a 'black box', inside which everything operates perfectly smoothly and everybody does what they are told (Hart p. 16)."

- ▶ Continued
 - ▶ "Second, the theory has nothing to say about the internal organization of the firms—their hierarchical structure, how decisions are delegated, who has authority (Hart pp. 16-17)."
 - ▶ "Third, and related, the theory does not satisfactorily pin down the boundaries of the firm (Hart p.17)."

Principle Agent Model

- ▶ Basic Sole Proprietorship Model
- ▶ Jensen and Meckling start with a sole proprietor (owner) of a firm that derives two types of returns from his operation of assets: Wealth (or the net present value of profit) $V(I)$ (where I is the level of investment), and “utility generated by various non-pecuniary aspects of his entrepreneurial activities (Jensen and Meckling p.312)” (where X is a vector of the levels of non-pecuniary benefits).

- ▶ They then define $C(X)$ as the cost of providing these non-pecuniary benefits [perks], $P(X)$ as the value of those perks to the firm, and $B(X) = P(X) - C(X)$ as the net benefits of the perks to the firm. The optimal level of perks is then defined by the level of perks X^* such that

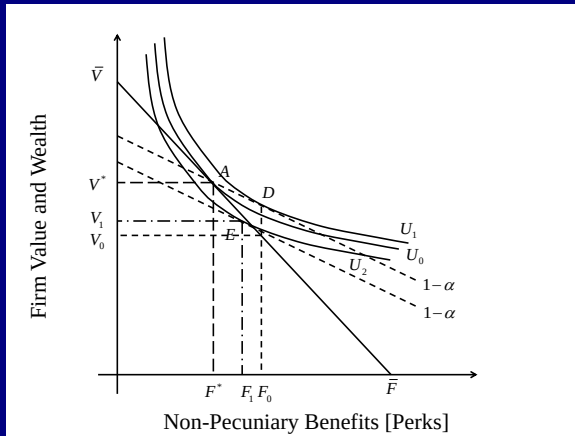
$$\frac{\partial B(X^*)}{\partial X^*} = \frac{\partial P(X^*)}{\partial X^*} - \frac{\partial C(X^*)}{\partial X^*} = 0. \quad (1)$$

Choosing the level of perks according to Equation 1 maximizes the value of the firm with respect to perks.

- ▶ The economic cost associated with giving the manager too many perks is then represented by $F = B(X^*) - B(X) > 0$.

- ▶ The manager always maximizes utility at some positive level of F .
 - ▶ If no perks are given to the owner/operator, the value of the firm is $\bar{V}$ (with $F = 0$ and assuming that the overall level of investment in the firm is initially fixed at $\bar{I}$ so that $\bar{V} = V(\bar{I})$), while dedicating all the proceeds to perks yields perks of $\bar{F}$ (with $\bar{V} = 0$).
 - ▶ $\bar{V}\bar{F}$ yields a “budget constraint.”
 - ▶ The slope of this budget constraint is -1 (to gain an additional dollar of perks requires giving up a dollar of wealth or income).
- ▶ The owner/operator maximizes utility subject to this budget constraint yielding an optimal choice of the value of the firm of V^* and an optimal level of perks of F^* – implying a utility of U_0 at point A.

Choice of the Firm Value and Non-pecuniary Benefits by Sole Proprietorship



External Investment

- ▶ Assume that the owner/operator sells α ($0 \leq \alpha \leq 1$) of the firm to an outside investor.
 - ▶ We assume that the agreement stipulates that the investor will receive α of the wealth (V) generated for his investment.
 - ▶ This sale changes the original owner/operator's budget line. It no longer has a slope of -1, but now has a slope of $-(1 - \alpha)$.
 - ▶ This means that the original owner/operator does not have to pay the full cost of his perks.
 - ▶ His optimal now shifts from A on utility function U_0 to point D on utility function U_1 (by choosing perks F_0).

- ▶ Unfortunately, this choice lies outside the budget constraint. If the original owner/operator chooses perks F_0 , the value of the firm falls to V_0 .

Theorem. For a claim on the firm of $(1 - \alpha)$ the outsider will pay only $(1 - \alpha)$ times the value he expects the firm to have given the induced change in behavior of the owner-manager (Jensen and Meckling p. 318).

- ▶ The loss in firm value associated with the principal/agent problem is $\bar{V} - V_0$.
- ▶ This decline in value is entirely borne by the owner/operator.
- ▶ The owner/operator is forced to choose point E (at a utility of U_2). He gets perks of F_1 which is greater than his original perks of F^* and he is able to sell an ownership share of αV_1 . However, we notice that the value of the firm is still less than its original value ($V^* - V_1 > 0$).
- ▶ It is clear that the owner/operator would never choose to sell a share of the equity of an existing firm because the principal/agent problem implies that the loss in the value of the firm exceeds the gain in perks (i.e., the resulting level of utility U_2 is lower than the original level of utility).

- ▶ How viable is the Jensen and Meckling model for the behavior of farm firms?
- ▶ One question is the choice of equipment size.