

**UNIT EC425, LEVEL 2**

**PRINCIPAL – AGENT ANALYSIS**

**MICROECONOMICS 2:  
ECONOMICS AND ORGANISATIONS**

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## **The Divorce of Ownership from Control: How can we control 'errant' agents?**

### **Introduction**

The rapid development of the stock market and increases in overseas investments in the early decades of the 20<sup>th</sup> century led many authors to question the traditional theory of the firm based on the firm maximising profits. Such events led to the divorce of ownership from control, and thus the opportunity for managers to maximise their own utility at the expense of profits. This, of course, required that owners were passive (possibly lacking information) and that product markets were imperfect. In the late 1950s and early 1960s a number of authors developed theoretical perspectives that embodied this rise in 'managerialism'. Specifically, there was

- Baumol's (1962) revenue maximisation hypothesis
- Williamson's (1963) expense preference model
- Marris' (1963) growth maximisation model

In the public sector too, managers, in the form of 'bureaucrats', were seen to be maximising their utility at the expense of the public. Due, in no small measure to the inability (unwillingness?) of politicians, who are viewed as putting electoral considerations before management of public servants.

Thus, models by

- Niskanen (1968)
- Migue and Belanger (1974)

criticised the development of government bureaucracies.

Non-profit organisations too were subject to scrutiny. For example,

- Newhouse (1970)

discussed the not-for-profit hospital showing how professional interference hampered the optimal quantity-quality mix.

### **Agency Issues**

Theoretical models and real world experience have shown that there is a multiplicity of stakeholders with varying goals. Since the 1970s microeconomic theory has addressed the differences between stakeholders in terms of Principals and Agents, reflecting a hierarchy of goals. Examples of principal-agent relationships include

- Shareholders and managers
- Managers and employees
- regulators and regulated
- customers and suppliers
- students and lecturers (though note there may be multiple principals and one agent in this relationship)

The theory of Agency, as it has become to be known, has two strands

- positive - that which deals with predicting the realisation of outcomes between principals and agents
- normative - that which shows what the relationship should be by designing optimal contracts.

We begin with the former, which is identified with the contractual school and has its roots in the private sector. The normative approach, on the other hand, is considered a management tool irrespective of the sector concerned.

### **Managerial Behaviour and ownership structure**

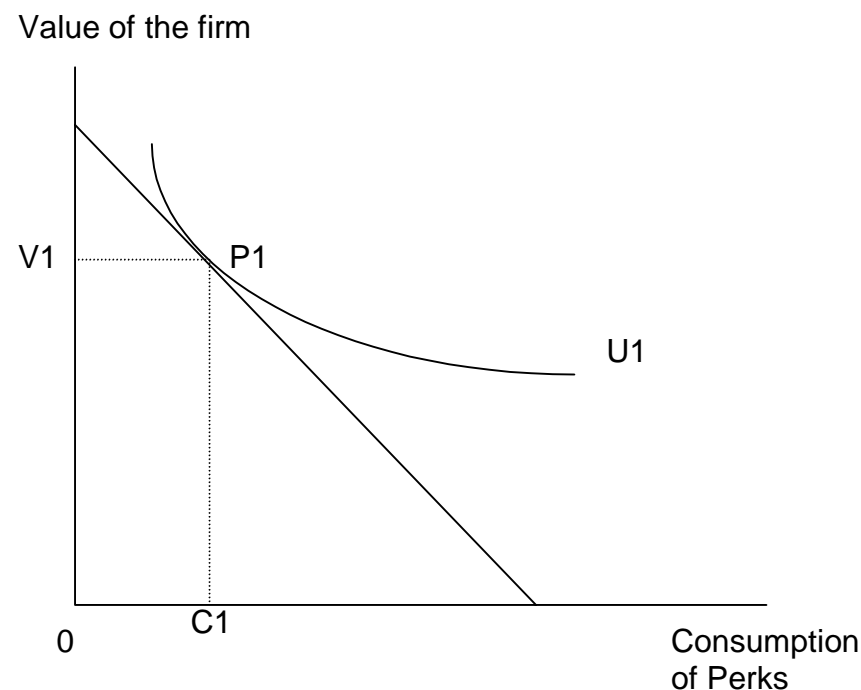
How does ownership structure of the firm affect the behaviour of the manager?

### **Jensen & Meckling (1976)**

Argued that there are incentives for managers to increase their consumption of perquisites and that it is in the interests of owners to constrain such behaviour.

J & M show this by making the owner-manager sell part of their equity.

The initial equilibrium is given where the owner-manager maximise their utility by trading off the firms (and thus their) wealth with perks. This is the point where the MU of an additional £ of spending on perks equates with the MU of an additional £ of wealth. Diagrammatically, this means equating the firm's budget constraint (a slope of -1) with the owner-manager's highest indifference curve depicting perk-wealth trade-offs. Point P1.

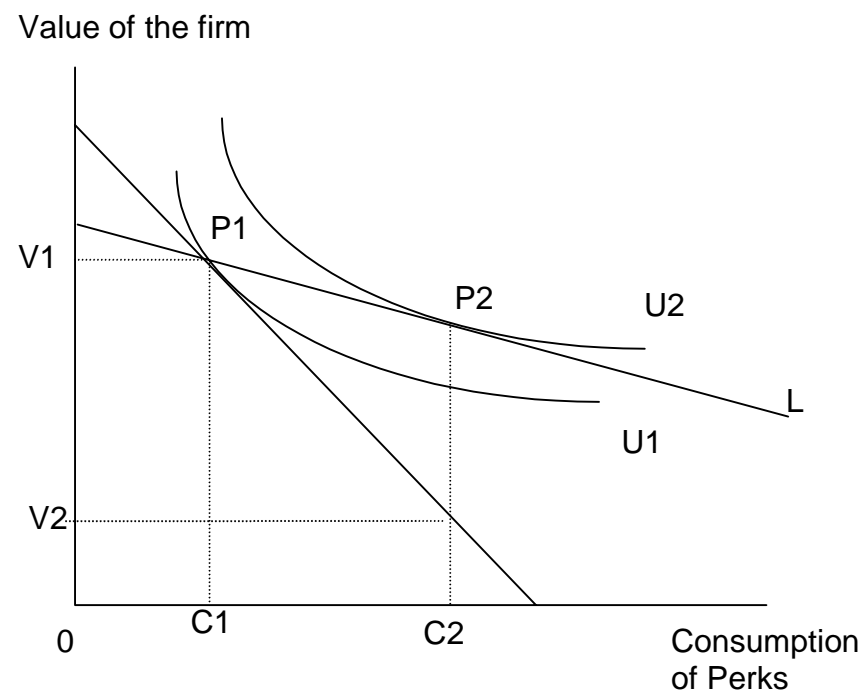


Suppose the Owner Manager sells a fraction of their shares (1 - a) to outsiders, i.e. the manager owns a. Assume  $a = 0.6$ . If the manager decides to spend an additional £ on perks, the value of the firm is reduced by £1 but personal wealth will only fall by 60p for every additional £ spent on perks. The wealth of outside shareholders falls by 40p. The manager will now spend more on perks, in this case they will spend more on personal consumption until the MU of an additional £ on perks equals the MU of an additional 60p in personal wealth.

How much more the manager will spend on perks depends on

### 1. Whether the outside purchasers are Naive

Suppose the outsiders are willing to pay 40% of the total value of the firm, i.e. 40% of  $V_1$ . The budget constraint must have a slope of -0.6, since the manager can trade £1 of perks for 60p of wealth. The budget constraint also passes through  $P_1$ . This is the point where the manager consumes  $C_1$  and wealth of the firm is  $V_1$  (though 40% of  $V_1$  is in the form of cash and 60% are shares). The budget constraint is now  $L$ .

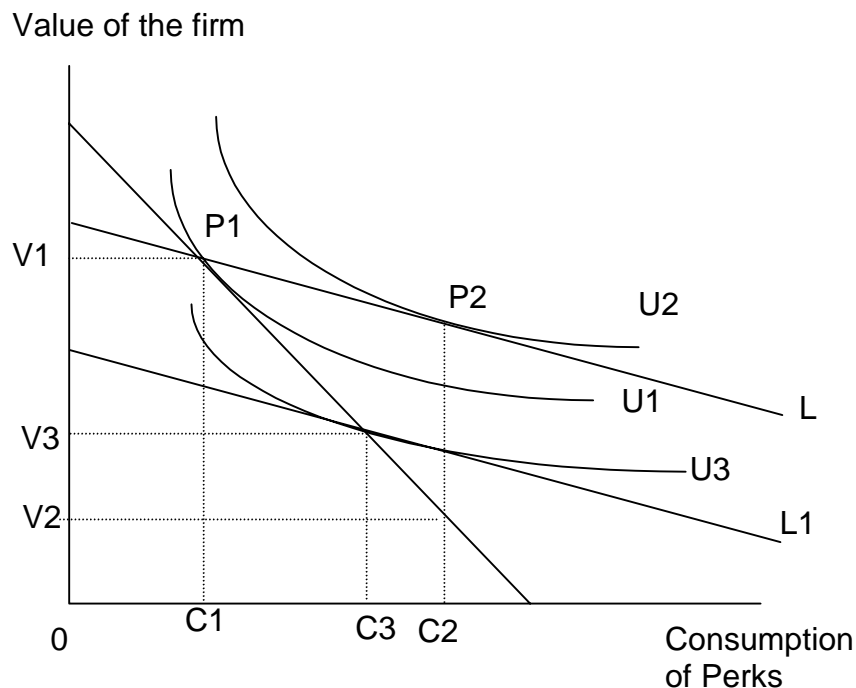


If outsiders are naive, the manager will consume more perks  $C_2$ . The value of the firm is reduced to  $V_2$ . Outside shareholders find the value of their shares are now only worth 40% of  $V_2$  (not 40% of  $V_1$ ).

## 2. Outsiders are not so naive

Clearly, in the real world, outside buyers are not so naive. Assume that outsiders know

- that managers will increase their consumption on perks such that  $MU$  of an extra £ on perks =  $MU$  of 60p on firm value.
- the preferences of managers i.e., the shape of their indifference curves.



They will only be prepared to pay 40% of  $V3$  for the shares not 40% of  $V1$ . Thus, outsiders neither gain nor lose by buying into the firm.

The wealth of the manager is reduced from  $V1$  to  $V3$  and perks have increased. Utility is decreased from  $U2$  to  $U3$ .

So the manager will only sell shares in his firm if they prefer wealth in the form of cash.

## 3. Bonding and monitoring

Monitoring involves observing the manager's behaviour to restrict expenditure on perks e.g. external auditors, a board of directors.

Bonding is an initiative taken by the manager so that they will not spend more on perks.

Bonding and monitoring costs are borne by the manager but by consuming less they increase their utility.

Note that monitoring costs reduces perks but at a reducing rate. See the article by Jensen and Meckling (1976)

Unlike other theory of the firm approaches Jensen and Meckling are demonstrating the rational tendency for managers to embark on maximising their own utility once

control begins to lie elsewhere (other models only assume this).

Agency costs can be high but note that efficiency is not hampered. Sellers must want cash because the MU they obtain from an alternative use is higher. Similarly, purchasers must be placing a higher value on this project than on an alternative.

### Principal-Agent Analysis

In P-A analysis we are concerned with the design of contracts by principals that will induce agents to offer high levels of effort.

Consider a situation where an Agent has the following utility function.

$$U_A = f(w, e)$$

where  $w$  is the wage rate,  $e$  is the level of effort put in by the agent in his/her work specifically,

$$U_A = w^{0.5} - e^2$$

Note that the wage rate shows diminishing MU of income or money and that effort costs.

We will assume that the Agent can put in 2 effort levels

$e=1$ . A low effort level which is associated with a lower output for the organisation and hence profit for the Principal.

$e=2$ . A high effort rate.

Ideally, the Principal would like the Agent to work hard but the environment is uncertain.

Further assume

	Boom	Normal	Slump	
Sales	$p=0.333$	$p=0.333$	$p=0.333$	<u>Expected Sales</u>
$e=1$	500	100	100	233
$e=2$	500	500	100	366

So how can the Principal induce maximum returns for himself, thereby maximising his utility?

Essentially, the Principal has to do 2 things.

- Make the Agent participate in the contract, given the existence of various states of nature. This is called the **Participation Constraint**.
- Give the Agent the incentive to engage in high levels of effort once they have joined the contract. This is called the **Incentive Compatibility Constraint**.

The former requires knowledge of the minimum level of expected utility that the Agent will accept and thus their reservation wage. In this case we will assume

$$EU_A = 3, \text{ implying with } e = 1 \text{ that } w = 16, \text{ i.e. } (3 = 16^{0.5} - 1)$$

The latter involves the Agent comparing the two levels of effort along with their reservation wage to see if it is worthwhile engaging in high levels of effort.

However, it is possible to make the Agent engage in high levels of effort if they can be deterred from shirking (moral hazard). This is possible only in cases where information is perfect.

### **Case 1: No information Asymmetries between Principal and Agent**

In a perfect world the Principal could observe the Agent's effort level and the Principal would expect Sales to be £366. However, is this sufficiently above £233 to make it worthwhile for the Principal to pay the Agent to provide  $e=2$ ?

Essentially, the Principal can provide a fixed wage and the Agent would bear no risk for effort levels  $=2$ . The risk is borne by the Principal because the sales achieved are only random.

But what should be the wage level?

The wage needed to get the Agent to work is determined by deriving the Agents reservation wage given that the Agent's overall utility function must equal at least 3

so,

$$w^{0.5} - 4 \geq 3$$
$$\underline{w \geq 49}$$

Thus, the Principal and Agent would gain from this contract.

Principal's profit = £366 - £49 = £319 which is > £233

Agent's income = £49, which is > £16.

### **Case 2: Information Asymmetry**

In the real world, the Principal cannot observe the Agent's effort. The principal can observe outcomes but only *ex post*.

Thus, a fixed wage deal would allow (at least in a one period setting) the opportunity to shirk.

So the Principal must design a contract, *ex ante*, that exposes the Agent to some risk. The Principal must first make the Agent want to participate in the contract. They do this by noting that pay will be linked to the likelihood of the state of nature and comparing this to the Agents 'bottom line' (that is, their minimum expected utility). Let

y be the remuneration of £100  
z be the remuneration associated with £500

So

$$0.666(y^{0.5} - 1) + 0.333(z^{0.5} - 1) \geq 3$$

$$0.666y^{0.5} \geq 4 - z^{0.5}$$

$$\underline{y^{0.5} \geq 12 - z^{0.5}}$$

Participation Constraint

Further, it is necessary to give the Agent an incentive to produce high effort levels. This is done by simultaneously ensuring the Agent gets higher expected utility from higher effort levels (but with higher returns for given states of nature) than from lower effort levels.

So

$$0.666(y^{0.5} - 1) + 0.333(z^{0.5} - 1) \leq 0.666(z^{0.5} - 4) + 0.333(y^{0.5} - 4)$$

This simplifies to

$$\underline{y^{0.5} \leq z^{0.5} - 9}$$

Constraint

The Incentive Compatibility

Setting the ICC and PC as equalities and solving as simultaneous equations gives  $y = £1$  and  $z = £100$ . So there is a £99 bonus if things go well.

Would the Agent accept the contract?

Yes. If the reservation wage is £16 the expected wage from  $e = 2$  is

$$0.666 \times £99 + 0.333 \times £1 = £66.33$$

Hence,  $ew > rw$  so a 'rational' Agent would put in high levels of effort.

The Principal would also be better off.

Expected Net profits = expected sales - expected costs

$$= £366 - £66.33$$

$$= \underline{\underline{£299.66}}$$

### Some Issues

- Factors that favour high incentive pay
  - The employee's output is sensitive to effort.
  - The employee is not very risk averse.
  - The level of risk that is beyond the employees control is low.
  - The worker's response to increased incentives is high.
- This is a static single period model. Over the long term, moral hazard (shirking) may be difficult to practice.

- Where there are several Agents and one Principal peer pressure may induce effort maximising behaviour. Alternatively, the Principal may be able to obtain benchmarks of good performance against which to measure an Agent's effort. There are a variety of methods discussed in Schotter (1997 chapter 8) relating to the types of control over groups. Specifically, he discusses
  - Forcing Contracts. These specify that the workers meet a certain target that is easy to monitor. If the target is not met then the employer pays the workers nothing. This will increase the effort levels. However, it crucially depends on the extent to which trust exists between the principal and the agents.
  - Efficiency Wages. Here employees motivate workers by paying above the opportunity (reservation) wage and have inspectors monitor job performance at random intervals. If shirking occurs, then the employee is fired on the spot. Clearly, monitoring costs the firm so employees must balance the costs of getting caught shirking on the job with the potential gains from a higher wage.
  - Revenue/Profit Sharing. Here revenue or profit is shared equally. Sadly, this gives rise to a classic prisoner's dilemma – all will defect in the absence of incentives to cooperate.

- Is money the only inducement to ensure effort maximising behaviour? Professionalism and Altruism are important elements of the make-up of many individuals. Principal - Agent models describe situations where individuals are likely to act in their own self-interest and thus need to be constrained. Indeed, although 'optimal contract design' is suggesting choice between Principal and Agent, it is really showing that hierarchy and discipline are the important aspects of successful organisations. Many organisations do require high levels of effort by individuals and some form of inducements must be put in place. However, pecuniary rewards are not the only 'weapon' at the disposal of Principals. A good working environment, including an interesting job, are of paramount importance.

A useful test to see the importance of Principal-Agent contract design is to ask whether there is any link between company performance and the rewards paid to company directors. Here most of the evidence points to virtually no causality. See, for example, the recent articles in the Economic Journal May 1995 on corporate governance, and an interesting paper by Bruce and Buck in Keasey, K, Thompson S and Wright M (1997). This suggests that the link with company performance is significantly strengthened when executive stock options are included in the equations.

In addition, we must remember that there are a variety of other deterrents to shirking by chief executives

- Market for corporate control
- Market for managerial labour
- Product market
- Finally, what implications does this approach have for our understanding of pareto optimality?

### **Reading**

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