

Economic Spying in the Information Age

Industrial espionage is the illicit appropriation of a firm's valuable or confidential information by its competitors. Its strategic importance and sheer volume in the knowledge economy is huge. What is the net effect of economic spying on the marketplace? How strict should anti-espionage legislation be? In this paper, we use game theory to formally answer these questions. We model industrial espionage as a game of information acquisition between two firms, who can learn about demand by independent market research or by spying on the competitor's information. Our main finding is optimistic: we show that aggregate profit in the industry increases as the precision of spying technology improves.

Costs and Benefits of Industrial Espionage

Despite the crucial role of industrial espionage in today's business world, its net effect on the market place is still a subject of heated debate. Management literature identifies the following costs and benefits of economic spying:

- individual businesses suffer significant losses due to illegal acquisition of their commercial secrets;
- + shared knowledge means firms can better coordinate their pricing and production decisions;
- + increased competition benefits consumers, e.g. affordable smartphones due to Samsung spying on Apple.



Image courtesy of stockimages at FreeDigitalPhotos.net

Research Question: Net Effect of Spying

What is the net effect of industrial espionage on market outcomes, competition and welfare? Which of the above factors dominate: costs or benefits?

Game theory – an area of applied mathematics which studies strategic interaction and conflict – helps us answer this question. We model spying as a game and find the equilibrium of this game, i.e. a pair of strategies, one for each “player”, such that each firm's strategy is maximizing its profit, given the competitor's strategy.

The Game of Information Acquisition

Suppose there are two firms on the market producing imperfect substitutes (e.g. Apple and Samsung smartphones). Each firm needs to decide which price p to charge. The profit-maximizing price depends on market demand, which firms are uncertain about. They use two channels of information to learn about demand.

Channel 1: Market Research. This channel is noisy since the firm cannot survey all customers on the market. There will always be some sample bias. Denote the precision of the market survey (the inverse of sampling variance) by m . Optimal price, as calculated using the market research results, is denoted by p_m .

Channel 2: Industrial Espionage. After conducting independent research, each firm steals the results of its competitor's market survey. We assume it is impossible to acquire all confidential documents, hence the spying technology is not perfectly accurate. Denote the precision of intelligence technology by i and the optimal price, as suggested by espionage results, by p_i .

Optimal pricing. In equilibrium, firms will choose a price which is an average of signals generated by market research and industrial espionage, weighted by their precision:

$$p = \frac{p_m m + p_i i}{m + i}.$$

We then substitute the above formula for optimal pricing into the profit equation of the firms and establish how the precision of the spying device p_i affects the sum of the firms' profits, which constitutes our main result.

Result: the sum of the firms' profits increases as the precision of the spying technology improves.

Future Research and Extensions

- We have shown that firms benefit from more precise spying. In order to evaluate the total effect of industrial espionage, we need to consider **consumer welfare**.
- In the current model, industrial espionage is costless. **Costly information acquisition** can alter the firms' incentives to spy, which we will consider next.

Main References

- 1) Barrachina, A., Y. Tauman, and A. Urbano (2014). Entry and espionage with noisy signals. *Games and Economic Behavior* 83, 127-146.
- 2) Myatt, D. P. and C. Wallace (2012). Endogenous information acquisition in coordination games. *The Review of Economic Studies* 79 (1), 340-374.



Image courtesy of basketman at FreeDigitalPhotos.net