

## Chicken!

Consider the game “Chicken!”. Two drivers race towards each other down a straight. First driver to veer is the “chicken”, and loses face. Of course if neither driver veers, their payoffs are very low. If both veer, then they miss each other, of course. Model this as a simultaneous-play game with two actions: Veer or Straight.

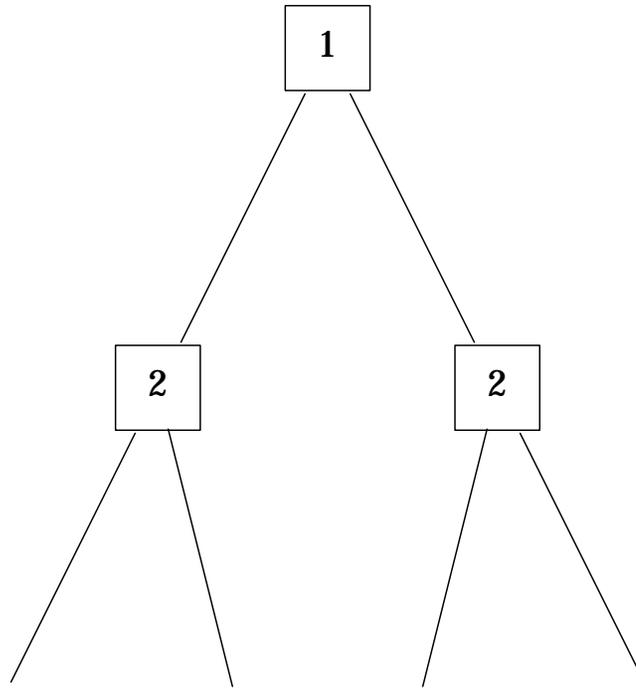
- a. Since the players are identical, focus on one. Describe the four outcomes of the  $2 \times 2$  payoff matrix, and rank them, from 1 = worst to 4 = best.
- b. Is there an Nash equilibrium? (No dice throwing.)
- c. Plot the extensive form of the game. Is there a first-mover advantage? Explain.
- d. How might commitment to one action (“Straight”) be established? Why should this be desirable? How does such commitment turn our simultaneous-play game into a sequential-play game with first-mover advantage?
- e. Can you think of an economic/managerial strategic interaction which resembles Chicken? Explain.


## **Boeing v. Airbus.**

Consider the rivalry between Airbus and Boeing to develop a new commercial jet aircraft. Suppose Boeing is ahead in the development process, and Airbus is considering whether to enter the market.

If Airbus stays out, it earns zero profit, while Boeing enjoys a monopoly and earns a profit of \$1 billion. If Airbus decides to enter and develop the rival 'plane, then Boeing has to decide whether to accommodate Airbus peacefully, or to wage a price war. In the event of peaceful competition, each firm will make a profit of \$300 million. If there is a price war, however, each will lose \$100 million because the prices will fall so low that neither will be able to recoup its development costs.

- a. Draw the tree for this game. Use rollback to find the equilibrium.
- b. Why is Boeing unlikely to be happy about the equilibrium? What would it have preferred? Could it have made a credible threat to get Airbus to behave as it wanted?
- c. What if Boeing had moved first? Would there still have been a credibility problem with Price War? Explain.



## **Strategic Use of Excess Capacity**

An established firm in an industry stands to gain by keeping out new competition. Then it can raise prices to monopoly levels. Since monopoly is socially harmful, the ACCC try to detect and prosecute firms that employ strategies to deter rivals from entering the business.

In 1945, Alcoa was convicted of such a practice. An appeals court in the U.S. found that Alcoa had consistently installed more refining capacity than was justified by demand. In his opinion, judge Learned Hand said:

It was not inevitable that [Alcoa] should always anticipate increases in the demand for ingot and be prepared to supply them. Nothing compelled it to keep doubling and redoubling its capacity before others entered the field. It insists that it never excluded competitors; but we can think of no more effective exclusion than progressively to embrace each new opportunity as it opened and to face every newcomer with new capacity already geared into a great organization.

This case has been debated at length by scholars of competition (antitrust) law and economics. Let's consider the conceptual basis of the case.

- How could the construction of excess capacity deter new competitors?
- What distinguishes this strategy from others?
- Why might it fail?

### *Case Discussion*

An established firm wants *to convince* potential new competitors that the business would not be profitable for them. This basically means that if they entered, the price would be too low to cover their costs. Of course, the established firm could simply put out word that it would fight an unrelenting price war against any newcomers. But why would the newcomers believe such a verbal threat? After all, a price war is costly to the established firm too.

Installing excess capacity in excess of the needs of current production *gives credibility* to the incumbent's threat. When such capacity is in place, output can be expanded more quickly and at less extra cost. It remains only to staff the equipment and get the materials; the capital costs have already been incurred and are byones (sunk). A *price war* can be fought more easily, more cheaply, and therefore *more credibly*.

This makes sense in the logic of strategy, but will such a device work *in practice*? There are at least two qualifications that limit its success:

- If there are many firms already in the industry, then discouraging newcomers gives more profit to all of the incumbents. Will any one firm bear the costs of capacity when it only reaps a part of the benefit? This is a *standard Prisoner's Dilemma*. If one firm is large enough, it may be in its own interests to provide such a service to the rest of the industry. Otherwise the firms must collude in building capacity; this may be hard to hide from the competition watchdog.

In the Alcoa case, we should not regard the dilemma of who will install capacity as a serious problem, because Alcoa had a 90% share of the primary aluminium ingot market.

- But — second — is the market for aluminium ingots the right market? Even if there are no other other producers of primary ingots, secondary production from scrap is a source of competition. So is Alcoa's own future production. Many aluminium-based products are highly durable. If Alcoa puts more aluminium on the market in the future, then the values of these durable goods will fall. If the company cannot credibly guarantee customers that it will *restrict its own future output*, then they will fear such losses, and therefore reduce the price they are willing to pay for aluminium now.

This second point is similar to *IBM's problem of pricing mainframe computers*. The U.S. government argued that by leasing them instead of selling them, IBM had established an entry barrier for other firms, resulting in monopoly profits. *IBM defended its leasing policy*: insulates customers from the risk of obsolescence, provides flexibility when needs change, commits IBM to maintain its leased equipment, and overcomes problems of raising capital for small firms.

But how would you expect prices to differ if IBM sold most of its large mainframes, rather than leasing?

When a new computer is launched, IBM can sell the first models at very high prices to customers impatiently awaiting the new technology. Once a greater flow of computers is available, IBM is tempted to lower the price and sell more: the main cost of developing and producing the computer has already been incurred, and each additional sale is gravy.

But here's the problem: if customers expect that IBM is about to lower its price, they will delay their purchase. When most customers are waiting, IBM has an incentive to accelerate its price reductions and capture the customers sooner. *For durable goods, a monopolist in effect competes with its future self in a way that lowers prices.*

*Leasing* serves as a *commitment device* that enables IBM to keep prices high. The leasing contracts make it much more costly for IBM to lower its price, since, with short-term leases, any price reductions must be passed on to *all* customers, not just the ones who haven't bought yet. But when the existing customer base owns its computers, this trade-off does not arise: the owners are not eligible for refunds.

Short-term leases are like moving in small steps: using short, renewable contracts, IBM can credibly maintain high prices, customers have no reason to wait, and IBM earns high profits.

## Two Wrongs Keep Things Right

Parents often face a difficult problem *punishing their children for bad behaviour*. Kids have an uncanny sense that the parents' *threats to punish may not be credible*. They recognise that the punishment may hurt the parents as much as the children (although for very different reasons). The standard parental dodge to the inconsistency is that the punishment is for the child's own good. How can parents do a better job at making their threat to punish bad behaviour *credible*?

### *Case Discussion*

With two parents and one child, we have a three-person game. Teamwork can help the parents make an honest threat to punish a naughty child. Say the son misbehaves, and it's the father's turn to carry out the punishment. If the son attempts to rescue himself by pointing out the "irrationality" of the father's actions, Dad can respond that he would, given the choice, prefer not to punish Junior, but, were he to renege, then that would be breaking an agreement "with your mother". *Breaking that agreement would be worse than the cost to the father of punishing the child.* Thus the threat is made credible.

Even single parents can play this game, but the argument gets much more convoluted, as the punishment agreement must be made with the child. In response to the son's accusation of "irrationality", Dad can respond that he would, given the choice, prefer not to punish his son, but, were he to renege, then this would be a misdeed on his part, a misdeed for which he should be punished. Thus he is punishing Junior only to avoid getting punished himself. *But who is there to punish him?* It's Junior!

Junior: "If you forgive me, I'll forgive you and not punish you for not punishing me."

Dad: "But if you fail to punish me for being lenient, then this would be the *second* punishable offence of yours today!"

And so on and so forth do they keep each other honest. This may seem a little farfetched, but no more convoluted than most arguments used to justify punishing naughty kids.