Competition and Nonmonotonicity

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- Suppose there if innovation is feasible, is a net benefit G from innovation.
- By spending c in R&D, a firm can determine whether innovation is feasible.
- Ex ante feasibility is β.
- Assume that if the firm does not spend c, sunk costs are so high that going ahead with the innovation activity is a negative NPV project.
- Assume that the firm currently is a monopolist in some market.
- However, if he innovates successfully, he has to quit the current market.
- Then if the following condition holds, no innovation occurs:

$$\beta G - c < a.$$

- Suppose now that there ate 2 firms. If one firm innovates, it confirms that the innovation is feasible.
- This enables another firm to follow suit without incurring cost c. However, patent protection means that both firms get θG, where $1 \geq \theta \geq 1/2$.
- Assume the following hold:

$$\beta G - c > (1/2)a$$

$$\theta G - c < a$$

- These conditions imply that one firm will innovate, but the other will enjoy monopoly profits.

- Suppose now there are 3 firms.
- The following conditions imply that while it is profitable to innovate if only one firm were to do so (the first condition below), one of the remaining Duopolists would mimic (the second condition).
- But then it is no longer profitable ex ante for the first firm (third condition).
  $\beta G - c > (1/3)a$
  $\theta G - c > (1/2)a$
  $\beta\theta G - c < (1/3)a$
- We show below that there exist feasible parameter values for which all of the above conditions for Monopoly, Duopoly and 3 firm Oligopoly hold
- Thus, we have non-monotonicity of innovation w.r.t. the number of rims.

Suppose $\beta = \theta$.

Need $\beta^2 G < (1/3)a + c$

$\beta G < a + c$

$\beta G > (1/2)a + c$

$\beta = (1/2)$

$G = 3.5$

$a = 1$

$c = 1$

$\beta^2 G = 0.875 < (1/3)a + c = \frac{4}{3}$

$\beta G = 1.75 < a + c = 2$

$\beta G = 1.75 > (1/2)a + c = \frac{3}{2}$