How broad should the scope of patent protection be?

Klemperer
1990, RAND

• What is the optimal breadth of patent protection?

• Patents of optimal length and breadth that allocate a given profit to the innovator at the least social cost.
Sketch of the model:

- horizontal differentiation,
- a patentholder ($H$) and competitors,
- **Breadth**: distance of the product spectrum away from the patentholder’s product where competing firms are allowed,
- Consumers prefer the patented products at equal prices,
- $H$ and consumers are located at 0,
- Consumers’ have
  a. travel cost per unit of distance, $t$;
  b. reservation price, $m$. 
Graph: 3 consumers, identical $m$, different $t$

- Consumer 1 is indifferent between
  - buying $H$’s product located at 0 at price $p^*$,
  - and buying the product from a competitor; the travel cost is $t_1b$.

- Consumer 2 buys from a competitor because $p^* > t_2b$, i.e., it is cheaper to travel to $b$ and buy from a competitor.

- Consumer 3 buys from $H$ because $p^* < t_3b$, i.e., it is cheaper to buy the patented product rather than travelling to $b$. 
1. A simple illustration of Klemperer (van Dijk, 1994)
• If perfect competition: maximum welfare, no loss.
• Comparison of the patent situation with the perfectly competitive situation.

Two kinds of welfare losses ($WL$):
• $WL_1$: consumers who shift to less preferred varieties. These consumers face travel costs (e.g., consumer 2, who incurs travel cost $t_2b$)

• $WL_1$: consumers drop out of the market; too low reservation price.
  – e.g., if the reservation price of consumer 3 is below the price charged by $H$ ($p^* > m$) he will not buy.
  – Or if $t_2b > m$, consumer 2 will not buy.
• Assumption: there is a minimum profit level that makes $H$ invest in R&D.

• Patent policy maker have two instruments:
  – patent breadth,
  – patent length;

• A long but narrow patent can provide as much profit as a short but broad patent.

• **Problem**: How to determine the optimal mixture of breadth and length that is optimal from a social viewpoint?

• The distribution of $t$, and the distribution of $m$ turn out to be decisive for the optimal mix.
• **Extreme cases:**
  – narrow patents with long life are optimal when consumers face identical travel costs;
  – broad patents with adjusted life are optimal when the reservation prices are identical.

• **Why?**

• **A1:** all consumers face identical travel costs.
  
  \[ H \text{ sets } p^* = tb - \varepsilon. \]

  Suppose that all consumers have the same travel cost \( t_1 \) (see graph), thus \( p^* < t_1 b \). No consumers will buy from competitors. \( WL? \)
  
  – \( WL_1 = 0 \)
  
  – \( WL_2 > 0 \)

• **Objective of policy maker:** reduce \( WL_2 \);
  
  set very narrow patent to force \( H \) to reduce the price.
  
  The lifetime will be adjusted such as to give the given reward to \( H \).
• A2: all consumers have identical reservation prices.

\[ p^* = m \] (comparable to perfect price discrimination which is commonly known to cause no welfare loss, compared to perfect competition).

\[ WL? \]
- \[ WL_1 > 0 \]
- \[ WL_2 = 0 \]

• **Objective of the policy maker:** reduce \( WL_1 \); set very broad patent in order to reduce \( WL_1 \).

The lifetime must be adjusted in order to provide the minimum profit level required.