Patent Pools & Product Development: Perfect Complements Revisited

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[1]The views expressed are those of the authors. They are not purported to re ect the views of the U.S. Department of Justice.

Patent Pools

De nition (Patent Pool)

A collection of distinct patents held by separate entities that are pooled for purposes of joint licensing.

Costs

No production costs, only licensing costs:

1. **Fees** (treated as xed costs)
   hence: the incentive to pool is tied to market pro t
2. **Royalties** (common form of licensing)

$$\begin{aligned} \text{Pool:} \quad & R_p \quad 2Q(R_p) & =) \quad & R_p = \tfrac{a}{2} \\ \text{No Pool:} \quad & r_k\,(Q_i(r_k + r_l) \quad + Q_j(r_k + r_l)\ ) & =) \quad & r \quad = \tfrac{a}{3}: \end{aligned}$$

$$R_p = \frac{1}{2}a < \frac{2}{3}a = 2r \quad = R_n$$

Theorem (Generalized Conventional Wisdom)

Pooling increases all measures of welfare when there are royalty contracts, even when products are di erentiated and there are are spillovers in development:

$$W_p > W_n; \qquad 8 \ ; \quad \text{and } W \ 2 \ fCS; \quad ; V; TWg$$

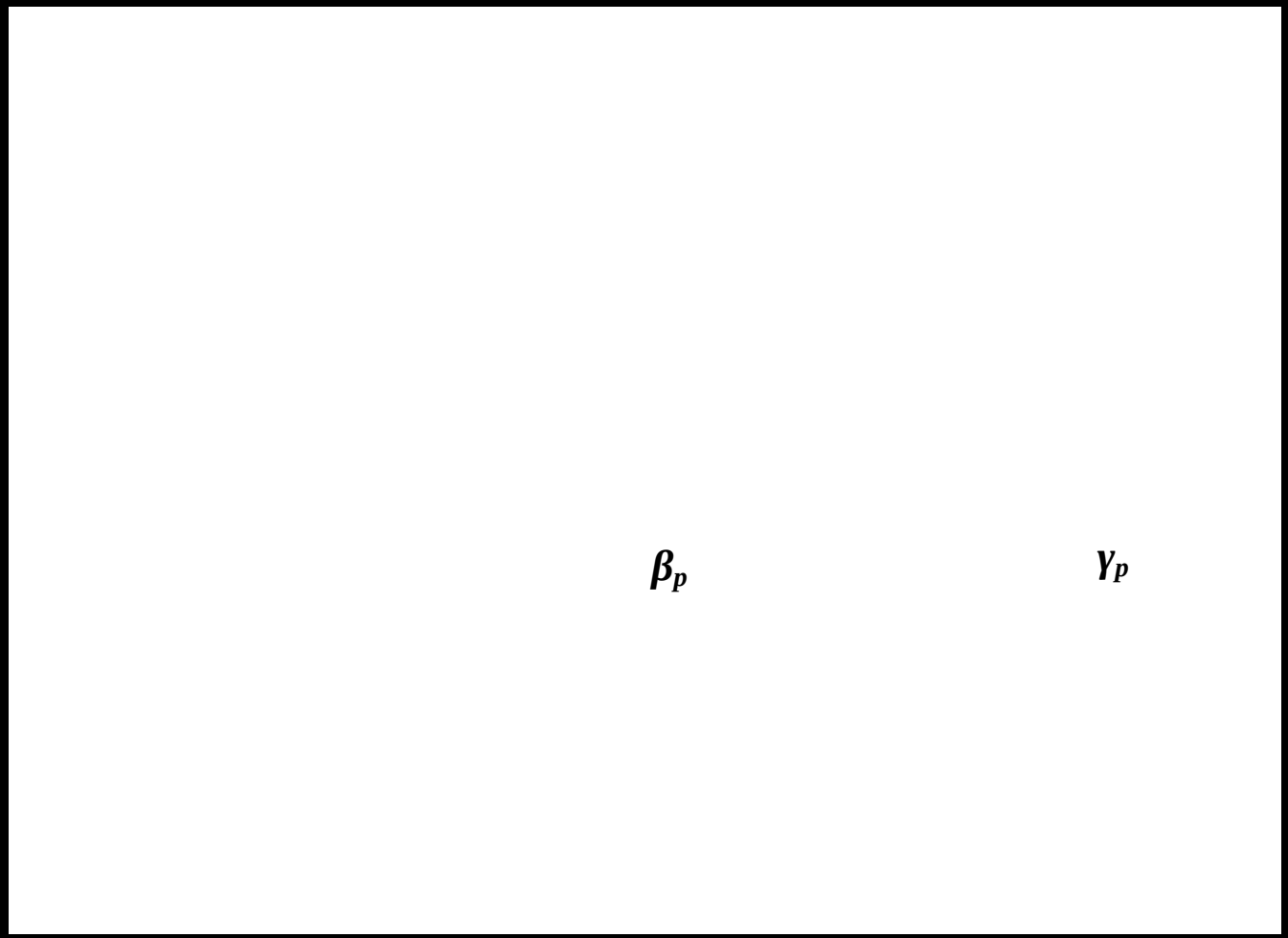
The Generalized Conventional Wisdom holds, provided that pooling doesn't a ect spillovers or di erentiation.

The Impact of Pooling on Development and Product Di erentiation

Patent pools can, thus, be viewed as information sharing institutions.

- Spillover E ects:
  - Pooling increases spillovers in development: $_p > _n$.
- Di erentiation E ects:
  - Pooling increases product homogeneity: $_p > _n$.

The Structure of Innovation and Competition



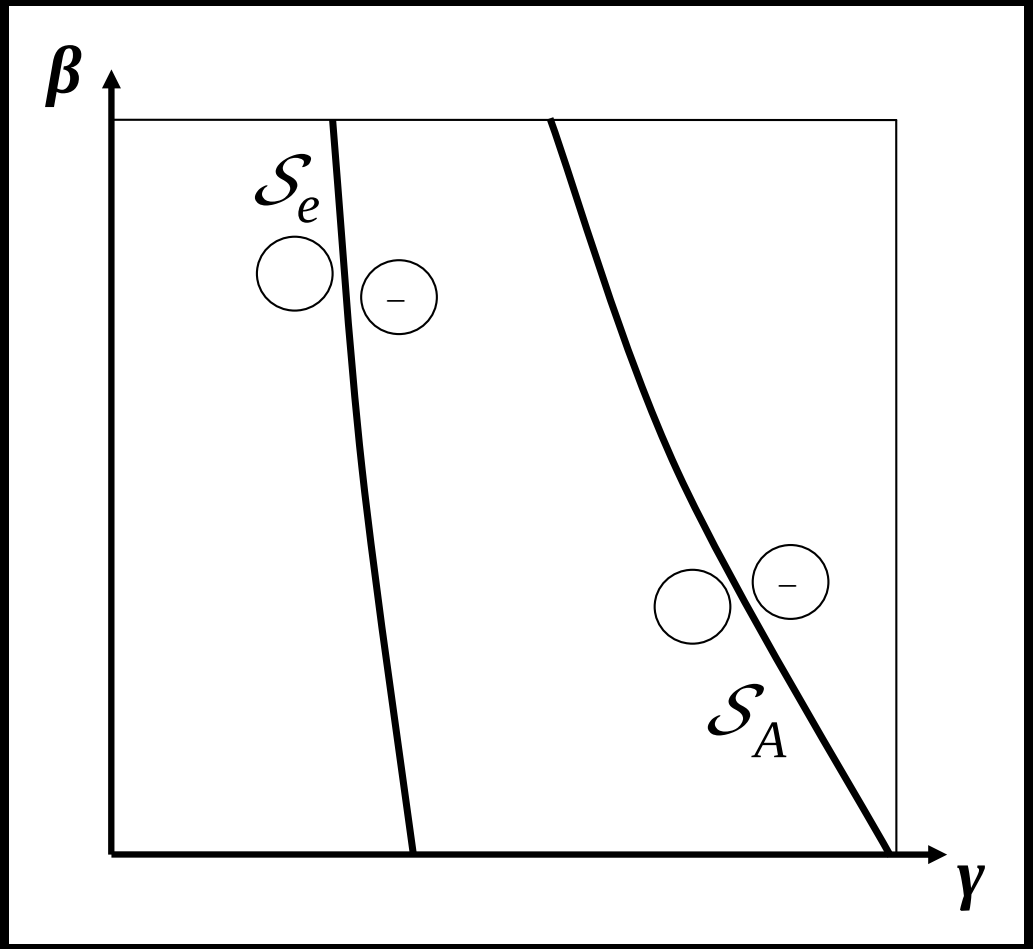


Figure: Impact of the Spillover E ect on E ort and Market Size

If products are su ciently homogenous, then the spillover e ect can make pooling undesirable:

Figure: Impact of the Spillover E ect on Payo s

Note subscripts: $1 \; ! \; R; 0 \; ! \; F$

Di erentiation E ects

Equilibrium e ort, and hence equilibrium base market size, is decreasing in the degree of product homogeneity, *i.e.*,

$$\frac{de}{d} < 0 \qquad =) \qquad \frac{dA}{d} < 0; \qquad 8 \ ; \ :$$

Increases in the degree of product homogeneity adversely a ect fee-charging patent-holders' and rms' interests. That is,

$$\frac{dV_{I=0}}{d}; \frac{d}{d} \qquad 0; \qquad 8 \ ; \ :$$

But consumers may bene t from the increased competition of reduced product di erentiation:

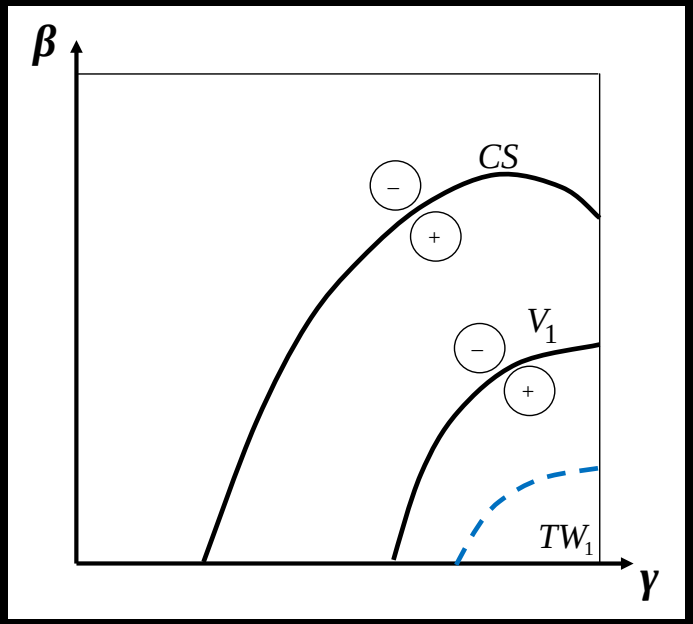


Figure: Impact of the Di erentiation E ect on Royalty Revenue and Consumer Surplus

Figure: A Case of Pro t-Maximizing Pooling that Reduces Total Welfare

Cause for policy concern:
Despite patents being perfect complements, there are constellations in which patent pools would be expected to form, yet pool formation is against the consumers' interests and also lowers total welfare.

Royalties:

Theorem (Partial Corroboration of Cournot-Shapiro)

Given per-unit-of-output royalties, the pooling of perfectly complementary patents always generate an increase in consumer surplus, i.e.,

$$CS_p > CS_n; \quad 8 \ _n; \ _p; \ _n; \ _p:$$

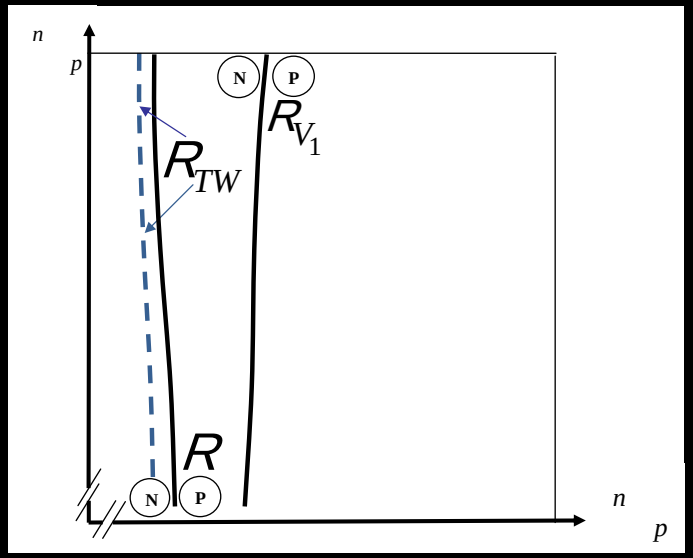


Figure: Reduction of Total Welfare due to Pooling with Royalties

Su cient Condition for E cient Pooling:
Since consumers always prefer pooling, a su cient condition for e cient pooling is that industry desires to pool (in contrast to the example found with fees).