A Framework for thinking about IP innovation

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Coordination & Commercialization Panel
Richard Gray
University of Saskatchewan

Unique Attributes of Genetic Improvement

- Non-rival
- Sequential incremental improvement - links IP over time
- Much of the IP currently lies in the public domain
- Genetic improvement is very different than real property, which tend to be both non-sequential and rival
IPR Related Issues

- Three general forms of market failure
  - Lack of private research incentives/ funding issues
  - Market power – monopoly pricing reduces adoption P > MC
  - Anti-Commons

- This is a very new industry with new IPRs
  - *about 13 years old
  - * the policies/ industrial structure and innovation systems will evolve to find solutions to the market failure
Lack of Funding

- Land grants
- CGIAR
- Plant Breeder rights
- Hybrids
- UPOV 92
- Patents/Biotech
- Genomics

Market power adoption

Anti-commons – non use fragmentation

Funding Institutions/IPRs/Technologies

- Land grants
- Plant Breeder rights
- CGIAR
- Hybrids
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Market power adoption

Anti-commons – non use fragmentation
Anti-Commons

- Commons: right to use a resource > right to exclude
- Anti-commons: the right to exclude > right to use
Its all about externalities:
Parisi, Schulz and Depooter (2003)

- Anti-commons
  \[ \frac{\partial V_i}{\partial x_j}(x_i, x_j) > 0 \quad \text{or} \quad \frac{\partial V_i}{\partial p_j}(p_i, p_j) < 0 \]

- Some asset complementarities or specificity
- Over pricing – double marginalization
- If transaction and strategic costs exceed value the resource my go unused

Simultaneous versus Sequential Anti-commons

- (Parisi Schulz and Depooter, 2003)
- Simultaneous – all players must simultaneously act – property sale/ joint venture, Bayer-Monsanto, Golden Rice
- Sequential – some players must act first
  - Can be a vertical relationship
  - Sunk costs are involved
  - Player that move later can act opportunistically
  - Hold-up problem – first players won’t invest
  - I.e. the Hold up is a sequential anti-commons problem
Anti-Commons Issues in Genetics

- This problem is recognized in the literature many related to Biotech where IP is prevalent
  - Simultaneous anti-commons
  - Hold up problem
  - Double marginalization
  - Knowledge fragmentation

Anti-commons

- Assets exist but are not combined
- With Biotech crop there are many pieces of IP and multiple owners
- The classic case- Golden Rice
  - 60+ pieces of IP about ten owners (in the US not in most jurisdictions)
  - No one owner has the ability or incentive to commercialize, some companies have donated their IP
- There are many new varieties and development streams sitting on the shelf many of these are anti-commons issues- Canola
Freedom to operate

- Freedom to operate is legal ability a firm or public institution to commercialize a product without seeking further agreements from IP owners.
- This has become a prerequisite for breeding work in the public and private sector.
- In the transgenic crops most firms and public institutions have purchased and developed their own research platforms to get FTO → High cost.

Hold-up problems

- The firms do not want to incur the large sunk costs and then negotiate rights.
- Breeder’s rights have limited value.
- Investment are not made …. but you can’t easily observe the hold up.
Knowledge Fragmentation

* Until recently almost no exchange of IP between competing multinational biotech firms
* Eg., Bayer had the highest yielding/disease resistant germplasm while Monsanto had the best HT system.
* Given there non rival nature it makes sense to combine these traits (i.e. anti-common’s issue)
* Cross licensing is starting to occur- Market power?

M & A: The 90s Trend- (Smyth & Gray)

* Numerous firms merger to gain advantages of both scale and scope
* In the scramble to establish market share in the new ag-biotech market, firms simply bought other firms that had patented platforms or desired traits
* As firms grew larger, they developed a deeper pool of ag-biotech IP
* This is Coase’s “Theory of the Firm” in action
* One major cost of this is that technologies that naturally fit together are split (Bayer’s genetics and Monsanto’s HT)
* IP silos had emerged within the MNEs
Licensing Agreements

<table>
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<tr>
<th>Date</th>
<th>Firms</th>
<th>Traits/Technology</th>
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<tbody>
<tr>
<td>Jan. 06</td>
<td>Dow &amp; Monsanto</td>
<td>IP &amp; product in corn &amp; soy; HT cotton; Bt</td>
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<td>April 06</td>
<td>DuPont &amp; Syngenta</td>
<td>JV on seed genetics (corn, soy); IR</td>
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<td>Nov. 06</td>
<td>Bayer &amp; Senesco</td>
<td>Oilseed yield tech for hybrids</td>
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<td>Dec. 06</td>
<td>BASF &amp; Monsanto</td>
<td>Clearfield canola marketed by DeKalb</td>
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<td>March 07</td>
<td>BASF &amp; Monsanto</td>
<td>Joint R&amp;D/comm; 1.5B Euro</td>
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<td>May 07</td>
<td>Monsanto &amp; Chromatin</td>
<td>Gene stacking: corn, cotton, canola, soy</td>
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<td>June 07</td>
<td>Bayer &amp; Monsanto</td>
<td>Share LL/RR, IR and RNAi tech</td>
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<td>Aug. 07</td>
<td>Monsanto &amp; Senesco</td>
<td>Yield/stress traits for corn and soy</td>
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<td>Sept. 07</td>
<td>Dow &amp; Chlorogen</td>
<td>Chloroplast tech</td>
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<td>Sept. 07</td>
<td>Dow &amp; Monsanto</td>
<td>IR/HT sharing to create 8-gene corn</td>
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<tr>
<td>Oct. 07</td>
<td>Syngenta &amp; Chromatin</td>
<td>Gene stacking for corn and soy</td>
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<td>Feb. 08</td>
<td>Syngenta &amp; DuPont</td>
<td>IR in corn</td>
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<tr>
<td>March 08</td>
<td>DuPont &amp; Arcadia</td>
<td>Nitrogen use efficiency in corn</td>
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Anti-Commons Issues

- Lack of Research Funding
- Patents/ Biotech
- Market power adoption
- Anti-commons –non use fragmentation
Summary IPR Issues

- Research Funding incentives, Anti-Commons
  Market power all matter
- We will have to govern this new industry in a
  second best framework
  - Public, industry and private structures
- What institutional innovations can improve
  innovation performance
- Path dependence makes decisions important
Lack of funding

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Market power
Adoption

Anti-commons – non use fragmentation

IPR issues

F
Lack Research Funding

M
Market Power

A
Anti-commons
IPR issues

1. Research Funding
2. Anti-commons
3. Market Power