Innovation Surprises: Fresh Insights from New Methods

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Motivation

Innovation critical driver of
- Creation, growth, and obsolescence of markets
- Survival, growth and success of firms
- Wealth of nations

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Prior Research

Relies much on

- Micro case method
- Macro country data
- Organizational or country surveys
New Paradigm of Research

- Historical (archival) market data
- Longitudinal and cross sectional
- All firms/innovations/technologies in market
- Combined with performance (stock market, sales)
- Within and across countries

Tellis & Johnson: Success in India & China
Research Questions

1. How do technologies evolve?
2. Who introduces disruptive innovations?
3. Does R&D in innovation payoff?
4. Should you make or buy innovations?
5. When do innovations takeoff?
6. Which countries most innovative?
With Ashish Sood, Abhishek Borah, Peter Golder
Available at www.gtellis.net
Study 1: Research Question

- How do technologies evolve?
- Belief: Series of successive S-curves that intersect once

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From Theory of S-Curves

Performance

discontinuity

inflection

T₁

T₂

transition, tech crossing

Effort (Time)
Study 1: Method

- Selected 7 markets (lighting, analgesics, printers, data transfer, memory, monitors, auto engines)
- Collected entry & performance of all technologies in each market over extended time periods
Study 1 Results: Lighting

The graph shows the lamp efficacy (LpW) over time from 1879 to 1999, comparing different types of lighting technologies:

- **Incandescence** (red line)
- **Arc discharge** (orange line)
- **Gas discharge** (green line)
- **LED** (blue line)
- **MED**

The graph highlights the evolution of lamp efficiency with time, indicating improvements in technology and efficiency over the years.
Study 1 Results: Desktop Printers

- Dot Matrix
- InkJet
- Laser
- Thermal

Pages per minute

<table>
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<th>InkJet</th>
<th>Laser</th>
<th>Thermal</th>
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</table>
Study 1: Conclusions

- Evolution follows step function not S-curve
- Sharp jumps in performance follow long flat performance
- Multiple crossings in performance
- Old technologies do not die easily, but compete on multiple dimensions to multiple segments simultaneously
- SAW Model can predict evolution
Study 2: Research Question

- Who introduces “disruptive technologies”
- Belief: new entrants

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Study 2: Method

- Collected technological evolution as in prior study
- Added incumbent and entrant strategies and performance
Study 2: Results

- Incumbents introduce at least as much “potentially disruptive innovations” as entrants
- Incumbents cause more disruptions than entrants
- Hazard model can predict disruptions fairly well
Study 3: Research Question

- Does R&D on innovation pay off?
- Belief: Stock market short sighted, discourages investment in long term, uncertain innovations
Study 3: Method

- Prior data as in study 1 and 2
- Plus collected all announcements of every stage and event in every technology (project) of every market and firm: Over 5431 announcements
- Plus stock market returns for each of above events
Results 3: Returns to Initiation

Average of 4.7 years before launch

Sood and Tellis

Returns to Innovation

03-09
Study 3: Returns by Phases

Sood and Tellis Returns to Innovation

03-09
Study 3: Returns by Event

Average time from start of project to commercialization: 4.7 years
Study 3: Conclusions

- Markets strongly responsive to all stages of development of innovation
- Strongest returns to start and development years before launch
- Returns to launch lowest of all events
- Returns exceed investments
Study 4: Question

Is it better to buy or make innovations?
Belief: Watch & see: acquire if and when an innovation takes off
Study 4: Method

- Prior data as in studies 1 to 3
- Plus data on acquisitions events and stock market returns
Study 4: Results

Average Abnormal Return (AAR) for make and buy innovation events

Day

Average Abnormal Return

-0.20%
-0.15%
-0.10%
-0.05%
0.00%
0.05%
0.10%
0.15%
0.20%
-0.20%
-0.15%
-0.10%
-0.05%
0.00%
0.05%
0.10%
0.15%
0.20%

buy
make
Study 4: Conclusions

- Make significantly outperforms buy
- Make events lead to positive returns
- Buy events lead to negative returns
- Marketing intensity positively affects buy strategy & all returns
Study 5: Research Question

Why and when do new innovations take off?
Belief: due to word of mouth diffusion
Study 5 Method

- Collect data on radical innovations that started a new category
- Sales, prices, market penetration, type of category. Year of introduction
- Define takeoff
- Build hazard model of takeoff
Study 5: Results

Sales

Time

No takeoff

Takeoff

Even
Study 5 Conclusions

- Takeoff distinct event in diffusion of innovation
- Innovations do not take off even when well known
- Takeoff highly dependent on price
- Time to takeoff declining with calendar time
- “Visible” categories take off faster
Study 6 Question

Do countries differ in innovativeness?
Belief: major economies most innovative
Study 6 Method

- Data in study 5
- Plus data across countries
<table>
<thead>
<tr>
<th>Country</th>
<th>Time To Takeoff</th>
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<td>Greece</td>
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</table>
Study 6 Results

- Time-to-takeoff is a good metric of innovativeness.
- Countries can be ranked on time-to-takeoff.
- Economics is not the primary determinant of (takeoff) innovativeness.

Tellis & Johnson: Success in India & China
General Conclusions

Importance of
- Market data vs only case or survey
- Longitudinal vs only cross-sectional
- Performance vs only input measures
- Micro x country vs only macro-country
Thank you!