

A META-ANALYSIS OF UNIVERSITY TECHNOLOGY TRANSFER EMPIRICAL RESEARCH

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BIG ORANGE. BIG IDEAS.®

About University Tech Transfer

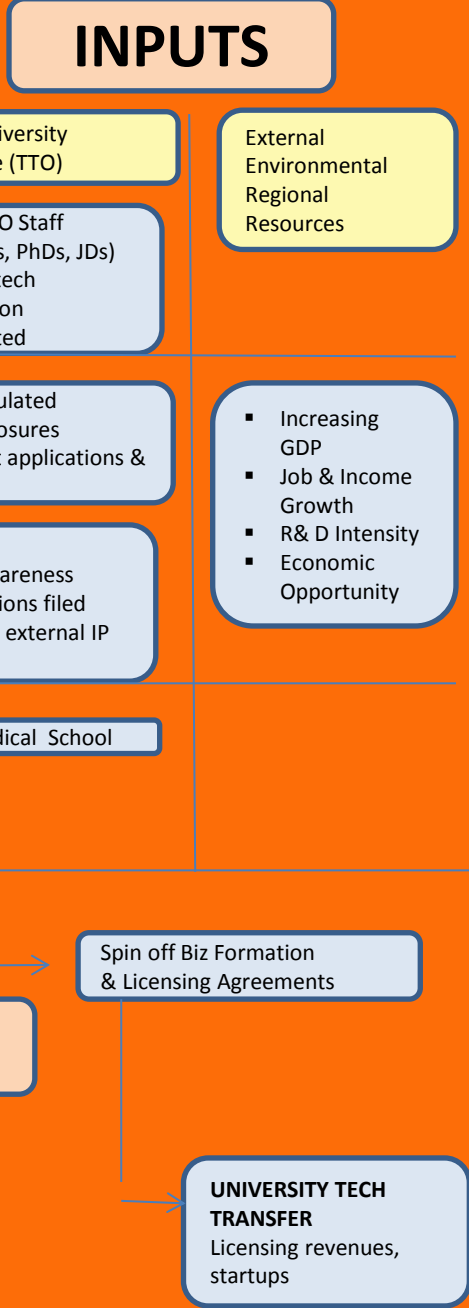
- *Morill Act of 1862*
- *Bayh-Dole Act (P.L. 96-517) of 1980*
 - allows universities to obtain
 - ownership title to inventions created with government funded research
 - established Technology Transfer Offices (TTOs) to manage the process of patenting and licensing these inventions.



*How to improve
university
technology transfer
performance?
What matters??*

Relevant Theories

- **Barney's 1991 Resource Based Theory (RBT)**
 - TTOs require human, organizational, and physical resources to succeed
- **Castrogiovanni 1991, 2002's External Environmental Munificence (E)**
 - When external environments are more munificent, it makes it easier for an organization to survive and prosper.
 - TTOs require industry funding, total research funding, a healthy GDP, and regional R&D intensity to succeed.



Concept Model

- **Resources Input**

- Human
- Organizational
- Physical
- Internal to University
- vs.
- External

- **Performance Output**

- Licensing Agreements
- Licensing Revenues
- Startup businesses

Hypotheses

- **Hypothesis 1.** Human resources are positively related to TTO performance in the areas of patenting, licensing, and generating startups.
- **Hypothesis 2.** Organizational resources are positively related to TTO performance in the areas of patenting, licensing, and generating startups. These resources are invention disclosures, patent applications and patents.
- **Hypothesis 3.** Physical resources are positively related to TTO performance in the areas of patenting, licensing, and generating startups. These physical resources include incubators and medical schools.
- **Hypothesis 4.** External environmental munificence is positively related to TTO performance in the areas of patenting, licensing, and generating startups.

Meta Analysis

- A meta-analysis can be used to accumulate evidence ***within a macro research stream***; and as a motivator to re-evaluate established theories and develop new theories (Combs, 2011)
- Requires a ***Literature Review***
 - Searched for observed effects such as correlations, r
 - Empirical studies correlating tech transfer resource inputs and performance outputs

Meta Analysis

- Meta-analysis yields a weighted average effect of the size of a relationship (Hunter, 2004).
- Meta-analyses minimize the impact that sampling and measurement error have on any given study's results because meta-analyses aggregate effects sizes from multiple studies so that small samples do not distort the overall findings and measurement errors are minimized (Hunter, 2004).
- The goal is to consider whether the extent of the effects are large enough to matter to TTOs

Literature Review: Sep – Nov 2014

| Study | Journal |
|------------------|--|
| Cardoza, 2011 | J. of Technology Transfer |
| Carlsson, 2002a | J. of Evol Econ |
| Carlsson, 2002b | J. of Evol Econ |
| Chapple, 2005 | Research Policy |
| Comacchio, 2011 | J. of Technology Transfer |
| Curi, 2012 | Cambridge Journal of Economics |
| Friedman, 2003 | J. of Technology Transfer |
| Gonzalez, 2013 | Economic Development Quarterly |
| Ho, 2014a | J. of Technology Transfer |
| Ho, 2014b | J. of Technology Transfer |
| Hulsbeck, 2011 | J. of Technology Transfer |
| Jong, 2014 | Research Policy |
| Lockett, 2005 | Research Policy |
| Louis, 1989 | Administrative Science Quarterly |
| Markman, 2005a | Journal of Business Venturing |
| Markman, 2005b | Research Policy |
| Owen-Smith, 2003 | Research Policy |
| Powers, 2003 | Journal of Higher Education |
| Powers, 2005 | Research Policy |
| Rogers, 2000 | Journal of the Association of University Technology Managers |
| Siegel, 2003 | Research Policy |
| Sine, 2003 | Management Science |
| Swamidass, 2009 | J. of Technology Transfer |
| Van Looy, 2011 | Research Policy |

| | Constructs impacting Tech Transfer | Definitions | Sample Measures |
|---------------|------------------------------------|---|--|
| INPUT | | | |
| | Human (H) | Universities' TTO staff and legal resources | TTO staff size (FTEs) TTO age TTO legal expenditure |
| | Organizational (O) | Universities' internal organizational resources | Invention disclosures Patent applications filed Patents owned |
| | Physical (P) | Universities' internal physical resources | Presence of an Incubator Presence of a medical school |
| | External environment (E) | Regional external resources | Regional GDP Regional R&D intensity Total research funding Industry funding |
| OUTPUT | | | |
| | Performance | Outcomes of the university TTO's activities | Licenses executed Licensing revenues Startups |

| IV | DV | N | K | Obs. r | Corrected r | 99% CI Lower Bound Hetero | 99% CI Upper Bound Hetero |
|----|-------|------|----|--------|-------------|---------------------------|---------------------------|
| H | Per | 993 | 9 | 0.312 | 0.400 | 0.147 | 0.477 |
| H | Lic | 854 | 7 | 0.432 | 0.554 | 0.264 | 0.601 |
| H | Start | 921 | 7 | 0.321 | 0.411 | 0.022 | 0.620 |
| O | Per | 1115 | 12 | 0.507 | 0.650 | 0.325 | 0.689 |
| O | Lic | 961 | 10 | 0.627 | 0.804 | 0.534 | 0.720 |
| O | Start | 497 | 4 | 0.520 | 0.667 | 0.069 | 0.971 |
| P | Per | 451 | 4 | 0.105 | 0.134 | -0.082 | 0.292 |
| P | Lic | 370 | 3 | 0.007 | 0.009 | -0.181 | 0.194 |
| P | Start | 343 | 3 | 0.134 | 0.172 | -0.131 | 0.400 |
| E | Per | 789 | 8 | 0.370 | 0.474 | 0.221 | 0.518 |
| E | Lic | 635 | 6 | 0.274 | 0.351 | 0.069 | 0.479 |
| E | Start | 464 | 4 | 0.550 | 0.705 | 0.285 | 0.815 |

Findings

- Both **human and organizational resources** are significant related to patents, licensing, and startups.... **rather than physical resources..**
- The magnitude of the effects for human and *organizational* resources related to **licensing** are stronger than in relation to startups.
- Applying the RBT, this is likely due to the fact that with respect to licensing, the TTO organizational and human resources are valuable, rare and hard to imitate.
- External environmental munificence also relates to TTO performance.

Any Questions?

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