

Firm Social Capital and the Innovation Process

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Why this paper?

- Interest in understanding *how* firms innovate
- Physical, human, and financial capital may not fully explain differences in firm innovation output
- Social capital may also be a productive form of capital
- The economic literature on the benefits of firm social capital to innovation is limited, however
- This paper addresses the gap by developing a theoretical model that posits social capital as an input into innovation production
- Additionally, measures of firm social capital are developed to empirically test the existence of the relationship

Research Questions

3 research questions are considered:

1. Are there dimensions of social capital that benefit innovative firms in the pursuit of developmental (i.e., late-stage) funding?
2. Are there social capital characteristics of innovative firms that are associated with realizing sales resulting from the commercializable technology? and
3. Are there certain types of social capital associated with the probability that an innovative firm experiences growth-related activities resulting from its innovations, such as through the execution of an initial public offering (IPO), as a spin-off into a financially independent organization, a firm sale, a firm merger, a joint venture agreement, or a product licensing agreement?

Contribution

There are 3 key contributions of this dissertation:

1. Creating a theoretical framework that includes a firm's social capital as a factor of innovation production
2. Development of measures of firm social capital based on the structural and content dimensions of intra- and inter-firm relationships
3. Using a firm's social capital measures to explain empirically important outputs of the innovation process

Implications

- First known attempt to systematically set forth a path for inquiries on the relationship between firm social capital and the innovation process
- Empirical tests suggest social capital is an important and productive component of a firm's overall capital structure in innovation production
- Firms that innovate may consider policies/relationships that build social capital with its employees and business partners
- Public/private awards to innovative firms should consider the dimensions of a firm's social capital in making decision

Methodology

- Theoretical model:

$$I = A * f(K(F), H(F), S(F))$$

Innovation output (I) depends on several inputs:

- physical capital (K)
- human capital (H)
- social capital (S)
- an indirect impact of financial capital (F) in innovation production
- an unmeasurable innovation shift factor (A), which includes other unobservable factors not measured by these capital inputs

Methodology

- Data:
 - 315 firms that received early-stage funding from the NIH through the Small Business Innovation Research program
 - Responded to a 2005 survey by the National Research Council
 - Includes firm behavior and experiences associated with funding
- Dependent variables – binary indicators of innovation outputs that correspond to research questions:
 1. Firm received additional developmental funding
 2. Firm commercialized a technology
 3. Firm experienced a growth-related activity

Methodology

- Measures of firm social capital
 - Strong social ties
 - Number of Phase II SBIR Awards Received
 - Number of Scientific Publications Submitted
 - Number of Patent Applications Submitted
 - Number of Firms Founded by the Funded-Firm's Founders
 - Weak social ties
 - Receipt of Project Funds Prior to Phase II from Venture Capital, Other Private Company, or Private Investor
 - Marketing/Distribution Agreements in Place
 - Research/Development Agreements in Place

Methodology

- Other independent variables:
 - Physical capital
 - Growth of firm due to SBIR (categorical)
 - Human capital
 - Number of employees when Phase II was proposed
 - Firm characteristics
 - ‘nascent’ binary variable if firm founded because of SBIR and firm did not receive prior Phase II funding for project

Methodology

- Empirical model specification with social capital measures:
 1. Firm received additional developmental funding
 - STRONG social ties that measure collaborative work, a culture of innovation, working towards a common goal
 2. Firm commercialized a technology
 - WEAK social tie measures of relationships with external parties that promote sharing of ideas and research, best practices
 3. Firm experienced a growth-related activity
 - WEAK social ties that measure connections with third parties through strategic agreements, obtain guidance from experienced investors

Results

- Positive and significant results from multivariate probit:
 1. Firm received additional developmental funding
 - STRONG social tie - # patent apps (collaborative activities)
 - STRONG social tie - # firms founded by founders (firm culture)
 2. Firm commercialized a technology
 - WEAK social tie - marketing/distr. agreements (best practices)
 3. Firm experienced a growth-related activity
 - WEAK social tie - research/develop. agreements (sharing ideas)
 - WEAK social tie - funds from private investors (advisement)

Future Research

- Develop Firm Social Capital Index
- Evaluate other types of innovation productivity and gains
 - First to market in new products/services
 - Firm market share in sector of innovation
 - Firm stock price performance, P/E ratios
- Employee attrition and other labor-related outcomes are natural extensions using firm social capital as an explanatory variable

Future Research

- Firm Social Capital Index
 - Using publicly available data:
 - Filings and other public records (e.g., patents)
 - Employment websites (Glassdoor, Indeed, LinkedIn)
 - News publications
 - Generate composite using data extraction techniques (ML, NLP):
 - Job reductions or labor-related cost-cutting
 - Change in the number of employees
 - Research/patent activities
 - Mentions of “trust”, “collaboration” in filings and news releases
 - Indications of types of work environments (WFH, flex-time)
 - Sentiment of reviews on employment websites
 - Firm on “best” lists, such as best place to work, best CEOs