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Contents

Firm Social Capital and the Innovation Process

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ABSTRACT

This monograph conceptualizes, measures, and evaluates social capital as a productive input for innovative firms. First, a theoretical production function is conceptualized that considers social capital as an input into the production of three important innovation outputs: receipt of developmental (i.e., late-stage) funding; commercialization of an innovation realized through sales of a new product, service, or process; and growth-related activity of the firm developing the innovation, such as an initial public offering, formation of a spin-off firm, a firm sale or merger, a joint venture, or a product licensing agreement. Second, measures of social capital for innovative firms are developed based on the structural and content dimensions of relationships cultivated internally by and externally to the firm. Through internal collaboration and engagements with external parties, social trust and reciprocity are built that promote the sharing of ideas and innovation. Third, social capital as an input into the production of innovation outputs is evaluated using a unique dataset comprising survey responses to a Federal small business award program-the U.S. Small Business Innovation Research (SBIR) Program-that supports early-stage funding needs of firms developing an innovation. The dataset

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contains questions that provide insight into a firm's innovation output and its social capital, such as the nature and degree of engagements with third parties, as well as the accomplishments associated with the firm's internal collaborative activities. The empirical results presented in this monograph suggest that social capital may have significant importance in the production of innovative outcomes. The key contributions of this monograph include the development of a theoretical production model that includes social capital, the measurement of a firm's social capital as an input into production, and the quantification, empirically, of social capital as a productive input for innovative firms.

1

Introduction

In a traditional economic production function, output is characterized as a function of some combination of physical capital and labor capital. Physical capital inputs, such as machines, equipment, and laboratories, are typically tangible fixed assets used in the manufacturing of goods and services. Labor is arguably a more complex input in production than are physical assets since it includes intangible dimensions of a firm's employees, such as skills, abilities, and social norms, that must be managed and balanced to optimize production efficiency. The intangible dimensions of labor are important factors in the production process as they provide the know-how, experiences, and richness of social interactions that propel a firm toward desired outcomes.

Becker (1993) characterizes the intangible dimensions of labor, such as education, training, and experience as knowledge wealth human capital, but also acknowledges the existence of "other knowledge" (p. 53) when considering the accumulation of human capital. This "other knowledge" within a firm includes the knowledge wealth of social relationships cultivated among its employees through collaborative activities, exchanging of ideas, and shared values and ideals as well as the leveraging of best practices and knowledge transfers realized through the engagement with external parties. These intangible "other knowledge" dimensions of labor contribute to the social capital of the firm, which is characterized by norms of trust and reciprocity within a firm's social network. By exploring the productive nature of the "other knowledge" social dimensions of labor capital, a more informative view of the benefits of social capital for firms can be developed.

Exploring the role of social capital in firm production is important for several reasons. First, given the broad skills and multi-dimensional nature of firms, distinguishing between the two labor inputs of human capital and social capital allows for a delineation and differentiation between the intangible labor dimensions of firms. Second, as the dimensions of social capital are further enumerated, it may be possible to theorize more clearly the implications of greater or lesser degrees of such dimensions on firm activities, including producing innovations. Third, theorized relationships between certain social capital dimensions and firm activities can be tested empirically, potentially advancing the literature on the intangible labor dimensions that drive innovation in an increasingly knowledge-based environment.

The contribution of this monograph is therefore threefold. First, by explicitly distinguishing labor inputs into two core components, human capital and social capital, a theoretical framework that includes a firm's social capital as a factor of production is developed to provide the necessary structure to evaluate social capital as a potential contributing input to various forms of output, including innovations.

Second, the social capital of a firm is described and measured based on the structural and content dimensions of relationships cultivated through trust-building interactions and the formation of expectations of reciprocity among the firm's employees as well as with external parties to the firm.

Third, measures of a firm's social capital are included as factors of production to explain empirically key outputs of the innovation process for firms as described by the following research questions:

(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?

(3) Are there certain types of social capital associated with the probability than 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?

Using a unique dataset based on responses to a Federal survey of small businesses funded through the U.S. Small Business Innovation Research (SBIR) program, the relationship between social capital and the three aforementioned outputs in the innovation process are empirically tested. The SBIR dataset consists of responses to firm- and project-level surveys of Phase II projects. The survey was administered by the National Research Council (NRC) of the National Academies in 2005, and it relates specifically to the National Institutes of Health (NIH)-funded Phase II SBIR projects.

Acknowledging the exploratory nature of the analysis herein due to the limitations of the direct measurements of the social capital within the SBIR dataset and the use of contemporaneous data to evaluate multiple outputs, the reported empirical results related to each of the above questions suggest that social capital is an important input in the production of innovation outputs. Specifically, social capital, as measured as strong social ties through the collaborative production of intellectual property as well as the shared values and cultural vision necessary to create and build a business by its founders, is positively and significantly associated with the output of the SBIR project receiving additional developmental funding. Social capital, as measured as weak social ties cultivated through strategic agreements with U.S. and/or foreign companies and investors, is positively and significantly related to the output of commercializing an innovation. Additionally, weak social ties, including engagements with private investors, such as venture capitalists, are shown to be positively and significantly related to a firm's execution of growth-related activities, potentially underscoring the benefits of social capital in the attainment of strategic growth and equity funding sources for a firm.

An implication of the findings in this monograph is that firms investing in activities that support the cultivation of intra- and inter-firm social relationships may benefit from those investments through the realization of positive innovation outputs. Such activities could be advanced by focusing on collaborations that build trust and reciprocity among its employees and by fostering relationships with external parties where mentoring and guidance can be facilitated. Additionally, given the relationship between social capital and innovation, entities or organizations that provide financial assistance to innovative firms for research and development (R&D), such as the SBIR program, may be well served to consider the dimensions of a firm's social capital as an additional criterion for providing financial support.

The remainder of this monograph is structured to discuss each of its three contributions. With respect to the first contribution, Sections 2–5 define and conceptualize social capital as a form of capital in the innovation process. Section 2 defines social capital and how it is different than human capital as an intangible input in production. Section 3 reviews the literature relating human capital to innovation outputs given the relatively larger body of economic research on this type of intangible capital input in production. Next, Section 4 reviews the more limited economic literature relating social capital to innovation outputs, which highlights the gap in the research to pursue the theoretical and empirical economic analysis developed in this monograph. Lastly, Section 5 outlines the theoretical framework to include social capital as an input into the innovation process.

Once social capital is conceptualized in an innovation production framework, Section 6 discusses the role unique role of financial capital in innovation production and how it can lead to higher levels of a firm's social capital. Additionally, Section 7 describes the financial support to innovating firms provided by the SBIR program, which is the source of data for the empirical analysis.

With respect to the second contribution of this monograph, the measurement of a firm's social capital, Section 8 lays out the dimensions of firm social capital, an approach to measure each dimension, and how to operationalize social capital measures.

Finally, the third contribution of this monograph is detailed in Section 9, which uses the social capital measures to empirically test the relationship between a firm's social capital and three key innovation outputs to answer the research questions outlined in this section. A concluding summary and discussion of potential implications pertaining to this monograph are presented in Section 10.

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