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An empirical test of geographic knowledge spillovers using geographic information systems and firm-level data

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Abstract

Most research on economic geography focuses on large geographic areas, such as nations and states. I use a geographic information system and a firm-level dataset to explore agglomeration and spillovers at the firm level over discrete distances. I calculate the distance between each firm-pair to explore co-location, and use these calculations to devise a test of spillovers: is participation in the Small Business Innovation Research (SBIR) program, which provides R&D grants to small firms, a function of whether nearby firms win SBIR grants? I find that the number of other SBIR firms within a fraction of a mile predicts whether a firm wins awards, even controlling for regional, firm, and industry characteristics. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

The economic success of areas such as California's Silicon Valley has caused the study of economic geography to boom as researchers explore the extent, implications, and causes of industrial concentration. Researchers find that in-

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dustrial clustering in regions is widespread (e.g. Krugman (1991a, 1998)) and greater than would be expected if geographic distributions were random (Ellison and Glaeser, 1997). Others find evidence of regional knowledge spillovers (e.g. Jaffe (1989) and Jaffe et al. (1993)). Unfortunately, data limitations have forced the existing literature to explore these issues only within large geographic units such as nations or states. As a result, while we know that industries cluster in certain regions and that firms located in the same regions benefit from knowledge spillovers, we know little about distances between individual firms *within* regions and whether distance matters for spillovers.

These limitations are unfortunate because some industries and firms cluster in areas much smaller than states or cities. Venture capital, for example, is famously concentrated: about a third of all venture capital in the United States originates in a 2-mile stretch of Sand Hill Road in Menlo Park, California. A company tracking local real estate markets notes that venture capitalists ‘all want to be within walking distance of each other, and that little stretch of Sand Hill Road is where you’ve got to be’ (Colliver, 1998). Policy makers and private entities believe that benefits arise when firms locate very close together. Governments and large firms fund more than 550 business incubators — facilities that house tens or even hundreds of small firms — in North America (National Business Incubation Association, 1998). Nonetheless, we have not yet empirically explored the effects of tight concentrations of firms.

I use a computerized Geographic Information System (GIS) and firm-level data to explore economic geography over distances rather than within pre-defined geographic units. The paper has two primary components. Firstly, I develop a method of measuring spatial agglomeration at the firm level. Using GIS location coordinates I calculate the distance between each firm-pair in a large dataset of small, high technology firms. For each firm I then create ‘density variables’, which measure the number of other firms within any radius. These variables allow a detailed look at how close together firms locate and how they are distributed over specific distances. Secondly, I use these variables and time variation in the data to devise and implement a test of spillovers. The test asks whether these small, high-technology firms are more likely to receive a government grant from the Small Business Innovation Research (SBIR) program if their neighbors received grants.¹

The results are intriguing. Firstly, firms that participate in SBIR tend to locate very close together — almost 20% are within one-tenth of a mile of at least one other SBIR firm — and are not distributed uniformly over small distances. The fact that firms are co-located motivates a test of spillovers over distance. Empirical

¹SBIR is a government program that provides grants to small firms for R&D aimed at producing a commercially viable project. Firms submit proposals and the government chooses whether to fund them. See Wallsten (1998, 2000) or www.sba.gov/SBIR for more detail on the SBIR program.

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