

Mansfield's Innovation in the Theory of Innovation

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ABSTRACT. Edwin Mansfield combination of well-founded theoretical formulation about the process of innovation, the systematic testing of broadly accepted views in economics. His pioneering work helped to shape the theory of innovation from a primary focus on industry and firm specific characteristic as well as on the external environment, such as spillovers. The purpose of this paper is to link the seminal contributions of Mansfield. The first focuses on the determinants of firm, the second is concerned with industry context and the third is concerned with university-based knowledge spillovers. The purpose of this paper is to provide a link between these literatures spawned by Mansfield. By linking industry and firm-specific characteristics as well as access to knowledge spillovers from universities, the empirical evidence suggests that knowledge spillovers as well as firm-specific characteristics influence firm growth.

Key words: university spillover, firm growth, entrepreneurship

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1. Introduction

Edwin Mansfield was at the cutting edge of theory and understanding concerning innovation and technological change throughout his career. He accomplished this not by taking a position and then defending it to the end, but rather by constantly scrutinizing his views by subjecting them to systematic empirical testing, allowing

him to either accept the prevailing thought, or else push it into a new direction.

Well into the 1970s, a conventional wisdom about the nature of technological change generally pervaded. This conventional wisdom had been shaped largely by scholars such as Alfred Chandler (1977), Joseph Schumpeter (1942) and John Kenneth Galbraith (1956) who had convinced a generation of scholars and policy makers that innovation and technological change lie in the domain of large corporations and that small business would fade away as the victim of its own inefficiencies.

At the heart of this conventional wisdom was the belief that monolithic enterprises exploiting market power were the driving engine of innovative activity. Schumpeter had declared the debate closed, with his proclamation in 1942 (p. 106) that, "What we have got to accept is that (the large-scale establishment) has come to be the most powerful engine of progress." Galbraith (1956, p. 86) echoed Schumpeter's sentiment, "There is no more pleasant fiction than that technological change is the product of the matchless ingenuity of the small man forced by competition to employ his wits to better his neighbor. Unhappily, it is a fiction."

At the same time, the conventional wisdom about small and new firms was that they were burdened with a size inherent handicap in terms of innovative activity. Because they had a deficit of resources required to generate and commercialize ideas, this conventional wisdom viewed small enterprises as being largely outside of the domain of innovative activity and technological change. F.M. Scherer (1991, p. 25) describes confronting this conventional wisdom "at a fundamentalist revival", where the Fifth Plan of the French Government had an explicit objective of promoting "the constitution, or the reinforce-

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ment where extant, of a small number of firms or groups ...”.

While this conventional wisdom about the singular role played by large enterprises with market power prevailed during the first three decades subsequent to the close of the Second World War II, Edwin Mansfield, along with other leading scholars such as F.M. Scherer helped to pioneer a wave of new studies that has challenged this conventional wisdom. Most importantly, these studies identified a much wider spectrum of enterprises contributing to innovative activity, and that, in particular, small entrepreneurial firms as well as large established incumbents play an important role in the innovation and process of technological change.

Taken together, these studies comprise the foundations for understanding innovation and technological change. The purpose of this chapter is to explain how and why Ed Mansfield's work, along with that of a handful of other scholars of his generation, shaped our understanding about innovation.

2. The firm context

Mansfield's primary focus was on what influenced the innovative activity of firms. The starting point of this research was on the relationship between the most observable characteristics of a firm, principally its size, and its innovative activity. The focus on the firm as the most relevant unit of observation perhaps reflected the theoretical concern of Schumpeter's later work, which argued that “the large, monopolistic corporation provided an ideal environment for advancing technology” (Scherer, 1991, p. 24). However, testing the so-called Schumpeterian Hypothesis proved to be less than obvious. While size is not without measurement problems, measuring innovative activity is fraught with ambiguities and challenges.

The initial attempts to quantify technological change at all generally involved measuring some aspects of inputs into the innovative process (Grabowski, 1968; Mansfield, 1968; Mueller, 1967; Scherer, 1965a, b; 1967). Measures of R&D inputs—first in terms of employment and later in terms of expenditures—were only introduced on a meaningful basis enabling inter-industry and

inter-firm comparisons in the late 1950s and early 1960s.

A clear limitation in using R&D activity as a proxy measure for technological change is that R&D reflects only the resources devoted to producing innovative output, but not the amount of innovative activity actually realized. As Mansfield (1981, p. 130) pointed out, these studies “focus attention solely on the total amount spent on R&D, not on its composition. This is a very important limitation. R&D includes fundamental investigations as well as superficial ones, work directed at major new products and processes, as well as projects aimed at minor modifications of existing processes and products; and long-term and risky projects as well as short-term and safe ones. It is widely recognized that attempts should be made to disaggregate R&D expenditures in studies of this type.”

Kleinknecht *et al.* (1991) have systematically shown that R&D measures incorporate only efforts made to generate innovative activity that are undertaken within formal R&D budgets and within formal R&D laboratories. They find that the extent of informal R&D is considerable, particularly in smaller enterprises.¹ And, as Mansfield (1984) points out, not all efforts within a formal R&D laboratory are directed towards generating innovative output in any case. Rather, other types of output, such as imitation and technology transfer, are also common goals in R&D laboratories.

As systematic data measuring the number of inventions patented were made publicly available in the mid-1960s, many scholars interpreted this new measure not only as being superior to R&D but also as reflecting innovative output. In fact, the use of patented inventions is not a measure of innovative output, but is rather a type of intermediate output measure. A patent reflects new technical knowledge, but it does not indicate whether this knowledge has a positive economic value. Only those inventions which have been successfully introduced in the market can claim that they are innovation.

Besides the fact that many, if not most, patented inventions do not result in an innovation, a second important limitation of patent measures as an indicator of innovative activity is that they do not capture all of the innovations actually