

preneurs and policy makers and Chapter 9 discusses the value added by venture capitalists "... by being actively involved in the success of the enterprises in which they invest." They explore this last topic by examining the venture-capital investing process and by citing results of a study conducted for the National Science Foundation that examined the flows of venture capital and the investing process.

The importance of venture capital is linked to regional economic development. Chapter 10 describes venture capital's role in financing innovation and creating jobs, and also traces the development of venture capital complexes and the regional flow of capital. In answer to the question: "Can a high-tech entrepreneurial region be planned?," the authors lean toward a conclusion that credits more to serendipitous events than to rational planning. The factors influencing the flows of venture capital are the topic of Chapter 11, and the final chapter offers a future outlook for the VCI that I have already discussed. In the last chapter, the authors also look ahead to the year 2000 and assess how well the United States economy is performing at furthering creativity, technology, and entrepreneurship from the point of view of culture, education, and government. Calling for minimal regulatory policy, greater investment in human capital, and the teaching of entrepreneurship and finally emphasis on new political/tax incentive structures for venture capital pools, Bygrave and Timmons conclude that the venture capital industry has arrived at a crossroads. They summarize their position as follows:

For practitioners, the roads lead to either opportunity or peril - opportunity for those who focus on value-adding and peril for those who bring only capital to venture capital deals. For policy-makers, the crossroads represents an opportunity to shape the environment for entrepreneurship and venture capital for the twenty-first century in a way that can go far to revive America's competitiveness. Academics also have choices to make and new avenues to explore in their research and teaching. As fields of formal study, entrepreneurship and venture capital are in their adolescent stages; scholars have a chance to build solid intellectual foundations for both of them.

This book is indeed a treasure-packed classic about venture capital that will benefit all who read it. Practitioners, students, academics, investors, researchers and entrepreneurs alike can appreciate

this definitive treatment of a critically important industry facing a strikingly intriguing future.

SANDRA HONIG-HAFTEL
Wichita State University
Wichita, KS 67208

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Community R&D action gives rise to considerable added value at the European level ... Effective subsidy requires that priorities be carefully chosen and the effect of Community activities be measured in order to guide future action ... [Archibugi and Pianta (1992).]

These words, from President Jacques Delors of the Commission of the European Community, illustrate the social need for reliable R&D measurement and its associated results. Not only governmental officials, but R&D managers are increasingly required to justify their programs and their spending patterns in terms of measurable economic benefits.

Along with this need for management-productivity measurement there is a scientific need for this measurement as well. In the field of industrial organization "a fundamental problem in the study of innovation and technical change is the absence of satisfactory measures of new knowledge and this contribution to 'technological progress'" (Cohen and Levin [1989, p. 1062]). The output of the innovation process was traditionally measured by patent counts. The several drawbacks to this type of output measure stimulated economists to search for a more adequate measurement system.

The book, now under review, is a collection of scientific papers edited by Alfred Kleinknecht and Donald Bain. Alfred Kleinknecht is an economist researching innovation in an empirical fashion and Donald Bain is a policy analyst now working for the European Community. This talent combination is well positioned to suggest new measures of innovation.

Two new measures of innovation output (INO) are offered and analyzed in this book. Since new measures require methodological research, the

questions asked are: How to avoid biases resulting from data collection?; How to explain the difference between outcomes and traditional outcomes based on these new data?; and, In what sense are these new outcomes more reliable than earlier ones? This book deals with these questions in a fresh and original way. Reading the book from cover to cover, I re-experienced their exciting process of discovery. I was able to appreciate the early concerns of researchers about the use of conventional measures of INO and ended with an analysis of their first exciting results using these entirely new measures. The frequent use of the words "critics could say . . . , but" illustrates the completeness that makes this book worth recommending to those who not only want to keep up with new developments in the field of INO measurement, but also want to be able to judge the intrinsic value of the measurement systems themselves.

In chapter one, Alfred Kleinknecht mentions the drawbacks to the traditional patent measure of INO. He states, "the propensity to patent an invention may differ between industry branches, depending on the relative costs of innovation and imitation. Moreover, little is known about what firms do with their patents: What is the share of patents that are actually translated into commercially viable products?" (p. 2). Kleinknecht then discusses the relevance of good output measures to using R&D resources most efficiently. This search for efficiency resulted in the development of several new innovation measures, most of which were developed during 1970's and the 1980's. Kleinknecht lists the types of new measures as follows:

- (1) the identification and counting of major innovations from the historical record;
- (2) the identification and counting of innovations by consulting experts;
- (3) the managers' assessment through postal surveys of numbers of innovations; and
- (4) the counting of innovations using trade journals as sources of information.

The last two measures, (3) and (4) above, are discussed in this book at some length.

Chapter 2 consists of a reprint of the classic paper written by Acs and Audretsch in which the authors use trade journals as sources of informa-

tion about INO. Acs and Audretsch interpret the patent count measure as only an intermediate output measure and an inferior one at that. They state that, "A patent reflects new technical knowledge, but it does not indicate whether this knowledge has a positive economic value" (p. 12). Acs and Audretsch use 1982 US data to shed new light on the Schumpeterian discussion. The conventional wisdom in economics, regarding innovation and technological change, holds that technological change is best promoted by the existence of giant corporations able to exploit enormous market power. These ideas stem from Schumpeter and are typically justified in empirical studies by using, namely, the conventional measure of innovation - R&D expenditures.

Acs and Audretsch cannot justify this approach in principle or with the new data. A potential explanation for the evident anomaly is that the *significance* of innovation varies between large and small firms. To study this, they divide all innovations in different "significance" categories and test whether the distribution over these categories is the same for small and large firms. They do not find different distributions, and so they resolve the apparent paradox by concluding that "each additional dollar of R&D is found to yield less in terms of innovative output" (p. 29). This gives small firms the advantage in the number of economical innovations per dollar of R&D.

Chapters 3, 4 and 5 contain papers analyzing innovation in European countries also using the innovative trade journal measure. These papers are Kleinknecht, Reijnen and Smits (The Netherlands); Fleissner, Hofkirchner and Pohl (Austria); and by Cogan (Ireland), respectively. Their discussions differ from the Acs and Audretsch paper in three ways. First, they are more concerned with describing and justifying the method of data collection. Second, their respective databases are more recent than Acs and Audretsch. Finally, an innovation is valued according to two characteristics; its complexity and its novelty. Although valuation is worthwhile, it is not yet used to its full potential. Kleinknecht *et al.*, signal this in their paper, when they admit that "when applying [the] appropriate weights to [a] type of innovation and [to a] degree of complexity, the [resulting] correlation would probably have been higher" (p. 71). The empirical foundations of Schumpeter's

famous thesis, which were challenged by the findings of Acs and Audretsch, are also now challenged again by similar findings for both the Netherlands and Ireland. (Unfortunately, this type of analysis was not done for Austria.)

Furthermore, each of the papers analyzes innovation intensity in different regions as well as within different industries. Differences between countries in industries that are most innovation-intensive, indicate degrees of regional specialization.

The countries listed below are discussed in the book and their respective areas of high innovation-output may be identified as follows:

COUNTRY	INDUSTRY
The Netherlands	Machine Building,
Austria	Food & Beverages,
Ireland	Paper Products

I commend the authors for making these identifications.

Trade journal data enables an analysis on the inter-industry innovation flows. We know which industry the trade journal represents and hence what market is served by any particular innovation. Knowing what market the innovating firm is in, on the other hand, informs us about the origin of the innovation also. Astonishing high interindustry flows are reported in all three studies. The subsequent analysis of the relation of innovation to market structure should take account of the two separate markets involved. Studies that research market structures that result in a high degree of innovation, should be focused on the sector of activity of the firm itself, whereas studies researching economic consequences of a high degree of innovation should be focused on the sector of final use, which can be an entirely different sector of the economy.

Chapter 6 contains a paper by Steward on innovation in the United Kingdom. Next to a trade journal based measure, he introduces an output measure based on yearly winners of a certain innovation award. Unlike the earlier chapters, data on more than one year are now provided.

Another method of INO measurement is the questionnaire survey that asks for a manager's

personal assessment of the number of innovations in his firm. Whereas the trade journal analyses only provide information on output measurement, the questionnaire is intended to cover a wide range of potentially useful information on the innovation process, not all of which is easily quantified. In chapter 7, Kleinknecht reports on the development and testing of an internationally harmonized questionnaire. The project has been supervised by the OECD, because the questionnaire will be used for surveys among the OECD nations. The deliberations leading up to the common OECD questionnaire also resulted in valuable guidelines for collecting innovation data. A pre-test in five countries was conducted using these guidelines and Kleinknecht thoroughly analyzes the results and makes recommendations concerning the development of future questionnaires. Both the questionnaire itself and the summary of the results can be found in this book.

The book ends with a chapter highlighting the pros and cons of the proposed new output measures. I would like to end this review with a few concluding lines of Kleinknecht exhibiting the scholarly freshness so typical of his work:

Given the obvious and unavoidable shortcomings of all presently available innovation indicators, including the new indicators, which are now becoming available, it is essential to collect them all. A close check of possible deviations between them may give us valuable indications of their reliability and about the limitations of their practical use.

I recommend this book to all students of *Small Business Economics*.

Albert J. Menkveld
Centre for Advanced Small Business Economics
Erasmus University Rotterdam
The Netherlands

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