too descriptive and too unco-ordinated. Many areas have been ignored and key areas such as strategy are discussed with little depth. The book calls out for some much more detailed analyses of individual firms' management successes, showing the integration of corporate "culture", labour policies, financial issues, marketing, exporting, strategic planning innovation and the business-government relationship.

One glaring omission is that of the role of technology, research and development and the innovation process. The chapter on the Seiko company (written by its President) talks extensively of its own product innovation strategy designed to meet competition and develop new markets, but he does not explain the process of managing innovation within the firm. Likewise, in the chapter on competition, it is pointed out that industrial groups have co-operated in introducing technology to Japan, but no more is said about it. It is left to Thurow to talk (in passing) about the Japanese experience in the labour-technology interface. At a time when the US is trumpeting warnings of advancing Japanese superiority in information technology, when Japan is enhancing its efforts in basic R & D, when Japan's industrial success has relied so extensively on R & D applications, a study of Japanese management such as this one must deal at length and in detail with these aspects of the Japanese "challenge".

Alan Rix
Department of Japanese and Chinese Studies, University of Queensland

High Tech America: The What, How, Where and Why of the Sunrise Industries
by Ann Markusen, Peter Hall and Amy Glasmeier.
(Allen and Unwin, Boston, 1986), pp. xviii + 227, Cloth, $75.00, ISBN 0-04-338139-1

The term "high-tech" has been bandied about by politicians, planners, academics, business and labor leaders and the general public since at least the mid-1970s. The authors claim that this book is written for two of these groups: "the academic community, which wants to understand where high tech jobs are being created", and "decision makers who want to know how to attract high tech to their city or state" (p. vii). The primary audience seems to be the latter group, the members of which are encouraged to compete with one another by undertaking the policy recommendations of the last chapter.

Since the term means many things to many people, the necessary first task is to formulate a meaningful, workable definition of "high-tech". A number of definitions used in the past are rejected, and the general criterion adopted for classifying an industry as high tech is whether the proportion of certain technical and professional occupational categories in the industry exceeds the manufacturing average. This is a logical and certainly tractable definition, but the occupational categories chosen (engineers, engineering technicians, computer scientists, life scientists and mathematicians) seem to be arbitrary.

Using these five categories, and the manufacturing average as the cutoff point, apparently gives the authors a list of high tech industries compatible with their *a priori* beliefs. For example, a higher cutoff point was rejected because using the manufactuing average "highlighted industries with innovation potential"

(p. 184). Another procedure was not used because it would exclude eight industries, three "of which have substantial high tech components" (p. 184). It is not clear how industries with "innovation potential" or "substantial high tech components" are identified **before** high tech is formally defined. While these five categories may be a reasonable choice, and it is stated that the rank ordering of industries is not extremely sensitive to the number of categories used, I must wonder whether the results of the analysis that follow would be different had another combination of occupational categories been used in the definition of high tech.

An additional problem with the definition used, as the book makes clear, is that it includes only manufacturing sectors, thus excluding other potential high tech sectors in the services category. Based on this definition, 100 industries at the four-digit SIC level are identified as high tech. Using these sectors, the authors proceed to an analysis of how, why, and where high tech industries grow.

The "why" and "how" questions are addressed through product-profit cycle theory, which suggests four stages of industry development: innovation, market penetration, market saturation, rationalisation. The compound annual growth rate in employment from 1947 to 1981 is used to classify 29 sectors identified as high tech into one of these four categories or a fifth, termed "volatile", due to dependence on defence spending. Since the entire post-World War II period is used, the analysis can only be undertaken at the three-digit SIC level, "for the good reason that many of our individual high tech industries did not even exist in the late 1940s" (p. 48). Is it meaningful, then, to analyse growth in employment over a 35-year period in industries whose composition has changed considerably over that span, to determine in what phase of the "product cycle" an industry is situated? In fact, can any industry that has existed for over 30 years really be said to be in the "innovative" stage? Six of the 29 sectors are classified in that category, which is described as the "earliest stage of development", in which "a new sector is distinguished by its preoccupation with the design and commercialization of a new product" (p. 41).

It would seem more logical to conduct this analysis at the four-digit level, using all 100 sectors identified earlier. If data were not available because a sector did not exist in earlier years, that in itself would be an indication that the sector was in the earlier stages of product development. Nonetheles, eight-firm concentration ratios are used to corroborate the classifications of the previous chapter, which were based on three-digit sectors.

Chapter 6 provides an interesting and useful discussion of the location of high tech industries using the traditional concepts of agglomeration and decentralisation, applied to specific cases. Agglomerative factors such as an available labour force, the spread of information to nearby firms, and new firms "spinning off" from established ones all contribute to the clustering of firms in the early stages of a sector. As sectors become more developed, decentralisation takes place in response to rising costs at the centres of innovation. Also taken into account at this stage is the location of buyers, not so much because of product transportation costs, but "the increased emphasis on just-in-time production, relatively customized products, and prompt servicing" (p. 76). The results of a separate study by one of the authors are reported, in which technical and administrative occupations are found to be clustered, while production and assembly occupations are more dispersed.

An entropy measure is calculated for each industry to determine its level of geographic concentration or dispersion. A "coefficient of redistribution" is also calculated for each industry as the difference in location quotient from 1972 to 1977, summed over the 3,140 counties in the US. Because various corporate

functions are segregated and many high tech industries have already gone through the agglomerative stage, it is concluded "that there is much potentially mobile employment in high tech sectors, particularly those that are growing rapidly" (pp. 95-96). This will undoubtedly cause much excitement among state and local officials anxious to get a piece of the action. Indeed, the authors go on to say that this "is good news for places that have to date missed out on high tech economic development" (p. 96).

Advice on what these local entities should do to attract high tech is apparently a major goal of the model of high tech location developed and estimated in Chapters 8 and 9. Amenity variables, access features, measures of agglomeration, and "socio-political" factors tend to be significant explanatory variables for the number of plants and jobs in 1977 and the change in plants and jobs from 1972 to 1977. Labour force variables are not significant.

Chapter 10 provides policy implications based on the empirical results of Chapter 9. A subheading states that "High tech location is explicable, therefore manipulable" (p. 174). This is somewhat misleading as well as disturbing. Some of the variables which are significant in explaining high tech growth are **not** manipulable, as the authors themselves point out. Climate cannot be changed and the number of Fortune 500 firms is not a policy option for local governments. One significant variable, the percentage of an area's population that is black is included "as a proxy for racist attitudes on the part of employers and fellow employees" (p. 146). This variable certainly is manipulable by local governments through zoning laws, encouragement of gentrification, and other policies. Are the authors implying that local or state governments wishing to attract high tech industries foster those racist attitudes, and drive blacks out?

Perhaps the most disturbing aspect of the final chapter, and indeed the book, is that the notion of states and municipalities trying to outdo each other with tax breaks, promises of infrastructure, and other preferential treatment in an attempt to attract industry, high tech or otherwise, is never questioned. This is not surprising since one of the target audiences for the book consists of the local planners and decision makers who are attempting to do just that. While no one would question the benefit to an area of a firm that decides to locate a plant in that area with no concessions from local government (particularly a "clean" plant), one must ascertain the value a plant will add to the local economy before committing resources to influence the firm's location decision by "outbidding" other localities. While the authors offer many suggestions on **how** to attract high tech industries, nowhere do they even hint that a cost-benefit analysis be done to determine whether or to what extent high tech industry **should** be pursued.

Some minor problems arise from the attempt to appeal to two audiences. While the authors claim that they have "shifted the details into appendices" (p. vii), some of these details are missing. For example, in Chapter 4, employment growth rates "based on ordinary least squares regression" (p. 48) are reported, but nowhere is the actual regression model specified: is it a simple linear growth path, exponential, quadratic, or something else? In the same table, a column labelled "R^2" is said to show "the correlation between the two calculations" (p. 49). It is not clear whether this is the R^2 from the unspecified regression analysis, or the square of the correlation between two different measures of growth rates.

In summary, this book provides a useful discussion of product-profit cycle theory and location theory as they apply to high tech industries and offers some

insight into the location of high tech activity. The authors have a very rich data base in the county level values of employment in high tech sectors, but the data are not always appropriate for the theories and hypotheses being tested. The dichotomy of the book's intended audience causes some problems in the presentation of the material.

Robert Garhart
College of St. Thomas, St. Paul, Minnesota

Improving Australia's Competitiveness Through Industrial Research and Development. A Report to the Prime Minister, *by the Australian Science and Technology Council*
(AGPS, 1987) pp. vii + 56, ISBN 0-644-6716-0.

The theme of this ASTEC report is that Australia's industrial and economic competitiveness has been eroded by insufficiently well-directed and energetic research and development. The central point is made in Chapter 1. World manufacturing trade has grown almost ten-fold in the past 25 years, while agricultural trade has barely doubled. Australia remains primarily an agricultural and mineral exporting nation and is not participating in this growth of world trade. The solution: "Indigenous R&D will play an important role in increasing Australia's competitiveness, through enhancing industry's capability to develop high growth industries . . ." (p. 19).

It is difficult to know how much poetic and dramatic licence is desirable in major government reports. R&D, like many other forms of expenditure, is undoubtedly a good thing. It **does** promote productivity in industry (mineral, agricultural and manufacturing). The **real questions** concern how much national effort should be placed in R&D, and who should decide the amount, and direction in which it is spent.

Crude comparisons with R&D activity in other countries are the main method for supporting the assertions of the report. This is a most unwise mode of analysis. World trade in manufactures has grown dramatically for many reasons, and among these reasons technological product innovation is probably fairly unimportant. The big changes are due to the expansion and development of the EEC, the continued success of GATT, and the emergence of Japan as a revitalised player on the international scene.

If trade growth is important for economic growth, then Australia must promote policies which free-up the trade in agricultural and mineral products, since these are industries in which the country has most comparative trading advantage. Unfortunately the ASTEC report focuses almost exclusively on manufacturing industry, which is a small part of Australia's present (and prospective) export market.

Clear and dramatic improvements in agricultural and mining productivity have enabled Australia to maintain a major world position in these markets, even in the presence of a hostile trading environment. Continued productivity gains in these areas are essential if this position is to be maintained in the future.

Recent evidence indicates that, in purchasing power terms, Australia has maintained a fairly steady ranking among the leading Western economies since