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FORMALIZING THE DERIVATION OF FIRM-SPECIFIC INPUT-OUTPUT MULTIPLIERS

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Introduction

Recent advancements in the capacity of microcomputers to perform algebraic operations on large matrices plus the availability of regional input-output (I/O) models and I/O programs that operate on microsystems have created a profusion of local economic impact assessment studies on tourism, waste management projects, and plant closings.

For most impact studies, the economic impact assessment model has been a nonsurvey regional I/O model. Time and cost factors have precluded the development of survey-based I/O models.

Considerable discussion and debate have focused on the accuracy of nonsurvey I/O models. This debate generally has been addressed by comparing multipliers derived from nonsurvey I/O models with those derived from comparable survey-based I/O models. The results of these studies are mixed, but the apparent general consensus is that survey I/O models for regional impact studies should be developed if affordable.

The subject of this paper is the derivation and use of firm-specific multipliers when detailed information concerning a family of firms is known and when limited information is known concerning a regional I/O model. It is this research's contention that at the regional level the primary issue is not whether the I/O model is a survey or a nonsurvey model, but how the initial impact (event) is represented in the I/O model.

Rarely is a survey-based regional I/O model available for a given study area. Analyses of an impact with different levels of information have been made. A method for estimating input-output type output multipliers (short-cut multipliers) when no I/O model exists is presented by Burford and Katz (1981, 1982) and Drake (1976). Phibbs and Holsman (1981) are critical of the application of short-cut multipliers. Mulkey and Hite (1979) examine a method for determining regional multipliers using only a national input-output model, national sector totals, regional sector output totals, and national and regional sector employment totals. The Mulkey-Hite approach treats the regional economy as a single sector augmented to a national table. The Mulkey-Hite multipliers conceivably could be applied to regional or single firm level models if appropriate data were available.

Latham and Mulkey (1979) further explore the application and relevance of the Mulkey-Hite multipliers comparing the approach with the

Chenery-Moses system and the truncated interregional multipliers approach. This approach addresses the problem of limited data and resources available in making policy decisions. A broader approach is taken by Blair and Miller (1983) utilizing a form of multiregional truncated output multipliers with limited regional feedbacks in a multiregional I/O model. Early studies by Isard and Kuenne (1953) of the steel industry and Miller (1957) of the aluminum industry demonstrate a method that includes a new sector in an existing regional table. Both of these studies consider one detailed firm level (or industry level) production function in the evaluation. In the Miller article, the detailed production function considers all requirements of the aluminum industry.

The early approaches treat the initial impact plus the first round of activity as exogenous to the reference base I/O model. These studies present an approach that is time consuming and expensive but reasonable given the level of information available.

At the regional level, the initial impact typically is plant or firm specific, e.g., a plant closes or a firm wins a major contract or purchase order. To measure the economic impact of a firm-specific event correctly requires firm-specific information. Industry-based information (e.g., industry average direct requirements coefficients) likely would misrepresent the total impact on the region.

The firm-specific argument needs to be taken an additional step. It is likely that the firm where the impact originates has firm-specific local suppliers. In short, the argument is that in most economic impact cases at the regional level, a substantial portion of total impact occurs within a group or family of firms. The term *family of firms* is used in this article to represent any level of firm or plant association with other firms or plants.

The firm-specific impact argument is not new. This paper's intent is twofold. First, at the regional level, firm-specific information is extremely important for accurately measuring impacts. Detailed information on a set of firms easily can be utilized to produce firm-level impacts in a region. Second, a formalized way to treat firm-specific information within a survey or non-survey I/O framework is presented. This formalized method advances present techniques, such as the successive approximations procedure, for calculating regional impacts.

Method

In matrix algebra fashion, the method involves conjoining firm-specific information (i.e., firm-specific input requirements) with interindustry information (i.e., average industry direct requirements coefficients). The regional I/O model can be a survey or a nonsurvey model. In many cases, minimal effort is involved in obtaining the firm-specific information, as typically only a few firms form the family of firms

in question. The current approach double counts firms; a firm is considered in a sector by itself and also is considered in a parent industry sector in the regional model. This double counting marks a departure from previous research. The current paper presents equations that generate firm-level output, income, and employment multipliers when only detailed information about a family of firms plus output, income, and employment multipliers for the regional economy are known. The current approach does not require either the full direct requirements table or the total requirements table for the regional economy.

Let R be a partitioned matrix containing regional input coefficients with a set of c firms as the family of firms and a set of n industries (sectors) for the region's general economy. (The number of c firms can be one or several.)

$$(1)\ R = \begin{bmatrix} P & O \\ S & A \end{bmatrix}$$

where:

A = An n x n matrix denoting the direct requirements table for the region's general economy. This table (matrix) can be a survey or a nonsurvey-based regional I/O model. The parent industries or sectors of the family of firms are included in the regional direct requirements table (i.e., the A matrix). The household sector can be included or excluded;

P = A c x c matrix representing firm-to-firm input requirements among the family of firms;

S = An n x c matrix representing purchases by the family of firms from the regional economy. If the A matrix includes the household sector, then the S matrix must include the household sector in the appropriate row; and

O = An n x c zero-filled matrix indicating (by definition) that the region's industries do not purchase directly from any firm in the family of firms. This restriction is not severely constraining. Because each specific firm within the family of firms also is included in its parent industry in the A matrix, indirect purchases of a specific firm's output is captured by the respective parent industry in the A matrix.

A limited number of inquires usually is required to determine firm-to-firm input requirements within the family of firms and firm-to-industry input requirements from the region. A direct requirements table (A matrix) for the regional economy can be constructed using nonsurvey

I/O techniques. For application, however, only the summary multipliers for a regional I/O model are necessary.

The following derivation shows the use of the regional I/O multipliers to calculate firm-specific multipliers. The first step is to determine the Leontief inverse of the R matrix. Let:

$$(2)\ (I-R) = \begin{bmatrix} I-P & O \\ -S & I-A \end{bmatrix}, \text{ and}$$

$$(3)\ (I-R)^{-1} = \begin{bmatrix} T & O \\ U & V \end{bmatrix}.$$

If the inverse of (I–R) exists, then

$$(4)\ (I-R) \cdot (I-R)^{-1} = I.$$

Substituting equations (2) and (3) into equation (4) yields:

$$(5) \begin{bmatrix} I-P & O \\ -S & I-A \end{bmatrix} \begin{bmatrix} T & O \\ U & V \end{bmatrix} = \begin{bmatrix} I & O \\ O & I \end{bmatrix}.$$

Multiplying the partitions of equation (5) yields:

$$(6)\ (I-P)T = I;$$

$$(7)\ -ST + (I-A)U = O; \text{ and}$$

$$(8)\ (I-A)V = I.$$

Solving equation (6) for T yields

$$(9)\ T = (I-P)^{-1}.$$

Substituting equation (9) into equation (7) and solving for U yields

$$(10)\ U = (I-A)^{-1} S (I-P)^{-1}.$$

Finally, solving equation (8) for V yields

$$(11)\ V = (I-A)^{-1}.$$

Therefore,

$$(12)\ (I-R)^{-1} = \begin{bmatrix} (I-P)^{-1} & O \\ (I-A^{-1})S(I-P)^{-1} & (I-A)^{-1} \end{bmatrix}.$$

Equation (12) illustrates the Leontief inverse of the augmented regional I/O model. Neither the Leontief inverse of the entire model, $(I-R)^{-1}$, nor the Leontief inverse of the regional model, $(I-A)^{-1}$, however, are required to determine firm-specific multipliers if the appropriate multipliers for the regional model are known.

Output Multipliers

Once the $(I-P)^{-1}$ matrix is calculated, a straightforward determination of the firm-specific output multipliers can be made. Let O_g be the output multipliers for the n sectors in the regional I/O model and O_c be the output multipliers for the c specific firms in the family of firms. Using equation (12), output multipliers for matrix R can be defined as:

$$(13)\ [O_c\ O_g] = i'\ (I-R)^{-1},$$

where:

i' = Row vector of ones.

Expanding equation (13) with information from equation (12) results in:

$$(14)\ [O_c\ O_g] = i' \begin{bmatrix} (I-P)^{-1} & O \\ (I-A)^{-1}S(I-P)^{-1} & (I-A) \end{bmatrix}.$$

Multiplying and separating terms in equation (14) yields firm-specific output multipliers:

$$(15)\ O_c = i'\ (I-P)^{-1} + i'(I-A)^{-1}\ S(I-P)^{-1};\ \text{and}$$

general economy output multipliers:

$$(16)\ O_g = i'\ (I-A)^{-1}.$$

Finally, substituting equation (16) into equation (15) yields a solution for the firm-specific output multipliers based only on the output multipliers of the regional economy and information from the family of firms:

$$(17)\ O_c = (i' + O_gS)\ (I-P)^{-1}.$$

Other Multipliers

Derivation of income and employment multipliers is similar to that of the output multipliers. Figure 1 is a table of firm-specific multipliers that can be calculated using industry summary multipliers from the region's I/O model.

Empirical Examples

This section demonstrates the use of firm-specific multipliers, the loss in accuracy due to the limited industry-to-firm feedback, and the effects of firm dominance in an industry.

Suppose there exists for a region an I/O model with five interindustry sectors. Let Figure 2 represent the transactions table and Figure 3 represent the direct requirements table (i.e., the A matrix) from the regional I/O model.

Next suppose that detailed expenditures data have been obtained for a family of three firms. This information is used to create Leontief production functions for the family of three firms as illustrated in Figure 4.

Output multipliers for the regional I/O model (O_g) are calculated. These regional multipliers with the S matrix and the $(I–P)^{-1}$ matrix are used in equation (17) to calculate firm-specific multipliers (O_c). Figure 5 compares the firm-specific multipliers with their corresponding parent industry multipliers. In this example, each O_c multiplier is greater than the corresponding O_g multiplier; however, this outcome is not to be interpreted as a general rule.

Firm-specific multipliers differ from their corresponding industry multipliers. We must question how much error is incurred in the proposed approach, given that the industry-to-firm feedback is limited.

Truncation Error

Prohibiting the direct feedback from the region's general economy to a specific firm(s) under investigation produces erroneous multipliers when compared to a fully linked firm-industry I/O model. The error is reduced substantially, however, because of the inclusion of the specific firms in their corresponding parent industries. Generally, 80 percent or more of a total regional impact occurs in the first few rounds of activity, and most of this impact occurs within the family of firms.

Figure 6 shows a standard fully linked firm-industry transactions table. The industry by industry portion of the table explicitly excludes the corresponding firms, but includes all linkages to and from those firms. This table is treated as the true economy transactions table. In

this example, firm 1 accounts for 10 percent of output from industry 1, firm 2 accounts for 30 percent of output from industry 2, and firm 3 accounts for 50 percent of output from industry 3. Figure 2 can be constructed from Figure 6 by consolidating firms 1, 2, and 3 into industries 1, 2, and 3. Figure 7 represents the direct requirements of the fully linked model.

Taking the Leontief inverse and calculating output multipliers of the fully linked regional model yields true firm-specific multipliers of 3.196, 3.103, and 3.141. The estimated firm-specific multipliers (O_c) are closer to the true firm-specific multipliers than to the general economy industry-specific multipliers, O_g.

This single example illustrates the increased accuracy of using firm-specific data with existing regional level multipliers. A single example, however, is not sufficient to verify our claim.

Monte Carlo Simulation

To examine the truncation error problem more fully, a Monte Carlo simulation is performed. A software package designed for I/O analysis, called ADOTMATR, is used to produce 1000 simulations.

For each simulation, a random fully linked and balanced transactions table is created including three firms as the family of firms, five industries, primary payments, final demand, and output totals. Output of firm 1 is set at 10 percent of the total output of firm 1 and industry 1 combined. Output of firm 2 is set at 30 percent of the total output of firm 2 and industry 2 combined. Output of firm 3 is set at 50 percent of the total output of firm 3 and industry 3 combined. Output multipliers for each fully linked model are calculated. The multipliers for the first three firms in the fully linked model are considered true firm-specific multipliers.

Each firm in the family of firms is consolidated into its corresponding parent industry. General economy output multipliers are calculated. Deviations of general economy industry multipliers 1, 2, and 3 from the true firm-specific multipliers 1, 2, and 3 are calculated. Detailed expenditures data for the family of firms and the general economy multipliers are used to create estimated firm-specific multipliers using equation (17). Deviations of estimated firm-specific multipliers from true firm-specific multipliers are calculated.

The sample mean and sample variance for the resulting multiplier deviations are presented in Figure 8. There is a slight negative bias in each of the estimated firm-specific multiplier deviations. Though the bias is present at the 95 percent level of confidence, the variance is small. The estimated firm 1 specific multiplier deviation is 80 times smaller than the corresponding regional industry 1 multiplier deviation. A

rather large positive bias is found in the industry multipliers when compared to the true firm multipliers. Though on average an industry output multiplier of the regional economy may reflect the average firm-specific multiplier accurately, the variation in the deviations of the regional multipliers make them unacceptable. Further evaluation of bias and stability of these multiplier deviations, similar to the approach of Roland-Holst (1989), is beyond the scope of this article.

Industrial Concentration

In the Monte Carlo simulation, firm 1 represents 10 percent of industry 1's output, firm 2 represents 30 percent of industry 2's output, and firm 3 represents 50 percent of industry 3's output. If a firm is more dominant in an industry, the corresponding industry multiplier is a better estimate of a specific firm's true multiplier. The comparison in Figure 8 shows that as concentration increases (from firm 1 to firm 3), only the variance declines. Most nonsurvey models, however, use the average U.S. technical coefficients as a proxy for the regional technical coefficients. Trade is estimated for each industry creating a set of intraregional input coefficients. If the firm in question does not follow the average U.S. technology and the estimated trade patterns for the region, then the industry will not represent the specific firm. Firm dominance in an industry generally is not a valid reason to assume that the industry multiplier accurately represents the specific firm's multiplier.

Conclusion

Firm-specific multipliers can be generated with relative ease and accuracy when a selected set of multipliers for the regional economy and specific expenditure information for a specific firm or family of firms are known. Inclusion of firm-specific information results in accurate multipliers.

Many ad hoc methods implicitly use the approach formalized in this article. This formalization should reduce the time required in determining firm-specific multipliers.

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Figure 1
Multipliers

Output	Type I & Type II	$O_c = (i' + O_gS)(I-P)^{-1}$
Income	Simple & Full	$H_c = (h_c + H_gS)(I-P)^{-1}$ $= (h_c + Y_g\hat{h}_gS)(I-P)^{-1}$
	Type I & Type II	$Y_c = (h_c + H_gS)(I-P)^{-1}\hat{h}_c^{-1}$ $= (h_c + Y_g\hat{h}_gS)(I-P)^{-1}\hat{h}_c^{-1}$ $= H_c\hat{h}_c^{-1}$
Employment	Simple & Full	$E_c = (w_c + E_gS)(I-P)^{-1}$ $= (w_c + W_g\hat{w}_gS)(I-P)^{-1}$
	Type I & Type II	$W_c = (w_c + E_gS)(I-P)^{-1}\hat{w}_c^{-1}$ $= (w_c + W_g\hat{w}_gS)(I-P)^{-1}\hat{w}_c^{-1}$ $= E_c\hat{w}_c^{-1}$

h_c = 1 x c matrix containing the household row of the family of firms (last row of the S matrix);

h_g = 1 x n matrix containing the household row from the region's direct requirements table (last row of the A matrix);

H_c = Simple or full income multipliers for the family of firms;

H_g = Simple or full income multipliers for the industries defined in the regional I/O model;

Y_c = Type I or Type II income multipliers for the family of firms;

Y_g = Type I or Type II income multipliers for the industries in the regional I/O model;

w_c = 1 x c matrix containing the physical labor coefficients for each specific firm within the family of firms;

w_g = 1 x n matrix containing the physical labor coefficients for the industries in the regional I/O model;

E_c = Simple or full employment multipliers for each specific firm within the family of firms;

E_g = Simple or full employment multipliers for the industries in the regional I/O model;

W_c = Type I or Type II employment multipliers for each specific firm within the family of firms; and

W_g = Type I or Type II employment multipliers for the industries in the regional I/O model.

Vectors with a ^ are treated as diagonal matrices. For example the vector w_g is treated as a diagonal matrix whenever the ^ sign is placed above the w.

Figure 2
Regional Transactions Table

	Industry Sectors 1	2	3	4	5	Final Demand	Total Output
Industry 1	12	60	234	28	25	141	500
Industry 2	89	89	143	124	34	221	700
Industry 3	79	98	30	26	151	516	900
Industry 4	39	53	44	59	118	387	700
Industry 5	34	246	223	61	1	235	800
Other	247	154	226	402	471	1000	2500
Total	500	700	900	700	800	2500	

Figure 3
Regional Direct Requirements Table

	Industry Sectors 1	2	3	4	5
Industry 1	.0240	.0857	.2600	.0400	.0313
Industry 2	.1780	.1271	.1589	.1771	.0425
Industry 3	.1580	.1400	.0333	.0371	.1888
Industry 4	.0780	.0757	.0489	.0843	.1475
Industry 5	.0680	.3514	.2478	.0871	.0013

Figure 4
Firm-Specific Sectors
P and S Matrices

	Transactions Firm Sectors 1	2	3			Direct Requirements Firm Sectors 1	2	3
Firm 1	0	15	20		Firm 1	.0000	.0714	.0444
Firm 2	10	0	60	P	Firm 2	.2000	.0000	.1333
Firm 3	15	40	0		Firm 3	.3000	.1905	.0000
Industry 1	1	35	193		Industry 1	.0200	.1667	.4289
Industry 2	1	33	67		Industry 2	.0200	.1571	.1489
Industry 3	1	17	3	S	Industry 3	.0200	.0810	.0067
Industry 4	2	0	7		Industry 4	.0400	.0000	.0156
Industry 5	10	30	40		Industry 5	.2000	.1429	.0889
Other	10	40	60		Other	.2000	.1905	.1333
Total	50	210	450					

Figure 5
Comparison of Output Multipliers

Sector	Firm-Specific (O_c)	General Industry (O_g)
1	3.196	2.276
2	3.103	2.790
3	3.141	2.722

Figure 6
Fully Linked Transactions Table

	--Firm Sectors--			---Industry Sectors---					Final	Total
	1	2	3	1	2	3	4	5	Demand	Output
Firm 1	0	15	20	2	1	0	3	0	9	50
Firm 2	10	0	60	29	21	10	29	1	50	210
Firm 3	15	40	0	36	17	6	24	91	221	450
Industry 1	1	35	193	9	9	21	25	25	132	450
Industry 2	1	33	67	49	35	6	95	33	171	490
Industry 3	1	17	3	27	24	21	2	60	295	450
Industry 4	2	0	7	37	53	37	59	118	387	700
Industry 5	10	30	40	24	216	183	61	1	235	800
Other	10	40	60	237	114	166	402	471	1000	2500
Total	50	210	450	450	490	450	700	800	2500	6100

Figure 7
Fully Linked Direct Requirements Table

	-----Firm Sectors-----			----------Industry Sectors----------				
	1	2	3	1	2	3	4	5
Firm 1	.0000	.0714	.0444	.0044	.0020	.0000	.0043	.0000
Firm 2	.2000	.0000	.1333	.0644	.0429	.0222	.0414	.0012
Firm 3	.3000	.1905	.0000	.0800	.0347	.0133	.0343	.1138
Industry 1	.0200	.1667	.4289	.0200	.0184	.0467	.0357	.0313
Industry 2	.0200	.1571	.1489	.1089	.0714	.0133	.1357	.0413
Industry 3	.0200	.0810	.0067	.0600	.0490	.0467	.0029	.0750
Industry 4	.0400	.0000	.0156	.0822	.1082	.0822	.0843	.1475
Industry 5	.2000	.1429	.0889	.0533	.4408	.4067	.0871	.0012

Figure 8
Deviations From the True Firm Multipliers

	---------Estimated---------			----------General----------		
	Firm-Specific Deviations			Economy Deviations		
	Firm 1	Firm 2	Firm 3	Industry 1	Industry 2	Industry 3
Count	1000	1000	1000	1000	1000	1000
Mean	-0.0107	-0.0088	-0.0081	0.0425	0.0435	0.0642
Variance	0.0052	0.0058	0.0048	0.4262	0.2543	0.1200
STD	0.0720	0.0762	0.0694	0.6528	0.5043	0.3464
Maximum	0.43	0.43	0.35	2.49	2.47	1.68
Minimum	-0.39	-0.55	-0.34	-1.74	-1.42	-0.97

The Contingent Economy: The Growth of the Temporary, Part-Time and Subcontracted Workforce. **By Richard S. Belous. Washington, D.C.: National Planning Association, 1989.**

Reviewed by Scott M. Fuess, Jr., University of Nebraska, Department of Economics

Richard Belous opens *The Contingent Economy* by noting that in recent years U.S. employers have been seeking greater workforce flexibility. Chapter 1 and the Executive Summary discuss this drive toward flexibility, which has proceeded on two tracks. First, employers have altered compensation packages, trying to align wages and benefits more closely with firms' financial circumstances. Second, firms have changed the nature of employment by turning to contingent labor. Firms are hiring more temporary and part-time workers and leasing more work, that is, subcontracting more jobs to outside workers. This book focuses on the second track, attempting to evaluate the tendency of firms increasingly to turn from full-time, core workers to contingent labor.

Following the introductory material, the book proceeds essentially in two parts. The first part, Chapters 2 and 3, considers what employers have been doing to achieve greater workforce flexibility and how they have used contingent labor. The second part, Chapters 4 and 5, attempts to summarize economic effects of a greater emphasis on contingent employment.

Chapters 2 and 3 use a mixture of anecdotes about individual firms and official aggregate labor statistics to discuss employers' move toward contingent labor. (Company identities are not revealed in the book, with the exception of a temporary services firm.) Figures are reported for the growth of part-time and temporary workers in the 1980s, as is information on the increased use of labor subcontracting. Belous notes that part-time and temporary workers are predominantly female and of prime working age; these workers typically are found in administrative support, retail sales, and other service jobs. Further, he reports that most part-time workers are part-timers by choice, not persons who cannot find full-time work.

Evidently the company anecdotes are meant to supplement the statistics reported, by discussing some firms' reasons for relying more on contingent labor. These anecdotes also are used to illustrate some potential problems of contingent work. Belous argues that switching to contingent labor often represents a haphazard reaction by firms to changes in market conditions. Further, he relates that tensions between contingent and full-time workers can undermine workplace productivity.

Chapters 4 and 5 discuss economic effects of contingent labor, continuing the mix of aggregate data with anecdotal accounts. Citing a number of econometric models, Belous argues that labor markets have become significantly more flexible. Further, he recounts that in the 1970s and 1980s in Detroit, a mainstay of full-time work, employers pressed for more flexible employment. These recent developments are attributed to structural changes in the economy, enhanced competition in output markets—due in part to deregulation and greater international competition—declining unionization, diminished internal labor markets, a shifting intellectual landscape, and a more short-run view adopted by employers due to changes in financial markets.

The book closes by considering effects of contingent employment on workers' compensation and on social welfare. Belous reports that the weekly and hourly earnings of part-time workers are less than those of their full-time counterparts; similarly, part-timers' nonwage benefits are relatively smaller. There is also speculation that a more flexible labor force contributes to shorter unemployment spells and that contingent employment promotes worker (re)training. Belous concludes by arguing that a drive toward more flexible labor markets, with consequent reductions in wages and workers benefits, also requires more flexible social welfare policies.

The Contingent Economy's mixture of aggregate statistics and company anecdotes is likely to whet a reader's appetite by raising a number of interesting employment questions. Those looking for a brief sketch of the contingent economy should be satisfied with the fare in this book. Those researchers looking for a formal, systematic analysis of the determinants of the contingent economy and the effects of more flexible employment, however, will be hungry for more substantial analysis. Although the book attributes the tilt toward contingent employment to a number of factors, its hypotheses are not tested. Greater workforce flexibility is ascribed to economic, political, and sociological factors, but the relative importance of these impulses is not estimated. Because the book does not analyze formal models of employer or worker behavior vis-à-vis full-time and contingent employment, many questions are left unanswered. For example, what factors would require service employment to be more flexible than manufacturing employment? What would make females (males) more likely to work in part-time or temporary (subcontracted) jobs? Although the book discusses some policy issues associated with the rise of the contingent economy, there is no analysis of the likely effects of policy changes or of the prospects for such policies to be enacted.

In closing, this book should not be regarded as an in-depth analysis of contingent employment. But the book could inspire future analyses of the causes and consequences of labor market flexibility.

Regional Structural Change: Experience and Prospects in Two Mature Economies. **Edited by Lay James Gibson and Robert J. Stimson. Peace Dale, Rhode Island: Regional Science Research Institute, 1989. vi + 161 pp.**

Reviewed by R. Bradley Hoppes, Department of Economics, Southwest Missouri State University.

This text comprises 11 papers from a 1984 Australia—U.S. seminar in Palm Springs, California. These papers focus on various aspects of structural change in the two countries over the past few decades. Several papers deal with:

- Demographic changes, population, and migration (Chapters 2-5);
- Employment changes by industry as well as locational shifts of industries (Chapters 6-7); and
- Special topics (Chapters 8-11).

Although the seminar was held in 1984 and much of the investigative research uses data/trends from the 1960s and 1970s, this is a good collection of papers whose assortment will interest readers from many areas—economics, geography, demography, economic development, and planning and forecasting. It would have been nice for the reader if he or she could identify more easily the codifying themes. Given the breadth of the topic and the seminar format, however, such a criticism is not severe.

After an interesting overview chapter comparing and contrasting the two countries, the next four chapters investigate various aspects of demographic changes. Chapter 2 is a lengthy chapter comparing population changes in the U.S. to those observed in Australia. Some of the population aspects discussed are fertility, mortality, family size, the elderly, and migration. Also covered are sector industrial shifts and the accompanying decentralization of employment. Many of the changes/developments in the two countries are congruent.

The major focus of Chapter 3 is internal migration in the U.S. This paper is empirical and theoretical, as it discusses the impact of population/decentralization shifts. The major migration flow is expected to continue to come from the core areas, but there will be less flow into the periphery than was witnessed in the 1970s. It is an interesting chapter that encourages more research in the area in order to deal better with observations from other research—for example, two-thirds of the migration that occurs is to states with lower wages than the origin state.

Internal migration in Australia is investigated similarly in Chapter 4, which contains a good discussion of migration and its impetus. Is migration led by population or by employment? Population theory, which purports migration is due to changes in preferences and attitudes, is discussed. It also is hypothesized in this theory that population movements create jobs. An additional theory, employment theory, is addressed. Employment theory posits that migration is due mostly to changes in the location of the demand for labor. There is some discussion that these need not be mutually exclusive in a market system where labor can change the weight of nonpecuniary aspects of employment. Elderly migration in the U.S. is the focus of Chapter 5. This empirical paper tests a theory that seeks to develop factors that will measure the likelihood of elderly migration.

Chapter 6 discusses metropolitan changes and the role these nodes play in economic development. With the relative decline in R & D monies as well as in general investment dollars in U.S. and Australian cities, such cities will become less significant in the global economy. Several models—substitution, technology, product cycle—are used to investigate and forecast the spatial distribution of economic activity.

Chapter 7 also compares the U.S. to Australia, but its focus is the restructuring of manufacturing. While manufacturing is decentralizing in both countries, a basic difference lies in its decentralization effects. The differences are noted through the implementation of a core-periphery (leading core and lagging periphery) model and a spatially integrated (central place theory) system. Australia, being more of the former type, is expected to have smaller gains from the decentralization and deagglomeration of manufacturing.

The remaining chapters are more topical. These papers focus on nonmetropolitan population in the western U.S. and in Australia using shift-share analysis on employment and occupation data and cluster analysis, respectively. Chapter 10 focuses on resource use, primarily water and the environment problems resulting from economic growth in the southwestern U.S. Finally, issues relating to declining private investment and growing public investment (infrastructure problems) in Australia's sparsely settled pastoral zone are discussed.

This book brings together various aspects of structural change in two industrialized countries through comparison, contrast, theory, empiricism, and forecast. The reader certainly will finish with a broader perspective of structural change and a deeper appreciation of its complexities.

South Australian Manufacturing in Transition. **Edited by T.J. Mules. Kent Town, South Australia: Wakefield Press, 1989. vii + 188 pp.**

Reviewed by Allan D. Stone, Southwest Missouri State University, Department of Economics.

Australian has long been associated with isolation from its trading partners, minerals, low population, and vast pastoral areas. While continuing to enjoy a relatively high standard of living by world standards, there is concern in Australia over slow growth and loss of manufacturing output in the post-1970s. As the name of this book indicates, special attention is devoted to one state, South Australia.

This book was developed for the Centre for South Australian Economic Studies in an attempt to identify what has been happening to South Australian manufacturing. Nine academics, primarily from the University of Adelaide, subjectively, analytically, and historically discuss the development of manufacturing through the case study method. Of interest to many will be their views of government policy to assist manufacturing growth. The consensus view is that the policies were of minor effect at best and that resources likely would have been utilized better elsewhere.

There are questions and conjectures regarding the differences in productivity among the states. South Australia compares poorly on the basis of capital intensities, composition of manufacturing, and scale. Structural adjustment has occurred as the contribution of manufacturing to GDP has fallen and government policies aimed at encouraging manufacturing have not had intended effects.

The large centers along the Sydney-Melbourne axis have set the pace and driven the economy; South Australia tends simply to follow. South Australia can claim to be unique, however, in cozy labor relations. Although beyond the friendly labor-management cricket contests of several decades ago, relations often are described as informal, cooperative, and intimate. The state seems to follow trends determined along the major axis of the country where the major companies are headquartered and the firms and numbers of employees are large. South Australia thus far has failed to meet the goals of international competitiveness.

This book contains considerable manufacturing-related data for anyone with an interest in South Australia. The reader can feel the problems and gain an understanding and appreciation of them from the attempts of government to deal with manufacturing. There was reasonable growth in manufacturing in the 1950s and 1960s during a period of trade protectionism. The 1970s, however, brought a decline that contin-

ues. Although federal government policies such as tariffs are cited as allied forces associated with the growth period, the decline is associated with high energy prices and the failure to be competitive internationally. It is not suggested that protectionism will be a general solution. One of the interesting actions is examined in the chapter on the Technology Park Adelaide (TPA). This was the jewel of the crown of the intended industrial development of South Australia. This project was intended to attract human and financial capital in moving the base toward high technology. Several chapters will familiarize the reader with the processes and failings involved when the government becomes involved in the planning and support of moves toward revitalization.

This book definitely will be of interest to anyone with an interest in the Australian economy, especially South Australia. The emphasis is regional, concentrating on an area that has experienced low productivity and low capital investment for over 50 years.