

Differing Patterns of Industrial Dynamics: New Zealand, Ohio, and Sweden, 1978–1994

Bo Carlsson

ABSTRACT. New Zealand, Ohio, and Sweden have experienced sharply divergent macroeconomic developments since the early 1970s. During the 1980s, New Zealand went from being the most heavily regulated and protectionist OECD country to one of the least regulated and most open economies in the world. Ohio suffered severe economic downturns when its major industries (steel, automobiles, and machinery) went through devastating crises. Since then, a major restructuring has taken place, and manufacturing output, exports, and employment have generally grown faster than in the United States as a whole. Sweden had an outstanding industrial growth record for several decades until the mid-1970s but then suffered economic setbacks from which it has not yet fully recovered. Industrial output declined for several years, resumed growth in the early 1980s but then stagnated again in the early 1990s.

The object of this paper is to study the microeconomic responses to these differences in the macroeconomic environment. While manufacturing employment declined by more than 20 percent in each country, the number of establishments in manufacturing stayed constant in Sweden while it declined by 9 percent in Ohio and more than doubled in New Zealand.

While there are certainly structural differences in the composition of the manufacturing sector in the three economies, these differences explain only a small portion of the differences in development patterns. Only a handful of 3-digit ISIC industries grew in terms of employment in each country between 1978 and 1993, but the growth industries were not the same across countries, and there were substantial differences in the growth patterns within these industries.

I. Introduction

In recent years there has been growing interest in the role of small business and of the interdependence among firms and other entities, regardless of size, in economic growth. There is increasing awareness that economic activity tends to cluster in various ways, both geographically and in a backward/forward linkage sense. This seems to be true especially of innovative activity. As long ago as 1950, Erik Dahmén analyzed Swedish industrial entrepreneurial activity in terms of what he called “development blocs” – clusters of interdependent technologies and economic actors (Dahmén, 1950, 1989). Backward and forward linkages, input-output analysis, the French concept of “*filière*” and, more recently, industrial networks are all variations on the same theme. In 1987, a group of Swedish scholars set out to study “technological systems” – networks of actors interacting in a specific area of technology under a particular infrastructure for the purpose of generating, diffusing, and utilizing technology (Carlsson and Stankiewicz, 1991). Porter’s by now well-known diamond describing the determinants of competitive advantage in various industries and countries is similar in concept (Porter, 1990). Saxenian’s recent (1994) comparison of the “local industrial system” in Silicon Valley in California with that along Route 128 in Massachusetts opens up new dimensions (involving corporate culture, hierarchical structures, and geographic proximity) for continued research. Feldman’s (1994) study on geographical aspects of innovation is also suggestive.

A common element in all of this literature is the idea that economic activity is not evenly spread among regions and industries but rather tends to cluster in space and time. This, in turn, gives rise

Final version accepted on August 18, 1995

Department of Economics
Weatherhead School of Management
Case Western Reserve University
Cleveland, Ohio 44106-7206
U.S.A.

to questions not only about differences in patterns and structures but also about causality: What is it that *causes* such clusters? What are the necessary and sufficient conditions? What constitutes a critical mass? How do such clusters come into being? Can they be created, or do they simply emerge? What should be the role of public policy in this context? These are the kinds of questions which lie at the heart of what I have referred to as Industrial Dynamics (Carlsson, 1987, 1989, 1992).

In order to find answers to these questions, one needs to study a variety of industrial systems under different circumstances. The purpose of this paper is to compare the industrial development in three countries in different parts of the world, exhibiting large differences in the environment for industrial growth during the last couple of decades, namely New Zealand, Ohio, and Sweden.

The reasons for choosing these three particular countries are the following. Until the early 1980s, New Zealand was the most heavily regulated and protectionist OECD country but has undergone a complete re-orientation of its economic policies during the last decade so that it is now one of the least regulated and most open economies in the world. Having had a dismal growth record during the late 1970s and early 1980s, New Zealand has had among the highest GDP growth rates (about 6% per annum) of the OECD countries during 1993 and 1994.

Ohio is part of America's industrial heartland which experienced severe economic downturns, first in the mid-1970s and then again in the late 1970s and early 1980s, when its major industries (steel, automobiles, and machinery) suffered devastating crises, earning the area the epithet "the Rustbelt". Since that time, a major restructuring has taken place, and manufacturing output, exports, and employment have generally grown faster than in the United States as a whole. (Given the fact that we are interested in regional and industrial clusters and developments at a detailed industrial level, Ohio seems a more appropriate choice than the United States as a whole.)

Sweden had an outstanding industrial growth record for several decades until the mid-1970s but then suffered economic setbacks from which it has not yet fully recovered. Industrial output declined for several years, resumed growth in the early

1980s but then stagnated again in the early 1990s. The Swedish welfare state, once held up as a model for the world, is now in serious crisis with the outcome uncertain.

How are such radically different circumstances for macroeconomic growth reflected in the industrial dynamics at the micro level? How has the manufacturing sector fared in relation to the total economy? What industries have grown and which have declined? Are they the same in all countries, or do the patterns of growth differ? Has the size structure of firms and plants changed in various industries? Are the changes similar across countries? In particular, what similarities and differences do we observe with respect to the role of small business in various industries? These are the questions with which this paper is concerned.

The paper is organized as follows. We begin in Section II with an overview of industrial growth since 1960 in the three regions. This is followed in Section III by a comparison of the structure of manufacturing industry in terms of employment, number of establishments, and average size of establishment at the 3-digit level in 1978, the base year for our more detailed analysis, as well as at the end of the period (1993).¹ Section IV examines the comparative development since 1978 in the three regions and identifies the industries which seem particularly interesting for further study. In section V, an analysis is made of some more detailed data on the structural development in these industries. The paper concludes with a summary of the results and a discussion of the questions for further research.

II. Overview of the industrial economy in New Zealand, Ohio, and Sweden

Table I presents some overall statistics for the three regions. Sweden and Ohio are fairly similar in terms of total population (with 8.7 and 10.9 million inhabitants, respectively), while New Zealand's population (3.4 million) represents roughly one-third of the other two regions. Sweden's land area is 70% larger than New Zealand's and more than four times larger than Ohio's. GDP is largest in Ohio, both in the aggregate and per capita. The manufacturing share of total employment is highest in Ohio (at 21.5 percent) and lowest in New Zealand (17.0

TABLE I
Overview data on New Zealand, Ohio, and Sweden

	Unit	Ohio	New Zealand	Sweden
Population (1993)	millions	10.8	3.4	8.7
Total land area	'000 Sq. km	106.1	265.1	449.8
GDP (1993)	billion USD*	252.0	53.6	146.7
GDP per capita (1993)	'000 USD	23.3	15.5	16.8
Total employment (1993)	thousands	4,880	1,496	3,964
Manufacturing employment (1993)	thousands	1,046	255	689
Manufacturing share of total labor force	percent	21.5	17.0	187.4
Number of manufacturing establishments (1993)	thousands	18.4	20.2	25.2

* Current prices, at purchasing power parity.

Sources: Population: U.S. Bureau of the Census, *Statistical Abstract of the United States: 1993* (113 edition), Washington, D.C.: USGPO, 1993.

Total land area: *The World Almanac and Book of Facts 1993*, New York: Pharos Books, 1992.

Total employment and manufacturing employment in New Zealand and Sweden: International Labour Office, *Yearbook of Labor Statistics, 1993*. Geneva: ILO, 1993. Total employment and manufacturing employment in Ohio: U.S. Bureau of Labor Statistics, *Employment and Earnings Tape File*.

Number of manufacturing establishments: Statistics New Zealand, *Census of Manufactures, 1993*. U.S. Department of Commerce, *County Business Patterns, 1993*. Statistics Sweden, *Central Registry of Firms and Establishments, 1993*.

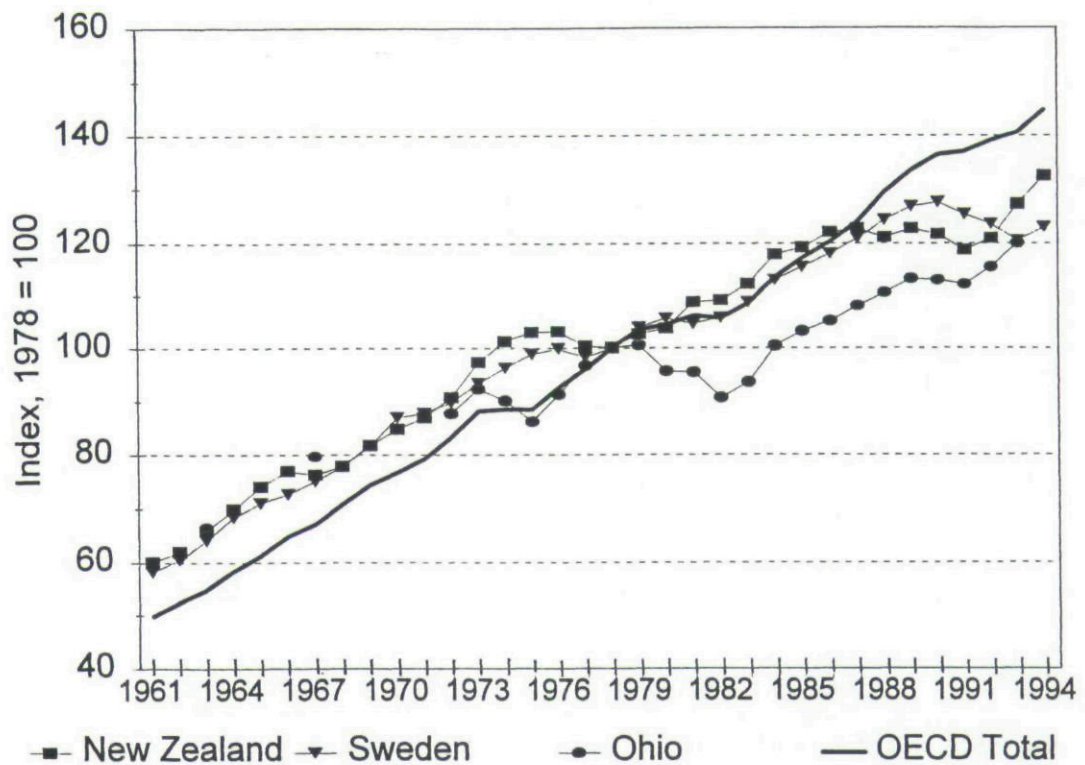
percent). More surprisingly, and remarkably, New Zealand has a larger number of manufacturing establishments than does Ohio with more than three times New Zealand's population. Even though Sweden's manufacturing employment is only 2/3 of Ohio's, Sweden still has 1/3 more manufacturing establishments than Ohio.

The development of GDP over time shows great variation among the three regions. As shown in Figure 1, all three kept pace, more or less, with the world economy (as represented by the OECD total) until the first oil crisis hit in 1973. After that, the growth patterns began to differ. The Ohio economy stagnated and declined, while Sweden kept growing and New Zealand surged ahead for a few years. After 1975, the Ohio economy revived while New Zealand and Sweden stagnated or declined. By 1978, the starting point for the more detailed analysis below, both Sweden and New Zealand resumed their growth at approximately the same rate as the OECD average, while Ohio went into a sharp decline which lasted until 1982. The decline was particularly severe and prolonged in manufacturing; only in the early 1990s did manufacturing output show a strong upward trend. See Figure 2. The New Zealand manufacturing sector declined from 1984 to 1991 but has since grown rapidly. In Sweden, the manufacturing sector, having declined sharply

1975–1978, grew at about the same rate as the OECD average until 1989 and then dropped about 12% before starting to grow again in 1993. As a result, all three economies had lost substantially relative to the OECD average by the early 1990s. Thus, all three regions have grown more slowly than the OECD average in both manufacturing and GDP over the period studied here.

It is interesting to note the different policy responses to these events. New Zealand launched a comprehensive overhaul of its entire program of economic policies, including removal of import licensing, export and production subsidies, and domestic price controls; establishing a bi-lateral trade union with Australia; privatization of all state-owned trading activities; establishing user-pay charges for government-provided services and an accrual-based accounting system for the public sector; reform of labor market relations; deregulation of all domestic industries, including the financial markets; and a 20 percent devaluation of the New Zealand dollar (Frater and Stuart, 1995).

In Ohio, by contrast, the policy responses were rather modest. Ohio competed with other States for direct foreign investment, the most successful result being Honda's decision to locate its U.S. assembly plant in Ohio. The State also established the Ohio Edison Program to support regional



Sources:

New Zealand, OECD, and Sweden:

OECD, *National Accounts. Main Aggregates, Volume 1, 1960–1994*, Paris: OECD, 1995.

Ohio:

1963–1977: Vernon Renshaw, Edward A. Trott, Jr., and Howard L. Friedenbergs, 'Gross State Product by Industry, 1963–1986', *Survey of Current Business* 68(5), May 1988, pp. 30–46.

1977–1993: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Analysis Division, diskette file.

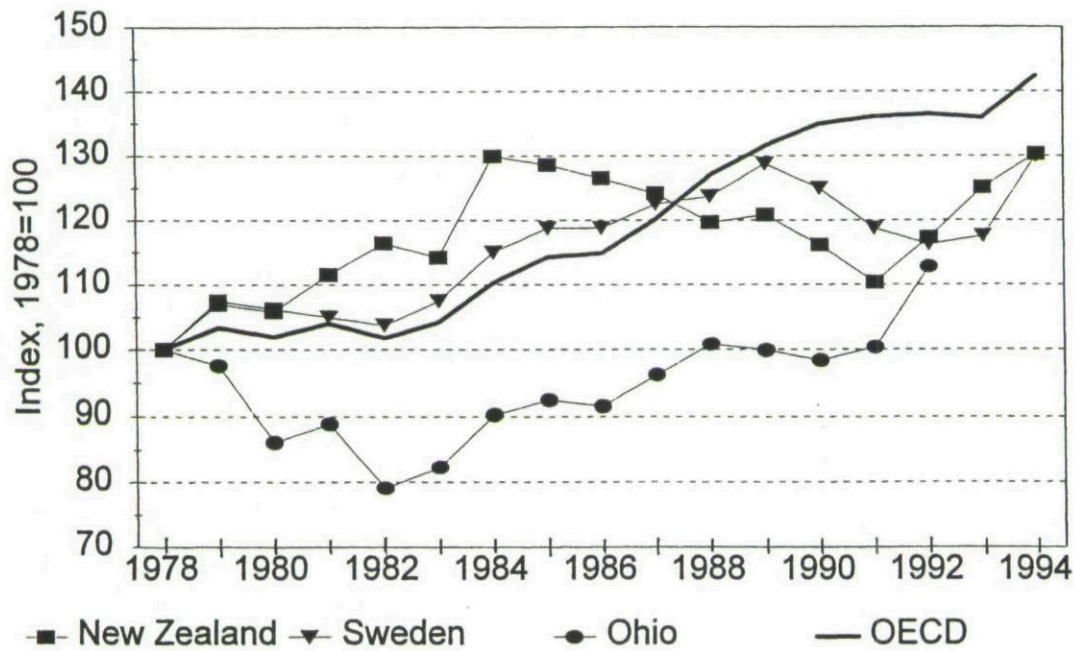
Fig. 1. Development of GDP, 1961–1994 in New Zealand, Ohio, Sweden, and OECD.

innovation centers as well as research and development. The Federal government deregulated the capital markets, the airlines, trucking industry, railroads, and telecommunications. It also instituted various measures to protect (temporarily) the steel and auto industries during a transitional period. More recently, it negotiated the North American Free Trade Agreement (NAFTA) and U.S. participation in the GATT (General Agreement on Tariffs and Trade).

Meanwhile, in the late 1970s Sweden instituted a program of industrial subsidies to prevent unemployment in the industries most severely hurt in the aftermath of the 1973–74 oil crisis, particularly steel and shipyards (Carlsson, 1983). Legislation was introduced to increase job security

and to strengthen the existing social security programs. The subsidy programs were gradually reduced and the capital market was partially deregulated during the 1980s. But it was only when the government faced mounting budget deficits (on the order of 15% of GDP) that government involvement in the economy began to be scaled back and the social security programs curtailed.

Table II gives an overview of the development in the manufacturing sector in conjunction with the policy and macroeconomic changes just outlined. Manufacturing employment declined in all three regions, most dramatically (by 25 percent) in Ohio, vs. 24 percent in Sweden and 20 percent in New Zealand. However, the pattern



Sources:

New Zealand and Sweden: IMF, *International Financial Statistics Yearbook*. Washington, D.C.: International Monetary Fund, 1995.

Ohio: U.S. Department of Commerce, National Economic, Social and Environmental Data Bank, diskette file.

OECD: 1978–92 (Real value added in manufacturing): OECD, *Historical Statistics*, various issues. Paris: OECD.

1993–94 (industrial production): OECD, *Main Economic Indicators*, January 1996.

Fig. 2. Manufacturing output, 1978–1994 in New Zealand, Ohio, Sweden, and OECD.

over time has been different. Virtually all of the decline in Ohio occurred between 1978 and 1983; manufacturing employment has since stayed constant. By contrast, manufacturing employment in New Zealand *increased* between 1978 and 1983 but has since declined at an accelerating rate. In Sweden, manufacturing employment declined by 90,000 between 1978 and 1984, increased slightly until 1987 and then fell by over 170,000.

The development of the number of establishments in manufacturing also shows three different patterns. The number of establishments more than doubled in New Zealand, while it fell dramatically in Ohio between 1978 and 1983 and then increased steadily, resulting in a net loss of 1,300 establishments over the period as a whole. In Sweden, the number of establishments has stayed relatively constant around 25,000.

Thus, the picture that emerges for the manufacturing sector is the following. The number of

manufacturing establishments grew rapidly in New Zealand while the economy declined and manufacturing employment fell. As a result, the average establishment declined in size (in terms of employment) from 30.9 to 11.5. In Sweden, the number of establishments in manufacturing stayed almost constant while employment dropped sharply. One result was a reduction in the average establishment size in manufacturing from 37.0 to 27.3 employees per establishment. In Ohio, the number of establishments dropped sharply at first and then rose again. Employment fell sharply as the economy took a downturn between 1978 and 1983 and then leveled off. The average size has declined by 20 percent as the number of establishments has grown while employment has stayed constant.

At the very least, these differences suggest that the environment for industrial growth and entrepreneurship differed substantially among the three

TABLE II
Employment and number of establishments in
manufacturing in New Zealand, Ohio, and Sweden,
1978–1993

Year	Number of establishments	Number of employees	Average establishment size
<i>New Zealand</i>			
1978	9,498	293,080	30.9
1983	14,518	305,841	21.1
1988	19,834	282,000	14.2
1993	20,241	232,892	11.5
<i>Ohio</i>			
1978	19,804	1,389,710	70.2
1983	15,931	1,070,171	67.2
1988	17,905	1,120,168	62.6
1993	18,500	1,044,346	56.5
<i>Sweden</i>			
1978	24,517	907,201	37.0
1984	24,723	817,182	33.1
1987	25,540	859,818	33.7
1993	25,240	688,710	27.3

Sources: Statistics New Zealand, *Census of Manufactures*, various issues. Regional Financial Associates (elaboration on U.S. Department of Commerce, *County Business Patterns*, various issues). Statistics Sweden, *Central Registry of Firms and Establishments*, various issues.

regions. Apparently, the creation of new establishments was strongly encouraged in New Zealand in spite of a declining economy, was also encouraged in Ohio after the initial shock in the late 1970s but was discouraged in Sweden even though the economy continued to grow, albeit at a slow pace. In order to uncover the reasons behind these differences, we need to dig deeper by disaggregating more.

III. Comparison of the structure of industry in 1978

Table III presents data on the number of establishments, employment, and average establishment size in the 3-digit ISIC manufacturing industries in New Zealand, Ohio, and Sweden in 1978. Manufacturing employment was about 53 percent larger in Ohio than in Sweden and almost five times larger than in New Zealand. The number of establishments differed much less, being somewhat more than twice as large in Ohio as in New Zealand and 20 percent smaller than in Sweden.

The average establishment size in Ohio was almost twice as large as in Sweden and more than twice as large as in New Zealand.

How much of these differences are due to differences in composition of industrial activity and how much to differences within industries? Table IV provides partial answers. There the industries have been ranked according to employment in Ohio, their respective ranks in Sweden and New Zealand also being shown. An examination of the table indicates that the ranking of the Swedish industries is similar to that of Ohio, while New Zealand differs from both. This is confirmed by the correlation coefficients: 0.88 between the employment by industry in Ohio and Sweden, 0.36 between Ohio and New Zealand, and 0.58 between New Zealand and Sweden.

Another indicator of the structural similarities and differences is obtained by ranking the industries by employment in Ohio as in Table IV and then calculating how much of manufacturing employment is represented by the top ten industries. It turns out that the ten largest industries in Ohio represented 81% of manufacturing employment in 1978. The same ten industries accounted for 74% in Sweden and 63% in New Zealand. If the industries are ranked by their employment in New Zealand instead, the ten largest industries accounted for 77% of manufacturing employment in New Zealand, an identical percentage in Sweden, and 67% in Ohio. Similarly, the ten largest industries in Sweden represented 81% of manufacturing employment in Sweden, 76% in Ohio, and 70% in New Zealand.

These differences and similarities can be further illustrated through the following calculation. If the manufacturing labor force in New Zealand and Sweden had been distributed by industry the same way as in Ohio, keeping the average establishment size in each country at its actual size, the result would have been almost unchanged number of establishments and average establishment size in Sweden, while the number of establishments would have been 18 percent greater and the average establishment size correspondingly smaller in New Zealand. This indicates that there is not much difference in either composition by industry or average establishment size in each industry between Sweden and Ohio. To follow the Ohio pattern, the Swedish manufacturing labor

TABLE III

Number of establishments, number of employees, and average establishment size in Sweden, New Zealand, and Ohio 3-digit ISIC industries, 1978

ISIC	Sweden			New Zealand			Ohio		
	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size
311/312 Food	2,489	71,696	28.8	1,103	66,074	59.9	956	62,989	65.9
313 Beverage	120	5,729	47.7	119	4,529	38.1	112	9,812	87.6
314 Tobacco	6	1,433	238.8	6	1,268	211.3	3	541	180.3
321 Textiles	704	23,064	32.8	405	15,972	39.4	107	6,325	59.1
322 Apparel	923	18,637	20.2	721	21,148	29.3	394	18,276	46.4
323 Leathergoods, furdressing and dyeing	117	2,583	22.1	144	3,456	24.0	24	569	23.7
324 Footwear	186	3,431	18.4	108	5,198	48.1	14	3,141	224.4
331 Wood and wood products	2,889	60,677	21.0	861	15,664	18.2	574	13,984	24.4
332 Furniture and fixtures (excl. metal)	810	16,579	20.5	509	6,944	13.6	383	19,083	49.8
341 Paper and paper products	403	61,287	152.1	100	10,384	103.8	287	31,948	111.3
342 Printing, publishing and allied industries	2,707	54,048	20.0	611	17,932	29.3	2,243	69,993	31.2
351 Industrial chemicals	250	17,709	70.8	126	5,764	45.7	297	16,432	55.3
352 Other chemical products	313	18,577	59.4	195	7,352	37.7	387	25,299	65.4
353 Petroleum refineries	18	1,644	91.3	13	464	35.7	10	2,126	212.6
354 Misc products of petroleum and coal	37	1,530	41.4	19	320	16.8	308	4,617	15.0
355 Rubber products	347	10,437	30.1	91	4,602	50.6	260	35,362	136.0
356 Plastic products nec	566	12,700	22.4	246	6,454	26.2	765	57,397	75.0
361 Pottery, china and earthenware	54	3,569	66.1	26	1,215	46.7	957	29,762	31.1
362 Glass and glass products	89	5,436	61.1	69	2,361	34.2	144	29,078	201.9
369 Other non-metallic mineral products	956	21,926	22.9	435	6,779	15.6	208	12,376	59.5
371 Iron and steel basic industries	170	55,731	327.8	48	3,254	67.8	459	134,410	292.8
372 Non-ferrous metal basic industries	188	13,394	71.2	74	3,363	45.4	422	29,236	69.3
381 Fabricated metal products	4,153	92,405	22.3	1,353	24,136	17.8	3,219	196,423	61.0
382 Machinery (excl. electrical)	2,882	126,989	44.1	969	15,181	15.7	4,815	219,175	45.5
383 Electrical machinery etc.	1,243	76,722	61.7	328	15,945	48.6	999	135,745	135.9
384 Transport equipment	959	109,732	114.4	462	21,959	47.5	611	183,039	299.6
385 Professional, scientific etc. equipment	415	13,000	31.3	50	1,201	24.0	300	26,823	89.4
39 Other manufacturing industries	523	6,536	12.5	307	4,161	13.6	546	15,749	28.8
Total major division 3	24,517	907,201	37.0	9,498	293,080	30.9	19,804	1,389,710	70.2

Sources: See Table II.

force would have had to shift away from wood and paper products (ISIC 33 and 34) where Swedish plants are large into rubber and plastics (ISIC 355 and 356), basic metals, and fabricated metal products (ISIC 37 and 381) where Ohio plants are relatively large. New Zealand, on the other hand, would have had to shift its labor force away from the raw material-based industries (ISIC 31–34) where it has attained comparatively large scale

into the metals and machinery industries (ISIC 37–38) where its plants are relatively small.

A similar analysis can be made for the end of the period studied here (1993) (see Table V). A comparison of the bottom lines in Tables III and V tells the major story, as already indicated: manufacturing employment fell by 24% in Sweden, 21% in New Zealand, and 25% in Ohio, while the number of establishments more than doubled in

TABLE IV
Industries ranked by employment in Ohio, 1978

ISIC	Sweden			New Zealand			Ohio		
	Rank	# Empl.	Avg. size	Rank	# Empl.	Avg. size	Rank	# Empl.	Avg. size
382 Machinery (excl. electrical)	1	126,989	44.1	9	15,181	15.7	1	219,175	45.5
381 Fabricated metal products	3	92,405	22.3	2	24,136	17.8	2	196,423	61.0
384 Transport equipment	2	109,732	114.4	3	21,959	47.5	3	183,039	299.6
383 Electrical machinery etc.	4	76,722	61.7	7	15,945	48.6	4	135,745	135.9
371 Iron and steel basic industries	8	55,731	327.8	22	3,254	67.8	5	134,410	292.8
342 Printing, publishing and allied industries	9	54,048	20.0	5	17,932	29.3	6	69,993	31.2
311/312 Food	5	71,696	28.8	1	66,074	59.9	7	62,989	65.9
356 Plastic products nec	18	12,700	22.4	14	6,454	26.2	8	57,397	75.0
355 Rubber products	19	10,437	30.1	17	4,602	50.6	9	35,362	136.0
341 Paper and paper products	6	61,287	152.1	10	10,384	103.8	10	31,948	111.3
361 Pottery, china and earthenware	23	3,569	66.1	25	1,215	46.7	11	29,762	31.1
372 Non-ferrous metal basic industries	16	13,394	71.2	21	3,363	45.4	12	29,236	69.3
362 Glass and glass products	22	5,436	61.1	23	2,361	34.2	13	29,078	201.9
385 Professional, scientific etc. equipment	17	13,000	31.3	26	1,201	24.0	14	26,823	89.4
352 Other chemical products	13	18,577	59.4	11	7,352	37.7	15	25,299	65.4
332 Furniture and fixtures (excl. metal)	15	16,579	20.5	12	6,944	13.6	16	19,083	49.8
322 Apparel	12	18,637	20.2	4	21,148	29.3	17	18,276	46.4
351 Industrial chemicals	14	17,709	70.8	15	5,764	45.7	18	16,432	55.3
39 Other manufacturing industries	20	6,536	12.5	19	4,161	13.6	19	15,749	28.8
331 Wood and wood products	7	60,677	21.0	8	15,664	18.2	20	13,984	24.4
369 Other non-metallic mineral products	11	21,926	22.9	13	6,779	15.6	21	12,376	59.5
313 Beverage	21	5,729	47.7	18	4,529	38.1	22	9,812	87.6
321 Textiles	10	23,064	32.8	6	15,972	39.4	23	6,325	59.1
354 Misc products of petroleum and coal	27	1,530	41.4	28	320	16.8	24	4,617	15.0
324 Footwear	24	3,431	18.4	16	5,198	48.1	25	3,141	224.4
353 Petroleum refineries	26	1,644	91.3	27	464	35.7	26	2,126	212.6
323 Leathergoods, furdressing and dyeing	25	2,583	22.1	20	3,456	24.0	27	569	23.7
314 Tobacco	28	1,433	238.8	24	1,268	211.3	28	541	180.3
Total major division 3		907,201	37.0		293,080	30.9		1,389,710	70.2

Sources: See Table II.

New Zealand, fell by 7% in Ohio and increased by 3% in Sweden. As a result, the average establishment size declined by two-thirds in New Zealand, 26% in Sweden and 20% in Ohio. A comparison of the tables, industry by industry in each country, reveals that average plant size declined across the board in all three countries, with only three exceptions in Ohio (Food,

Beverages, and Petroleum refining) and two in Sweden (Beverages and Miscellaneous products of petroleum and coal). The number of establishments increased in all but two industries in New Zealand (Footwear and Petroleum refining) and in 12 in Sweden but in only nine in Ohio. Manufacturing employment declined in all but two industries in New Zealand (Plastic products and

TABLE V
3-digit ISIC industry data for Sweden, New Zealand, and Ohio 1993

ISIC	Sweden			New Zealand			Ohio		
	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size
311/312 Food	2,046	61,476	30.0	2,048	58,364	28.5	674	50,845	75.4
313 Beverage	44	5,270	119.8	180			66	7,031	106.5
314 Tobacco	8	1,050	131.3	8	..C		1	2	2.0
321 Textiles	570	10,248	18.0	849	9,869	11.6	83	3,412	41.1
322 Apparel	383	6,074	15.9	1,236	12,802	10.4	385	13,759	35.7
323 Leathergoods, furdressing and dyeing	82	943	11.5	215	2,945	13.7	34	960	28.2
324 Footwear	62	610	9.8	83	1,732	20.9	5	892	178.4
331 Wood and wood products	2,430	38,461	15.8	1,779	15,375	8.6	1,015	21,160	20.8
332 Furniture and fixtures (excl. metal)	636	12,928	20.3	1,438	7,206	5.0	383	15,342	40.1
341 Paper and paper products	346	46,789	135.2	162	8,713	53.8	410	32,596	79.5
342 Printing, publishing and allied industries	3,780	52,510	13.9	1,491	16,797	11.3	2,674	75,566	28.3
351 Industrial chemicals	328	16,850	51.4	205	4,170	20.3	239	7,132	29.8
352 Other chemical products	346	21,320	61.6	374	5,700	15.2	467	27,607	59.1
353 Petroleum refineries	25	1,605	64.2	4	..C		6	2,015	335.8
354 Misc products of petroleum and coal	106	1,529	14.4	42	425	10.1	174	3,194	18.4
355 Rubber products	314	6,650	21.2	124	1,880	15.2	297	26,980	90.8
356 Plastic products nec	603	12,800	21.2	442	7,268	16.4	969	67,985	70.2
361 Pottery, china and earthenware	54	1,779	32.9	218	668	3.1	622	17,397	28.0
362 Glass and glass products	105	3,758	35.8	201	1,374	6.8	135	16,937	125.5
369 Other non-metallic mineral products	757	12,839	17.0	466	4,038	8.7	155	8,734	56.3
371 Iron and steel basic industries	148	26,311	177.8	76	3,057	40.2	260	72,291	278.0
372 Non-ferrous metal basic industries	135	7,642	56.6	117	3,080	26.3	373	22,631	60.7
381 Fabricated metal products	5,216	78,387	15.0	2,666	19,538	7.3	2,672	136,703	51.2
382 Machinery (excl. electrical)	3,505	90,361	25.8	2,952	16,040	5.4	4,095	147,393	36.0
383 Electrical machinery etc.	1,331	60,133	45.2	656	9,707	14.8	686	77,663	113.2
384 Transport equipment	997	90,452	90.7	1,076	13,200	12.3	526	141,511	269.0
385 Professional, scientific etc. equipment	465	14,257	30.7	86	1,029	12.0	475	30,502	64.2
39 Other manufactuirng industries	418	5,678	13.6	1,047	4,083	3.9	619	16,106	26.0
Total major division 3	25,240	688,710	27.3	20,241	232,892	11.5	18,500	1,044,346	56.5

Sources: See Table II.

Machinery), in eight industries in Ohio, and in all but two (other chemical products and Plastic products, n.e.c.) in Sweden.

Table VI is designed to provide an overview of the structural differences among the three regions. The table reports the same data for Sweden as in Table V. For New Zealand and Ohio, the data presented are derived by dividing each column in Table V by the corresponding column for Sweden, resulting in a ratio with the Swedish

figure as numeraire. The bottom line in Table VI shows the averages for the manufacturing sector as a whole. Thus, on average, New Zealand manufacturing plants are only 42% the size of the Swedish plants, while Ohio plants are more than twice the Swedish size. The range in New Zealand is from 9% (in Pottery, china, etc.) to 212% (in Footwear) and in Ohio from 58% (in Industrial chemicals, ignoring the tobacco industry) to 1,813% (in Footwear). If these industries are

TABLE VI
New Zealand and Ohio industry data relative to Swedish data, 1993

ISIC	Sweden			New Zealand/Sweden ratios New Zealand			Ohio/Sweden ratios Ohio		
	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size	# Est.	# Empl.	Avg. size
311/312 Food	2,046	61,476	30.0	1.00	0.95	0.95	0.33	0.83	2.51
313 Beverage	44	5,270	119.8	4.09			1.50	1.33	0.89
314 Tobacco	8	1,050	131.3	1.00			0.13	0.00	0.02
321 Textiles	570	10,248	18.0	1.49	0.96	0.65	0.15	0.33	2.29
322 Apparel	383	6,074	15.9	3.23	2.11	0.65	1.01	2.27	2.25
323 Leathergoods, furdressing and dyeing	82	943	11.5	2.62	3.12	1.19	0.41	1.02	2.46
324 Footwear	62	610	9.8	1.34	2.84	2.12	0.08	1.46	18.13
331 Wood and wood products	2,430	38,461	15.8	0.73	0.40	0.55	0.42	0.55	1.32
332 Furniture and fixtures (excl. metal)	636	12,928	20.3	2.26	0.56	0.25	0.60	1.19	1.97
341 Paper and paper products	346	46,789	135.2	0.47	0.19	0.40	1.18	0.70	0.59
342 Printing, publishing and allied industries	3,780	52,510	13.9	0.39	0.32	0.81	0.71	1.44	2.03
351 Industrial chemicals	328	16,850	51.4	0.63	0.25	0.40	0.73	0.42	0.58
352 Other chemical products	346	21,320	61.6	1.08	0.27	0.25	1.35	1.29	0.96
353 Petroleum refineries	25	1,605	64.2	0.16	0.00	0.00	0.24	1.26	5.23
354 Misc products of petroleum and coal	106	1,529	14.4	0.40	0.28	0.70	1.64	2.09	1.27
355 Rubber products	314	6,650	21.2	0.39	0.28	0.72	0.95	4.06	4.29
356 Plastic products nec	603	12,800	21.2	0.73	0.57	0.77	1.61	5.31	3.31
361 Pottery, china and earthenware	54	1,779	32.9	4.04	0.38	0.09	11.52	9.78	0.85
362 Glass and glass products	105	3,758	35.8	1.91	0.37	0.19	1.29	4.51	3.51
369 Other non-metallic mineral products	757	12,839	17.0	0.62	0.31	0.51	0.20	0.68	3.32
371 Iron and steel basic industries	148	26,311	177.8	0.51	0.12	0.23	1.76	2.75	1.56
372 Non-ferrous metal basic industries	135	7,642	56.6	0.87	0.40	0.47	2.76	2.96	1.07
381 Fabricated metal products	5,216	78,387	15.0	0.51	0.25	0.49	0.51	1.74	3.40
382 Machinery (excl. electrical)	3,505	90,361	25.8	0.84	0.18	0.21	1.17	1.63	1.40
383 Electrical machinery etc.	1,331	60,133	45.2	0.49	0.16	0.33	0.52	1.29	2.51
384 Transport equipment	997	90,452	90.7	1.08	0.15	0.14	0.53	1.56	2.97
385 Professional, scientific etc. equipment	465	14,257	30.7	0.18	0.07	0.39	1.02	2.14	2.09
39 Other manufacturing industries	418	5,678	13.6	2.50	0.72	0.29	1.48	2.84	1.92
Total major division 3	25,240	688,710	27.3	0.80	0.34	0.42	0.73	1.52	2.07

Sources: See Table II.

ignored in the comparison, the New Zealand range is from 14% (in Transport equipment) to 119% (in Leathergoods, etc.). In Ohio, the range is from 59% in Wood and wood products to 340% in Fabricated metal products.

As far as ratios for the number of establishments and number of employees are concerned, the highest and lowest ratios are shown in Table VII. Apparently, the industry structures in New

Zealand and Ohio differ so much that there is no overlap in the industries listed except for Pottery, china, etc.

The correlation coefficients between the employment by industry in the three countries in 1993 are almost the same as those for 1978: 0.90 between Ohio and Sweden (vs. 0.88 in 1978), 0.36 (0.36) between Ohio and New Zealand, and 0.58 (0.58) between New Zealand and Sweden. Thus,

TABLE VII

Largest and smallest number of manufacturing establishments and employment by industry in New Zealand and Ohio relative to Sweden, 1993 (ratios)

New Zealand/Sweden		Ohio/Sweden	
Ratio	Industry	Ratio	Industry
<i>Number of Establishments:</i>			
4.09	Beverages	11.52	Pottery, china, etc.
4.04	Pottery, china, etc.	2.76	Nonferrous metals
3.23	Apparel	1.76	Iron and steel
2.62	Leathergoods, etc.	1.64	Misc. petroleum prods.
2.50	Other manufacturing ind.	1.61	Plastic products
0.80	All manufacturing	0.73	All manufacturing
0.40	Misc. petroleum prods.	0.20	Nonmetal mineral prods.
0.39	Rubber products	0.15	Textiles
0.39	Printing, publishing, etc.	0.13	Tobacco
0.18	Prof. and scientif. equip.	0.08	Footwear
<i>Number of Employees:</i>			
3.12	Leathergoods	9.78	Pottery, china, etc.
2.84	Footwear	5.31	Plastic products
2.11	Apparel	4.51	Glass and glass products
0.96	Textiles	4.06	Rubber products
0.95	Food	2.96	Nonferrous metals
0.34	All manufacturing	1.52	All manufacturing
0.16	Electrical machinery	0.55	Wood and wood products
0.15	Transport equipment	0.42	Industrial chemicals
0.12	Iron and steel	0.33	Textiles
0.07	Prof. and scientif. equip.	0.00	Tobacco

Sources: See Table II.

the similarities between Ohio and Sweden were preserved, as well as the differences between New Zealand and the other two regions.

IV. Comparison of the structural development since 1978

In this section we look more closely at the growth and decline of the various industries in the three countries in order to identify interesting similarities and differences. The analysis is summarized in Table VIII. Given that the aggregate manufacturing employment declined in all three countries, it is not surprising that only a few industries increased their labor force. In fact, it turns out that seven industries grew in terms of employment in Ohio, while only three grew in Sweden and four in New Zealand.

Looking first at Sweden, the industries whose employment grew over the period 1978–1993

were Other chemical products, Professional and scientific equipment, and Plastic products. These industries also grew in terms of number of establishments. The industries whose employment declined the most are also listed in the table: Footwear, Apparel, Leathergoods, Textiles, and Iron & steel.

In Ohio, the three fastest growing industries (with the exception of Wood and wood products) were the same as in Sweden: Plastic products, Professional and scientific equipment, and Other chemical products. The number of establishments also grew in each of these industries whose employment increased. The most rapidly declining industries were Tobacco, Footwear, Industrial chemicals, Iron and steel, and Textiles.

New Zealand had only one growth industry in common with the other countries, namely Plastic products. The other growth industries were Petroleum and coal products, Nonelectrical

TABLE VIII
Analysis of growing and declining industries, 1978–1993
(ratios, 1993/1978)

	# Empl	# Est	Avg. size
In terms of employment, the following industries grew:			
<i>Sweden</i>			
Other chemical prods.	1.15	1.11	1.04
Prof. & scientific equip.	1.10	1.12	0.98
Plastic products	1.01	1.07	0.95
<i>Ohio</i>			
Wood and wood products	1.51	1.77	0.86
Plastic products	1.18	1.27	0.94
Prof. and scientif. equip.	1.14	1.58	0.72
Other chemical products	1.09	1.21	0.90
Printing & publishing	1.08	1.19	0.91
Other manufacturing ind.	1.02	1.13	0.90
Paper & paper products	1.02	1.43	0.71
<i>New Zealand</i>			
Petrol. and coal prods.	1.33	2.21	0.60
Plastic products	1.13	1.80	0.63
Nonelectr. machinery	1.06	3.05	0.35
Furniture and fixtures	1.04	2.83	0.37
The following industries declined the most:			
<i>Sweden</i>			
Iron & steel	0.47	0.87	0.54
Textiles	0.44	0.81	0.55
Leathergoods	0.37	0.70	0.52
Apparel	0.33	0.41	0.79
Footwear	0.18	0.33	0.53
<i>Ohio</i>			
Textiles	0.54	0.78	0.70
Iron & steel	0.54	0.57	0.95
Industrial chemicals	0.43	0.80	0.54
Footwear	0.28	0.36	0.80
Tobacco	0.33	0.00	0.01
<i>New Zealand</i>			
Glass & glass products	0.58	2.91	0.20
Pottery, china, etc.	0.55	8.38	0.07
Rubber products	0.41	1.36	0.30
Footwear	0.33	0.77	0.43
All manufacturing			
Sweden	0.76	1.03	0.74
Ohio	0.75	0.93	0.80
New Zealand	0.79	2.13	0.37

Sources: See Table II.

machinery, and Furniture and fixtures. The most rapidly declining industries were Footwear, Rubber products, Pottery and china, etc., and Glass and glass products. Among these, the number of establishments declined only in the

Footwear industry; the number of establishments increased more than eight-fold in Pottery and china, etc., despite the fact that its labor force was almost cut in half.

Thus, only the Plastic products industry grew in terms of employment in all three countries. Glancing back at Table VI, it is also an industry which exhibits interesting structural differences. Its share of manufacturing employment is more than five times as large in Ohio as in Sweden and more than half as large in New Zealand as in Sweden. The average establishment in this industry is smaller relative to both New Zealand and Ohio than is the average manufacturing establishment. It therefore seems to be a promising candidate for further, more detailed analysis.

The Professional and scientific equipment industry was one of the fastest growing industries in Sweden and Ohio but not in New Zealand where its employment declined somewhat less than in manufacturing as a whole. Along with Other chemical products it was the only industry whose employment grew substantially in Sweden. Therefore, exploring the structural differences and conditions for growth in this industry in the three countries would be interesting in further research.

The Footwear industry is included among the declining industries in all three countries. Although they do not show up among the most rapid decliners in all three countries in Table VIII, the following industries are generally shrinking in terms of employment: Textiles, Apparel, Leathergoods, Rubber products, Glass and glass products, and Pottery, china, etc. This list hardly contains any surprises.

V. More detailed industry analysis

V.1. Plastic products

A first step in an analysis of the type indicated above is the following. Table IX provides detailed information on the structural development in the Plastic products industry in all three countries. Employment growth in this industry has been erratic in Sweden, with rapid growth occurring in the mid-1980s, followed by sharp decline in the early 1990s. The total number of establishments shows a similar development. The same pattern is found in each size category except the 50–99

TABLE IX
356 Plastic products nec

	0-9 employees		10-49 empl.		50-99 empl.		100-499 empl.		> 100 empl.		Total		Avg est. size
	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	
Sweden													
1978	356	1,497	155	3,203	28	2,026	25	4,733	27	5,974	566	12,700	22.4
1984	348	1,396	198	3,915	34	2,378	27	4,931	28	5,565	608	13,254	21.8
1987	367	1,461	210	4,312	37	2,675	30	5,641	33	7,721	647	16,169	25.0
1993	290	1,299	184	3,835	40	2,737	23	4,396	89	4,929	603	12,800	21.2
New Zealand													
1978	116	637	101	2,124	17	1,205			12	2,401	246	6,367	25.9
1983	169	745	118	2,488	20	1,160			23	3,126	330	7,519	22.8
1988	285	1,050	137	2,910	25	1,670			12	2,050	459	7,680	16.7
1993	282	970	127	2,910	19	1,300			14	2,370	442	7,550	17.1
Ohio													
1978	215	792	289	7,368	117	8,423	124	23,509	144	40,814	765	57,397	75.0
1983	203	747	274	6,942	111	7,935	89	22,489	138	38,192	726	53,816	74.1
1988	252	926	340	8,601	137	9,832	151	29,354	170	46,176	899	65,535	72.9
1993	251	941	370	9,095	154	11,122	185	37,299	194	46,827	969	67,985	70.2

Source: See Table II.

size class where both employment and the number of establishments grew steadily. The data here do not suggest any dramatic structural changes in the industry in Sweden.

In New Zealand, the number of establishments in the smallest categories has grown, while the number of larger establishments has stagnated. But the growth in the smaller size categories has been sufficient for the industry to grow overall in terms of both employment and number of establishments. Put differently, the growth in New Zealand's plastics industry is attributable entirely to the entry of new, small-scale units. A preliminary hypothesis here is that the restructuring of the New Zealand economy which has occurred as a result of the economic reforms during the 1980s has involved the closing of a few large foreign-owned plants no longer viable after the removal of trade barriers, and the relocation of the labor thus released to new and existing smaller firms competing primarily in the domestic market.

In Ohio, by contrast, there has been growth in every size category in terms of both employment and number of plants following a decline between 1978 and 1993. About 70 percent of the employment was in establishments with more than 100 employees, compared with one-third to one-half in Sweden and New Zealand. As a result, the Ohio

plants were substantially larger: 70.2 employees on average in 1993 vs. 21.2 in Sweden and 17.1 in New Zealand. One suspects that many of the Ohio plastics manufacturers are suppliers to the automobile industry; the same may be true in Sweden, while it is certainly not the case in New Zealand. A contributing factor to the Ohio development in this industry is probably the extraordinary success of particular Ohio-based companies such as Rubbermaid.

V.2. Other industries

Similar analyses can be made for other industries. Tables X-XII provide data for Nonelectrical machinery, Electrical machinery, both of which are major industries in Ohio and Sweden, and Professional and scientific instruments – one of the most rapidly growing industries in Ohio and Sweden but not in New Zealand. In Nonelectrical machinery there was a decline in Sweden in terms of both employment and number of plants in the largest size classes, while the medium-sized groups held their own, and the smallest size class grew substantially in terms of both employment and number of establishments. In New Zealand, the smallest size category again accounted for more than the aggregate growth (probably

reflecting the same type of restructuring mentioned above with respect to the Plastic products industry). In Ohio, the largest size groups contracted throughout the period, whereas the smallest ones regained some of their initial losses (1978–83).

The stories are similar in other industries. In Ohio and Sweden, the size distribution tends to be truncated through the decimation of the largest entities. In New Zealand, the smallest entities grow in number, but not much else.

VI. Summary and questions for further research

Our findings may be summarized in the following way. The three economies studied here have experienced sharply divergent macroeconomic developments since the early 1970s. The different macro environment generated different policy responses, growth patterns, and structural changes. While manufacturing employment declined by over 20 percent in each country, the number of establishments in manufacturing stayed constant in Sweden and declined by 9% in Ohio while it more than doubled in New Zealand. As a result, the average establishment size declined by 26% in

Sweden and 20% in Ohio and was reduced by two-thirds in New Zealand.

While there are certainly structural differences in the composition of the manufacturing sector in the three economies, these differences explain only a small portion of the differences in development patterns. Only a handful of 3-digit ISIC industries grew in terms of employment in each country between 1978 and 1993, but the growth industries were not the same across countries, and there were substantial differences in the growth patterns within these industries.

These findings suggest that no single explanation or theory is likely to suffice but rather that very different (and probably complex) micro-economic mechanisms are at work in the three economies. What these mechanisms are will be the object of further research: Are there different dynamics at work, different types of specialization within industries? What kinds of products are made in each industry in each region? Do the smaller New Zealand plants manufacture the same type of products as their larger counterparts in Ohio and Sweden, or do they specialize in certain niches? Who are the customers and suppliers in each region, and what type of interdependence or networking can be observed? To what extent are

TABLE X
382 machinery (excl. electrical)

	0-9 employees		10-49 empl.		50-99 empl.		100-499 empl.		> 100 empl.		Total		Avg est. size
	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	
Sweden													
1978	1,677	5,792	802	18,072	167	11,439	191	40,458	236	91,686	2,882	126,989	44.1
1984	1,788	6,312	776	16,557	189	12,976	179	37,419	215	69,724	2,968	105,569	35.6
1987	2,022	7,159	909	20,008	195	13,457	189	38,509	232	83,015	3,358	123,639	36.8
1993	2,373	7,540	812	17,215	149	10,264	144	30,827	171	55,342	3,505	90,361	25.8
New Zealand													
1978	584	2,932	329	6,731	41	2,769			15	2,413	969	14,845	15.3
1983	1,290	4,860	359	5,868	81	3,074			132	5,194	1,862	18,996	10.2
1988	2,454	7,380	365	7,350	35	2,380			12	2,170	2,866	19,280	6.7
1993	2,599	7,600	316	5,910	28	1,910			9	1,150	2,952	16,570	5.6
Ohio													
1978	2,217	9,171	1,808	39,203	365	24,104	367	75,501	425	146,697	4,815	219,175	45.5
1983	1,734	7,080	1,346	28,823	263	17,328	254	52,261	295	103,243	3,638	156,474	43.0
1988	1,944	7,838	1,450	30,932	277	18,440	252	51,370	295	101,113	3,966	158,323	39.9
1993	2,049	7,977	1,469	31,568	285	19,505	252	47,647	292	88,343	4,095	147,393	36.0

Source: See Table II.

TABLE XI
383 Electrical machinery

	0-9 employees		10-49 empl.		50-99 empl.		100-499 empl.		> 100 empl.		Total		Avg est. size
	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	
Sweden													
1978	787	2,698	266	5,824	63	4,496	91	20,127	127	63,704	1,243	76,722	61.7
1984	865	3,039	305	6,338	59	4,082	94	21,364	130	59,534	1,359	72,993	53.7
1987	952	3,292	349	7,166	72	4,921	93	21,665	132	64,330	1,505	79,709	53.0
1993	843	2,899	303	6,452	68	4,839	94	21,944	117	45,943	1,331	60,133	45.2
New Zealand													
1978	140	725	116	2,546	30	2,146			42	9,952	328	15,369	46.9
1983	327	1,277	116	2,455	43	2,474			61	9,388	547	15,594	28.5
1988	525	1,780	146	3,140	26	1,970			26	5,540	723	12,430	17.2
1993	501	1,530	116	2,370	19	1,500			20	4,520	656	9,920	15.1
Ohio													
1978	360	1,351	299	7,424	100	7,555	171	38,154	240	119,415	999	135,745	135.9
1983	211	814	203	4,953	77	5,818	124	27,620	167	79,734	658	91,319	138.8
1988	221	810	210	5,071	81	6,132	122	27,344	160	75,032	672	87,045	129.5
1993	228	826	222	5,248	90	6,614	116	26,996	146	64,975	686	77,663	113.2

Source: See Table II.

TABLE XII
385 Professional and scientific instruments

	0-9 employees		10-49 empl.		50-99 empl.		100-499 empl.		> 100 empl.		Total		Avg est. size
	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	# Est	# Empl	
Sweden													
1978	261	876	102	2,153	24	1,740	24	4,915	28	8,231	415	13,000	31.3
1984	232	824	117	2,422	28	2,001	21	3,673	24	5,596	401	10,843	27.0
1987	259	887	126	2,662	28	1,839	23	3,924	28	6,753	441	12,141	27.5
1993	304	981	114	2,361	21	1,587	20	3,952	26	9,328	465	14,257	30.7
New Zealand													
1978	20	93	24	478	3	216			3	361	50	1,148	23.0
1983	47	157	19	340	13	480			2	426	81	1,403	17.3
1988	73	210	25	510	3	220			2	520	103	1,460	14.2
1993	70	220	13	260	1	50			2	560	86	1,090	12.7
Ohio													
1978	105	310	102	2,385	26	1,785	58	13,660	67	22,343	300	26,823	89.4
1983	121	378	112	2,589	30	2,078	59	13,674	67	21,546	330	26,591	80.6
1988	174	536	143	3,352	36	2,507	69	15,412	79	24,134	432	30,529	70.7
1993	188	702	167	3,758	40	2,866	72	15,497	80	23,176	475	30,502	64.2

Source: See Table II.

the activities geographically clustered within each region? What kind of supportive infrastructure is in place? Thus, even a relatively cursory analysis of the sort conducted here indicates that there are many interesting questions whose answers will

provide useful insight into the processes underlying industrial development. Understanding these processes, in turn, is essential for further developing the field of industrial dynamics.

Acknowledgements

This paper is part of a study on Industrial Structure and Technological Systems in New Zealand, Ohio, and Sweden undertaken jointly by Paul Frater and George Stuart at Business and Economic Research Limited (BERL), Wellington, New Zealand; Pontus Braunerhjelm at the Industrial Institute for Economic and Social Research (IUI), Stockholm, Sweden; and Stephen Gage at the Cleveland Advanced Manufacturing Program (CAMP), Cleveland, Ohio, in collaboration with the Center for Regional Economic Issues (REI) at Case Western Reserve University, Cleveland, Ohio. The present author is project coordinator. Data for this study have been obtained through these various institutes whose collaboration and support is gratefully acknowledged. Financial support from the Swedish National Board for Industrial and Technical Development (NUTEK) is also gratefully acknowledged.

Note

¹ While data limitations and availability force us to limit the scope of the present study to manufacturing industries, the issues discussed here are certainly not confined to manufacturing.

References

- Carlsson, Bo, 1983, 'Industrial Subsidies in Sweden: Macroeconomic Effects and an International Comparison', *The Journal of Industrial Economics* 32(1), 1-23.
- Carlsson, Bo, 1987, 'Reflections on "Industrial Dynamics": The Challenges Ahead', *International Journal of Industrial Organization* 5 (2), 135-148.
- Carlsson, Bo (ed.), 1989, *Industrial Dynamics: Technological, Organizational, and Structural Changes in Industries and Firms*, Boston/Dordrecht: Kluwer Academic Publishers.
- Carlsson, Bo, 1992, 'Industrial Dynamics: A Framework for Analysis of Industrial Transformation', *Révue d'Économie Industrielle* 61(3), 7-32.
- Carlsson, Bo and Rikard Stankiewicz, 1991, 'On the Nature, Function, and Composition of Technological Systems', *Journal of Evolutionary Economics* 1(2), 93-118.
- Dahmén, Erik, 1950, *Svensk industriell företagarverksamhet. Kausalanalys av den industriella utvecklingen 1919-1939* (Swedish Industrial Entrepreneurial Activity. Causal Analysis of the Industrial Development 1919-1939), Stockholm: Industriens Utredningsinstitut (IUI).
- Dahmén, Erik, 1989, "Development Blocks" in Industrial Economics', in Bo Carlsson (ed.), *Industrial Dynamics*, op. cit., pp. 109-121.
- Feldman, Maryann, 1994, *The Geography of Innovation*, Boston/Dordrecht: Kluwer Academic Publishers.
- Frater, Paul and George Stuart, 1995, *The New Zealand Innovation Environment*, Report from Business and Economic Research, Ltd. (BERL), Wellington: BERL.
- Porter, Michael E., 1990, *The Competitive Advantage of Nations*, New York: The Free Press.
- Saxenian, AnnaLee, 1994, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge: Harvard University Press.

Copyright of Small Business Economics is the property of Kluwer Academic Publishing / Business and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.