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PATTERNS OF INDUSTRIAL STRUCTURAL CHANGE BIOBIO REGION, CHILE. 1974-1989

by

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ABSTRACT

Chile's recent experience with the liberalization of foreign trade provides a singular case study because of: the high level and many types of tariff protection before the reforms; the extraordinary effect of rapid trade policy liberalization; and the current structure that the country's economy has assumed.

The protection of Chile's manufacturing began after the Great Depression and gradually increased after the second World War. However, from 1973 a profound economic reform radically changed the traditional protectionism shielding the Chilean economy. This paper analyzes the adjustment of industrial firms to both trade liberalization and policy reforms for stabilization, during the military regime. The study is conducted using two hypotheses that link manufacturing firms to their location in the region and to the final destination of their production.

The main conclusions of the study suggest the advantages and disadvantages that the present industrial structure of the region might face as a consequence of its specialization. They summarize changes of both internal and external conditions that have been favourable to regional industrial growth.

Internally there has been industrial specialization according to the comparative advantage of the Biobio region in natural resources. External influences have driven a shift to capital intensive sectors, which have grown rapidly relative to other manufacturing sectors, and have replaced labour-intensive sectors as the dominant component of the regional industrial base.

The overall result is that the structure of manufacturing in the Biobio region has changed in a process of restructuring different from that anticipated and predicted by free trade theorists.

CHAPTER 1

INTRODUCTION

1.1. THESIS RESEARCH PROBLEM

Between 1974 and 1989, during the period of authoritarian military rule, Chile undertook a profound and fundamental shift in its development strategy. As a consequence, Chile has undergone a difficult process of structural adjustment. This process included the implementation of an externally-oriented development strategy, a market-oriented economic system, a gradualist macroeconomic stabilization programme and the beginning of a process of decentralization.

The economic policies applied to implement this strategy drastically changed the face of Chile's economy. They represented a profound reversal of Chile's tradition of state intervention in market prices as a device to promote domestic industrialization.

This study contributes an empirical analysis of the impact that the external, market-oriented strategy has had on the second most industrial region of Chile - the Biobio region. The study examines the effects on regional employment patterns of growth in manufacturing industries. It also assesses the extent to which, after 15 years of application, the planned policies are responsible for changes in the industrial structure of the region in the study time-frame (1974-1989).

In the study period national policies affected industrial patterns of growth in a dramatic way in the Biobio region. For example, during the period 1973-1984 these economic policies resulted in increased unemployment throughout the country. From 1975

to 1984 the average rate of unemployment in Chile was 19.4 percent [2]. Certain regions suffered more than others. The Biobio region was one of the most negatively affected with average unemployment figures for the period reaching 21.1 percent (*op. cit.*).

As a consequence an important part of the import substitution industry drastically shrank in the Biobio region in this period [3]. The decrease of traditional government investment in the industrial sector was one of the major reasons for the decline. After sixteen years a substantial restructuring of industry, with a completely new scheme of ownership and changed orientation of its final production is evident.

1.2. RELEVANCE OF THE RESEARCH

The most important episode in recent Chilean history has been the coup and subsequent military government of the country from 1973 to 1989. When the military took power in September 1973 the Chilean economy was in a serious crisis. The annual inflation rate that year, in August, was 647 percent. The fiscal deficit had grown so large that revenues financed only 47 percent of total expenditure [4]. The best example of excessive government intervention was in industry.

The Biobio region was, and despite profound changes continues to be, the second most industrial region of the country. By 1973 its industry was based mainly on traditionally protected industries such as pottery, textiles and steel. In these productivity was extremely

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[2] This figure includes people supported by welfare schemes developed to alleviate the effects of widespread unemployment (Tomic *et al.* 1990).

[3] These changes are discussed in Chapter 2.

[4] Gwynne 1985.

low, largely due to the high number of employees.

Beginning in 1974 new government policies strongly affected all regional industries. Those that had experienced high protection - through tax exemptions, subsidies, and other regulations - were particularly affected. The early government policies have been described as attempting to correct the most serious distortions of the economy [5] . However, since 1975 a more radical change was applied to the economy:

> "Some commentators feel that lectures given by Milton Friedman in Chile in March 1975 influenced the government. "I do not think that a gradualist policy makes sense in Chile", said Mr Friedman. "I am afraid that the patient might die before the treatment takes effect. I think Chile has much to gain by examining examples of shock treatment for the problem of inflation and disorganisation." On April 17, 1975, Pinochet appointed former students of Friedman at the University of Chicago as economics minister, and president and vice president of the Central Bank...".
>
> (Source: Gwynne 1991: 29 and 30)

After this an economic shock policy was implemented. This included an acceleration of privatisation, reduction in government expenditure, and the elimination of tax exemptions and subsidies (*op. cit.*). All these measures affected the economy as a whole, but there is no doubt that the most strongly affected sector was the formerly protected manufacturing

[5] See, for example, Foxley (1982); Gwynne (1991); and World Bank (1979).

sector.

Chile had always experienced a variety of serious regional problems as a consequence of the high degree of centralization in its political and institutional system. The creation of regions at the beginning of the military government, even though it was an important step toward decentralization, did not extend development to all regions. Implemented at the same time as the new economic policies, regionalization exaggerated the effect of those policies.

These rapid and profound transformations need to be analyzed and explained. Many studies have been carried out on this subject, but from a regional point of view there have been few. This paper is a contribution in this direction.

1.3. CHOICE OF THE STUDY AREA

Chile is a country extending - north to south - some 4,200 kilometres. There are thirteen regions numbered in Roman characters from I to XII, plus the Metropolitan Region of Santiago. The latter is located more or less in the middle of the country, between Regions V and VI. Region I is located in the upper north and Region XII in the far south. About 80 percent of population is concentrated in mediterranean Chile between Region V (Valparaiso) and VIII (Biobio).

According to its economic performance, the country has been classified by the World Bank as a middle income nation (World Bank, 1985). Some relevant indicators are its low infant mortality rate 18.9 per thousand; literacy rate of 94.3 percent; and its life expectancy

at birth of 71.8 years [6] .

Macroeconomic indicators for the country have been extremely positive in recent years. Growth of GDP reached 8.8 percent in 1989; its balance of trade was ten million dollars (U.S.) for the same year; and the expected inflation rate for 1992 is less than 12 percent (5.5 percent accumulated up to July 1992) [7] .

In terms of contribution to GDP the principal economic activities in 1987 were:

services 30.2 percent	agriculture 8.8 percent
industry 21.0 percent	mining 8.1 percent
commerce 16.9 percent	

(Source: National Statistic Office (INE) 1989)

Industry appears as the most important economic activity insofar as production is concerned. This underlines the importance of the sector for the national economy. Changes in the economic strategy and policies have changed industrial composition substantially over the last two decades.

In general terms industry in Chile decreases in importance radiating from the centre of the country out to its northern and southern extremities. Thus industry is concentrated in the same areas as the population. The historic evolution of Chilean industry has always been concentrated in this area.

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[6] The life expectancy datum is for 1988. See Appendix B for complete list.

[7] Sources: 1989 GDP data from INE 1990; 1992 inflation rate from INE 1992a.

1.4. MANUFACTURING SECTOR: HISTORY

Prior to 1950, in the 1930s and after the world depression, Chile began a period of slow increase in its industry. However, as Gwynne notes, it was only under the Alessandri administration (1958 - 1964) that the impact of industrial stagnation, first suggested by the Economic Commission for Latin America and the Caribbean (ECLAC), was addressed. The Alessandri government began to promote an extended of manufacturing in Chile (Gwynne 1985).

Technologically advanced products, rather than being imported, were first assembled and then manufactured in Chile beginning in the 1960s. Plants expanded and adopted new product lines such as refrigerators, radios, gramophones, televisions, and motor cars. These substituted for imports. The last three years of Alessandri's government witnessed a 23.0 percent increase in industrial production (Gwynne 1985).

The Frei government (1965-1970) maintained this industrial growth, expanding industrial production through a process of income redistribution. In order to improve the technological expertise of Chilean industry, this government attracted foreign investment in manufacturing, and promoted the establishment of manufacturing subsidiaries by foreign corporations. Between 1967 and 1969 the proportion of foreign investment in Chilean manufacturing increased from 16.6 percent to 20.3 percent.

Industrial production also grew. During the first three years of Frei's administration it grew by a total of 19.0 percent. However, industrial expansion began to slow once again in the last three years of his administration. The origins and causes of industrial stagnation once again became a crucial area of political debate.

This was the situation when president Salvador Allende took office. The new administration argued that it was necessary to reduce the impact of monopoly capitalism on Chile's industrial activity. Industrial stagnation would be solved by a massive redistribution of income so that demand would increase. With full utilization of industrial capacity achieved, the per-unit cost of industry would come down and with close government supervision prices would come down as well (Gwynne 1991).

Industrial production responded erratically to Allende's policies. In 1971 industrial production rose by 14.6 percent, but by 1972 industrial growth slowed down considerably as production increased by only 2.8 percent for the year. Uncertainties and inefficiencies of public ownership caused a major decline and overcame earlier increases.

What follows is a review of the industrial policies effects on Chilean economy for the period 1974 - 1989, or since the application of the new strategy.

1.4.1. POLICIES AFFECTING INDUSTRY IN THE 1974-1989 PERIOD

Participation of industrial employment in total national employment has been gradually increasing since the Alessandri's government at the end of the fifties. This is a consequence of the priority given to industrial growth. The measures taken to support this strategy affected all other economic sectors negatively. Those industrial policies constitute an economic phenomenon that has had, and continues to have, major repercussions for the Chilean economy.

The policies radically changed during the first decade of the military administration. The early thrust of policy under Pinochet was an attempt to correct the distortions caused

by industrial protection. The first measures included:

a) a major devaluation to reduce the disparity between the black market and the official exchange rate; and

b) a relaxation in price controls; and privatization of nationalized banks and industrial enterprises (Gwynne 1985).

Thus, since the 1973-1974 period industry started to play a subordinate role to other economic indicators such as inflation, the exchange rate and monetary growth. "It has generally been the rule that if one of these indicators was in conflict with prospects for the industrial sector, it was the industrial sector that normally suffered." (Gwynne, 1985: 5). The industrial crisis of 1982/83 is a good example of this subordination.

The measures implemented to activate the new strategy resulted in the application of a wide variety of policies that directly affected industry. Among others, a progressive reduction in tariffs together with a real money exchange policy were adopted (Gwynne, 1984). Many industrial commodities produced at high costs were not able to compete with low-price imported products. During the second decade industry showed an important recovery overall. However, it was not continuous but rather went through different stages of increase and decline.

The different stages of Chilean industrial development between 1974 and 1989 can be subdivided into three parts. The first period (1974 - 1980) is the period when extreme economic austerity was imposed in order to reduce the 500 percent level of inflation of 1973, and to limit overseas borrowing. As a result manufacturing production fell by 27.0 percent in the period (Gwynne, 1985). Austerity was followed by a period of significant

growth from 1976 to 1979. The GDP index rose by an annual average of 7.5 percent. Paralleling this development was a radical change in manufacturing activity, as almost all tariffs were reduced to 10 percent by 1979. This, together with continual devaluation of the Chilean peso against international currency boosted the export sector of manufacturing.

In this period the industrial sector was also affected strongly by the measures taken in order to deal with two major international developments: the first Oil Shock; and a drop in the price of copper, Chile's main source of external income. The measure to overcome these crises was a tariff reform to lower taxes on exports. Industries that used imported raw materials were most affected. The consequent industrial decline was reinforced by the dramatic reduction in internal demand, consequent upon government policies.

According to Gwynne, the major decline observed in the period 1974-1980 was sufficiently continuous to be described as a process of deindustrialization. From the data he provided, the decline in Chilean industrial production was approximately 11 percent. For the period between 1973 and 1983 the same author estimated a reduction in manufacturing employment of 33 percent (Gwynne: 1985 and 1991).

At the beginning of the period 1980-1984 the main constraint affecting the Chilean economy was the tremendous increase of the international rate of interest. Chilean currency was devalued, thereby increasing considerably the cost of imported inputs on which domestic industry was based. It is also in this period when the cost of servicing external debt started to be the main problem of all developing economies, including that of Chile. Up to 1980 some successes can be recorded for Chilean manufacturing activity. Chilean economic authorities were intent on promoting exports and on keeping the peso value stable against

the dollar. As a result, so-called manufactured exports increased significantly.

TABLE 1

CHILE: MANUFACTURED EXPORTS
(Millions of US dollars)
1982 - 1989

	1982	1984	1986	1989
Food products	365.8	406.8	511.3	851.3
of which: fish meal	256.0	275.7	315.1	507.8
Drink	13.1	13.6	19.1	43.3
Wood products	122.3	116.3	135.0	344.9
Paper, cellulose	219.6	259.4	272.4	422.3
Chemicals & oil deriv.	87.5	80.2	88.7	284.2
Basic metals	325.6	302.1	280.8	414.7
Metal goods, machinery and electrical	35.8	19.5	30.8	52.9
Transport equipment	22.7	42.0	53.8	36.5
Miscellaneous	14.7	20.9	27.8	162.6
TOTAL	1,207.1	1,260.8	1,419.7	2,612.7

(Source: Declaracion de Exportacion de Aduanas)

In the third period (following 1985) the Chilean economy, in spite of its debt constraints, began a process of continuous growth. Manufactured exports increased considerably in this period (see above). By 1988 debt negotiations were achieving good results and the economy as a whole was reaching a progressive stabilization. Inflation was controlled, exports as well as foreign investment started to increase considerably (Table 1 presents the value of manufactured exports between 1982 and 1989). Within the industrial sector only two regions decline in their participation in manufacturing employment (Tarapaca and Valparaiso).

1.4.2. THE EFFECTS ON THE TRADITIONAL SECTOR

The import-substituting sectors that had previously been the cornerstone of Chilean manufacturing achieved different results by the end of the period. The textile sector that had been the second largest manufacturing sector in Chile in 1974 (10.7 percent of total production) was reduced to 38.0 percent of its former size by 1980, but it recovered strongly to reach 9.0 percent in 1989, and thus became again the second-ranking manufacturing sector. It is important to note that even though the textile sector continue to be second in importance food, the first-ranking industrial sector in the two years analyzed, tremendously increased its participation, going from 15.0 percent in 1974 to 26.2 percent in 1989.

The 1989 production of three other import-substituting sectors also declined to less than half of their former levels: leather, transport products, and miscellaneous manufactured products. In contrast two other sectors increased by more than one-third of their former levels: footwear and plastics. Another import-substituting sector, ceramics, rose 43.1 percent

in fifteen years.

It can be said that all these transformations of Chilean manufacturing industrial structure are the consequence of the monetarist framework that prevailed in the 1974-1989 period, in which the process of industrial decline was seen as necessary. The assumption was made that the decline of manufacturing sector was because it was unprofitable and uncompetitive in terms of world trade. Consequently, the wide variety of policies applied starting in 1974 in order to deal with the new strategy initially forced transformation of Chile's industrial structure. This first transformation caused a significant decline in manufacturing employment.

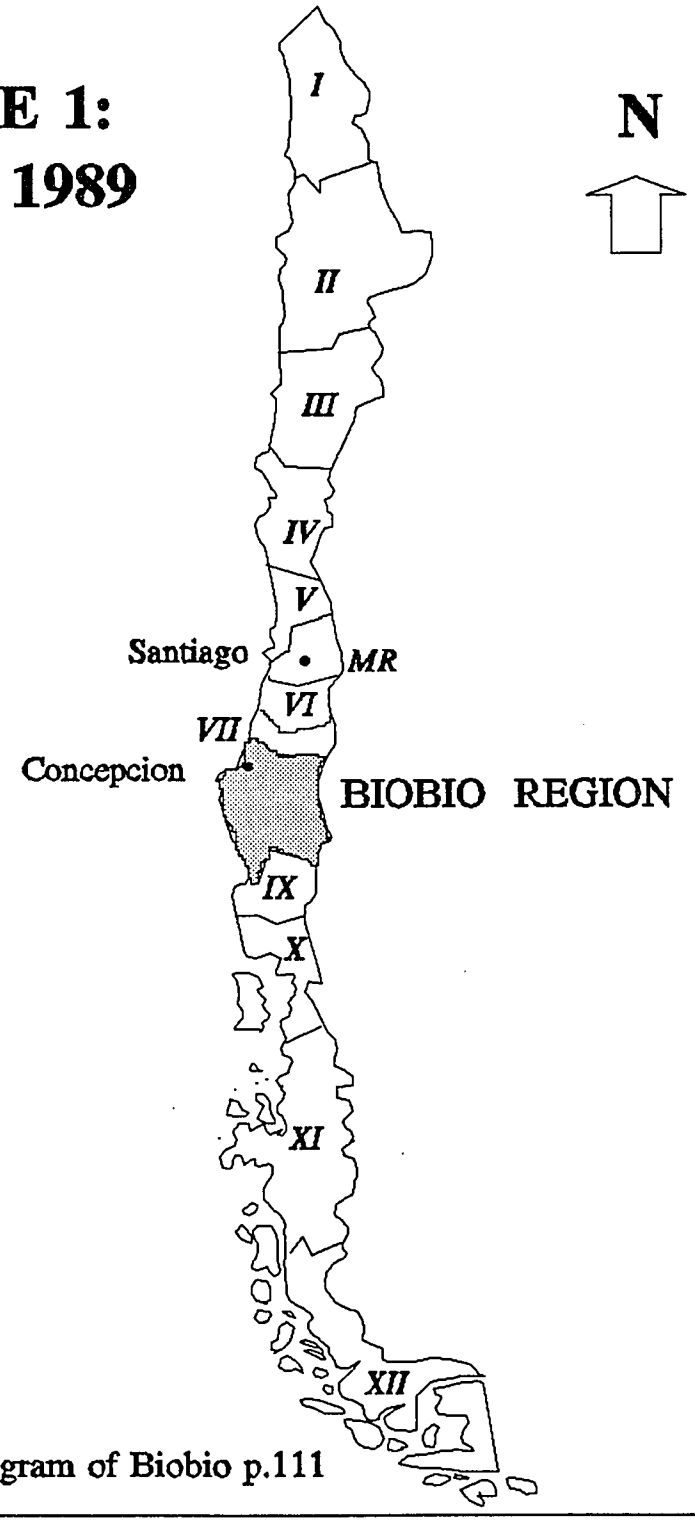
However, the results of this study show that for the whole period analyzed manufacturing employment has increased 15.1 percent between 1974 and 1989. This increase appears to contradict the projected impact of policies of the military government, which stated that the role of the manufacturing sector would become less important to the overall performance of the economy.

1.5. BIOBIO REGION: THE STUDY AREA

This study concentrates on the "Region del Biobio", although national-scale data are presented for comparison. The choice of this particular region is for historical and current reasons. The significance of the Biobio region as a study area is based on considerations set out below.

Biobio is located in south-central Chile, 400 kilometres south of the national capital, Santiago. It is between 36° 00" and 38° 30" south latitude (See Figure 1, following page).

FIGURE 1: CHILE 1989



NOTE: Detailed diagram of Biobio p.111

With a population of 1,729,920 in 1992 and 36,929.3 square kilometres (4.9 percent of Chile), the region has an approximate density of 47 inhabitants per square kilometre. Its urban population rose to 75.9% in 1988 and for the period 1982-1986 the average rate of increase of population was 1.31%. The population is concentrated in two urban centres: Gran Concepcion and Chillan. In 1982 they represented 61.4% and 11.2% of the regional total population respectively [8].

Beside its traditional coal mining activity, which accounts for 90% of the national production, the region has resources in agriculture, forestry and fishing. However, from the point of view of regional participation in national GDP Biobio Region is basically industrial. About one-third of the Biobio GDP comes from this activity. The study region is second to Santiago in population and industrial production [9].

The Biobio region traditionally has been the focus of most of the development strategies carried out in Chile. Under the Frei administration the inauguration of modern development policies saw a concentration of these efforts in Biobio (Boisier 1990). In all development strategies implemented since 1966 the Biobio region appears as the principal focus and has been the laboratory for testing strategies designed to achieve real regional development. According to the first official national development strategy:

> "The national strategy of development makes clear the need of stimulating, in parallel with the general increase of the country, a de-concentration process of economic activities and the decentralization in the decisional process for both the

---

[8] Sources: INE 1990 for statistics dated 1988 or earlier, and INE 1992c for 1992 data.

[9] Sources: INE 1990 and 1992c.

public and private sectors. Within this schema, the Biobio region has been given the highest priority in the investment process...."

(Source: ODEPLAN 1968; cited in Boisier 1990: 208).

In the same way, the National Commission for the Administrative Reform pointed out in 1976 that:

"The role of the region will be mainly based on the consolidation of its own development in order to stop migrations to Santiago, and in addition it is expected to play a key role in supplying agricultural, fishing, forest and industrial products of high specialization for the national and international consumption."

(Source: CONARA 1976, cited in Boisier 1990: 208).

These strategies have certainly affected the region in different ways. For example industry grew as the regional economy as a whole grew. The average rate of increase of the regional economy since the 1980s is higher than that of the nation. This economic growth appears to be solid since it is based on important flows of investment, particularly of foreign origin (Boisier 1990). Social equity, however has not gone together with this economic growth. On the contrary, the Biobio region is among the worst ranked regions in terms of social equity, rate of unemployment was by 1989 below the national average with poverty mainly concentrated in coal mining towns south of Conception. Public education and health are in poor condition.

Because of these contradictory indicators the Biobio region is said to be, still, at the beginning of a process of a real economic and political decentralization. The present consensus, shared by all political parties, seems to be leading to a more realistic

decentralization process, and consequent social equity.

One final major problem that the region will have to face in the future is that of the environment. Pollution is widespread in the region, affecting lakes, streams, forests, and beaches. Talcahuano Bay - Concepcion's main port - has been singled out as one of the most polluted places in Chile. The Biobio River accumulates all the wastes of forestry activity.

Boisier sees the future of the region, without an explicit strategy of regional development, as being similar to the present situation. The economic base of the region will continue to rely principally on two kinds of productive activities:

1) those linked to the exploitation of natural resources, with low incorporation of technology, and
2) manufacturing activities represented by a group of mature industries in terms of their use of technology. (Boisier S. *et al.* 1990).

What follows is an historical analysis of the Biobio region focusing on its recent economic history and its degree of subordination with respect to the core of the country. Such information is necessary so as better to understand the present situation.

1.5.1. THE HISTORICAL ROLE OF BIOBIO REGION IN CHILE

The historical centralization of political power and the economic apparatus of the country has resulted in a constant draining by Santiago of the surplus produced in the rest of the country. In fact the effects of centralization date back to Chile's independence from Spain. Santiago was for Spaniards the centre of the country as it continues to be in the

present, the place where all decisions were taken. Many attempts have been made to reverse this trend but few results have been achieved.

An important step towards decentralization was taken during the military government, when the country was regionalized. It has been argued that the decentralization process was designed to facilitate political and military control over the whole country (Tomic and Trumper 1990).

Concepcion, capital of the study region, has been historically one of the most important places outside Santiago and has often found itself in conflict with it. The area has based its economy on agricultural activities with a mining, industrial and administrative subregion extending north to south along the coast between Tome and Canete. In Biobio's coastal area a number of important industries permitted an incipient capitalist development. For many years the region has been identified with these still present industries. Flour mills, textiles, glass and pottery works grew in the north part (Tome, Lirquen, Penco, Talcahuano, Concepcion and Chiguayante), while transportation infrastructure and commerce developed in Talcahuano and Concepcion. Coal mining was established in Lebu, Curanilahue, Lota and Coronel. Banking, finance and administration concentrated in the city of Concepcion, the regional hub.

Despite its important and widely differentiated economy the region continues to be subordinate to Santiago. Perhaps the main problem has been that the more important industries of the region were built with investment from outside, which has worked directly against regional independence.

From the 1930s, after the Great Depression and mainly supported by the government,

industrialization became the national priority. Since the 1930s and because of a national policy of import substitution, the first-founded cities began an industrial stage developing an industrial conurbation located around Concepcion. Since 1950 and in conjunction with the concentration of more basic and dynamic industries based on heavy industry and steel mills located in the Concepcion-Talcahuano area, a traditional nucleus of industrialization (pottery, glass, textiles, and similar local products) continued to expand in Tome, Penco, Lirquen, Concepcion and Chiguayante. In the late 1960s the decline of the traditional economic base (textiles and coal) weakened peripheral satellite cities such as Tome, Lota and Coronel. This phenomenon stimulated a concentration process of regional growth in conjunction with economic and social areal differentiation, a process of stratification according to wealth.

From 1974 a comprehensive - and different - strategy of development, based on the liberalization of foreign trade and comparative advantages theory, started to be developed and implemented. Biobio was one of the regions where the effect of this strategy was experienced most profoundly. Regional industrial structure was so rapidly affected that by the end of the study period an industrial structure with an important proportion of modern industries oriented to the international trade system had appeared.

Chapter II

THEORETICAL FRAMEWORK AND THE DEVELOPMENT STRATEGY

This chapter reviews the literature on the development strategy applied to Chile, indicating the theoretical concepts involved in these strategies and their implications for this research. It also illustrates the way this study contributes, through empirical work, to the literature about the application of this global strategy. It includes a discussion on the effects that the strategy had on Chilean and, particularly, Biobio regional industry.

2.1 DEVELOPMENT STRATEGIES AND THEORETICAL CONCEPTS

In the following section, I review some basic theoretical concepts concerning the manner in which industrial firms adjust to economic changes.

2.1.1 NEO-LIBERALIST THOUGHT AND RICARDO'S THEORY OF COMPARATIVE ADVANTAGE

The world economy is becoming ever more integrated. In this integration process a neo-liberalist strategy of development has played a fundamental role in many countries of Latin America. According to Foxley "Neo-liberalism is a system of thought that combines a monetarist approach to economic stabilization with traditional liberal views concerning the organization of society and economy." (Foxley 1982: 5-19). Diaz and Korovkin point out that "In the neo-liberal view, the essential mechanism for the resolution of problems is an efficient allocation of resources through the market. Market efficiency is thus a central

assumption of all strategies of development that embrace neo-liberalism as a solution to the problems of underdevelopment" (Diaz and Korovkin 1991: 197).

In its economic dimension this strategy is characterized by four normative tenets:

a) the existence of private property. Private enterprise and the free market act to promote economic development;

b) withdrawal of the state from promoting development and regulating the economy;

c) the insertion of the country's economy into the international division of labour based on the Ricardian logic of Comparative Advantages; and

d) the opening of internal markets to foreign products in order to foster competition and efficiency in the national economy.

Under the military government development problems were associated to the situation of Chile in the world economy. It was accepted that Chile as an underdeveloped country required more participation in the world economy. The conservative approach to development problems in underdeveloped countries holds that these countries need more participation in the world economy to ensure faster and greater economic growth. Within the prevailing neo-liberalist strategy of development adopted by the military government, the main theory which asserted that Chile would benefit from more interaction in the world economy was Ricardo's theory of Comparative Advantage.

Ricardo pointed out that:

"It is quite important to the happiness of mankind that our enjoyment should be increased by a better division of labour, by each country producing those

> commodities for which by its situation, its climate and its other material or its artificial advantages, it is adapted, and by their exchanging them for the commodities of other countries.... Under a system of perfectly free commerce, each country naturally devotes its capital and labour to such employments as are more beneficial to each. This pursuit of individual advantage is admirably connected with the universal good of the whole."
>
> (cited in De Souza 1990: 32)

The theory holds that it is in the best interest of poor countries to exchange more labour for less. According to this theory, this unequal division of labour works to the advantage of all, allowing each country to make the best use of its natural resources, stock of skills, and infrastructure. Any deviation from free trade sacrifices efficiency and reduces world output and income.

An important strategy of development that embraces neo-liberalism and its concept, including Ricardo's comparative advantage theory is the "Export-oriented Strategy of development". This strategy has been applied in very different countries such as those of South East Asia and Latin America.

2.1.2 THE EXTERNAL AND MARKET-ORIENTED STRATEGY OF DEVELOPMENT

The World Bank defined the export-oriented strategy of development as an economic strategy in which the market and industrial strategy do not discriminate between producing for the internal or external market (Sanchez 1991).

Theoretically, the export-oriented strategy in developing countries is based on the feasibility of using correctly all the available resources of a country for its own economic increase, avoiding the negative effects that import-substitution causes in terms of higher costs of production, limited technological change, and unequal terms of trade in products.

The first developing countries to apply this strategy were those of South East Asia: Korea, Taiwan, Singapore, and Hong Kong. The development experience of these countries since 1960 has been principally based upon an export-oriented economy made possible by the profit from using low-cost labour.

The application of this Strategy in Chile was the answer for the traditional highly protected model in operation till 1973, when the military government took power. The problems with this model came from the fact that the exchange rate, tariff and price control policies enforced in the four decades following the world depression of the 1930s had exerted a significant bias in favour of domestic manufacturing, while discriminating against investments in mining and agriculture. All these policies were rapidly suppressed to implement the "Export-oriented Strategy" in Chile, right after the military coup in 1973. The export-oriented strategy was mainly based on natural resources spread out throughout the country, and on its low-cost labour.

Consistent with the general policy of assigning the role of price determination and resource allocation to the marketplace the government, since 1973, has not offer major subsidies or special incentives to exporters. Instead, the improved environment for exports relative to earlier periods came from the rationalization of the exchange rate, the lowering of import restrictions, and the elimination of certain administrative and bureaucratic obstacles to export (Sanchez 1991, using 1987 World Bank data).

At the same time many other measures intended to reduce distortions in the allocation of resources and to liberalize and simplify the management of foreign exchange were applied in order to incorporate Chile into the "Strategy". The renewed subjection of public enterprises and agencies to the same import duties and restrictions as the private sector, the public sector's progressive divestment of commercial enterprises, the gradual reduction of the special import references applied to particular regions and industries, and other similar measures effectively encouraged non-copper exports to grow rapidly after 1973. It is important to point out that copper exports have been traditionally one of Chile's main sources of income.

In order to highlight the evolution followed by Chile in the orientation of its economic policy, Table 2 shows the results of a survey carried out for the World Bank (World Bank 1987). The survey included forty-one developing countries in two periods of time, 1963 to 1973, and 1973 to 1985. Countries were ordered into four groups according to their market-oriented strategy. This table uses a selected group of those countries, Chile among them, in order to illustrate the rapid evolution of its economic policy under the post-coup policies.

TABLE 2

ORIENTATION OF THE STRATEGY OF DEVELOPMENT OF SELECTED DEVELOPING COUNTRIES. 1963-1973 and 1973-1985

	Externally and market-oriented economy		Internally and market-oriented economy	
Period	Strongly oriented	Moderately oriented	Moderately oriented	Strongly oriented
1963/73	Hong Kong S.Korea Singapore	Brazil Cameroon Colombia Costa Rica Ivory Coast	Bolivia El Salvador Honduras Kenya Madagascar	Argentina Bangladesh Burundi **Chile** Dominican Republic Uruguay
1973/85	Hong Kong S.Korea Singapore	Brazil **Chile** Israel Malaysia Uruguay Turkey	Cameroon Colombia Costa Rica	Argentina Bangladesh Bolivia

(Source: after Sanchez 1991, based on 1987 World Bank data)

Chile together with Uruguay and Turkey appear as the countries that in the reported time-frame have experienced the most significant shift. They moved from a strongly internal and market-oriented to a moderate external and market-oriented economy. One of the economic sectors that has played a key role in this important transformation of the Chilean economy certainly has been manufacturing, whose role in the economic growth of Chile has became ever more important in recent years.

2.2. THE IMPLEMENTATION OF THE STRATEGY IN CHILE

The magnitude of the transformation of Chilean economy came from the way the military saw development. While the governments of Alessandri, Frei, and Allende in their very different ways saw manufacturing growth as central to the economic performance of the economy, the military government saw the role of industry as less significant to the overall health of the economy. To deal with this, the new regime adopted the external and market-oriented strategy that would drastically change the face of the national economy. Trade liberalisation and the dismantling of the elaborate and complex framework of industrial protection were the most dramatic policies to affect industrial firms.

At the beginning of 1974, the new government presented a programme identifying the measures to be taken and the policies that would be pursued in order to stabilize the economy. These measures included:

a) rationalization of the public sector;

b) adjusting the currency exchange rate through devaluation;

c) encouragement of foreign trade through liberalized investment rules;

d) and wage and price policies.

The programme was not coordinated. However, it identified the internal or external resources that would have to be mobilized and that might be available for its implementation.

The programme grouped the measures into three categories addressing

1) infrastructure;

2) productive sectors; and 3) social sectors.

Measures to be taken within the industrial sector were extremely diversified and it was difficult to establish priorities. However, the criteria followed for arriving at decisions highlighted the importance given to forest industries, steel-making, and petrochemicals.

According to Saez criteria for arriving at decisions were basically:

a) Industries that satisfy the needs of a high proportion of the national population;

b) Industries that represent a high value-added, especially when they supply export markets at internationally competitive prices;

c) Industries which, although they are not in the preceding categories, have investment at such levels that they justify being put into operation;

d) Industries that related to Chile under the activities assigned to the country in the Andean Pact, particularly when these industries complement other activities within the area or represent capital goods for the area (Saez 1975).

Saez pointed out that "the programme was defined in such a way to encourage international agreements and national interests." (*op. cit.*), implying that existing Chilean international agreements and compromises would be respected. In spite of this assertion in 1976, when the externally and market-oriented strategy was achieving results, Chile retired from the Andean Pact [10] .

The major features of early policy towards manufacturing industry, under this programme, are summarized and discussed below:

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[10] The Andean Pact included Ecuador, Bolivia, Colombia, Peru, and Chile. It was signed in 1969. It aims at establishing economic and cultural unity through joint programmes to exploit resources, reduce trade barriers, and coordinate industrial development.

i) The lowering of tariff barriers on imported manufactures. The average level of nominal tariffs fell from 94.0 percent in 1973 to 14.0 percent in 1978; Table 3 summarizes this dramatic drop in the tariffs of industrial sectors for the 1974-1979 period and the effects on industrial production of 1980.

According to Gwynne the post 1973 reforms had very little impact on aggregated industrial production: "Industrial production in 1980 was only slightly higher than in 1973." (Gwynne 1991: 31). However, the extent of restructuring was quite remarkable. Table 3 shows the fall of tariffs and its consequences for different industrial sectors.

TABLE 3

CHILE: CHANGES IN EFFECTIVE RATES OF PROTECTION AND INDUSTRIAL PRODUCTION 1974 - 1980

Sector	Effective rates of protection (%) 1974	1979	Industrial production 1980 (1973=100)
Food	161	12	103.9
Drinks	203	13	159.6
Tobacco	114	11	109.1
Textiles	239	14	38.0
Footwear	264	14	47.8
Timber	157	15	109.0
Furniture	95	11	166.7
Paper	184	17	139.8
Printing/publishing	140	12	112.2
Leather	181	13	31.5
Rubber	49	15	51.3
Chemicals	80	13	74.0
Oil/coal products	265	13	275.2
Const. materials	128	14	158.4
Metal products	147	15	72.3
Machinery	96	13	57.9

(Source: Gwynne 1991)

Production in Textiles and Footwear, two traditional protected sector with effective rates of protection of more than 230 percent in 1974, was cut by over half between 1973 and 1980 as their effective rates of protection dropped to just 14 percent. Equally dramatic declines are observed in other highly protected sectors.

ii) Privatization. The state holding company, the "Corporacion de Fomento de Produccion" (CORFO) which had acquired large numbers of industrial firms under Allende's administration, started to sell off most of these enterprises. Most of the industrial firms sold by CORFO were purchased not by the formerly foreign companies but by Chilean companies with access to international sources of funding.

Among the changes that can be observed during the first five years of the Pinochet strategy, those of the export-oriented industrial sector may be regarded as the most successful. Manufacturing production grew more than seven hundred percent, accounting for more than sixty percent of Chilean non-copper exports in 1978 (Table 4, next page). Manufacturing exports alone experienced a five-fold increase in value from 1973 to 1976, from 1976 to 1978 they again substantially increased. Agricultural exports over the period 1974 - 1978 rose eight times from 2 percent to 8 percent of the total. "Chilean products were shipped to 90 different countries in 1977, double the 1973 number." (Gwynne 1991).

Liberalization and all the measures intended to reduce distortion in the allocation of resources have certainly benefited all sectors of industry. In subsequent years not only industry but also fruit and other non-copper exports rose so notably that by 1986 copper

exports represented only 40 percent all Chilean exports, half the 1973 proportion.

TABLE 4

CHILE NON-COPPER EXPORTS, 1973 - 1978

(Millions of US dollars)

	Other Mining	Agricultural [a]	Manufactures	Total
1973	127	25	103	255
1976	197	119	520	836
1978 [p]	221	204	781	1,206

a/ Includes primary forest and fisheries products.
p/ Provisional.

(Source: after Gwynne 1991)

2.2.1. FIRMS ADAPTING TO CHANGES IN CHILEAN ECONOMY

The extraordinary growth of manufactured exports is the response of firms to changes in the economic policy. An interesting analysis in this direction is suggested by Massey and Meegan's study of firms adapting to recession, and associated reduction in demand in the United Kingdom. According to Massey and Meegan firms principally react in two ways, both of which serve to reduce employment. First, the firm can simply react by reducing capacity; as a result both production and employment decline. Alternatively, the firm can react by investing in new machinery and equipment and thereby increase capacity. If the firm consequently manages to achieve high production levels, the impact of economies of

scale means that the per-unit cost of the product will be reduced, prices cut and market expanded. However, the new machinery is normally labour-saving and hence although production is increased, employment is reduced (Gwynne 1985).

An analysis of this kind is done in Chapter V to see how firms reacted in the Biobio region to the changes in the economic policies. This analysis carried out at the three-digit level complements that made at the four-digit level. In Chapter III the research methodology as well as the techniques used for analysing these changes are discussed and presented.

CHAPTER III

LITERATURE REVIEW

In this survey a number of works are analyzed to study the consequences of changes of development strategy on the industrial patterns of growth in Chile. The purpose of this review is to be familiar with studies developed on this subject and to select the appropriate analytical technique to carry out the research.

3.1. INDUSTRIAL PATTERNS OF GROWTH AND ANALYTICAL TECHNIQUES

Within the Canadian context Paraskevopoulos (1974); Edwards (1976); and Andrikopoulos (1977) have analyzed regional patterns of growth in manufacturing employment (Ansari 1983: 67). A brief discussion of Andrikopoulos' work (3.1.2. Study "B") as well as three other studies related to the Chilean case (Boisier 1985, Gwynne 1984, and Sanchez 1990) are also presented. The main conclusions of these studies are summarized and then discussed in order to pinpoint the contribution of this research to the subject.

3.1.1 STUDY "A" - Boisier 1985

Boisier and Silva try to determine the effects that the export-oriented strategy had on the composition, structure and changes in the manufacturing industrial sector in all regions of Chile. The technique they used measures the evolution of industrial sectors through the response to three effects that determine the increase or decrease of a region for a given period of time.

The effects are:

1) domestic demand;

2) import-substitution; and

3) exports

The magnitude, sign, and composition of the three effects combined explain the dynamic experienced in different industrial sectors. According to Boisier and Silva, this technique was first used by Chenery (1960), and in the Chilean case by Muñoz (1968), Vergara (1980), and PREALC (1984).

The difficulty of using this technique arises from the fact that it is practically impossible to determine exports and imports at the regional level. For this and related reasons the Boisier-Silva approach was not considered appropriated for this research, even through their results and conclusion are of great interest. In their study Boisier and Silva complemented employment data by using value-added in production, as well as average labour production.

In studies of regional disparities, regional economic base and flows among regions Boisier has also employed "Location quotient" and "Coefficient of specialization" as the technique to measure changes in the economic composition of one or more regions. The main constraint of this technique is that the analysis is limited to a specific moment in time. For this reason no dynamic analysis can be done.

In order to enrich the analysis it is worth using a technique that allows the researcher to study the evolution of a regional variable through time. One technique that allows such analysis is the shift-share technique.

3.1.2. STUDY "B" - Andrikopoulos 1977

To analyze the manufacturing employment growth in the province of Ontario for the period 1961 - 1973 this author used manufacturing employment data at the two - digit ISIC. By applying shift-share technique he identifies 3 growth components: a) national growth, b) industrial-mix (or proportionality shift), and c) regional share.

He formulated two basic hypotheses: i) the regional-share hypothesis, and ii) the industrial-mix hypothesis. He assumed that the regional-share hypothesis relates the industry's regional share component employment to four basic sets of regional factors: economic condition and market-size, agglomeration economies, capital formation, and the share variable.

He assumed that the industrial-mix component of employment should be affected either by policy-manipulated variables - variables that could inject fast growing industries into the province in order to compensate for their above average number of declining industries - or variables exogenous to the region - national variables affecting demand and supply. In order to test these hypotheses, he regressed the regional-share component and the industrial-mix component against selected explanatory variables.

Andrikopoulos concludes that:

> "The industrial-mix hypothesis suggests that structural deficiencies in the province can be rectified by policies acting either on the regional distribution of capital (local infrastructure investment, natural resources policies, etc.), or on changing the regional economic conditions (money wage policies, improving skills of labour, etc.). These

policies may induce the expansion of already fast growing industries or the establishment of new promising firms in industry."

3.1.3. STUDY "C" - Gwynne 1984

"An export-oriented strategy for industry"

In this study Gwynne analyzed the spatial implications of changes in the industrial policy of Chile during the seventies. The analysis is carried out at the three-digit level of industrial classification for the thirteen regions of Chile. Working with industries with fifty or more employees, he analyzed changes occurring between 1967 and 1978. On the basis of three components - differential shift, proportionality shift and net total shift - regional employment changes in industry are presented and discussed.

The results of the study show important differences in industrial performance among regions, principally among those with an important presence of import-substituting industries and those where the export-oriented policy has stimulated an accelerated growth in these sectors. The region with the lowest proportionality shift is the Metropolitan Region of Santiago due to its highly diversified export-oriented industrial sector. The rest of the regions present a positive proportionality shift either because they have stronger export sectors or because their import-substituting sectors were less significant than the export sectors. This is the case, for example, of Biobio region in which the export-oriented sectors, such as - 311 (food), 331 (wood), and 341 (paper), were much more important than the import-substituting's, such as - 321 (textiles), 362 (glass), and 384 (transport products) - the latter with a high concentration in Concepcion.

The high concentration of import-substituting industries in the Metropolitan Region of Santiago is reflected in the high negative value of the proportionality shift (-9,765). This is particularly important since Santiago is the only region showing negative values for both differential shift and industrial mix. This leads to the conclusion that the export-oriented industrial policies led to industrial decentralization in Chile. That is to say, a marked decline in the import-substituting industry of Santiago took place, in favour of a growth in the export-oriented industry of the rest of the regions. Table 5 presents the components of shift-share for the period 1967 to 1978.

TABLE 5

SHIFT-SHARE ANALYSIS FOR THE MANUFACTURING SECTOR AT THE THREE-DIGIT LEVEL. CHILE 1967 - 1978

	REGION	DIFFERENTIAL SHIFT	PROPORTIONALITY SHIFT	NET TOTAL SHIFT
I	Tarapaca	+ 116	+ 197	+ 313
II	Antofagasta	+ 50	+ 247	+ 297
III	Atacama	+ 1096	+ 82	+1178
IV	Coquimbo	+ 505	+ 43	+ 548
V	Valparaiso	+ 1692	+ 1447	+3139
MR	Santiago	- 7559	- 9765	- 17324
VI	O'Higgins	+ 2210	+ 335	+2545
VII	Maule	+ 1836	+ 901	+2737
VIII	Biobio	+ 705	+ 463	+1168
IX	Araucania	- 384	+ 197	- 187
X	Los Lagos	- 918	+ 1176	+ 258
XI	Aisen	...	...	...
XII	Magallanes	+ 663	+ 56	+ 719

(Source: Gwynne 1984)

The share of Santiago's manufacturing employment fell from 60.8 percent in 1970 to 52.2 percent in 1976, but rose again to 54.1 percent in 1978. Like Santiago, the Biobio region showed an important decline in its historically protected industrial sectors, such as textiles, furniture, pottery and china, steel, and transport products (ship and railway). This gave a net total shift of -6,546. New industrial sectors were emerging at that period but their importance in the regional share was not significant yet.

These changes were interpreted as being the beginning of a process of decentralization in the country which was seen as an important change in the historical process of centralization of activities in the capital city.

Gwynne concludes that:

a) The historical process of industrial centralization in Chile might be terminating and, instead, a process of industrial decentralization might be taking place.

b) Alternatively, it is also possible that the process of centralisation had just had a short-run regression and, since 1976 it is again increasing. Industry rose in Santiago from 52.2 percent in 1976 to 54.1 percent in 1978.

3.1.4. STUDY "D" - Sanchez 1991

"Regional development under the free-market policy: Chile 1975 - 1989".

Sanchez analyzed the manufacturing employment growth in the thirteen regions of Chile for the period 1975 - 1989. The data used in this analysis is manufacturing employment, at the four-digit level, and value-added. He divides the country into six macro-regions as follow: North (which includes the regions of Tarapaca, Antofagasta, Atacama,

and Coquimbo); Valparaiso (the Valparaiso Region); Central Valley (regions of O'higgins and Maule); Biobio (the Biobio region); and South (it includes the last four regions of La Araucania, Los Lagos, Aisen, and Magallanes).

He applied the shift-share model for three periods of time to identify three growth components: i) National growth; ii) regional share; and iii) industrial mix. The three periods correspond to significant stages of the economy.

a) 1975 - 1980 when the open-market strategy was first introduced

b) 1980 - 1985 when the international rate of interest rose significatively affecting all developing countries. In Chile it affected particularly industrial development.

c) 1985 - 1989 in this period Chile observed an important increase in foreign investment.

He formulated basic hypotheses related to the final demand of industrial production. First, he postulated that if either net total shift or differential shift are positive this indicates that industry exports its production. Second, he assumed that if net total shift or differential shift are negative, such an industry produces only for the internal market.

Sanchez concludes that:

a) In the 1975 - 1980 period regions rich in natural resources, but low manufacturing capability, were able to take part in the export process through trade of raw materials. In contrast regions with an important industrial structure, but low export capacity, could not compete with imported products and had to cut internal employment or simply stop operations. This is known as the deindustrialization

period in which manufactured products were substituted for raw materials in the export process.

b) In the 1980 - 1985 period performance of industrial sectors was highly influenced by the devaluation of national currency. This measure strongly affected foreign input values by increasing prices. Regions with solid economic base such as those of northern (in mining) and southern mediterranean Chile (in forestry) maintained an average growth higher than the national average.

c) In the 1985 - 1989 period, external investment rose considerably, new industries were created together with a process of privatisation of public enterprises. The combination of these measures caused a rebound of the national economy. The Santiago region benefited most due to its important industrial base.

Three of the studies discussed above(Andrikopoulos, Gwynne and Sanchez) introduced the kind of analysis that can be done using shift-share technique. The review of these studies permits us to focus interest on an aspect not explored by them. In this sense, and in order to contribute with a point of view not developed before, this study, using basically the same kind of data, tries to assess how the industrial manufacturing sector of the Biobio region has been transformed. In doing so, this study addresses these questions:

1) Have economic policies significantly changed manufacturing employment in the Biobio region ?;
2) How has the weight of key export industries changed within the regional industrial structure ?;
3) Are key industries actually benefiting by staying in this region ?

CHAPTER IV

RESEARCH METHODOLOGY

This chapter presents the hypotheses underlying the research and discusses in its varied forms the technique that has been used to carried out this study: shift-share analysis. The chapter justifies the choice of using this technique for studying industrial structural change. It makes reference to important studies which have applied shift-share to interpret regional growth in term of the dynamics of its industrial structure [11] . Second, it highlights the advantages and disadvantages of this methodology. Finally, it examines the kinds of data and points out the problems that were encountered during the compilation and analyses. It also describes the surveys conducted to supplement the census data and the way they complement the shift-share analysis.

4.1. THE HYPOTHESES

According to Ricardo's comparative advantage theory, Chilean regional economic strategy since 1974 has been based on its comparative advantages. The objective has been to achieve more participation in the world economy. Chile has opened its economy to the foreign market to exchange its products which has meant that national industry has had to compete in an open market. In this open market industries export those products in which they have comparative advantages.

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[11] In Chapter V the results of this research are compared with those reported in the studies used as examples.

The Biobio region has industries that benefit from staying in that particular location. It also has some that do not benefit of staying in its territory. In the same way, the region has industries that produce goods for the domestic as well as foreign markets. According to Ricardo, it can be assumed, therefore, that the Biobio region will export those product in which it has comparative advantages and will direct the others to domestic consumption.

The technique selected to test if industries are benefiting by staying in the Biobio region and to see if they sell locally or, on the contrary, export their production, is the shift-share technique. This is carried out by analysing two of its components: Differential-shift and Industrial-mix. Differential-shift is related to the allocation of industries, and industrial-mix to the orientation of their final production.

HYPOTHESIS A) DIFFERENTIAL-SHIFT ASSUMPTION

It is possible, within neo-liberalist thought, to ask whether the actual allocation of Biobio manufacturing industries corresponds to an efficient location of resources, or not. Since in the country there exist spatial differences among regions in terms of climate and other material or artificial advantages, industries will prefer to locate in the region they think they will have more profits. It has been suggested that the differential shift analysis is related to the spatial location of the activity (Gwynne 1985).

A positive differential-shift of sectors (industries growing faster or declining less rapidly than their national counterpart) will suggest that such industry benefits by staying in this particular region. A negative differential-shift (regional industries that either grow less rapidly or decline more rapidly than their national counterpart) will suggest that such

industry is losing benefits by staying in the Biobio region.

HYPOTHESIS B) INDUSTRIAL-MIX ASSUMPTION

The fact that the region has a positive industrial-mix (that is to say that has an above average proportion of national fast-growing manufacturing industries) means that the region has comparative advantage for the development of that particular sector. The assumption is made that if a sector is benefiting from comparative advantages (what would explain its rapid growth) it will prefer to export to foreign markets because of higher prices. Conversely, if it experiences a negative industrial-mix that particular sector will have industries producing for the internal market.

4.2. SHIFT-SHARE TECHNIQUE

Most of the studies reviewed used shift-share analysis for studying industrial structural change. This study concentrates on the analysis of only two of the components as stated in the hypotheses formulated.

Shift-share is designed to interpret the region's growth by breaking down differences between the value of a chosen variable - in this case industrial employment - as observed regionally and nationally. The technique is applied here on dis-aggregated employment data at the three- and four-digit breakdown of industrial classes used by the National Statistical Office (INE). Patterns of increase of industrial employment, as well as identification of faster growing (=key) regional industries at the national and sectoral level, are discernible.

Relevant studies that have used this technique are those by Dunn (1960), Perloff *et al.* (1960), Stilwell (1969), Buck (1970), Lasuen (1971), Edwards (1976), Norris and Percy (1981), and Ansari (1983). Within the Chilean context recent studies have used this technique, namely those by Gwynne (1984), and Sanchez (1991). All these studies were discussed in Chapter III.

According to Stilwell (1969) shift-share is a technique which has been used widely in the analysis of regional economic growth. The majority of these studies selected either manufacturing employment or industrial employment to analyze the regional patterns of growth. For the purpose of this study the shift-share technique and its notations were taken from Stilwell (1969). This technique divides the growth or change of a regional variable, such as employment, into three components:

a) The regional share (of national growth): This may be regarded as the amount by which total manufacturing employment in the region would have grown during the period studied if it grew at precisely the same rate as the total manufacturing employment in the nation as a whole.

Algebraically it may be expressed as:

$$NG_{ij} = E_{ijo} (E_t / E_o) - E_{ijo} \qquad \text{(equation 1)}$$

Where:

E_{ijo} is employment in manufacturing industry i in region j in the base year;

E_t is employment in all manufacturing industries in all regions in the terminal year;

E_o is employment in all manufacturing industries in all regions in the base year.

b) Industrial-mix (or proportionality shift): This may be thought of as the extra amount by which employment in the region has grown as a result of the region specialising in nationally fast-growing or slow-growing and declining industries. This shift will be positive in the case of a region with above average proportions of employment in industries with rapid growth rates at the national level. It will be negative in the case of a region specialising in nationally static or declining industries.

The algebraic expression is:

$$IM_{ij} = ((E_{it} / E_{io}) - (E_t / E_o)) * E_{ijo} \quad \text{(equation 2)}$$

Where:

E_{it} is employment in manufacturing industry i in all regions in the terminal year;

E_{io} is employment in manufacturing industry i in all regions in the base year.

The rest of notations are the same as mentioned above.

c) The differential shift (or regional): This third item reflects the extra amount of employment growth in the region resulting from employment in each industry in the region growing at a faster or slower rate than its national growth rate. A region in which employment grew faster than its industrial mix would suggest would feature a positive differential shift, while the shift would be negative in the case of a region in which employment grew more slowly than its industrial-mix would suggest.

Algebraically, differential shift may be expressed as:

$$DG_{ij} = E_{ijt} - ((E_{it} / E_{io}) * E_{ijo}) \qquad \text{(equation 3)}$$

Where:

E_{ijt} is employment in manufacturing industry i in region j in the terminal year. The rest of notations are the same as noted above.

d) Net Total Shift (NTS): The sum of the three growth components described above represents the absolute growth or change in employment during the period studied (that is, total employment in all industries of a region in the terminal year minus total employment in all industries of that region in the base year).

Expressed algebraically, net total-shift is represented as:

$$NTS = (NG + IM + DG) \qquad \text{(equation 4)}$$

Similarly, the algebraic sum of industrial-mix (IM) and differential growth (DG) components represents net total shift. It measures growth in employment that results from the combined effects of industrial mix and differential growth components.

The Net total shift may then be expressed as:

$$NTS_{ij} = (IM_{ij} + DG_{ij}) = E_{ijt} - ((E_t / E_o) E_{ijo}) \quad \text{(equation 5)}$$

Where: All notations are as defined above.

4.2.1. ADVANTAGES AND DISADVANTAGES OF THE SHIFT-SHARE TECHNIQUE

Shift-share is a technique that has been used widely to analyze changes in industrial structure and growth in employment of different study units such as regions or provinces. The main reason for its popularity are its simple data requirements, and the ease in calculation and comprehension. The technique, however, presents certain limitations.

Buck (1970) has demonstrated that at the order level (two digit) of industrial classification the technique produces a larger differential shift and a smaller proportionality shift, whereas at the minimum list heading level of industrial classification it produces results with a smaller differential-shift and a larger industrial-mix.

This study, carried out at a more dis-aggregated level of industrial classification show larger figures for industrial-mix than for differential-shift, which validates Buck's experience.

Dunn (1960) suggests that the shift-share technique does not take into account changes in industrial structure during the time period under consideration, because the

weighting of all its components is based on the industrial composition at the beginning of the period. Therefore, the larger the time period, the higher the distortion in the proportionality shift effect. In this research, which covers a long time-frame, complementary information was used, in the national and regional context. This adjustment takes into account changes that occurred during the period.

Stilwell (1969) emphasises that shift-share is a simple standardisation technique and non-statistical in as much as there is no way of determining whether the observed shifts are significantly different from zero. The same author suggests that there seems to be a general agreement that, while the method is a useful way of making an initial analysis of regional growth, it is not an end in itself. Shift-share as a technique does not provide the necessary tools to analyze changes in the industrial structure that might have taken place within the period studied. In order to take into account such changes, Stilwell has suggested some modifications to the standard shift-share technique to alleviate somewhat this limitation.

These modifications consider the employment growth as a result of the industrial composition existing at the end of the period under consideration. Again, changes which occurred within the period are not clearly noticeable.

Limitations that the shift-share technique presents may be overcome with further analysis, depending on whether the investigator is interested in the sectoral performance in a given region or set of regions, or the regional performance of a given industrial sector. In this study the emphasis is on the sectoral performance (industrial sector) of one specific region, the Biobio region, and on two components - differential-shift and industrial-mix.

4.3. DATA ACQUISITION

Data used for this research are for 1974 and 1989. 1974 data represent the existing employment structure of the region before the implementation of political and economic reforms by the military government. The 1989 data illustrate the growth after 15 years of application of these policies.

Both definition concepts and type of data are comparable for the two years for which data was collected.

Data for industries with more than 50 employees were available for the two years. The 1989 employment data is the most recent available. Small industry data were not available for the two years, so it is not possible to a comparison of industry over and under 50 employees. For the same reason data for this study were limited to industries with more than 50 employees. This stratum represents approximately 70% of the manufacturing industrial sector in the region (Boisier and Silva: 1985). Data for industrial employment come from two principal sources in Chile. One is provided by the "Sociedad de Fomento Fabril" (SOFOFA), the organization of the national manufacturing companies. The other is provided by the National Statistical Office (INE). In the industrial census all manufacturing firms with five or more employees are covered. The survey of firms with fifty or more employees is taken annually.

Data used here are those of the National Statistical Office and correspond to industrial employment at the level of three- and four-digit industrial classes. INE manufacturing employment data are classified according to the United Nations International Standard Industrial Classification (ISIC 1974).

It is important to point out the problems that were encountered during the compilation and arrangement of the data. The first problem is that data at this level of dis-aggregation are found only in the country of origin, in this case Chile. For this reason, and for more accuracy in the process of data collection and literature survey, an extensive field research was conducted in Chile, particularly in the Biobio Region.

In Chile data were easy to collect, since the relevant INE survey is published annually. The two-year survey of INE's manufacturing employment utilized in this study corresponds to the United Nations International Standard Industrial Classification, third revision [12] .

In order to supplement the census data about employment the survey conducted in the study area acquired data about gross value of production. Using these data the average labour production for industries at the three-digit level was calculated. That result was employed to measure changes in the per-unit cost of production, to test the competitiveness of industries in the period analyzed.

Shift-share analysis establishes patterns of change among industries as well as identifies key-growing industries, in terms of the variable selected. However, it does not highlight changes occurring within specific industries. This is particularly important for regions where structural change is occurring at all levels in traditional and modern sectors, such as those in the Biobio Region.

A final point to highlight is related to the extent that the results of this study effectively reflect the real situation of changes in the period analyzed. Two important

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[12] Corresponds to a revision of the United Nation ISIC published in 1974.

factors have to be considered when looking at the results of this research. First, during the 1973-1975 period the Chilean economy was affected by a tremendous hyper-inflation rate (375.9 percent in 1974) that make industrial statistics based on currency (i.e. gross value of production) not completely reliable. Second, industrial employment of 1974 might be expected to be exaggerated (4.8 percent unemployment) since one of Allende's main policy thrusts was in keeping full employment.

Figures 2 and 3 present changes in manufacturing employment for the 13 regions of Chile between 1974 and 1989.

FIGURE 2

CHILE. MANUFACTURING EMPLOYMENT

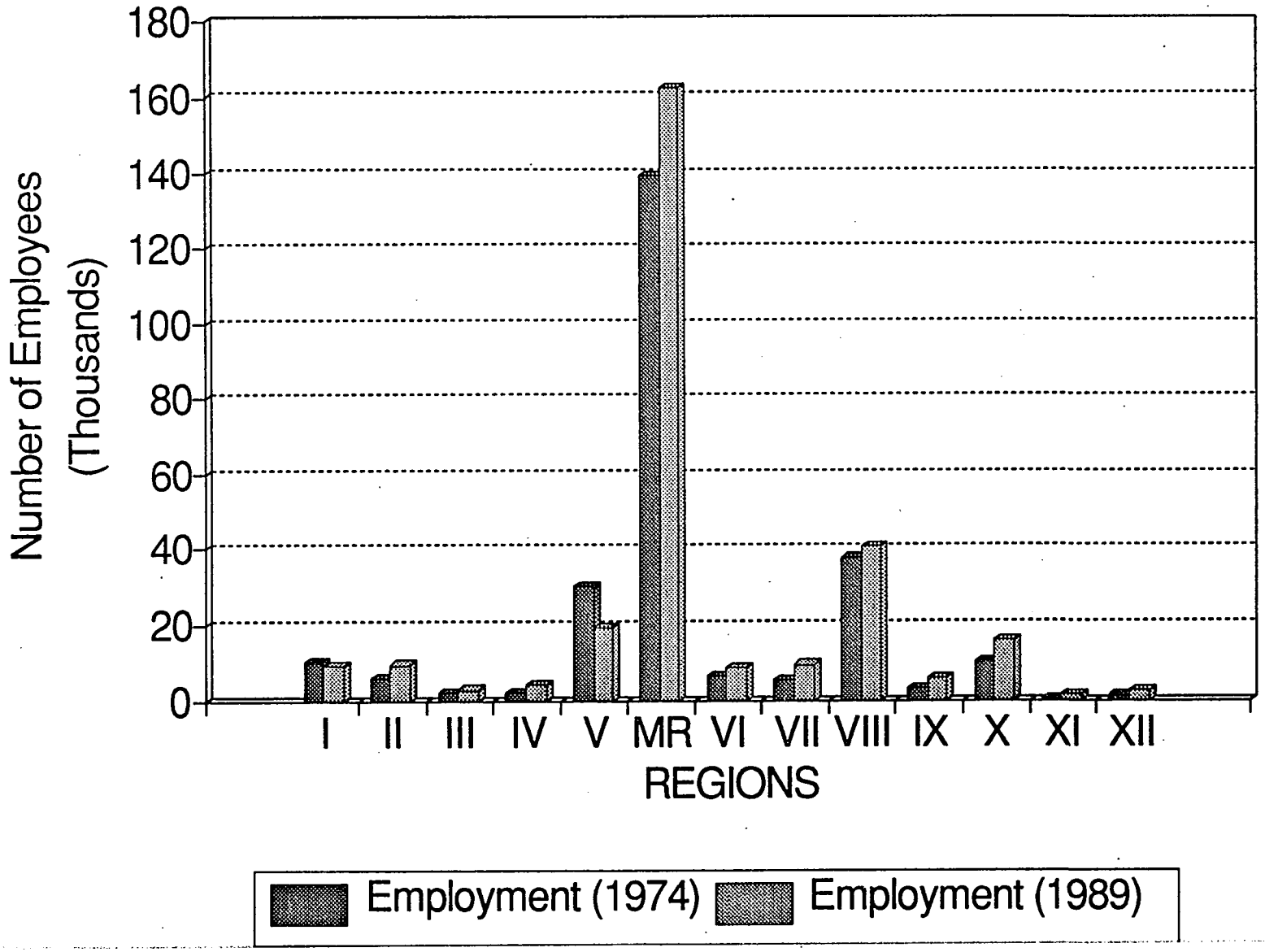
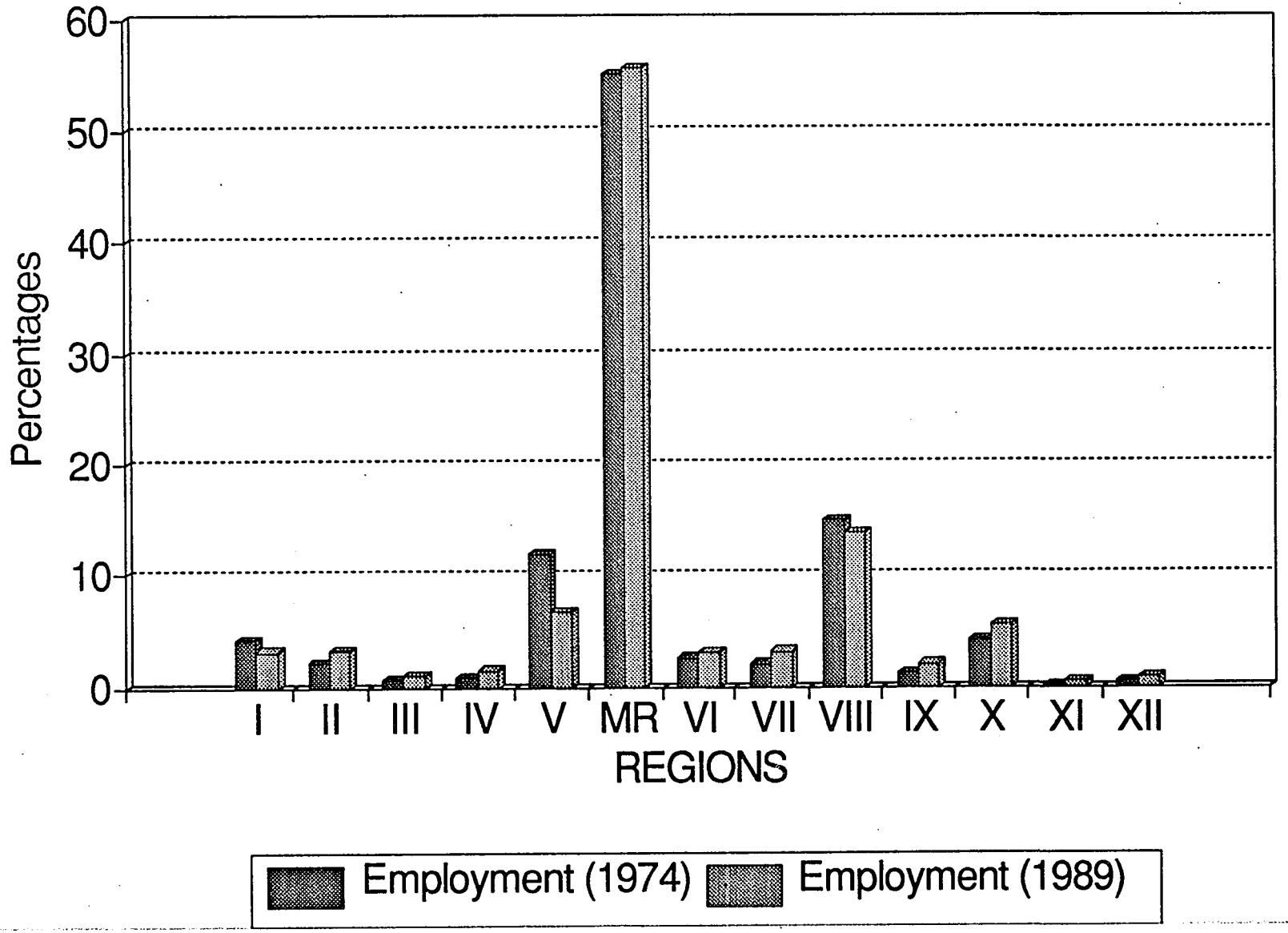


FIGURE 3

CHILE MANUFACTURING EMPLOYMENT



CHAPTER V

RESULTS OF THE RESEARCH

Chapter V presents the results of this study and contrasts them with results of other studies. The chapter first analyzes the general patterns of industrial employment growth in the thirteen regions of Chile in the study period. This part of the analysis is done by using data at the three digit of industrial classes for the period 1974-1989. This is intended to situate the Biobio region in the national context before exploring the changes occurred within the region. Second, a four-digit level analysis concentrated on key industries within the region. This analysis reveals how the different categories of manufacturing industries were performing in the region, which industries were responsible for the rapid or slow growth of the region, which industries have had a favourable or unfavourable industrial-mix in the region, and which industries have had a differential growth advantage or disadvantage in the region. According to the results of these components, the analysis intends to relate two of the components, differential-shift and industrial-mix, to the allocation of industries and to the orientation of manufacturing production (domestic or export oriented industries).

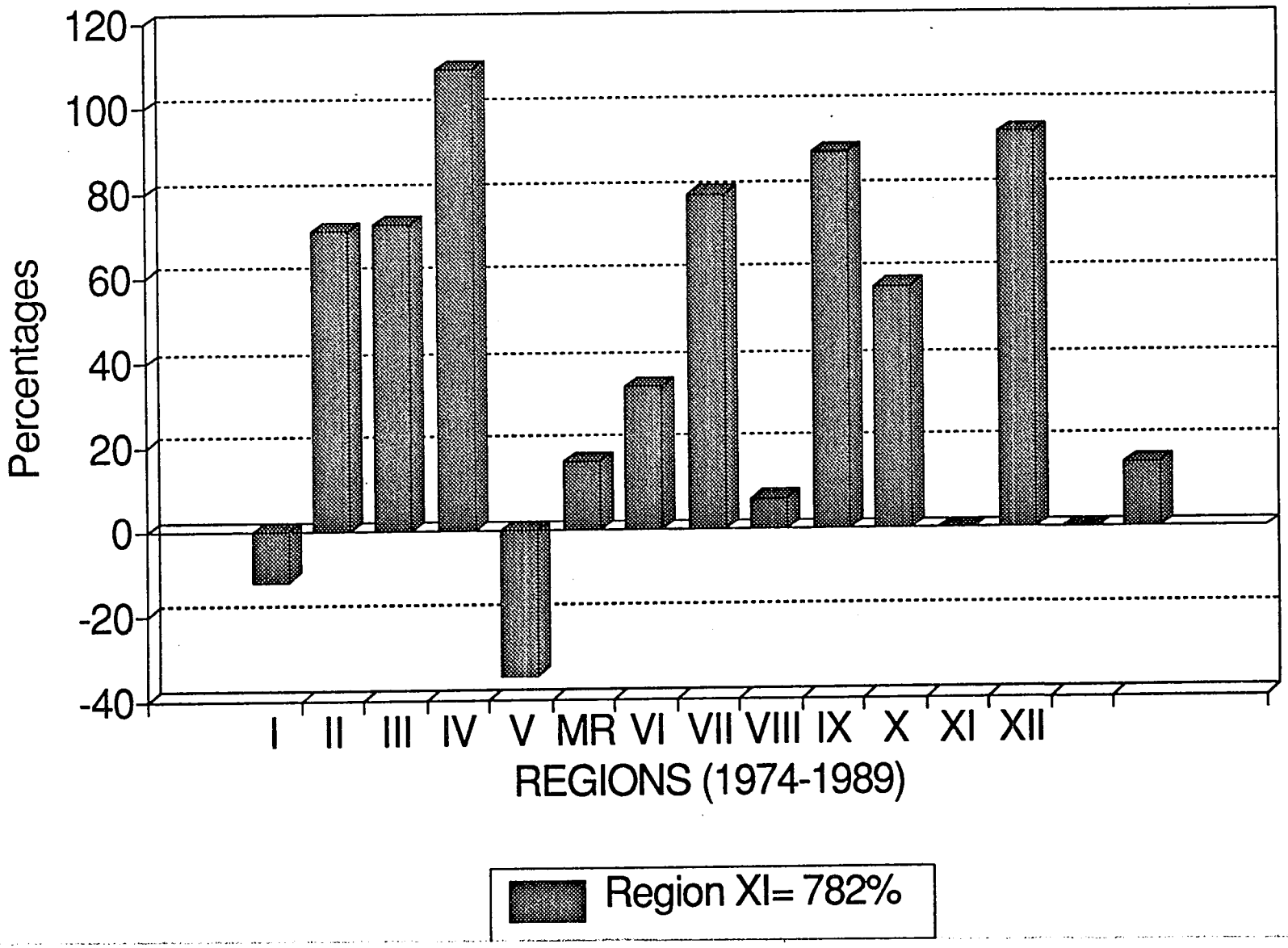
5.1. SPATIAL EFFECTS OF INDUSTRIAL POLICIES OF THE 1974-1989 PERIOD IN CHILE

5.1.1. VARIABLES CONSIDERED

Labour data at the three-digit level for industries with 50 and more employees provides the basic information to analyze the patterns of industrial growth in Chile.

FIGURE 4

CHANGES IN MANUFACTURING EMPLOYMENT



According to the annual industrial survey of the National Statistical Office (INE), this level gives a total of 28 sectors which are grouped in: Manufacture of food products, textiles and leather, wood and pulp, chemical products, non-ferrous metal, metal products, electric products, motor vehicles, and miscellaneous (Appendix Table G).

5.1.2. SPATIAL IMPLICATIONS

Within a spatial perspective, industrial policies resulted in the regions of the country performing differently, according to their own potentialities. The Santiago Region, together with Regions V and VIII, accounted for 76.3 percent of the manufacturing employment of the country in 1989 (Figure 2). In all regions except I and V manufacturing employment grew between 1974 and 1989 (Figure 4, page 53). Figure 3 shows that the same two regions lowered their relative participation at the national level.

The Biobio region increased its employment in the period but lowered its relative importance within the country. According to the Sanchez study, this would be a consequence of the high increase of Santiago's participation in the national total. Because of economies of scale, the Santiago region attracted most of the external investment that came to Chile between 1985 and 1989.

Regions I and V present a 12.2 and 34.7 percent decline respectively. The rest of the regions show a positive change for the period. The highest increase corresponds to regions IV (Coquimbo), IX (Araucania), XI (Aisen) and XII (Magallanes). Traditionally these have been less important in the industrial sector, and at the same time do not belong to the core of the country.

This behaviour of industry might suggest that industrial decentralization was taking place in Chile. However, even when growth has been at rates of over 80 percent, the increase is not significant for the total employment of the country as a whole. What actually explains major changes in the Chilean industrial sector, contradicting Gwynne's proposition of a process of industrial decentralisation, is the performance of the Santiago region which in 1989 was responsible for 55.7 percent of the total manufacturing employment of Chile.

The Santiago region, together with regions V (Valparaiso) and VIII (Biobio) [13] , concentrated 76.3 percent of manufacturing employment in 1989. Gwynne's main conclusion of his 1984 study that "the historical process of industrial centralisation might be terminating in Chile" became, with the 1989 figures, not valid. Instead, these data validate his second conclusion, that the process of centralisation had just had a short-run regression, and that since 1976 it was again increasing. Industry rose in Santiago region from 52.2 percent in 1976 to 54.1 percent in 1978 and to 55.7 percent in 1989.

Figures 5 presents the results of the differential-shift and industrial-mix components for all regions at the three digit-level. Regions showing a positive industrial-mix correspond to regions that concentrate a high proportion of industries growing at rates above the national average. In contrast the four regions whose industrial-mix is negative indicate that they have a higher proportion of slow growing industries. In the former case only the Valparaiso region, among the three most industrial regions of Chile, has a positive industrial-mix. The Santiago region together with the Biobio region have negative industrial-mix, which would indicate that their specialization is in slow growing industries.

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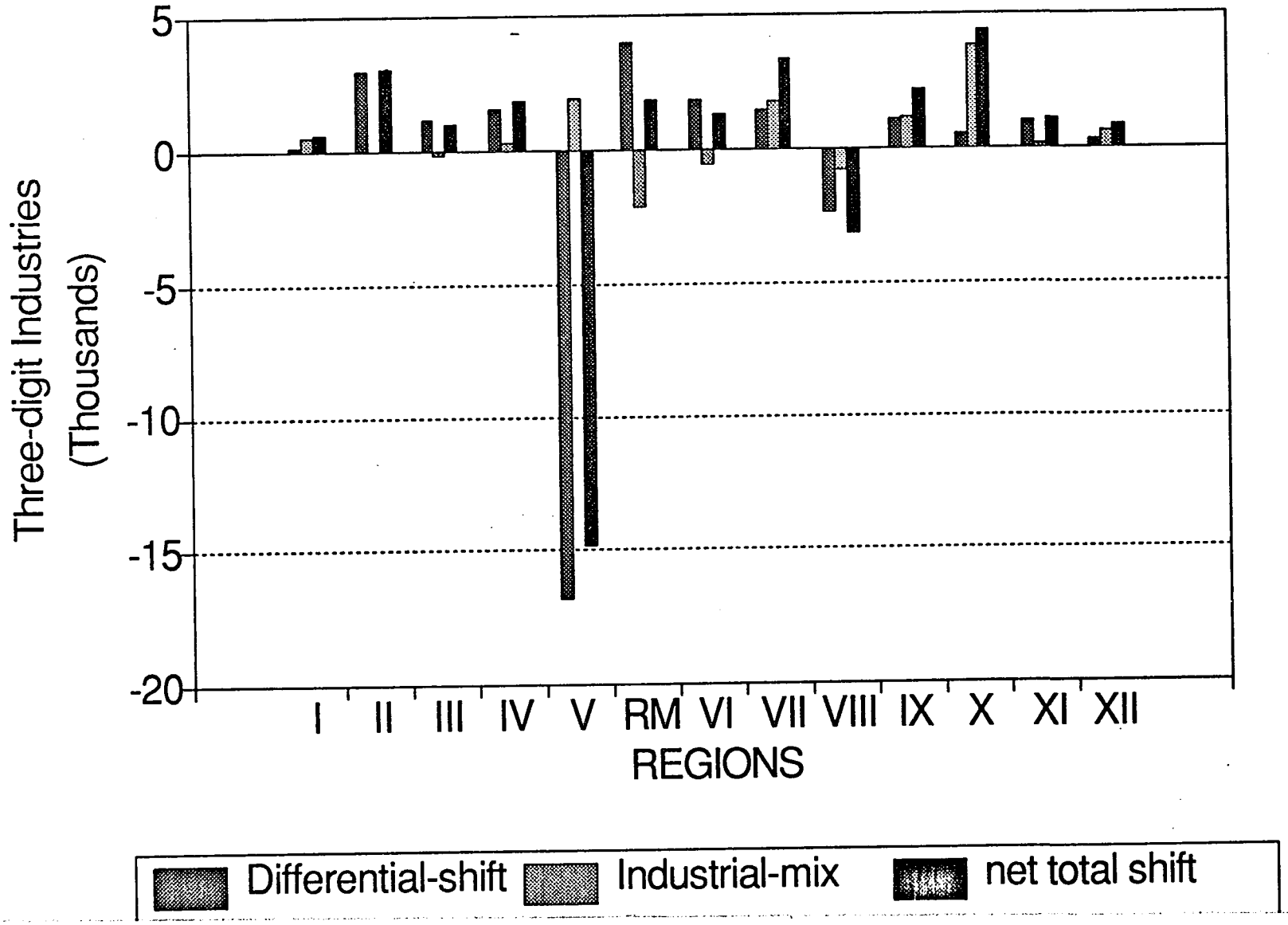
[13] All of these are located in mediterranean Chile.

FIGURE 5

SHIFT-SHARE MANUFACTURING EMPLOYMENT



According to Andrikopoulos, regions with an above average number of declining industries indicate regions with structural deficiencies.

According to the industrial-mix assumption these regions have, in fact, an above average number of industries producing for the internal market. Following from this assumption, their efficiency is lower than that of industries producing for the external market. This argument is valid for a system working precisely as indicated by Ricardo's theory.

Such a deficiency can be rectified, following Andrikopoulos, by policies acting either:

a) on the regional distribution of capital such as increasing local infrastructure investment; or

b) on changing the regional economic conditions such as money wage policies; or

c) by improving the skills of labour.

However, the problem of a negative industrial-mix of these two regions is not related to the structural deficiencies noted by Andrikopoulos, but simply to the role that the industry of these two regions have in supplying national demand.

5.2. PATTERNS OF INDUSTRIAL GROWTH IN THE BIOBIO REGION

This part of Chapter IV defines the variables considered to carry out the analysis of the industrial structure of Biobio region. It addresses the economic and structural effects of changes in the region as a result of the market-oriented policies.

5.2.1. VARIABLES CONSIDERED

Employment at the three and four digit level supplemented by production data

provided the basic data through which changes in the industrial structure of this region are analyzed. The analysis of the shift-share for the more dis-aggregated level, i.e. four-digit level ISIC codes of manufacturing industry concentrates on the differential-shift and industrial-mix components of key industries. Industrial-mix analysis is used to determine whether industries produce for the internal or foreign market. Differential-shift is used to determine if industries are benefiting or not by staying in this particular region. The analysis also reveals the performance of manufacturing industries in the region in order to suggest which industries are responsible for the rapid or slow growth of the region.

According to the United Nations Industrial Classification the four-digit category gives, theoretically, a maximum of 87 groups of industries. In the case of the Biobio Region forty-one of these groups are present in 1974 and forty-two in 1989. Five of these groups: 3235, 3512, 3540, 3695, and 3842 existed in 1974 but not in 1989. On the other hand, six of those that appeared in 1989 did not exist in 1974. These are: 3220, 3419, 3522, 3814, 3819, and 3824. Reasons for these variations are not explored, being beyond the scope of the study.

5.2.2. CHANGES IN THE INDUSTRIAL STRUCTURE OF BIOBIO REGION

The manufacturing sector in the Biobio region is based largely on industries with intensive use of natural resources such as forestry, fishing, agriculture and traditional industries (steel, chemical products, oil refineries, textiles, ceramics, sugar refineries, and leather and footwear). Compared to the rest of Chile's regions the increase of Biobio's manufacturing employment is significantly less important than for most regions (Figure 4). This trend of increase is the result of sectors growing at different rates.

Table 6 refers to industries with more than fifty employees. It is interesting to note that while production of all sectors increased significantly over the period 1974 to 1989 employment declined, severely in some cases.

TABLE 6

BIOBIO REGION: CHANGES IN INDUSTRIAL PRODUCTION AND EMPLOYMENT
1974 - 1989 (1974 = 100)

Sector	1989 Production (1974 =100)	1989 Employment (1974 =100)	Change in Prod. per employee, 1974/89 (1.0 = No change)
311 Food	636.5	200.3	3.01
313 Drinks	333.6	119.4	2.58
321 Textiles	136.2	72.4	2.98
322 Clothing	n.a.	202.3	n.a.
324 Footwear	837.9	128.7	0.05
331 Timber	1,316.6	159.6	7.76
332 Furniture	6,260.1	209.6	6.21
341 Paper	490.9	120.3	7.56
342 Print. and Publishing	194.5	111.8	3.79
351 Chemicals	1,444.2	46.3	3.85
352 Other Chemical	245.5	160.7	7.24
353 Oil Refineries	819.1	50.5	12.09
354 Prod. from coal Oil	n.a.	549.1	n.a.
361 Ceramics	864.1	143.1	4.22
362 Glass	232.8	54.9	7.12
369 Construction Materials	671.1	96.9	5.52
371 Iron and Steel	639.7	64.2	2.55
381 Metal Products	746.9	117.6	3.85
382 Machinery	105.1	94.1	9.13
384 Transport Products	365.5	43.3	4.86

NOTE: n.a. = data not available

(Source: calculated by author from INE 1975 and INE 1990)

The first shock affecting dramatically Biobio region's industrial composition occurred at the beginning of the study period when tariffs were drastically reduced. Manufacturing activity was undergoing radical change as almost all tariffs were reduced, together with a process of continual devaluation that kept the Chilean peso low against international currencies. Industries that had grown rapidly in the high-protection phase of Chile's industrial growth recorded employment declines of between 40 and 50 percent - chemicals, glass, iron and steel and machinery. Other sectors also contained industries where major declined occurred.

Because of the particular composition of its economic structure, the unemployment rate in Biobio region was higher than in the country at the beginning of the period. For this reason, production of an important part of its import substitution industry drastically shrank. Most affected were textiles, potteries, glass and other industries unable to compete in an open economy.

After 1985 the regional economy began to recover due to a massive inflow of state funds, together with foreign investment. This was evident in diversification of the export-oriented sector in which the region started to specialise - fisheries, forestry and fruit production were the main sectors (Table 7). The region had been targeted to become one of the centres of forestry production, and was expected as well to contribute to the transformation of Chile into an important fishing nation.

In this period the contribution of the Biobio Region to the economic growth of the country has been significant in fisheries and forestry. It has been calculated that the Chilean government provided around US$ 70 million in forestry subsidies between 1974 and 1989.

However, considering the large industry that has developed, the state investment has been exceptionally well rewarded (Gwynne 1991: 55).

Two other sectors (see Table 6) that expanded production between 1974 and 1989, and which are principally oriented to domestic markets, were able to successfully withstand increased foreign competition - drinks, and printing and publishing.

Table 7 summarizes increases in four export sectors. It is interesting to note the increase in fishing, another part of the core of Chile's non-traditional export-sector which substantially increased in this period. In 1988 the export of fish products was 11.6 percent of total export earnings while in 1974 it was only of 2.3 percent of total exports. Employment in the forest and fishing sectors in the Biobio region has more than doubled its size from 1974 to 1989.

TABLE 7

BIOBIO REGION: EXPORTS
(Millions of US dollars FOB)

Sectors	1985	1986	1987	1988	1989	1990
Agriculture	28.0	49.9	60.0	65.0	70.0	40.7
Forestry	297.0	343.0	485.0	624.0	643.0	700.7
Fishery	58.7	72.8	110.4	182.0	195.0	170.4
Industrial	33.3	37.6	40.0	65.0	87.0	99.5
TOTAL	417.0	503.3	695.4	936.0	1001.0	1011.3

(Source: Sanchez 1991)

The final balance of changes in the political economy of Chile since 1973 has caused the industrial sector to become a less important part of the national economy. In so doing the Biobio region, even when it continues to be the second largest industrial region of Chile, has experienced a reduction in its participation in national manufacturing employment. However, in terms of production and volume of exports of manufactured products the region has played an important role, especially in food products through fish meal products, wood products, paper-cellulose and chemicals and oil derivatives.

An interesting analysis can be done by looking at the performance of industrial production and industrial employment together. When looking at the changes at the three-digit level, it is an interesting statistical point that in Table 8, only two industrial sectors declined moderately (i.e. between 1 and 20 percent) over the period 1974 to 1989. Manufacturing industrial sectors either declined severely or increased their employment. It would be tempting to see this statistical gap as the different performance of import-substituting industry on the one hand and export-oriented industry in the other.

In Table 8, an industrial sector can be deemed to have recorded an expansion of production if their 1989 value of production was greater than their 1974 value (at 1992 prices). However, for some industries such as the oil refining industry, increasing value of production was caused also by an increase in the value of the raw materials and not only by increases in the level of production. Thus the value of output in the oil products sector is due to the quadrupling in oil prices between 1973 and 1980 and by 1984 again. It must also be pointed out that in 1979 and 1980, the Pinochet government encouraged the construction sector to be the leading motor of economic recovery. Constructed square

metres and the construction industry's labour force increased very rapidly in the subsequent years. As a result, it would be expected that industrial sectors related to construction had higher productions level in 1989 than 1974.

TABLE 8

BIOBIO REGION: INDUSTRIES CLASSIFIED ACCORDING TO CHANGES IN LEVEL OF PRODUCTION AND EMPLOYMENT BETWEEN 1974 AND 1989

		EMPLOYMENT	
		Increase	Decrease
PRODUCTION	Increase	- Food - Drinks - Footwear - Timber - Furniture - Paper - Printing and publishing - Other chemicals - Ceramics - Metal products	- Textiles - Leather - Chemicals - Oil refinery - Glass - Construction mat. - Iron and steel - Machinery - Transport product
	Decrease		

(Source: calculated by author from Table 6)

Four industrial sectors appear to have benefited from the construction boom -

construction materials, iron and steel, and principally furniture and timber. The timber industry also expanded to meet export demand. In the construction material sector, however, employment declined in the period. Five other sectors similarly expanded to meet export demand - food (mainly related to fish meal, fish oil and canned fish); footwear; paper; ceramics; and leather.

It is interesting to note that while production increased significantly among this size of firm (more than fifty employees) between 1974 and 1989, employment declined in 9 out of 21 sectors.

If one translates firm behaviour into sector performance [14] , Table 8 demonstrates that 9 out of 21 sectors fell into one of these two categories in the period studied. Nine sectors suffered from rationalisation and an associated decline in employment. Most of these sectors had expanded employment behind high protective walls to supply the Chilean market and found it difficult, at those high per-unit costs, to operate against foreign competition after trade liberalisation in the 1970s.

Meanwhile, the process of investment and technical change seems to have been the rule for the sectors where production increased but employment decreased. The implication is that such sectors had to modernise rapidly (and in so doing reduce employment levels, Figure 6 and 7) in order to successfully meet the threat of foreign competition. The important result is that in the export-oriented sectors (311 food, 324 footwear, 331 timber, 332 furniture and 361 ceramics) and the domestic market-oriented sectors (313 drinks, 341 paper, 342 printing and publishing, 352 other chemicals and 381 metal products, production

[14] Following the theoretical framework of Massey and Meegan, discussed in Chapter II.

FIGURE 6

BIOBIO MANUFACTURING EMPLOYMENT

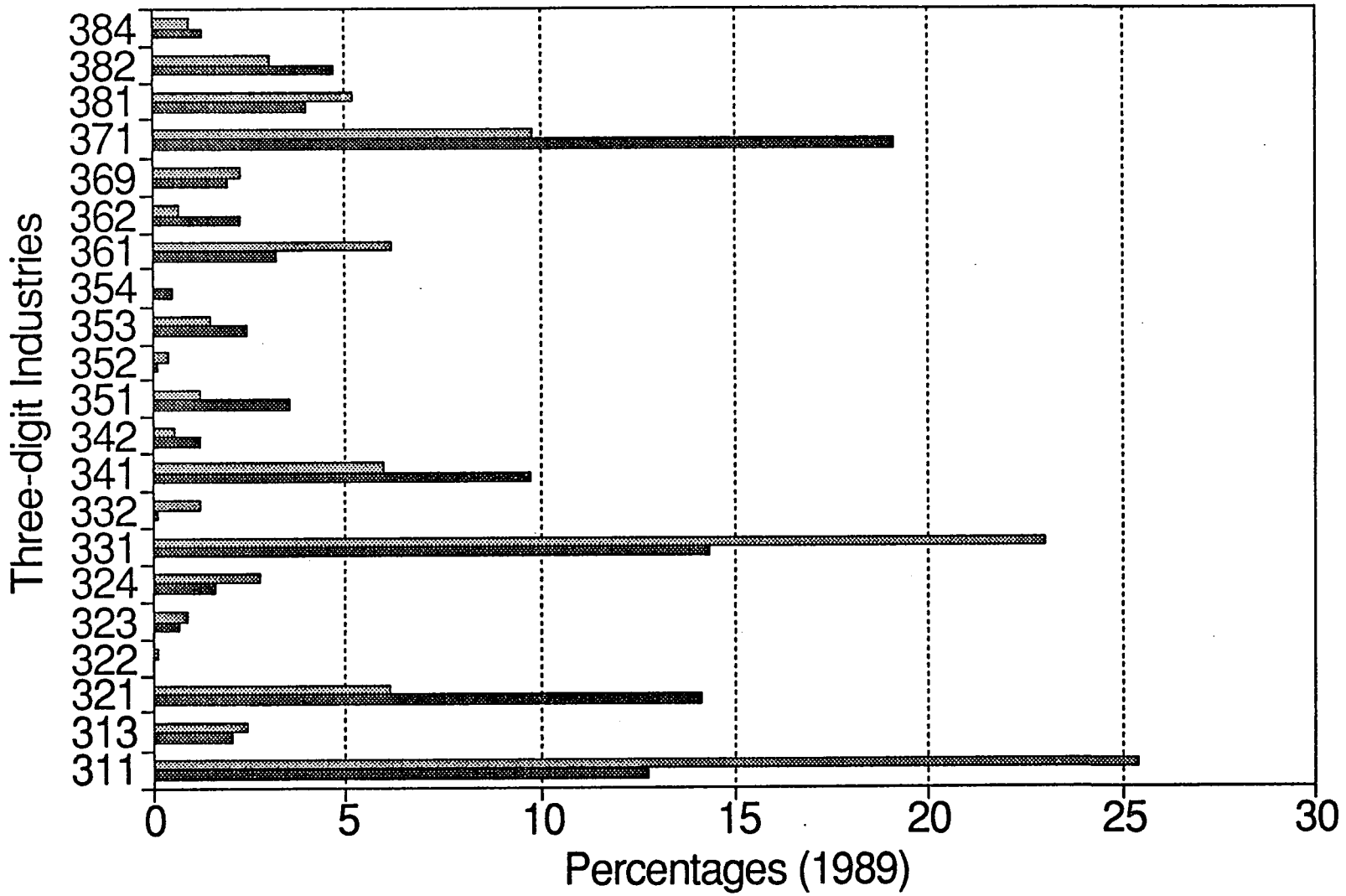
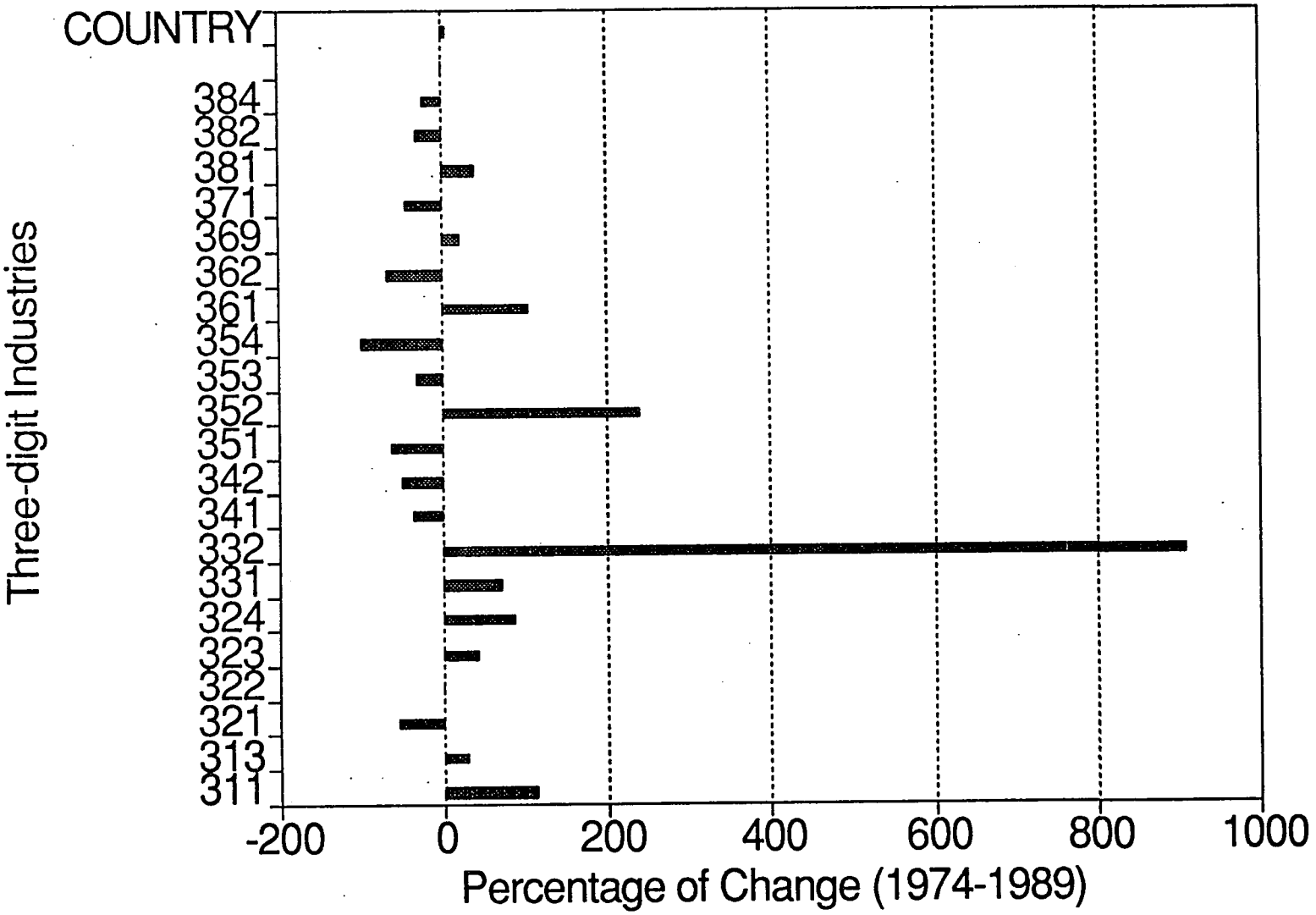


FIGURE 7

BIOBIO MANUFACTURING EMPLOYMENT



and employment increased between 1974 and 1989.

Between 1974 and 1989 the complex and complicated framework of protection that had developed around Chilean industry was effectively dismantled and Chile became perhaps one of the most open markets in the world. It is evident that in making this radical switch from protection to free market, total industrial production in both the country and the region increased, as the Chilean economy itself has been growing at over a 7 percent a year between 1976 and 1980 and between 1988 and 1991. Industry is again becoming important. In 1974 the industrial sector in Chile accounted for 29.5 percent of the GDP. By 1980 it constituted only 21.5 percent, but in 1988 it had increased to 24.3 percent.

Even while Biobio region has increased its industrial production and employment it has seen its participation decrease at the national total. In 1974 it represented 14.9 percent of the national total, while in 1989 it was 13.9 percent (Figure 3).

5.2.3. ANALYSIS OF THE RESULTS OF DIFFERENTIAL SHIFT AND INDUSTRIAL-MIX

To test the two hypotheses formulated (**A** and **B**), the analysis will be concentrated in those industries that either in 1974 or 1989 had more than one thousand employees.

A. A positive differential-shift of sectors will suggest that such industry benefits by staying in this particular region. A negative differential-shift will suggest that such industry is losing benefits by staying in the Biobio region.

B. If the region has a positive industrial-mix means that it has comparative advantage for the development of that particular sector. That sector will prefer to export to foreign

markets because of higher prices. Conversely, if it experiences a negative industrial-mix that particular sector will have industries producing for the domestic market.

The stratum of industries with 1,000 or more employees represents a total of eleven sectors that concentrate 31,363 employees, 77.4 percent of regional manufacturing employment in 1989 (Table 9). Both industrial-mix and differential-shift results will allow classifying these eleven industries as producing for the external or domestic market and as benefiting or not through staying in the Biobio region.

TABLE 9
FOUR-DIGIT INDUSTRIAL SECTORS WITH 1000 AND MORE EMPLOYEES
(1974 - 1989)

3113	Canning and preserving of fruits and vegetables
3114	Canning. preserving and processing of fish, crustacea and similar food
3115	Manufacture of vegetable and animal oils and fats
3211	Spinning, weaving and finishing textiles
3240	Manufacture of footwear, except vulcanized or moulded rubber plastic footwear
3311	Sawmills, planing and other wood mills
3411	Manufacture of pulp, paper and paperboard
3610	Manufacture of non-structural non-refractory ceramic ware (pottery, china and earthenware)
3710	Iron and steel basic industries
3813	Manufacture of structural metal products
3829	Machinery and equipment except electrical n.e.c. (not elsewhere classified)

(Source: INE 1975 and 1990)

FIGURE 8 (a)

BIOBIO MANUFACTURING EMPLOYMENT

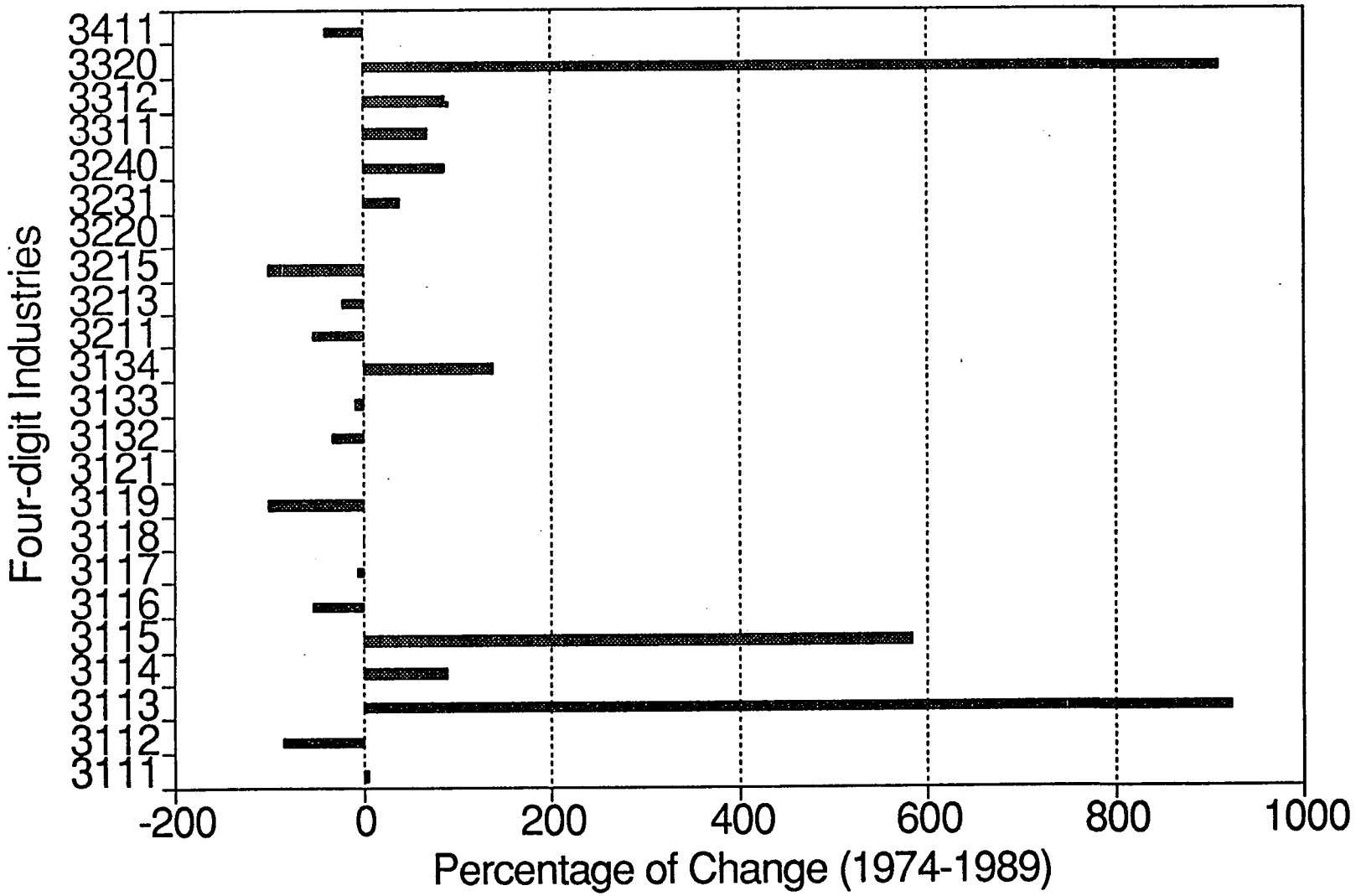
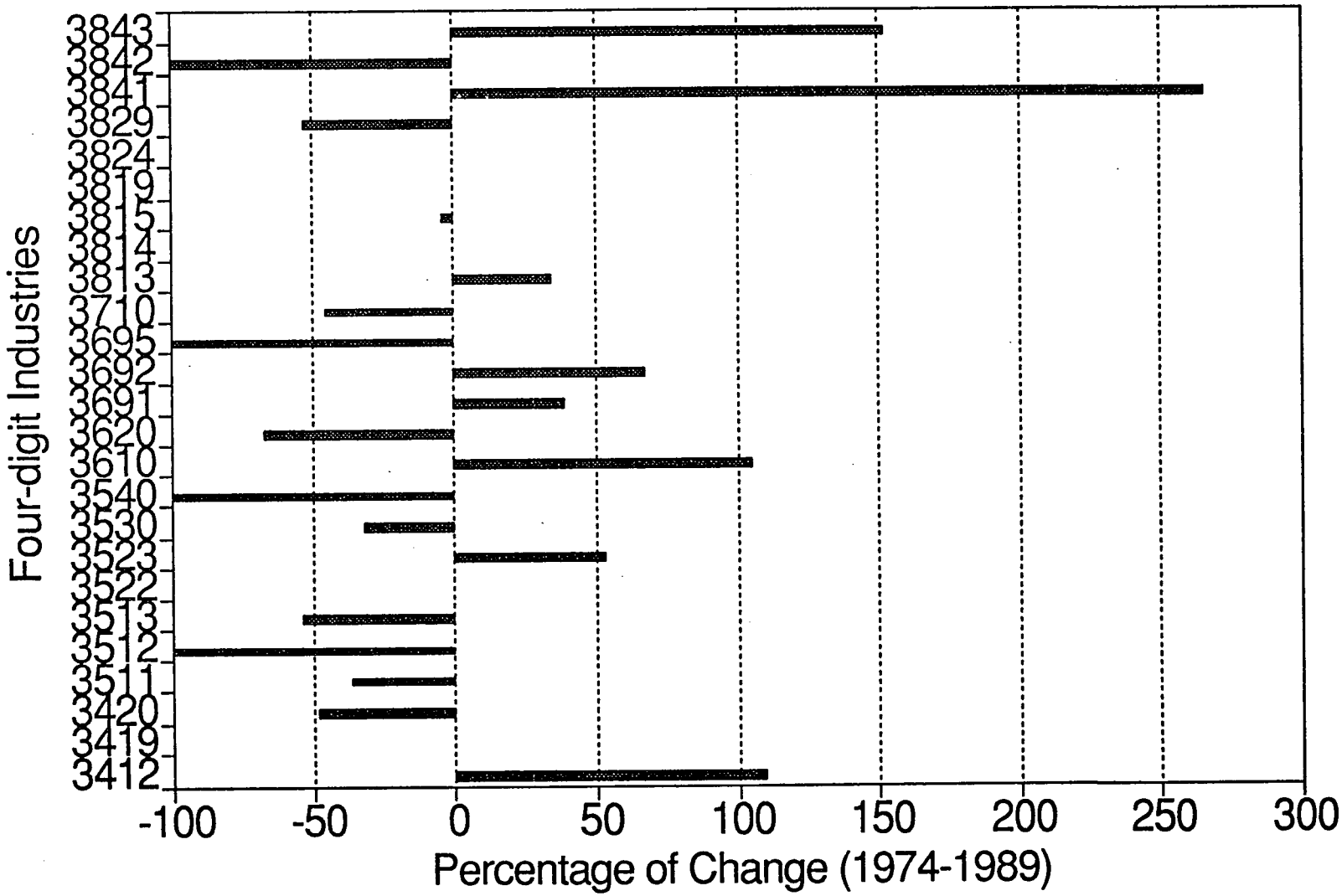


FIGURE 8 (b)

BIOBIO MANUFACTURING EMPLOYMENT



Changes in industrial employment for the period 1974-1989 and the results of differential-shift of all four-digit manufacturing industries are illustrated on the following pages (Figures 8 and 9).

DIFFERENTIAL-SHIFT ANALYSIS

For the Biobio region a positive differential-shift of sectors (industries growing faster or declining less rapidly than their national counterpart) will indicate that such sector or industry benefits from staying in this particular region. In contrast a negative differential-shift (industries that in the region either grow less rapidly or decline more rapidly than their national counterpart) will indicate that such industry is losing benefits by staying in the region.

The eleven industries on which the analysis is concentrated represented 77.4 percent of regional industrial employment in 1989. Table 10 shows the group of industries that performed a positive differential-shift for the period 1974-1989. These industries were responsible for 20.6 percent of regional industrial employment in 1974 and 44.6 percent in 1989.

The positive differential-shift for these five industries indicates that they are benefiting by staying in the Biobio region. These industries are growing faster than the same industries at the national level.

An industry could have eventually shown a decline in manufacturing employment and, however, have a positive differential-shift (i.e 3513 Manufacture of synthetic resins). This industry's differential-shift is 51.9 and its employment decreased from 234 to 108 in the time

period analyzed (Figure 9, pages 73 and 74). This is not the case in any of the industries with more than one thousand employees. On the contrary these, five industries present a tremendous increase in employment.

TABLE 10

BIOBIO REGION: INDUSTRIES THAT BENEFIT BY STAYING IN THE REGION
(One thousand and more employees)
(positive differential-shift)
1974 - 1989

Sectors	Differential-shift	Employment 1974	Employment 1989
3113 Canning and preserving of fruits and vegetables	+ 700.9	104	1066
3115 Manufacture of vegetable and animal oils and fats	+ 3146.2	660	4505
3240 Manufacture of footwear, except vulcanized ...	+ 356.1	608	1139
3311 Sawmills, planing and other wood mills	+ 1394.8	5202	8846
3610 Manufacture of non-structural non-refractory	+ 751.1	1222	2500
	Total Employment	7,796	18,056

Employment 1974	Employment index 1989 (where 1974 = 100)
7,796	231.6

(Sources: calculated from INE 1975 and INE 1990)

FIGURE 9 (a)

BIOBIO DIFFERENTIAL-SHIFT ANALYSIS

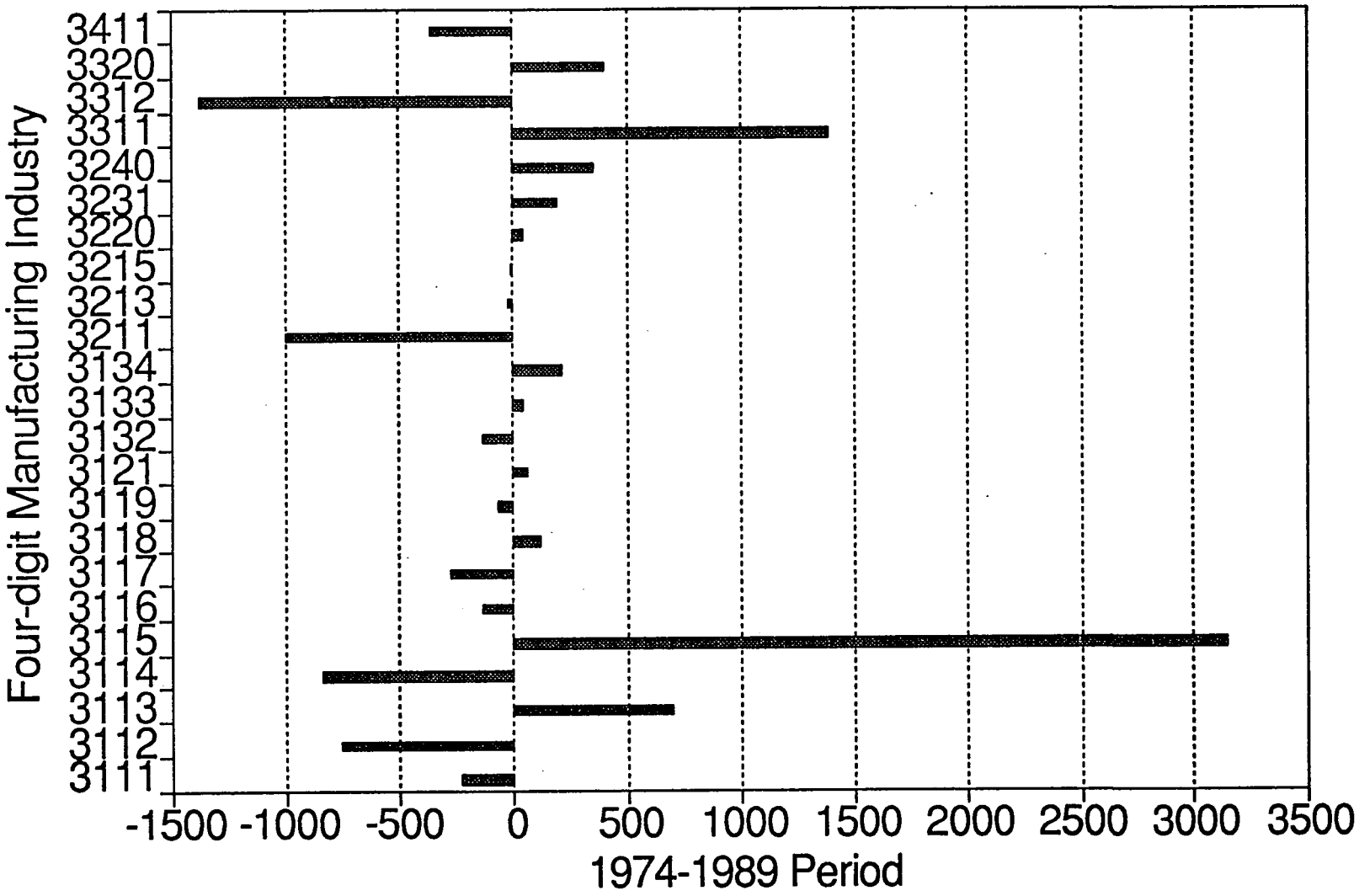
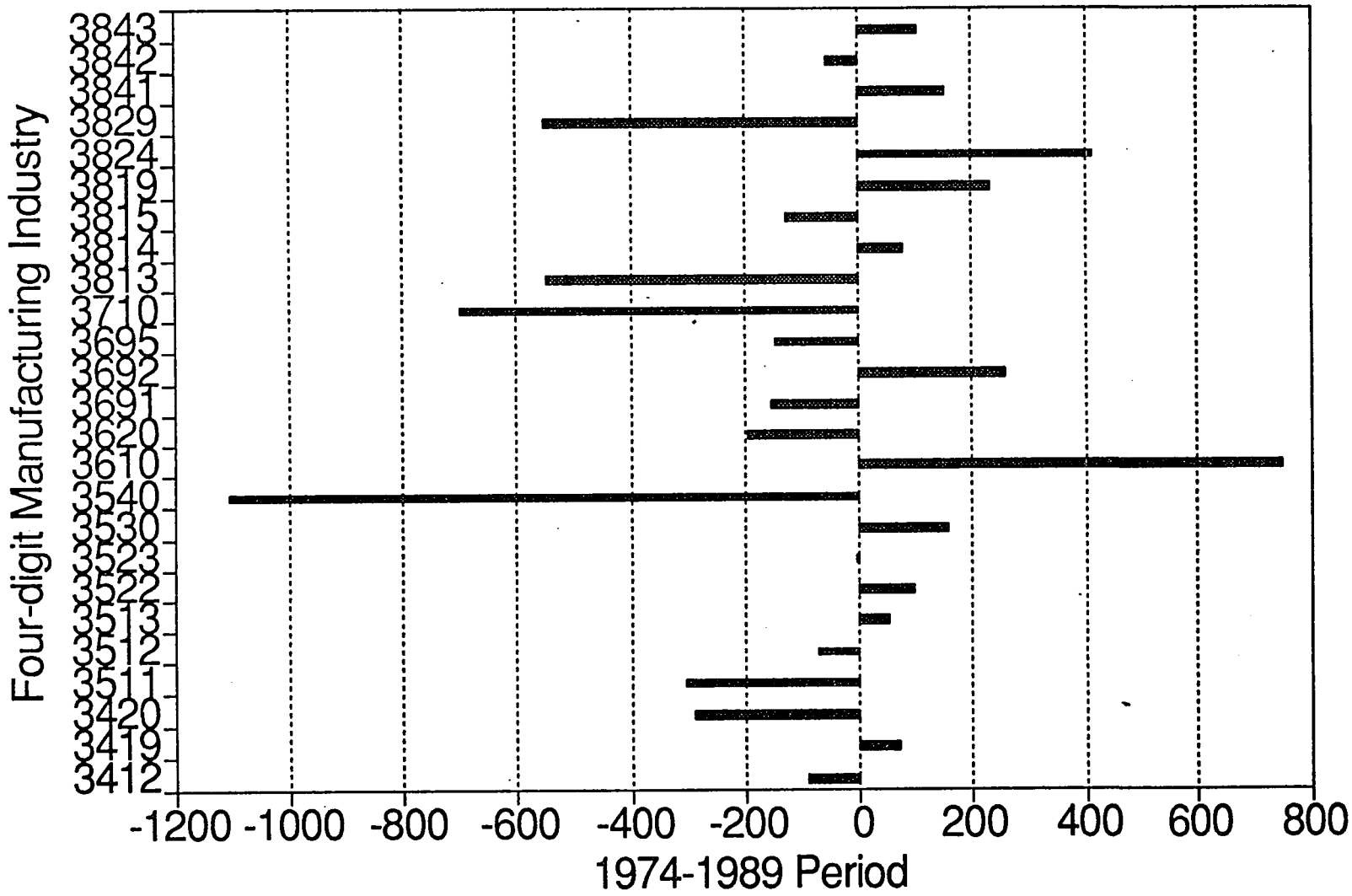


FIGURE 9 (b)

BIOBIO DIFFERENTIAL-SHIFT ANALYSIS



Industry 3115 (Manufacture of vegetable and animal oils and fats) and industry 3311 (Sawmills, planing and other wood mills) both more than doubled employment. These two industries together with industry 3113 (Canning and preserving of fruits and vegetables) are examples of industries closely linked to profit from the region's natural resources in agriculture and fishing.

Industries 3240 (Manufacture of footwear, except vulcanized ...) and 3610 (Manufacture of non-structural non-refract metal) are not linked to the region's natural resources, but correspond to two traditional protected industries that have been able to adapt and grow within the free market strategy.

It can be argued that the first three industries are profiting through staying in this particular region since they have been able to respond correctly to the model when producing those commodities for which its situation, climate and its other material advantages were supposed to be advantageous. The other two industries also benefit of being in this particular place, but in this case due to fact that they have taken advantage of their former artificial conditions. The region, following Ricardo, naturally devotes its capital and labour to such employments as are more beneficial to it.

A negative differential-shift (Table 11 - following page) represents industries that in the region either grow less rapidly or decline more rapidly than the same industry at the national level. This would indicate that such industry is losing benefits by locating in the Biobio region.

TABLE 11

BIOBIO REGION: INDUSTRIES NOT BENEFITTING BY STAYING
(One thousand and more employees)
(negative differential-shift)
1974 - 1989

Sectors	Differential-shift	Employment 1974	Employment 1989
3114 Canning, preserving and processing of fish.	- 839.9	1416	2685
3211 Spinning, weaving and finishing textiles...	- 999.0	5220	2402
3411 Manufacture of pulp, paper and paperboard.	- 362.3	3637	2224
3710 Iron and steel basic industries.	- 696.8	7231	3959
3813 Manufacture of structural metal products.	- 547.2	903	1208
3829 Machinery and equipment except electrical n.e.c.	- 551.5	1775	829
	Total employment	27,960	13,307

Employment 1974	Employment index 1989 (where 1974 = 100)
27,960	47.6

(Sources: calculated from INE 1975 and INE 1990)

Six out of eleven industries are in this category. The total employment loss by them was 14,653 in fifteen years. Two of these industries - 3114 (Canning, preserving and processing of fish) and 3813 (Manufacture of structural metal products) - actually show an increase in employment, but they grew less rapidly than their national counterpart.

It is interesting to notice this phenomenon since it would indicate that these sectors have shown a dynamic growth, particularly in the regions of Tarapaca and Los Lagos where industry 3114 (Canning, preserving and processing of fish) is further above the national average. Industry 3813 (Manufacture of structural metal products) is mainly concentrated in the Santiago region.

The four negative differential-shift industries which experienced decline in employment correspond to 3211 (Spinning, weaving and finishing textiles), 3411 (Manufacture of pulp, paper and paperboard), 3710 (Iron and steel basic industries), and 3829 (Machinery and equipment except electrical n.e.c.).

These sectors had expanded employment behind high protective walls to supply the Chilean market and found it difficult, under the new strategy of free market, to compete against foreign competition. These firms did not reduce capacity: they simply reacted by reducing employment. According to their differential-shift results these industries are achieving better results in other regions. Industries 3211 and 3411 had been a cornerstone of Biobio industrial structure. Now these two industries, textile and manufacture of paper respectively, are both concentrated in the Santiago region. Industry 3829 is also concentrated in Santiago, while the iron and steel industry has had a significant growth in

the Atacama region in northern Chile. Most of the manufacturing sectors that performed a positive differential-shift also had a positive industrial-mix. This would indicate that the profit they obtain by staying in the region is traduced in their insertion in the foreign market. Industrial-mix analysis is developed in the following pages.

INDUSTRIAL-MIX ANALYSIS

It is important to point out that the industrial-mix values do not represent an absolute change in employment of each particular sector in a given region but, instead, are a measure of change of the sector in the region compared to the performance of the same sector at the national level. Table 12 (page 79) shows groups of industries that performed a positive industrial-mix for the period 1974-1989. These industries were responsible for a 26.8 percent of the regional industrial employment in 1974 and 54.2 percent in 1989.

The model has certainly had a very favourable impact in the Biobio region in the so called non-traditional manufacturing sectors related to agriculture (3113, 3115), fishing (3114), and forestry (3311). The employment increase of these four sectors together was 9,720, which more than compensates the losses in the three traditional sectors.

The seven sectors whose positive industrial-mix reveal their orientation to foreign markets include these non-traditional sectors of agriculture, fishing and forestry (3113, 3114, 3115, and 3311). Two other sectors that performed positive industrial-mix are manufacture of ceramic ware, and manufacture of structural metal products (3610 and 3813). These are considered traditional protected sectors that have, however, managed to react positively to

the free market strategy by increasing employment and production. The manufacture of footwear sector (3240), even though can be classified as traditional protected sector, was not one of the most protected. Manufacture of footwear participates favourably in the strategy by increasing both employment and production, and simultaneously decreasing the per-unit cost of production (see figure 10 for a complete list of industrial-mix performance of four-digit manufacturing industries). Thus, this sector converted itself into an export sector.

TABLE 12

BIOBIO REGION: EXPORT-ORIENTED INDUSTRIES
(1000 and more Employees)
(Positive Industrial-mix)

Sectors		Industrial-mix	Employment	
			1974	1989
3113	Canning and preserving of fruits and vegetables	+ 245.1	104	1066
3114	Canning and preserving of fish and crustacea	+ 1889.7	1416	2685
3115	Manufacture of vegetable and animal oils and fats	+ 597.1	660	4505
3240	Manufacture of footwear, except rubber or plastic footwear	+ 81.1	608	1139
3311	Sawmills, planing and other wood mills	+ 1447.1	5202	8846
3610	Manufacture of ceramic ware	+ 338.5	1222	2500
3813	Manufacture of structural metal products	+ 713.0	903	1208
		Total employment	10,155	21,949

Employment 1974	Employment index 1989 (where 1974 = 100)
10,155	207.0

(Sources: calculated from INE 1975 and 1990)

FIGURE 10 (a)

BIOBIO INDUSTRIAL-MIX ANALYSIS

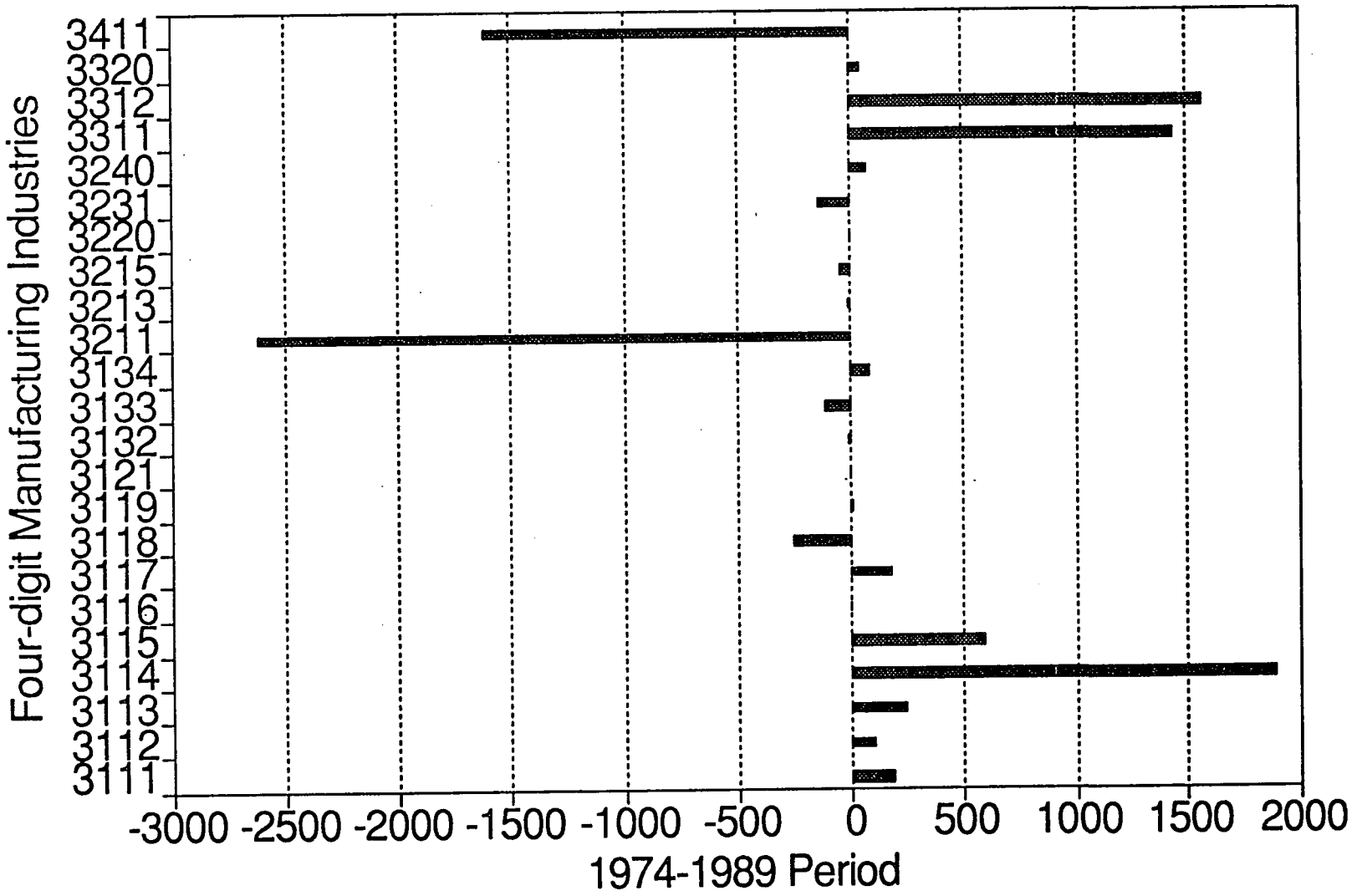
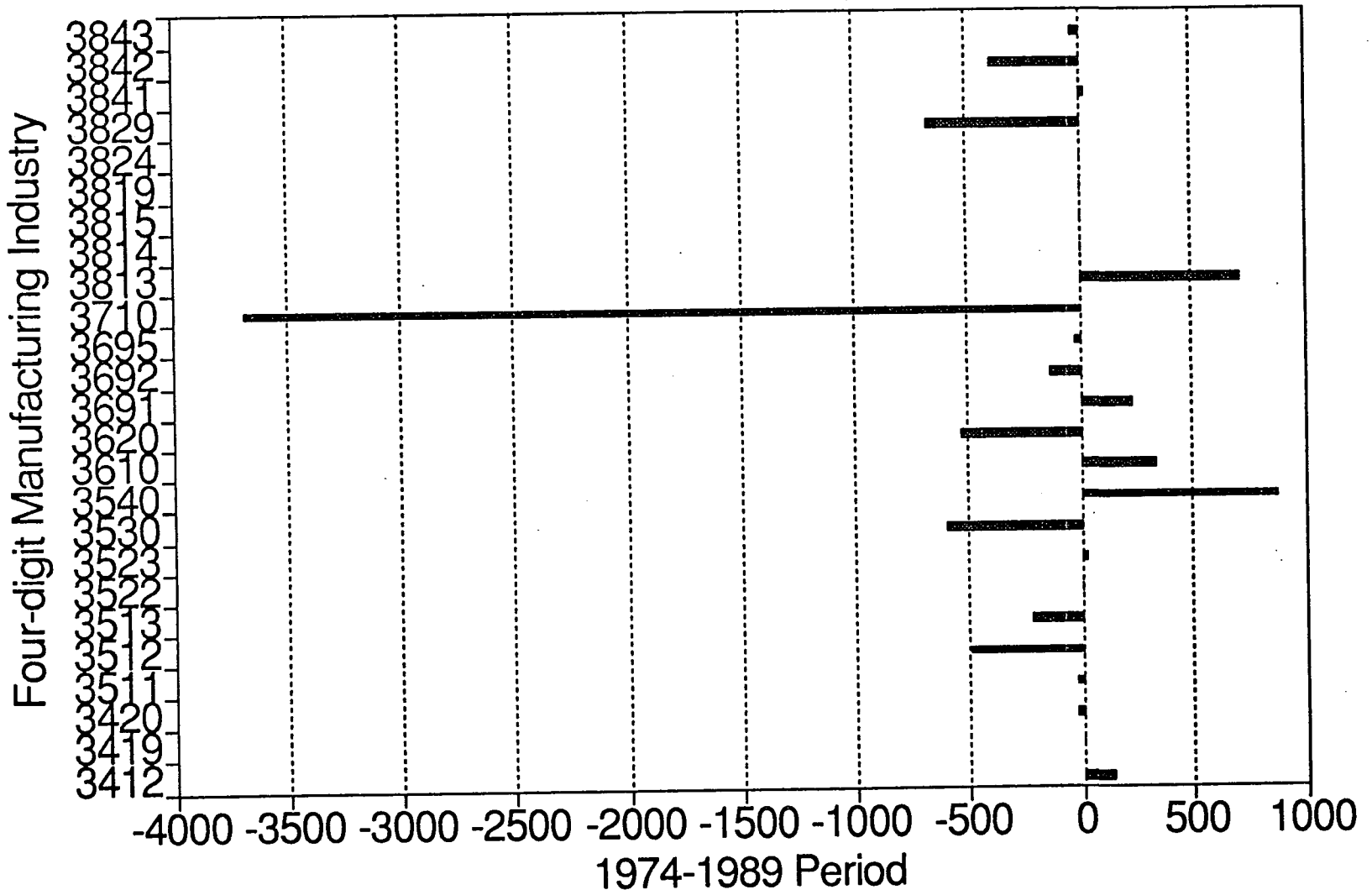


FIGURE 10 (b)

BIOBIO INDUSTRIAL-MIX ANALYSIS



Traditional protected industries such as the textiles, pulp and paper, and iron and steel, were not able to compete and adjust (Table 11). According to Massey and Meegan's theoretical framework, these industries adjust by reducing employment: in this case by almost 50 percent. These three industries alone were responsible for a total loss of 7,499 employment, 18.5 percent of regional employment in 1989. The negative industrial-mix they have means that companies limited themselves to the national market.

TABLE 13

BIOBIO REGION: INDUSTRIES ORIENTED TO DOMESTIC MARKET
(1000 and more Employees)
(Negative Industrial-mix)
1974 - 1989

Sectors	Industrial-mix	Employment 1974	Employment 1989
3211 Spinning, weaving and finishing textile	- 2623.7	5220	2402
3411 Manufacture of pulp, paper and paperboard	- 1611.3	5637	2224
3710 Iron and steel basic	- 3689.9	7231	3959
3829 Machinery and equipment except electrical n.e.c.	- 668.1	1775	829
	Total employment	19,863	9,414

Employment 1974	Employment index 1989 (where 1974 = 100)
19,863	47.4

(Sources: calculated from INE 1975 and INE 1990)

As a result of this analysis it can be said that in terms of market orientation this region has participated actively in this free market strategy by changing its industrial structure from a traditional protected industry, mainly oriented to domestic consumption, into a more competitive one, oriented to foreign markets. It can also be said that its competitiveness is based not only on low-labour cost, as traditionally occurs in developing countries, but instead is underpinned mainly by productivity increase.

According to the employers' organization, SOFOFA, the manufacturing sector grew in Chile by 23.4 percent between 1984 and 1988, while the Instituto Nacional de Estadisticas (INE) puts the figure at 21.7 percent. Manufacturing growth was slightly above the overall rate of economic growth for this period. An important consequence of the evolution of Biobio's manufacturing employment is that manufacturing growth is now much more linked to export growth. In 1974 manufacturing exports from Chile totalled US$ 290.6 million. Fourteen years later they had risen by a factor of seven to US$ 2,273 million.

Certain regions have participated in the export boom much more than others. Regions that benefited most are those that have sectors linked to the major non-traditional exports in agriculture, fishing and forestry, such as the Biobio region. Chilean food exports increased by a factor of 19.4 between 1974 and 1988 to reach a total of US $ 757.5 million, or one-third of total manufactured exports. Food exports consist mainly of processed fish, processed fruit and other agricultural products in which the study region has a strong base.

According to the comparative advantages theory this switch in the structure of manufacturing employment would correspond to a region that is making the best use of its

natural resources, stock of skills, and infrastructure, and by their exchanging production for the commodities of other countries.

When combining the results of the two analyses, there are two sectors that according to their industrial-mix were classified as export-oriented sectors (3114 Canning and preserving of fish and crustacea, and 3813 Manufacture of structural metal products). These same two sectors, however, are losing location advantages staying in the Biobio region. It would be of great interest to see the performance of these industries in the years to come in order to compare their performance with that of the rest of the sectors which presented a positive industrial-mix and differential shift.

CHAPTER VI

CONCLUSIONS

Conclusions are presented in three areas. First, they evaluate substantive issues of industrial changes. Second, they refer to the benefits and problems of using the shift-share technique for analysing industrial structural changes. Third, they allude to recommendations for future research.

6.1. SUBSTANTIVE ISSUES CONCERNING INDUSTRIAL CHANGE

This thesis research has attempted to demonstrate the sectoral and spatial extent of recent industrial performance of Chile and particularly of the Biobio region. Traditional development logic for developing countries has stressed the need for such countries to shift resources from primary to secondary production and build up a significant industrial sector. Chile followed that direction from the 1930's, after the Great Depression. Such strategy was lately supported by the ECLAC's recommendations (the Economic Commission for Latin America and the Caribbean), in which Prebish's views were instrumental. However, the military government that ruled the country for sixteen years, from 1973 to 1989, had a very different view of development and about the role of Chile in the international context.

At the beginning of its mandate the military government saw the role of industry as less significant to the overall performance of the economy and in consequence decided to reverse policy. The primary and the tertiary sectors of the economy received resources at

the expense of the secondary sector. As a result, till the early 1980's, the industrial sector declined in both absolute and relative terms. However, after 1984 the country started to make a tremendous effort of expanding exports. Among all sectors that participated in this process, industry played an important role. As this research shows, at the end of the period analyzed the results of Chile's industrial restructuring were distinctly different from the ones predicted in the programme that the government presented in 1974.

Differences between the programme and the actual results of industrial performance in Chile - particularly in the Biobio region - are linked to occurrence of certain phenomena not considered when the programme was developed.

First, the massive inflow of foreign capital into Chile between 1977 and 1981 created a highly indebted country. In terms of the relationships between per capita debt and per capita income Chile was, at that time, the fourth most indebted nation in Latin America after Bolivia, Nicaragua and Costa Rica (ECLAC, 1984). With the high world interest rates such indebtedness provided the major external constraint on Chile's development. In 1978 the external debt was 41 percent of GDP, and it grew by 1989 to 72 percent (ECLAC, 1990). For the same two years net interest on the external debt was 16 percent and 35 percent respectively. In 1984 Chile had to pay approximately US $ 1,800 million in interest payments, of which 1,000 million dollars was to come from a surplus on the balance of trade.

The critical point of such massive debt is that the only way to reduce its constraining influence on the economy was to increase exports. In that way the policy of boosting exports

had a favourable impact on manufacturing activity. Industry reacted to this strategy by increasing competitiveness. As we saw in Chapter IV, Biobio region's industrial firms reacted by investing in new machinery and equipment and thereby increased capacity. The firms concurrently managed to achieve high production levels, with the consequent impact on economies of scale, in which per-unit cost of production was reduced. It can be concluded further that in export-oriented industries new machinery and equipment were labour-saving, because production increased significantly and employment declined.

Second, the dismantling of the complex framework of protection sheltering Chilean industry, that particularly affected the traditional industries of Biobio region, resulted in a significant part of industry benefiting from free trade. Among the three-digit level of industrial sectors, this research has identified those that actually profited by free trade through increasing production, and by increasing production and employment together.

As the free trading model anticipated, the greatest demise occurred in those import-substituting sectors that found it difficult to compete against foreign imports at low levels of protection. Thus, in the transformation of Biobio's industrial structure between 1974 and 1989, as a general pattern, capital-intensive sectors were replacing more labour-intensive sectors in terms of relative importance.

Third, the actual results of Biobio's industrial restructuring were distinctly different from those that would have been predicted by free-trade theorists. This is because of the specific kind of industry in which the region specialized. International trade theory sees manufacturing growth in general and export growth in particular as emanating from labour-

intensive industries in less developed countries, basically because labour costs are cheaper than those in the developed countries. However, in promoting manufacturing growth in the Biobio region a reverse phenomenon occurred as labour-intensive industries declined and capital-intensive industries grew.

The reasons that would explain this phenomenon are that Biobio's industries that actually reacted by investing in machinery and equipment, thereby increasing capacity without increasing labour substantially. These industries are linked to the refining and processing of basic raw materials (minerals, forest, fishing). Most had always had a high capital-labour ratio.

This kind of industry did not compete with cheap manufactured products imported from South East Asian countries, already powerful exporters of labour-intensive goods which had cheaper labour costs than found in Chile. In terms of more sophisticated consumer goods, Chilean industrial firms did not have the technology or expertise to compete with imported manufactures principally from Japan. As protection levels declined Chilean consumers switched to equivalent products from Japan. Thus, in order to expand production an increase in capital and plant, rather than labour, was necessary.

Because of the type of industry in which the region has specialized and also because of its relationships with the international trade system regional industry might face the following constraints:

First, according to what this study has highlighted, there is a concentration of industrial employment in just a few industries. In 1989 eleven industries at the four-digit level, concentrated 77.4 percent of regional manufacturing employment. This concentration might be regard as regional specialization in a narrow range of activities. Such specialization might be positive or negative, depending on whether the region is able to profit from this situation or not.

Seven out of eleven of these industries recorded employment and production increases and, therefore, these industries are classified as export-oriented. However, all of them are industries producing basic goods (non-durable consumer goods and intermediate goods for industry). Those sectors producing more sophisticated goods (durable consumer goods and transport equipment, and capital goods) are significatively less important for regional employment. The former manufacturing sectors have participated in the export boom much more than others and among them, the most benefited are those linked to the major non-traditional exports in agriculture, fishing and forestry.

The problem for the future is that manufactured exports that emerge directly from the primary sectors are much more vulnerable to external demand, changes in prices and terms of trade than are more sophisticated manufactures.

Second, the high growth levels obtained since 1986 reflect international factors that have been to Chile's benefit. Growth in the developed world's GDP and in trade, after the recession of the early 1980's, favoured the export-led model adopted by Chile. Changes in this favourable condition would affect considerably the region and the country.

These constraints might partially be solved by diversifying export markets. Chile's shift into the Pacific has led to 21 percent of exports going to Japan, China and the NICs of East Asia. This strategy of diversification of export markets should be complemented with an increase in the share of exports of more sophisticated manufactures that the region already has.

Third, the fact that national industry in general and regional industry in particular rely on imported technology may be detrimental in the long term. Although not studied profoundly, it can be argued that there is little evidence of significant efforts made in technologically advanced industry in the region (with some exceptions in the chemical and steel industry). The output of sectors such as electrical goods, scientific and professional products, machinery and transport equipment is lower now than in 1974. In 1974 the advanced technology sectors could sell only within a heavily protected national market but were not capable of selling in overseas market. The increasing openness of the Chilean economy has made the survivors more efficient but growth into export markets has not been achieved to any notable extent. In the years to come this problem could be a major problem for growth.

6.2. THE SHIFT-SHARE TECHNIQUE

In order to explain regional economic growth performance in a national-regional system, the shift-share technique is a statistical procedure which summarizes information concisely. The components of this technique do not measure the growth or change in

absolute terms, but in relative terms. The sign and magnitude of each shift indicates the effect of growth or change in each region relative to the nation. It has been mentioned that for this type of analysis shift-share is widely used, mainly due to its simple data requirements and the ease in calculation. However, shift-share does not provide a theoretical explanation of differential growth in a region. Problems of using shift-share in a study of these characteristics are presented below.

First, since this study was carried out at the more dis-aggregated level, i.e. four-digit breakdown of industrial classification, it produced smaller differential-shift and larger industrial-mix. At the order level of industrial classification this technique would produce larger differential-shift and smaller industrial-mix. In addition, the high fluctuation between regional and national business cycles and between the initial and terminal year of the period under consideration might have accentuated these effects.

For these reasons, the results of the shift-share analysis may be to a certain extent distorted. However, in this particular study the analysis of the results of these two changes were not related to the magnitude of industrial-mix and differential-shift values, but rather to the fact that they were positive or negative. For this reason, this problem was not relevant for this study.

Second, as suggested by Dunn (Ansari, 1984) the shift-share technique does not take into account the changes in industrial structure occurring throughout the study period. The weighting of all its components is based on the industrial composition at the beginning of the period. Therefore the longer the time period, the higher the distortion in the industrial-

mix effect. The time period analyzed in this study might be considered as long enough to produce such distortion.

In the same way, Stilwell emphasised, shift-share is a simple standardisation technique and non-statistical in as much as there is no way of determining whether the observed shifts are significantly different from zero. Moreover, it assumes that the regional and industrial effects on growth are independent. The same author points out that these limitations may be overcome by the use of complementary information. For the purpose of this research additional information (i.e. industrial production and productivity) was collected to complement the shift-share applied on manufacturing employment.

6.3. RECOMMENDATIONS FOR FURTHER RESEARCH

Industrial performance has been a matter of considerable interest for both governments and academic sectors. In spite of this, very little work has been done on this phenomenon for specific regions. Most research has been restricted to the country as a whole and therefore has been unable to detect changes at the regional scale. I argued that regional economic growth policies can be implemented only when the existing structure of growth patterns are clarified, measured, and explained. In order to provide such information it is suggested that further research on this topic concentrate on specific regions.

The present process of decentralization that is taking place in Chile with the democratic government is supposed to give more autonomy to regions. One of the decisions that regions will have to make is that of the allocation of resources. Markets will not be the

only mechanism to determine the allocation of resources in a given territory. On the contrary, it is suggested that regional communities have to participate actively in decisions of this kind, through their elected authorities. It has been said that regions should have the faculty of negotiating with national and multinational corporations concerning aspects as crucial as pollution or revenues for the region that result of operation of these firms.

Again, better and more detailed information on these aspects would certainly contribute to a more correct decision on regional matters affecting the welfare of the regional community. It is suggested that more studies be carried out to analyze the composition of industry in terms of foreign capital invested in the region. This will determine the real position of the region in relation to the multinationals.

APPENDICES

A. TABLE A

CHILE. POPULATION AND STRUCTURE OF EMPLOYMENT. 1974 - 1989

Thousand and Percent

	Population		Employment		Agriculture Fishing & Forestry		Manufacturing	
	Total	Work Age (	Number	%	Number	%	Number	%
1974	10161.4	6689.1	2784.7	100	510.1	18.3	515.3	18.5
1977	10651.9	7225.3	2810.3	100	489.4	17.4	456.4	16.2
1980	11131.1	7783.5	3298.5	100	581.4	17.6	531.7	16.1
1983	11674.6	8299.2	3199.6	100	534.4	16.7	442.1	13.8
1986	12330.1a	9001.4	3741.2	100	605.4	16.2	642.3	17.2
1989	12956.8a	9603.9	4284.2	100	654.2	15.3	789.2	18.4

a. September of each year

Source: In A. R. M. Ritter

cont.

A. TABLE A (b)

CHILE. POPULATION AND STRUCTURE OF EMPLOYMENT. 1974 - 1989

Year	*Mining*		*Construction*		*Transp. Commun. and Utilities*		*Services (Gov. & other)*	
	Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*
1974	*103.2*	*3.7*	*158.3*	*5.7*	*212.1*	*7.6*	*1285.9*	*46.2*
1977	*96.1*	*3.4*	*100.6*	*3.6*	*201.1*	*7.1*	*1468.6*	*52.3*
1980	*88.6*	*2.7*	*175.5*	*5.3*	*222.6*	*6.7*	*1689.1*	*51.2*
1983	*64.3*	*2.1*	*113.7*	*3.6*	*204.9*	*6.4*	*1807.3*	*56.4*
1986	*99.1*	*2.6*	*184.6*	*4.9*	*265.2*	*7.1*	*1921.5*	*51.3*
1989	*114.3*	*2.7*	*278.1*	*6.5*	*300.7*	*7.1*	*2138.8*	*49.9*

Source: In A. R. M. Ritter

A. TABLE B

CHILE: Socio/economic and demographic indicators
1974-1989

	1974	1997	1980	1983	1986	1988
Real Remuneration Index Dec.1992=100.0	55.2	72.3	99.5	96.8	94.6	100.6
Unemployment(national)	9.1	17.4	15.6	27.4	13.9	6.7
Life expectancy(year)	66.5	68.7	71.0	71.3	71.6	71.8
Infant. Mort.Rate (per 1000 births)	65.2	50.1	33.0	21.9	19.1	18.9
Birth rate (per 1000 persons)	25.9	21.4	22.2	22.2	22.1	23.3
Mortality rate (per 1000 persons)	7.7	6.9	6.6	6.3	5.9	5.8
Demographic Dependency ratio (a) %	75.8	69.2	63.9	60.8	59.0	58.2
Literacy rate %	89.9	90.3	90.8	92.2	93.8	94.3

(a) Percentage of the population under 15 and over 64 as a proportion of the population aged 15-64 0

Source:In:A.R.M. Ritter p.164 CALACS vol 15 N.30 from
1.- Banco Central de Chile "Indicadores Economicos y Sociales" 1960-1988, Stgo.1989
.-Banco Central de Chile, Boletin Mensual No.748, Junio 1990

A. TABLE C

CHILE. MAJOR MACROECONOMIC INDICATORS. 1974 - 1989

	1974	1977	1980	1983	1986	1989
1 Growth of GDP p.c. (%)	2.2	8.1	6.2	-2.2	3.6	8.8
2 Balance of Trade ($ USm.)	250	35	-768	-0.5	5.3	10.1
3 Inflation Rate	375.9	63.5	31.3	23.6	17.4	21.1
4 Term of Trade (1980=100)	155.1	100.1	100	84.7	77.8	107.1
5 Fiscal Deficit, % of GDP	10.5	1.8	-3.1	3.8	2.8	0.4

In A. R. M. Ritter

Sources. *1 World Bank, 1980*
2 Banco Central de Chile

A. TABLE D

CHILE. POPULATION PER REGIONS. 1989 AND 1992

REGION		*1989*		*1992*	
		a/ Number Thousand	*%*	*Number Thousand*	*%*
I	*Tarapaca*	*332*	*2.6*	*341*	*2.6*
II	*Antofagast*	*383*	*3.1*	*407*	*3.1*
III	*Atacama*	*202*	*1.6*	*231*	*1.7*
IV	*Coquimbo*	*474*	*3.4*	*502*	*3.8*
V	*Valparaiso*	*1378*	*10.7*	*1374*	*10.4*
MR	*Santiago*	*5066*	*39.7*	*5170*	*39.1*
VI	*O'Higgins*	*647*	*5.1*	*688*	*5.2*
VII	*Maule*	*830*	*6.6*	*834*	*6.3*
VIII	*Biobio*	*1676*	*13.1*	*1730*	*13.1*
IX	*Araucania*	*778*	*5.9*	*775*	*5.9*
X	*Los Lagos*	*931*	*7.2*	*953*	*7.2*
XI	*Aisen*	*77*	*0.6*	*82*	*0.6*
XII	*Magallane*	*149*	*1.2*	*143*	*1.1*
	TOTAL	*12923*	*100*	*13232*	*100*

a/ Estimated

Source. National Statistic Office, INE

A. TABLE E

MANUFACTURING EMPLOYMENT PER REGION
(50 or more employees)
CHILE 1974-1989

	REGION	1974	%	1989	%
I	TARAPAC	10341	4.1	9081	3.1
II	ANTOFAGASTA	5608	2.2	9579	3.3
III	ATACAMA	1703	0.7	2932	1.0
IV	COQUIMBO	1987	0.8	4152	1.4
V	VALPARAISO	29903	11.8	19535	6.7
MR	SANTIAGO	139612	55.1	162411	55.7
VI	O'HIGGINS	6541	2.6	8766	3.0
VII	MAULE	5166	2.0	9256	3.2
VIII	BIOBIO	37832	14.9	40386	13.9
IX	ARAUCANIA	3035	1.2	5734	2.0
X	LOS LAGOS	10407	4.1	16341	5.6
XI	AISEN	144	0.1	1271	0.4
XII	MAGALLANES	1115	0.4	2155	0.7
	TOTAL CHILE	253394	100	291540	100

Source: INE 1974 and 1989

A. TABLE F

BIOBIO REGION POPULATION

	1970	*1982*	*1989/projection*
BIOBIO	*1,255,393*	*1,518,888*	*1,656,820*
CHILE	*8,884,768*	*11,329,336*	*12,961,032*

BIOBIO REGION. RATE OF INCREASE OF POPULATION

	1960-1970	*1970-1982*	*1982-1987*	*1982-1992*
BIOBIO	*1.67*	*1.19*	*1.31*	*1.31*
CHILE	*2.11*	*2.05*	*1.95*	*1.56*

Source: National Statistic Office. INE 1992

A. TABLE G

LIST OF THREE-DIGIT MANUFACTURING ACTIVITIES

Class	*Description*
311-312	*Food manufacturing*
313	*Beverage industries*
314	*Tobacco manufactures*
321	*Manufacture of textiles*
322	*Manufacture of wearing apparel, except footwear*
323	*Manufacture of leather and products of leather, leather substitutes and fur, except footwear and wearing apparel*
324	*Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear*
331	*Manufacture of wood and wood and cork products, except furniture*
332	*Manufacture of furniture and fixtures, except primarily metal*
341	*Manufacture of paper and paper products*
342	*Printing, publishing and allied industries*
351	*Manufacture of industrial chemicals*
352	*Manufacture of other chemical products*
353	*Petroleum refineries*
354	*Manufacture of miscellaneous products of petroleum and coal*
355	*Manufacture of rubber products*
356	*Manufacture of plastic products not elsewhere classifeid (n.e.c.)*
361	*Manufacture of pottery, china and earthenware*
362	*Manufacture of glass and glass products*
369	*Manufacture of other non-metallic mineral products*
371	*Iron and steel basic industries*
372	*Non-ferrous metal basic industries*
381	*Manufacture of fabricated metal products, except machinery and equipment*
382	*Manufacture of machinery, except electrical*
383	*Manufacture of electrical machinery apparatus, appliances and supplies*
384	*Manufacture of transport equipment*
385	*Manufacture of professional and scientific and measuring and controlling equipment n.e.c., and of photographic and optical goods*
390	*Other manufacturing industries*

Source: *United Nation (1971) Statistical papers serie M.*

A. TABLE H (a)

BIOBIO REGION. LIST OF FOUR-DIGIT MANUFACTURING SECTORS
1974

CLASS	*DESCRIPTION*
3111	*Slaughtering, preparing and preserving meat*
3112	*Manufacture of Dairy products*
3113	*Canning and preserving of friuts and vegetables*
3114	*Canning, preserving and processing of fish, crustacea and similar foods*
3115	*Manufacture of vegetable and animal oils and fats*
3116	*grain mil products*
3117	*Manufacture of bakery products*
3118	*Sugar factories and refineries*
3119	*Manufacture of cocoa, chocolate and sugar confectionery*
3132	*Manufacture of wines*
3133	*Manufacture of malt liquors and malt*
3134	*Manufacture of soft drinks, production of mineral waters*
3211	*Spinning, weaving and finishing textiles*
3213	*Manufacture of knitted and crocheted fabrics and articles*
3215	*Manufacture of cordage, rope, twine and netting*
3231	*Tanning and dressing of leather*
3240	*Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear*
3311	*Sawmills, planing and other wood mills*
3312	*Manufacture of wooden and cane containers and small cane ware*
3320	*Manufacture of furniture and fixtures, except primarily of metal*

Source: United Nations 1974

(cont.)

A. TABLE H (b)

BIOBIO REGION. LIST OF FOUR-DIGIT MANUFACTURING SECTORS
1974

CLASS	DESCRIPTION
3411	*Manufacture of pulp, paper and paperboard*
3412	*Manufacture of containers and boxes of paper and paperboard*
3420	*Printing, publishing and allied industries*
3511	*Manufacture of basic industrial chemicals except fertilizers*
3512	*Manufacture of fertilizers and pesticides*
3513	*Manufacture of synthetic resins, plastics materials and man-made fibres except glass*
3523	*Manufacture of soap and cleaning preparations, perfumes, cosmetics and other toilet preparations*
3530	*Petroleum refineries*
3540	*Manufacture of miscellaneous products of petroleum and coal*
3610	*Manufacture of non-structural non-refractory ceramic ware (pottery, china and earthenware)*
3620	*Manufacture of glass and glass products*
3691	*Manufacture of structural clay products*
3692	*Manufacture of cement, lime and plaster*
3695	*Manufacture of vibrocement products*
3710	*Iron and steel basic industries*
3813	*Manufacture of structural metal products*
3815	*Manufacture of cable, wire (no aislado), and wire articles*
3829	*Machinery and equipment except electrical n.e.c.*
3841	*Ship building and repairing*
3842	*Manufacture of railway and tramway locomotives and rolling stock*
3843	*Manufacture of motor vehicles*

Source: United Nations 1974

A. TABLE I (a)

BIOBIO REGION. LIST OF FOUR-DIGIT MANUFACTURING SECTORS
1989

CLASS	DESCRIPTION
3111	Slaughtering, preparing and preserving meat
3112	Manufacture of Dairy products
3113	Canning and preserving of friuts and vegetables
3114	Canning, preserving and processing of fish, crustacea and similar foods
3115	Manufacture of vegetable and animal oils and fats
3116	grain mil products
3117	Manufacture of bakery products
3118	Sugar factories and refineries
3121	Manufacture of food products n.e.c.
3132	Manufacture of wines
3133	Manufacture of malt liquors and malt
3134	Manufacture of soft drinks, production of mineral waters
3211	Spinning, weaving and finishing textiles
3213	Manufacture of knitted and crocheted fabrics and articles
3220	Manufacture of wearing apparel, except footwear
3231	Tanning and dressing of leather
3240	Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear
3311	Sawmills, planing and other wood mills
3312	Manufacture of wooden and cane containers and small cane ware
3320	Manufacture of furniture and fixtures, except primarily of metal

Source: United Nations 1974

(cont.)

A. TABLE I (b)

BIOBIO REGION. LIST OF FOUR-DIGIT MANUFACTURING SECTORS 1989

CLASS	DESCRIPTION
3411	*Manufacture of pulp, paper and paperboard*
3412	*Manufacture of containers and boxes of paper and paperboard*
3419	*Manufacture of pulp, paper and paperboard articles n.e.c.*
3420	*Printing, publishing and allied industries*
3511	*Manufacture of basic industrial chemicals except fertilizers*
3513	*Manufacture of synthetic resins, plastics materials and man-made fibres except glass*
3522	*Manufacture of drugs and medicines*
3523	*Manufacture of soap and cleaning preparations, perfumes, cosmetics and other toilet preparations*
3530	*Petroleum refineries*
3610	*Manufacture of non-structural non-refractory ceramic ware (pottery, china and earthenware)*
3620	*Manufacture of glass and glass products*
3691	*Manufacture of structural clay products*
3692	*Manufacture of cement, lime and plaster*
3710	*Iron and steel basic industries*
3813	*Manufacture of structural metal products*
3814	*Manufacture of home-use products*
3815	*Manufacture of cable, wire (no aislado), and wire articles*
3819	*Manufacture of fabricated metal products except machinery and equipment n.e.c.*
3824	*Manufacture of special industrial machinery and equipment except metal and woodworking machinery*
3829	*Machinery and equipment except electrical n.e.c.*
3841	*Ship building and repairing*
3843	*Manufacture of motor vehicles*

Source: United Nations 1974

A. TABLE J(a)

BIOBIO REGION. CHANGES IN MANUFACTURING EMPLOYMENT (Four-digit)

	50 or more employees 1974-1989		
CLASS	*EMPLOYMENT 1974*	*EMPLOYMENT 1989*	*CHANGE(%)*
3111	*348*	*365*	*4.9*
3112	*654*	*104*	*-84.1*
3113	*104*	*1066*	*925.0*
3114	*1416*	*2685*	*89.6*
3115	*660*	*4505*	*582.6*
3116	*189*	*88*	*-53.4*
3117	*465*	*433*	*-6.9*
3118	*983*	*998*	*1.5*
3119	*50*		*-100.0*
3121		*61*	
3132	*277*	*186*	*-32.9*
3133	*257*	*236*	*-8.2*
3134	*242*	*578*	*138.8*
3211	*5220*	*2402*	*-54.0*
3213	*70*	*55*	*-21.4*
3215	*54*		*-100.0*
3220		*50*	
3231	*260*	*363*	*39.6*
3240	*608*	*1139*	*87.3*
3311	*5202*	*8846*	*70.0*
3312	*258*	*495*	*91.9*
3320	*50*	*505*	*910.0*
3411	*3637*	*2224*	*-38.9*

Source: INE 1974 and INE 1989

(cont.)

A. TABLE J (b)

R

BIOBIO REGION. CHANGES IN MANUFACTURING EMPLOYMENT (Four-digit)

50 or more employees 1974-1989

CLASS	EMPLOYMENT 1974	EMPLOYMENT 1989	CHANGE(%)
3412	54	113	109.3
3419		70	
3420	473	242	-48.8
3511	619	393	-36.5
3512	485		-100.0
3513	234	108	-53.8
3522		98	
3523	51	78	52.9
3530	917	622	-32.2
3540	200		-100.0
3610	1222	2500	104.6
3620	868	282	-67.5
3691	364	504	38.5
3692	249	417	67.5
3695	145		-100.0
3710	7231	3959	-45.2
3813	903	1208	33.8
3814		80	
3815	608	583	-4.1
3819		233	
3824		415	
3829	1775	829	-53.3
3841	70	256	265.7
3842	384		-100.0
3843	54	136	151.9

Source: INE 1974 and nd INE 1989

A. TABLE K (a)

BIOBIO REGION. SHIFT-SHARE ANALYSIS. MANUFACTURING SECTOR

50 or more employees 1974 1989

CLASS	EMPLOY 1974	EMPLOYM. 1989	DIFFER. SHIFT	PROPORT SHIFT	NET TOTAL SHIFT
3111	348	365	-231.0	194.3	-36.6
3112	654	104	-756.4	105.6	-650.8
3113	104	1066	700.9	245.1	946.0
3114	1416	2685	-838.9	1889.7	1050.7
3115	660	4505	3146.2	597.1	3743.3
3116	189	88	-130.5	0.4	-130.1
3117	465	433	-279.9	176.2	-103.7
3118	983	998	120.9	-257.5	-136.5
3119	50		-70.7	13.0	-57.7
3121		61	61.0	0.0	61.0
3132	277	186	-132.9	-0.8	-133.7
3133	257	236	44.5	-105.2	-60.6
3134	242	578	214.1	84.6	298.7
3211	5220	2402	-999.0	-2623.7	-3622.7
3213	70	55	-20.8	-5.0	-25.8
3215	54		-16.4	-45.9	-62.3
3220		50	50.0	0.0	50.0
3231	260	363	197.9	-135.0	62.9
3240	608	1139	356.1	81.1	437.3
3311	5202	8846	1394.8	1447.4	2842.1
3312	258	495	-1373.0	1570.2	197.2
3320	50	505	400.0	47.3	447.3
3411	3637	2224	-362.3	-1611.3	-1973.6

Source: INE 1974 and INE 1989

(cont.)

A. TABLE K (b)

BIOBIO REGION. SHIFT-SHARE ANALYSIS. MANUFACTURING SECTOR

50 or more employees 1974-1989

CLASS	EMPLOY 1974	EMPLOYM. 1989	DIFFER. SHIFT	PROPORT SHIFT	NET TOTAL SHIFT
3412	54	113	-91.6	142.3	50.7
3419		70	70.0	0.0	70.0
3420	473	242	-288.3	-15.6	-303.9
3511	619	393	-303.6	-17.8	-321.4
3512	485		-71.6	-488.1	-559.8
3513	234	108	51.9	-214.0	-162.1
3522		98	98.0	0.0	98.0
3523	51	78	-5.0	24.2	19.1
3530	917	622	158.9	-595.3	-436.4
3540	200		-1102.6	871.8	-230.8
3610	1222	2500	751.1	338.5	1089.6
3620	868	282	-194.8	-525.0	-719.8
3691	364	504	-153.3	237.2	83.9
3692	249	417	262.1	-132.5	129.6
3695	145		-146.5	-20.9	-167.4
3710	7231	3959	-696.8	-3689.9	-4386.7
3813	903	1208	-547.2	713.0	165.8
3814		80	80.0	0.0	80.0
3815	608	583	-127.2	8.4	-118.7
3819		233	233.0	0.0	233.0
3824		415	415.0	0.0	415.0
3829	1775	829	-551.5	-668.1	-1219.6
3841	70	256	153.9	21.3	175.2
3842	384		-55.9	-387.3	-443.2
3843	54	136	107.9	-34.2	73.7
TOTAL	39884	42499	-479.3	-2764.5	-3243.8

Source: INE 1974 and INE 1989

REGIÓN DEL BIOBÍO

A. FIGURE L

PROVINCIA	COMUNA
ÑUBLE	1.–COBQUECURA 2.–QUIRIHUE 3.–NINHUE 4.–SAN CARLOS 5.–ÑIQUÉN 6.–SAN FABIÁN 7.–SAN NICOLÁS 8.–TREGUACO 9.–PORTEZUELO 10.–CHILLÁN 11.–COIHUECO 12.–COELEMU 13.–RANQUÍL 14.–PINTO 15.–QUILLÓN 16.–BULNES 17.–SAN IGNACIO 18.–EL CARMEN 19.–PEMUCO 20.–YUNGAY
CONCEPCIÓN	21.–TOMÉ 22.–TALCAHUANO 23.–PENCO 24.–FLORIDA 25.–CONCEPCIÓN 26.–CORONEL 27.–HUALQUI 28.–LOTA 29.–SANTA JUANA
BIOBÍO	30.–SAN ROSENDO 31.–YUMBEL 32.–CABRERO 33.–LAJA 34.–LOS ÁNGELES 35.–TUCAPEL 36.–ANTUCO 37.–QUILLECO 38.–NACIMIENTO 39.–NEGRETE 40.–MULCHÉN 41.–SANTA BÁRBARA 42.–QUILACO
ARAUCO	43.–ARAUCO 44.–CURANILAHUE 45.–LÉBU 46.–LOS ÁLAMOS 47.–CAÑETE 48.–CONTULMO 49.–TIRÚA

CONCEPCION

SIMBOLOGÍA

- Límite Internacional
- Límite Regional
- Límite Provincial
- Límite Comunal

NOTA: Los números identifican a las comunas

Escala 1:1.550.000

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