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REGIONAL ECONOMIC DEVELOPMENT BASED ON MAJOR RESOURCE EXPLOITATION: CAPITAL EQUIPMENT SOURCING FOR HIBERNIA HYDROCARBON PRODUCTION

BY

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ABSTRACT

This thesis is concerned with the regional economic impacts of the Hibernia oil and gas development. With the intention of showing the linkage-leakage process of major resource development, I develop a conceptual framework which combines notions of interregional input-output, location quotient and capital availability ratio. The framework suggests how standard approaches to input-output analysis could be modified by concepts of capital constraints; and used as a basis to formulate policies on how to extract significant economic benefits from resource development.

The study shows that the impact of resource development, particularly on Newfoundland, would be restricted to a few industrial sectors. Thus, extensive regional economic development could not be carried out based mainly on natural resource projects dictated by the operations of market forces. The main reason is that there are limited manufacturing establishments in Altantic Canada. Also, a significant portion of the equipment would be sourced from outside Canada. The results of the empirical analysis also indicate that given the manufacturing linkages between the provinces regional economic development should not be viewed in isolation, but rather should be considered within a broader context of how the regions relate to the national economy. Therefore, there is a need to develop a sourcing policy based on the principle of government-industry cooperation if the high expectations regarding the industrial and employments benefits to be generated by the Hibernia oil and gas development are to be realized.

The challenge facing policy makers in the coming years would be to nurture through their initiatives government-industry cooperation, as well as, develop operational policies that would balance regional interests with national objectives; while maintaining the "Single Window" concept through the Joint Offshore Management Boards (JOMB). Finally, I discuss the recently concluded Canada-United States Free Trade Agreement

(FTA) which is expected to come into force on January 1, 1989. There are seven specific provisions of the Agreement which would have an impact on major oil and gas development projects and the federal regional economic development policies and programs. The implications of the FTA would present a challenge to decision makers and analysts in designing programs and policies to optimize oil and gas development related benefits.

ACKNOWLEDGEMENTS

As the bibliograph indicates, this study would not have been possible without drawing heavily on several sources - published and written material and extensive discussions with officials in both the public and private sectors. I thank all those who contributed generously with their time and thoughts. In particular, I would like to thank Bob Algie and Nugent Miller (Input-Output Division) and Ken Young (Analysis and Development Section) of Statistics Canada for the input-output and location quotient analysis respectively. I would also like to thank Lynn Levac and Ann Richichi, both of the Canada Oil and Gas Lands Administration (COGLA). Lynn for her patience and carefully word processing the text and cheerfully coping with frequently revised drafts; and Ann for the cartographic work.

I am particularly indebted to my supervisor, Dr. Peter Harrison for his unfailing encouragement, continued guidance, and above all his understanding of an individual's personality, in academic and non academic matters. For all that and his abiding friendship I am very grateful.

The catalogue of lost weekends, disturbed nights, pre-occupied days, and missed attendance at social functions which my family had to endure in the course of the writing of this dissertation convinces me that thanking families is not a mere formality. I would therefore like to thank my wife Felicia, and my two daughters Owusua and Bofoa for putting up with me while I have been busy doing my particular thing.

Finally, I would like to indicate that the analyses and the first draft of the dissertation were completed before I joined the Canada Benefits Branch and later the Policy Analysis and Coordination Branch, both of the Canada Oil and Gas Lands Administration (COGLA), as Analyst in 1984. Notwithstanding my affiliation with COGLA, the views and interpretations expressed in this dissertation are mine and do not necessarily represent the official view of the Government of Canada/COGLA.

CHAPTER I

INTRODUCTION: REGIONAL ECONOMIC DEVELOPMENT BASED ON RESOURCE EXPLOITATION

1. INTRODUCTION

Natural resources exploitation historically has been the engine of regional economic development in Canada. Major capital projects have been used by both federal and provincial governments as a basis to maximize industrial development benefits, and to encourage local suppliers to exploit business opportunities. However, in such economically depressed regions like Atlantic Canada, attempts by government since the 1960's to promote economic growth have had mixed results (Walker 1979, Woodward 1974, and Usher 1974). The discovery of commercial oil and gas fields on the East Coast in 1979, Hibernia on the Grand Banks and Venture on the Scotia Shelf respectively; was viewed by government as another vehicle for creating employment and business opportunities as well as a catalyst for regional economic development. Consequently, the federal government in 1984 adopted as an official policy the use of resource development as an engine of economic growth (Government of Canada 1981, Doern 1983). The government's expectation in adopting this policy was that resource development would generate industrial spin-offs as industries manufacture the equipment needed for the projects.

This expectation is partly based on the experiences of the British North Sea hydrocarbon development (Baldwin and Baldwin 1975, Kemp 1975 and Mackay and Mackay 1975). The success of British companies in capturing a significant share of the oil and gas equipment supply market, in a relatively short time, has been attributed to Britain's manufacturing base and the proximity of the supply companies to the hydrocarbon development fields. British companies' share of the orders increased from 40 percent in 1974 to 70 percent in 1980 (Custi 1981).

For Canada's Atlantic region to benefit from the expected industrial spin-offs a 'significant' share of the capital equipment and services would have to be obtained from the area. This could be done either through joint ventures with local companies, relocation of manufacturing establishments to the area from other parts of Canada, creation of new manufacturing establishments or establishment of branch plants in the area. How well are industries in the region placed to compete for a share of the offshore business? Which sectors of the regional economy would benefit most? Would Canadian and regional companies require government assistance to help them to compete for a share of the business, and if so what kind of assistance? Answers to these and other questions and the "fine-tuning" of existing, or the design of new, regional development policies and programs require a detailed analysis of the sectoral and spatial impacts of Hibernia development investment.

2. OBJECTIVES

A number of studies have examined the onshore economic benefits of Canada's East Coast Offshore oil and gas development. These studies include: the impact on the regional economy of Eastern Canadian oil and gas development, (EIU 1972), technology assessment and East Coast oil and gas exploration (Gibbons and Voyer 1974), potential of energy projects for Canadian industries (Beale 1980), sectoral and spatial distribution of Hibernia field development (Harrison et al 1981), and industrial development opportunities from offshore oil (Voyer 1983).

The EIU study is one of the first which examined the Provincial distribution of the impacts of East Coast oil and gas development. Voyer's study on the other hand discussed the major players in offshore oil exploitation and their specific roles in developing industrial opportunities. The Harrison et al study examined the structure of linkages and leakages within and between regions which could result from Hibernia development. The Harrison study is based on the Government of Newfoundland and Labrador capital cost estimates. However this study did not address the question of capital equipment sourcing from the point of

view of manufacturing establishments. Apart from these Canadian studies, others have also examined the economic impacts of offshore hydrocarbon development in other areas: Grigalunas (1975), Harris and Hopkins (1974), New England River Basins Commission (1976, 1978a, 1978b, 1979) and Weston (1978). This growing body of literature has provided a series of frameworks for analysing impacts of offshore oil and gas development. Most of these studies are however, descriptive or case study analysis. A framework which has not received much attention in the literature is one which deals with capital equipment sourcing requirements.

The purpose of this dissertation is to develop a conceptual framework for analysing capital equipment requirements for East Coast offshore hydrocarbon development and to test it empirically . In so doing several major objectives may be isolated which form the basis for succeeding chapters.

The first objective is to analyse the spatial impacts (direct, indirect and induced) of the capital equipment expenditures required to develop the Hibernia field within a linkage-leakage framework. This will be done by using the capital equipment expenditure profile to run the Statistics Canada interprovincial input-output model. This will provide a sectoral and provincial distribution between provinces of Gross Domestic Product (GDP) expected to be created in Newfoundland.

The second objective is to analyse structurally the activities of selected industries which could play a key role in the domestic sourcing of the equipment requirements from 1961-1981 and the location of these industries.

The Ocean industry which is made up of companies ranging from ship or rig builders to consulting firms is the industrial backbone of offshore hydrocarbon development (Nickerson 1979). The third objective then, is to use the results of the first two to examine the locational dynamics of the ocean industry, particularly the equipment manufacturing subsectors.

Although these objectives are discussed separately in the following chapters, they are considered to be mutually dependent. This dependency does not only help to highlight the linkage-leakage structure of the Canadian economy and the interdependency of the various regions of the country; but it is also essential to the construction of the conceptual framework and the empirical methodology.

3. THESIS STRUCTURE

Chapter II begins with a review of the development scenarios for the Hibernia field and equipment requirements. This is followed by a discussion of offshore-onshore activities, and a review of British and Norwegian development experiences. Chapter II ends with a review of the oil and gas development process in Canada. The aim of Chapter III is to suggest a conceptual and an empirical framework for analysing the economic impacts of a major resource development. This chapter begins with a discussion of data sources and constraints. This is followed by a review of Input-Output analysis. Chapter III ends with a discussion of a Capital Constraint Index (CCI) which is employed in this thesis as an indication of manufacturing industries' ability to respond to sourcing opportunities.

Chapter IV reviews a number of regional development theories and relates them to regional development programs and policies, with particular emphasis on Atlantic Canada. The chapter ends with a discussion of the analysis of regional manufacturing specialization and regional differentiation in capital availability in Canada. The main aim of Chapter V is to discuss the results of the interprovicial input-output analysis. Chapter V begins with a review of the capital equipment demand profiles for both the Floating and the Gravity Systems. This chapter also examines how Canada's share of the equipment sourcing could be increased through import substitution. Chapter V ends with an examination of the composition, spatial distribution and clustering of the Ocean Industry in Canada. The Ocean Industry groups together all the major industrial sectors which would be actively involved in the Capital equipment sourcing for the Hibernia development.

Chapter VI presents a brief review of the sourcing approaches in Britain, Norway and Canada. The new Canadian Offshore Management Boards and the evolving approach to sourcing are also discussed in Chapter VI. Chapter VII summarizes the aims, objectives, and the results of the entire dissertation. This is followed by a brief review of the potential impact of the recently signed Canada-United States Free Trade Agreement (FTA) on oil and gas development projects in particular, and regional development policies and program in general. The general applicability of the conceptual framework and suggestions for further research based on the results of the preceeding chapters are also discussed.

4. EMPIRICAL ANALYSES

In order to address the regional impact (first objective), and the regional manufacturing differentiation and specialization, (second objective), four separate empirical analyses were carried out -- input-output analysis, location quotients analysis, capital availability ratio analysis and capital constraint index analysis. I did the capital availability ratio analysis and the capital constraint index analysis using the Lotus program. Because rules on confidentiality which prevent the release of manufacturing data for areas with a small number of manufacturing establishments, such as Nova Scotia; the Manufacturing Analysis Development Section, of Statistics Canada did the location quotient analysis. The input-output Division of Statistics Canada did the input-output simulation using the interprovincial input-output model. The allocation of the development expenditures among the various industrial commodity classification groups was done by the author in consultation with government and industry officials listed in Appendix 1. The Lotus program was used in preparing the summary tables and the graphs.

CHAPTER II

REGIONAL ECONOMIC IMPACTS OF OFFSHORE HYDROCARBON DEVELOPMENT

1. INTRODUCTION

Offshore hydrocarbon activities fall into three chronological phases. An exploration phase characterized by hopes and hunches of major discoveries and dreams of economic bonanza. The second phase is a development phase or pre-commercial production activities. The third phase is the production phase when oil and gas flow onshore for processing and marketing. The economic impacts of the production phase are usually in the form of, royalty payments, improved balance of payments, high and stable exchange rates, recouping of investments - higher corporate profits and dividend payments, or security of oil and gas supplies.

Production phase related impacts are "national" in scope and may not be directly apparent to residents and communities adjacent to offshore oil and gas activities, if they do not induce physical activities which can be identified in the economic landscape. The most visible and direct regional and community impacts are often associated with the development phase. However, a community's first exposure to the nature of offshore hydrocarbon related activities is during the exploration phase.

2. HIBERNIA DEVELOPMENT SCENARIOS

While there are several scenarios for the development of offshore oil and gas, the interplay of the harsh environmental, political and institutional frameworks within which Hibernia development will take place contrains the number of options. It is therefore important that the parameters of the study be clearly defined if the extent of the regional impacts are to be effectively analyzed. The Grand Banks area of offshore Newfoundland is plagued by fog, icebergs, pack ice and severe winds. Any development system for Hibernia would have to be designed to

be functional in such a severe environment, meet serious environmental conditions and operate with minimum downtime. Consequently, the production system would have to be able to withstand the impact of icebergs or be able to disconnect and move off location in the event of an iceberg threat.

Exploration drilling for the most part has concentrated in the shallow waters. However, exploratory drilling has started to move into deeper waters and continued deep water drilling appears inevitable if additional commercial discoveries are to be made. For severe operating environments, such as the Grand Banks and the North Sea, the size of the reserve must be about half a billion barrels to justify economic development (NERBC 1978). Apart from the two speculative fields assumed below, it is expected that a number of fields with reserves of between 200,000 and 400,000 barrels would be discovered. Thus, the technology and the development system finally selected for Hibernia would have to be adaptable for the development of medium size fields.

From 1983 to 1985 alone the oil companies invested over $3 billion in exploring for oil and gas off the East Coast and need to recoup some of their investments if they are to continue to finance and maintain the pace of exploration activities. Consequently, it is assumed that the oil companies would prefer a development option which generates revenue earlier rather than later. This preference however would have to be balanced against a development pace which enables coastal communities in Atlantic Canada and Newfoundland in particular, to derive the maximum economic benefits while at the same time to adjust to the social and economic impacts of offshore oil and gas development. Such a balance would also enable Canadian content of goods and services to be optimized, either through technology transfers or joint venture operations between Canadian and foreign businesses.

The first commercial discovery well, Hibernia P-15, was drilled on the Grand Banks in 1979. Since then there have been other significant discoveries: Hibernia O-35, Ben Nevis I-45, Hebron I-13, Terra Nova K-18 Whiterose. Figure II.1 shows the significant discoveries on the East Coast to date. The reserves of the Hibernia structure, which is about 196 miles from St. John's, was initially estimated to be between 500 million barrels and one and one half billion barrels (Government of Newfoundland and Labrador 1980). The current recoverable reserves are estimated at about 650 million barrels.

Based on the pattern of oil and gas discoveries in the North Sea and other parts of the world it is speculated that two other structures could be discovered with a combined reserve of about one to two billion barrels. This would bring the total recoverable reserves of the Grand Banks to between one and half a billion and three and one half billion barrels. Production from the Hibernia field could last about 30 years, depending on production rates. In addition the production life of the two speculative fields could be about 50 years. Thus, the combined production life of the three fields on the Grand Banks would be about 45 years. Daily peak production from Hibernia could be about 250,000 barrels while the combined daily peak production of the three fields would be about 550,000 barrels.[1]

a) Production Systems

A number of development systems have been considered for possible applications to Hibernia. These include permanent island, tunnel from shore combined with caverns as working environment, steel platforms, submerged production systems, gravity positioned icebergs, ship-shape systems, floating systems and fixed gravity systems

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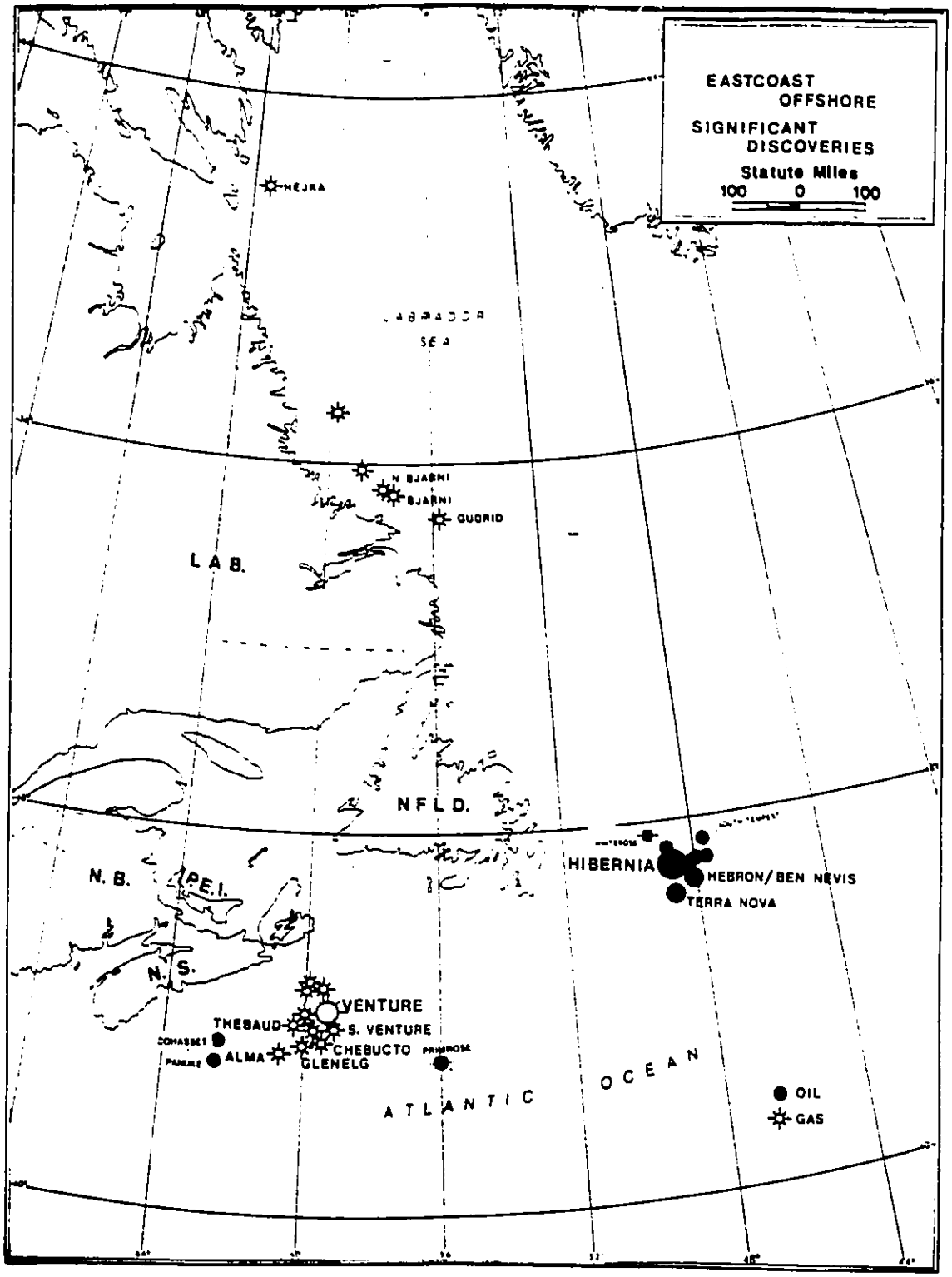
1 Based on several discussions with officials in both public and private sectors, see Appendix 1.

FIGURE II.1

EAST COAST SIGNIFICANT DISCOVERY AREAS



(Government of Newfoundland and Labrador 1981). Three of these development concepts reviewed in this study are the Floating System, the Fixed Gravity System and the Ship-Shape System. These systems are considered the most likely production mode for use on the east coast.

The Floating System would be designed to remain permanently moored in a 100 year storm. Production and injection equipment, non-hazardous machinery space and living accommodation would be located topside. The system would be self-propelled and could be moved off location if threatened by icebergs or pack ice. The floating system, assuming a shuttle tanker mode of transportation, would require a storage vessel for each production platform with a capacity of one million barrels.

Several configurations of the Gravity Based System which were initially considered included: circular shaped, hexagonal-shaped and inverted cone-shaped structures. The gravity system would be designed to withstand the impact of icebergs. A rock-filled berm would also be constructed around the structure to provide additional safety. This system would include topside and storage facilities. The gravity system presents several technical challenges that would have to be overcome. These include the ability of the structure to withstand the impact of icebergs which could not be towed away and the feasibility of constructing a rock berm given the water depth and the distance from shore.

The Ship-Shape System would involve using 1,000 feet long, 250,000 dead weight oil tanker, with onboard processing equipment, offloading facilities, living quarters and storage facilities. The main drawback is the delay involved in bringing the system back to full production if it is shut down. There is also concern that a single system would not be able to drain one field. Indications are that the ship-shape system is not a viable option for Hibernia but could be used in the development of marginal fields.

b) Transportation System

Oil from Hibernia field could be transported to Canadian markets either by pipeline or shuttle tanker. Two potential oil pipeline routes have been identified, a northern route (Hibernia-Bay Bulls) and a southern route (Hibernia - Trepassey). A maximum of 225 miles - 48 inches diameter - 8 inches cement coated steel pipeline would be needed to transport Hibernia crude oil to shore. The main advantage of a pipeline transporation mode is an uninterrupted supply. However this mode of transportation presents a number of problems, high wax content of Hibernia crude, and the need for special pumping facilities. About half of the distance to the Hibernia field from the Newfoundland coast is composed of bedrock with very little or no sand cover. This makes it impossible to bury a pipeline through this section of the route. Icebergs present a serious danger to an unburied pipeline.

The more likely transporation mode, at least for the early production stage, is the shuttle tanker for both the Floating and the Gravity systems. An "Off-the-Shelf" shuttle tanker could be designed to carry one million barrels of oil. The main advantage with a shuttle tanker is its adaptability to varying conditions. The main drawback is the interruption of shipment of supplies during severe weather conditions.

Associated gas could be disposed of by reinjection into the formation to maintain pressure, flared, transported by pipeline to shore for processing or liquified offshore and shipped to markets by Liquified Natural Gas (LNG) tankers. An offshore liquifaction process is an untried technology. Besides the cost of building an offshore liquifaction plant would be prohibitive. Large quantities of gas would be needed to justify the construction of an offshore plant. Consequently, this alternative is considered less likely for the disposal of associated gas. A gas pipeline is also considered

less likely for the same reasons given above for an oil pipeline. The most likely means of disposing of associated gas would therefore appear to be reinjection into the formation to maintain pressure or flared.

For the purpose of this dissertation and the analysis of the regional development impacts, it is assumed that either a Floating - Tanker system or a Gravity - Tanker system would be used.

3. OFFSHORE-ONSHORE ACTIVITIES

Onshore impacts of offshore oil and gas activities may be categorized as primary, secondary or tertiary (Kwamena 1980). The nature and type of onshore impacts are a function of scale and timing of offshore development (NERBC 1978a). During the exploration phase offshore oil and gas activities generate limited onshore related requirements. The major requirements range from shore bases, from where support vessels ferry drilling equipment, mud, and casing to drilling rigs, to company offices. Shore bases eventually become operational centres during the development phase. Communities with excellent harbour facilities, storage areas and repair facilities, and which are close to significant discovery areas are often preferred choices. Supporting companies such as diving firms, engineering and seismic firms and consultants also establish local offices in these communities.

In Scotland, Aberdeen and Peterhead became the main shore bases for the above reasons (Baldwin and Baldwin 1975). On the Canadian East Coast, Halifax, Nova Scotia and St. John's, Newfoundland have emerged as the main shore bases. With exploratory drilling moving to acreages further offshore, other communities with harbour facilities on the East Coast will compete with Halifax and St. John's for a share of the business. Notwithstanding competition from other communities in the future, Halifax and St. John's will likely continue to be the dominant centres of onshore operations and eventually centres of economic development.

Table II.1 summarizes exploration expenditures on the East Coast from 1983 to 1985. Expenditures averaged about $1 billion a year. Equipment accounted for about 60 percent of the total exploration expenditures. This was followed by consumables 15 percent and services 11 percent. Canadian content figures for equipment ranged from a low of 35 percent in 1983 to a high of 58 percent in 1985. Expenditure items with high regional or provincial content figures were services, logistics, and consumables. Each of these items had a content figure of over 30 percent. The projected decline in exploration expenditures for 1985 was partly a reflection of declining rig activities on the East Coast and the uncertainty regarding the incentive regimes that could replace the Petroleum Incentive Payments (PIP) which expired in 1986, and partly to declining world oil prices. The projected decline was also due to the fact that most of the promising structures may have been explored and attention and resources had to be directed to development activities and away from exploration activities. The East Coast exploration expenditure pattern, in general, parallels that of the U.K. North Sea where equipment accounted for 72 percent of the total exploration expenditure; services 10 percent, consumables 9 percent and seismic data acquisition and processing 6 percent (Jenkin 1982:16).

Tables II.2 and II.3 show the exploration related employment on the East Coast from 1983 to 1985. By 1985 a total of over 14,000 people had been employed; with slightly over half in Newfoundland. About 90 percent of the positions were filled by Canadians and 60 percent by local residents Table II.2. Table II.3 breaks down the employment by project groups. Half of the employment was in drilling. To date there has been no direct exploration related construction (harbours, or roads) on the East Coast. Drilling related employment decreased from 2,688 in 1983 to 1,762 by 1985. At the same time support employment increased from 619 in 1983 to 1,258 in 1985. It is expected that when offshore oil and gas activities move into the development phase construction and manufacturing activities would generate a greater proportion of the total employment.

TABLE II.1

EAST COAST OFFSHORE EXPLORATION - PROGRAM EXPENDITURES 1983-1985 ($ 000)

	1983									1984									1985*		
	BEAUFORT SEA			MACKENZIE			LABRADOR			BEAUFORT SEA			MACKENZIE			LABRADOR			BEAUFORT SEA	MACKENZIE	LABRADOR
	Total	% Cdn	% Reg	Total	% Cdn	% Reg	Total	% Cdn	% Reg	Total	% Cdn	% Reg	Total	% Cdn	% Reg	Total	% Cdn	% Reg	Total	Total	Total
Geophysical	14,259	76	16	11,749	75	26	26,888	76	21	13,867	70	17	16,991	86	19	91,151	78	25	12,820	21,470	96,290
Eng/Consultants	16,436	91	68	12,901	80	28	28,739	86	51	12,666	87	66	25,929	55	28	85,575	65	61	24,677	25,266	49,963
R&D	196	100	11	669	98	9	865	98	10	1,923	80	11	1,429	85	19	5,357	81	24	1,770	5,961	7,111
Total Pre-Drill.	30,891(5.0)	86	46	24,721(4.1)	78	26	55,612(4.7)	81	37	27,936(4.5)	79	47	46,349(8.0)	68	24	34,285(6.2)12		11	60,267(10.6)	51,027(7.3)	191,364(8.4)
Drilling Vessels	269,190	36	18	291,266	19	10	560,456	26	14	272,660	19	20	277,389	42	16	550,129	41	18	136,112	116,376	420,208
Supply Vessels	20,200	50	41	22,980	60	46	143,180	55	46	30,076	65	42	32,901	74	42	162,977	70	42	86,969	109,229	168,198
Air Transport	17,519	81	43	19,681	69	33	37,160	75	38	16,012	81	36	15,179	87	56	31,191	83	45	9,789	17,294	27,083
Special Purpose	10,242	67	10	11,913	28	17	22,155	23	25	3,267	62	19	3,861	88	41	7,108	76	31	2,717	4,394	7,111
Total Equipment	167,171(59.1)	86	46	195,710(69.2)	31	19	362,881(6.0)	35	21	161,995(58.4)66		25	169,610(61.7)51		23	730,605(61.0)69		24	182,807(69.5)	665,293(63.5)	633,100(58.1)
Mud/Suppl.&Chem.	24,576	79	58	17,511	83	41	42,107	81	52	20,937	76	66	11,952	74	45	32,889	76	66	15,696	12,186	27,322
Drill Bits/Reamers	6,706	56	35	3,627	35	18	10,338	47	29	4,795	52	25	2,767	55	14	7,522	53	21	3,090	4,120	7,210
Wellhead Equip.	9,106	37	19	5,174	6	2	14,478	25	25	10,147	27	21	7,985	28	15	18,132	28	19	4,842	4,560	9,402
Cement/Additives	3,359	81	40	1,814	82	32	5,193	81	37	5,108	86	35	2,489	82	30	7,597	86	33	3,222	2,867	6,619
Casing	35,113	38	23	16,956	30	4	52,279	35	17	26,106	50	19	11,666	42	9	37,550	48	16	13,696	17,908	31,602
Fuel & Lubricants	16,806	96	27	15,662	79	16	31,666	87	21	24,880	71	31	28,789	72	8	53,569	73	18	16,436	27,969	44,385
Miscellaneous	1,408	72	59	4,130	79	35	5,538	77	41	1,898	81	56	4,062	80	32	5,960	81	40	3,209	724	3,933
Total Consum.	96,488(15.5)	61	36	65,106(11.4)	59	20	161,592(11.5)	60	30	93,749(15.1)62		30	69,470(12.0)63		18	163,219(13.6)62		25	60,089(15.8)	70,434(10.1)	130,453(12.1)
Coring	586	85	21	720	85	9	1,306	85	14	883	91	51	896	78	17	1,777	78	17	772	1,669	2,421
Wireline Logging	22,779	71	62	19,806	75	35	42,085	73	50	26,674	76	46	13,141	74	33	39,815	75	40	17,265	21,868	39,133
Mud Logging	6,196	61	47	4,508	78	35	10,702	68	42	3,805	76	39	3,053	76	39	6,858	76	39	2,445	3,996	6,441
Ice Mgmt./Env.	2,365	96	71	1,766	97	96	4,109	96	85	2,791	92	72	4,590	96	80	7,381	93	77	1,917	3,625	5,542
Testing	16,706	76	32	15,649	79	57	32,355	77	47	18,507	82	41	14,283	77	40	32,790	80	41	15,971	13,847	29,818
Diving	7,410	74	41	7,055	80	45	14,465	80	41	5,519	59	27	4,460	81	49	9,979	69	37	1,963	8,150	10,093
Sp. Drill Serv.	2,257	69	50	8,522	58	31	15,779	61	40	12,939	73	40	6,520	74	25	19,459	71	35	8,656	16,536	24,994
Positioning	2,480	72	56	2,113	84	46	4,593	80	50	1,587	91	45	1,273	95	50	2,860	93	47	613	2,267	2,880
Cementing	2,957	83	46	4,179	79	39	7,136	81	42	3,729	61	25	2,865	93	29	5,796	72	26	1,956	5,363	7,319
Communications	2,801	82	48	2,198	42	29	5,199	65	39	3,971	85	51	1,579	75	33	5,550	79	51	2,098	4,661	6,759
Catering	167	90	56	127	100	100	294	95	76	1,688	92	90	0	0	0	1,688	92	90	1,578	565	2,143
Total Services	71,662(11.5)	73	50	68,429(12.0)	76	44	140,091(11.7)	75	47	82,113(13.2)77		43	55,158(9.6)	78	39	137,471(11.5)77		41	56,986(14.9)	82,527(11.7)	137,513(12.7)
Logistics	27,136(4.4)	79	67	15,851(2.8)	92	73	42,989(3.6)	86	69	31,160(5.1)	88	72	26,525(4.6)	92	78	57,685(4.8)80		75	23,126(6.2)	38,139(5.4)	61,116(5.7)
Other	28,269(4.5)	55	27	1,605(0.3)	90	70	29,874(2.5)	57	29	22,223(3.6)	77	32	12,327(2.1)	91	24	34,550(2.9)82		29	13,055(3.4)	14,465(2.0)	27,520(2.5)
Total Drilling	590,726	90	31	566,701	42	24	1157,427	46	28	592,424	56	31	533,617	59	27	1126,101	58	29	339,994	669,398	989,392
Total Program	621,613(100)	52	32	571,422(100)	43	24	1193,035(100)	48	28	620,423(100)	57	32	579,966(100)	59	27	1260,389(100)58		29	390,261(100)	708,475	1,098,736(100)

( ) - Percent of Total Year's Expenditure

* - Estimate

Source: Canada Oil and Gas Lands Administration (COGLA)
Canada Benefits Branch Unpublished 1985

TABLE II.2

EAST COAST OFFSHORE EXPLORATION - EMPLOYMENT BY REGION

1983 - 1985

Region	1983			1984			1985*		
	Total	% Canadian	% Regional	Total	% Canadian	% Regional	Total	% Canadian	% Regional
Nova Scotia	2,335	89	65	3,044	92	66	2,027	90	72
Newfoundland	2,610	76	49	2,115	90	62	2,374	90	58
East Coast	4,945	82	57	5,159	91	64	4,401	91	65

* Estimate

SOURCE: Canada Oil and Gas Lands Administration (COGLA)
Canada Benefits Branch, Unpublished 1985

TABLE II.3

EAST COAST OFFSHORE EXPLORATION - EMPLOYMENT BY PROJECT GROUP

1983 - 1985
1985*

	NOVA SCOTIA			NEWFOUNDLAND			EAST COAST		
	Total	% Canadian	% Regional	Total	% Canadian	% Regional	Total	% Canadian	% Regional
Drilling	793	85	68	969	82	43	1,762	83	54
Marine	341	98	65	468	99	72	809	98	69
Support	623	95	73	635	97	63	1,258	96	68
Direct Construction	270	90	86	302	93	75	572	92	80
Total	2,027	90	72	2,374	90	58	4,401	91	65

* Estimate

SOURCE: Canada Oil and Gas Lands Administration (COGLA)
Canada Benefits Branch, Unpublished 1985

TABLE II. 3 (Cont'd)

EAST COAST OFFSHORE EXPLORATION - EMPLOYMENT BY PROJECT GROUP

1983 - 1985

1 9 8 3

	NOVA SCOTIA			NEWFOUNDLAND			EAST COAST		
	Total	% Canadian	% Regional	Total	% Canadian	% Regional	Total	% Canadian	% Regional
Drilling	1,105	82	63	1,583	68	47	2,688	74	53
Marine	582	95	54	616	88	55	1,198	91	55
Support	424	97	88	195	91	64	619	95	80
Direct Construction	224	95	63	216	87	28	440	91	46
Total	2,335	89	65	2,610	76	49	4,945	82	57

TABLE II. 3 (Cont'd)

EAST COAST OFFSHORE EXPLORATION - EMPLOYMENT BY PROJECT GROUP

1983 - 1985

1 9 8 4

	NOVA SCOTIA			NEWFOUNDLAND			EAST COAST		
	Total	% Canadian	% Regional	Total	% Canadian	% Regional	Total	% Canadian	% Regional
Drilling	1,121	85	78	843	82	29	1,964	84	57
Marine	694	96	54	448	99	67	1,142	97	59
Support	960	97	77	612	94	69	1,572	96	74
Direct Construction	268	92	85	258	92	80	526	92	82
Total	3,044	92	66	2,115	90	62	5,159	91	64

If Canada's East Coast offshore development is to parallel that of the U.K., as most analysts have indicated, then the opportunities would be provided by small firms as was the case in the U.K. for:

> "the industry is characterized by large amount of sub-contracting, and many firms which enter the market on this basis are engaged in only a marginal way as a proportion of total turnover. Government estimates in 1974 placed the number of firms in the industry at close to 3,000, including 55 major contractors, 800 main sub-contractors and 2,000 firms involved in subcontracting work to varying degrees.[3] Other sources have given the number of firms involved in the industry at close to 1,000.[4]

The most detailed analyses of the characteristics of firms in the U.K. offshore supply industry were surveys conducted by the Scottish Economic Planning Department (SEPD) during 1974-8.[5] The surveys were limited to firms located in Scotland, and a major emphasis of the studies was on the employment creation effects of firms entering the offshore supply market. The survey results indicate that a total of 38,000 people were employed in 796 establishments in 1976 in work which was directly attributable to sales to the offshore market.[6] Of the manufacturing firms which reported, those building steel and concrete platforms and modules employed the largest number of people (12,550), followed by those supplying industrial plant, steelwork, etc. (4,750). In the services category, offshore contractors supplying transportation and communications services provided the most employment (3,350), followed by distribution and professional services (1,600 and 1,500

> respectively).[1] Manufacturing, not surprisingly, accounted for three quarters of the oil-related work force and thus the bulk of employment opportunities. Services accounted for the remaining quarter." (Jenkin 1981: 17-18)

A more recent study indicates that the characteristics of the U.K. offshore supply industry has not changed since 1981:

> "Most firms in the survey were small: they employed, on average, only 37 people in 1982, but had employed an average of 49 when activity was at its peak. In fact, 37 percent of firms employed ten people or fewer, 31 percent employed between 11 and 50, only 9 percent were in the medium size range of 51 to 100 employees, while 16 percent employed over 100. The rest (7 percent) did not say how many they employed. Only a quarter of the firms derived half or more of their business from North Sea Work, 62 percent derived less than half and, these, as many as 48 percent derived less than a quarter." (EIU, 1984:27)

While no official figures exist for the Canadian offshore supply industry, indications are that the industry is also fragmented. It is estimated that over 600 local and national companies supplied goods and services to the east coast oil and gas industry in 1985[1]. About 350 of these companies were in Nova Scotia, 200 in Newfoundland, and the rest in other provinces, mostly Alberta and Ontario. The local supply industry consists of indigenous companies, branches of Canadian-based firms, subsidiaries of international corporations, and joint-venture

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1 Based on discussions with officials of Canada Oil and Gas Lands Administration (COGLA).

companies. These companies provided goods and services ranging from drill bits, connectors, and cement, to logging, diving, supply vessels and ice and weather forecasting.

The large number of local companies in Atlantic Canada providing goods and services to the offshore oil and gas industry may be due in part to the full and fair opportunity provision of the Canada Petroleum Resources Act and its predecessor the Canada Oil and Gas Act and in part to the supplier development initiatives of the oil companies such as technology and know-how transfer, technical assistance, joint-venture and licensing agreements. It is most likely that the number of local suppliers would increase when east coast oil and gas activities move from exploration into the development phase.

The large number of local companies is also contrary to the commonly held view that in offshore oil and gas activities, one is dealing with only a few major multinational corporations. Consequently, the development of policies, programs and strategies to optimize industrial and employment opportunities should be directed both at the multinational oil companies as well as their major contractors and sub-contractors.

4. BRITISH AND NORWEGIAN EXPERIENCES

Indications as to the kinds of oil and gas related regional development impacts that Atlantic Canada and Newfoundland in particular could expect from offshore hydrocarbon development are provided by the experiences of U.K. and Norway. These impacts fall into four main categories - income from royalties and business taxes to the provincial or national treasury, industrial spin-offs, employment opportunities and socio-environmental effects. Spatially, communities on the water's edge, or close to offshore oil and gas fields are impacted directly as they are often used as staging areas for offshore development operations. Cities like Aberdeen and Peterhead in U.K. and Stavanger in Norway are examples of such communities. Environmental impacts range from oil spills resulting from accidents and blowouts to damage to fishing gear by oil related debris (Pearce et al 1978).

Norway's total income from oil as a percentage of Gross National Income increased from 18 percent in 1980 to 21 percent in 1981. This high proportion is expected to decline to 19 percent by 1985 (Earney 1982). In the U.K. about 22 percent of the increase in exchange rate between 1977 and 1981 has been attributed to the increase in North Sea oil price (Robinson 1983).

In 1982, there were 48,793 people working in offshore oil and gas related activities in Norway. This figure represents an increase of 14 percent over 1981 employment (Government of Norway: Royal Ministry of Petroleum and Energy 1983:1). Table II-4 shows the onshore-offshore breakdown of offshore oil and gas related employment in 1983 for Norway. Over 36,000 or 70 percent of the employment opportunities were onshore. Mechanical engineering, oil operators, engineering companies and drilling accounted for the bulk of the total employment opportunities. Opportunities provided by Norway's offshore oil and gas industry have helped to reduce regional unemployment. However, the high wages offered by the industry have pulled labour away from the farming and fishing industries, villages and small industrial establishments (The Economist, September 1974). In Scotland, the types of regional industries involved in the offshore oil and gas development include metal working, engineering and ship building (Gaskin, 1974).

The offshore oil and gas industry by its operations induces a "push-pull" process in regional economies whereby skilled labour and other needed resources are attracted to it. The industry is also able to over bid other industries which may be competing for the same resources. At the same time existing local industries are forced to increase their wages to keep their skilled workers and to compete for other resources. Local authorities have to provide additional social services to meet the demand created by the influx of workers and their families to the area. High prices are also offered for housing and prime land. The net result is a boom in the regional economy. The challenge then becomes one of managing this boom and extending the benefits over a longer period of time and to other regions. Atlantic Canada can learn from the British and Norwegian preplanning experiences by ensuring that the necessary

TABLE II.4

MALE AND FEMALE EMPLOYMENT IN THE NORWEGIAN OIL INDUSTRY AUGUST 1983

	Onshore			Offshore			Total		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Oil (operator)	4610	2230	6840	2848	72	2920	7458	2302	9760
Drilling	213	122	335	2873	46	2919	3086	168	3254
Transport	1099	209	1308	4016	16	4032	5115	225	5340
Mech Eng	14906	911	15817	2367	11	2378	17273	922	18195*
Service Cos	760	235	995	1635	8	1643	2395	243	2638
Engineering Cos	3318	1021	4339	168	2	170	3486	1023	4509
Bases	736	60	796	4	-	4	740	60	800
Catering	78	50	128	718	430	1148	796	480	1276
Terminals	2059	342	2383	-	-	-	2059	324	2383
Construction	1406	142	1548	-	-	-	1406	142	1548
Administration	380	163	543	-	-	-	380	163	543
Research*	713	126	839	17	3	20	730	129	859
Others	739	220	959	106	-	106	845	220	1065
Total	31017	5813	36830	14752	588	15340	45769	6401	52170

*including teaching.

SOURCE: McBarnet, A. (1985) "The Industry Vacancies That Don't Fill Easily" Offshore Engineer, June; p.86

infrastructure, housing and other facilities are in place well before the commencement of offshore development. Otherwise the region would not be able to effectively manage and sustain the spin-off of economic activities. Timing, however is critical in any preplanning exercise, particularly where the final decision for the project has not been made. To be better positioned to take advantage of opportunities businesses have to make investment decisions before the project development announcement is made. Houses have to be built in time to accommodate workers. Already there is a shortage of good hotel accommodation in St. John's Newfoundland and this is likely to get worse when development begins. Yet, because of the uncertainty regarding the project start-up date, there is no rush to build new hotels. The development process, particularly the environmental impact assessment and benefits plan approval phases discussed below are intended to address these issues. The extent to which costly mistakes are avoided will depend however, on the policy instruments that are used to optimize the proportion of the capital equipment sourced in the region. Furthermore, how well Atlantic Canada succeeds in maximizing its share of the equipment sourcing will also depend on whether a regional, as opposed to provincial, development approach is adopted (Kwamena, 1980). Such an approach will enable each province to maximize its economic potential by concentrating on its comparative advantage.

5. DEVELOPMENT PROCESS

The development of oil and gas resources on Canada's frontier lands is governed by the Canada Petroleum Resources Act (which replaced the Canada Oil and Gas Act) and the Oil and Gas Production and Conservation Act. Under these two pieces of legislation eight phases or approval requirements can be identified in the development process. These approval requirements are: declaration of commercial discovery and issue of significant discovery licence, issue of production licence, development plan approval, environmental assessment, benefits plan approval, issue of certificate of fitness, petroleum transportation approval, and production operation authorization. The development

process starts with the filing of an application to the Minister (Energy, Mines and Resources for activities south of 60°, or Indian and Northern Affairs for activities North of 60°) for a declaration of significant discovery.

The declaration gives the interest owner the right to apply for and be issued with a significant discovery licence which gives title to the discovery. The licence has no time limit. The significant discovery licence also enables the interest owner to carry out delineation drilling to determine whether the discovery is large enough to justify commercial development, to obtain additional characteristics of the reservoir, and to apply for a production licence. An application for a production licence may be filed with the Minister or the Board when an interest owner is ready to develop a field. To be issued a production licence the applicant must be a Canadian citizen resident in Canada, permanent resident, or a corporation incorporated in Canada and must have or provide an indication that it will have a Canadian Ownership rate (COR) of at least 50 percent. The production licence, which is issued for an initial term of 25 years and extended automatically if after the initial term the field is still producing, confers on the holder the title to the oil and gas produced and the exclusive right to develop the field.

The next phase in the process is the development plan approval phase. The development plan outlining in detail the technical and economic information related to the development of the reservoir must be submitted to the Minister or the area Board for approval, and must include information regarding reservoir characteristics, recovery system, development cost and pollution prevention measures. A development may be approved subject to special terms and conditions.

Hydrocarbon development projects are subject to an Environmental Assessment Review Process (EARP) or to a similar Federal-Provincial review process in areas where independent Boards have been established. The review process does not only assess the environmental implication of a development proposal but also provides an avenue for public

consultation and comment through a public review and study of the development proposal. The EARP is preceded by an Initial Environmental Evaluation (IEE) which assess the physical, biological and socio-economic impacts, as well as any unknown effects and the potential mitigating measures.

If, following the IEE, it is determined that the project could potentially have major adverse environmental effects, a detailed Environmental Impact Statement (EIS) is prepared by or for an operator for public review. Because of the interest and the importance the public attaches to it, socio-economic impact reviews are sometimes conducted separately but as part of the overall EARP review. In such cases a separate Socio-Economic Impact Statement (SEIS) document is prepared. To date two environmental impact/socio-economic impact statements have been prepared for proposed offshore hydrocarbon development projects on the East Coast - the Venture Development Project in 1983 and the Hibernia Development Project in 1985. Mobil Oil Canada is the proponent for both projects.

A Canada Benefits Plan (CBP) outlining the proponent's strategy for providing Canadian consultants, manufacturers, contractors and service companies with a full and fair access to competitive participation in the supply of goods and services to be used in the project must be approved by the Minister or the Board before the commencement of the project. The requirement to submit a benefits plan can be waived by the Minister or the Board with the agreement of the Federal and the Provincial Energy Ministers. The Benefits Plan may also be approved subject to specified terms and conditions. For example, the Canada-Newfoundland Offshore Petroleum Board (CNOPB) approved Mobil's Hibernia Benefits Plans subject to five conditions (CNOPB 1986: 90). The five conditions are that Mobil, the Project proponent, will:

- Consider all reasonable alternatives to provide for maximum Canadian participation in the construction of the shuttle tanker;

- o Submit a training and staffing plan for the employment and training of residents of Newfoundland;

- o Re-examine the feasibility of assembling and outfitting the Main Support Frame in Newfoundland;

- o Provide to the Board comprehensive listings of all major contracts and purchase orders, the Board will then determine which of the major contracts and purchase orders it will review; and

- o Provide advance notice of and information on major contracts and purchase orders for review by the Board.

The proponent has to assess in the Benefits Plan Canadian industrial capability to provide goods and services for the project and to identify sectors where Canadian suppliers are not available or may not be internationally competitive. The Benefits Plan must also indicate labour demand and supply and how expected shortages of skilled labour will be addressed. Effective monitoring and reporting of procurement decisions and expenditure and employment levels are essential to ensuring that benefits commitments are being addressed. Therefore, the proponent is expected to describe its process for regular monitoring and reporting and those of its contractors with respect to Canada and regional benefits performance as well as updating of its Benefits Action Plans.

An interesting aspect of Canada's approach to optimizing benefits compared to the British is that, unlike the British approach of auditing contracts over a certain threshold value after the contracts have been awarded, the Canadian approach is designed to avoid any surprises by having operators indicate before the commencement of activities what their benefits commitments would be. It may be argued, however, that by getting operators to indicate their plan at the very beginning takes the pressure off them to look for other innovative ways of providing additional benefits. The British approach on the other hand appears to indirectly pressure operators to improve on their content levels each

time new contracts are awarded. Both approaches, however, leave the procurement decisions to the operators and their contractors. This way the government is not involved in corporate decision making and the integrity of the confidential business bidding process not undermined. However, under the Canadian approach the proponent has to debrief government of the selection of the successful bidder before announcing its decision. This way the government is forewarned of the award of any potentially political sensitive contracts.

In addition to the above approvals the proponent has to obtain a Certificate of Fitness for the installation of the Production Structure, a Petroleum Transportation Approval for intra-territorial and offshore pipelines and a Production Operations Authorization for commercial production. The Certificate of Fitness may be approved by a Certifying Agency, for example the American Bureau of Shipping (ABS) on behalf of the Minister or the Board. The issuing Agency has to verify that the installation is designed, constructed, installed and operated according to the approved Development Plan and in accordance with the Canada Oil and Gas Production Installation Regulations and the Production and Conservation Regultions.

Petroleum Transportation Approvals are granted for intra-territorial and offshore pipelines for their construction, testing and operations. The approval of other petroleum transportation systems are the responsibility of other regulatory agencies such as the National Energy Board and the Department of Transportation.

The final stage in the development process is the granting of the Production Operations Authorization. Before this authorization is granted the proponent's contingency plans, maintenance and inspection programs and environmental protection plans have to be reviewed to ensure they meet Operating Standards. The whole development process can take four to five years assuming there are no delays with the public reviews and the development schedule is strictly adhered to. The duration of the development process may be shortened as applications for some of the

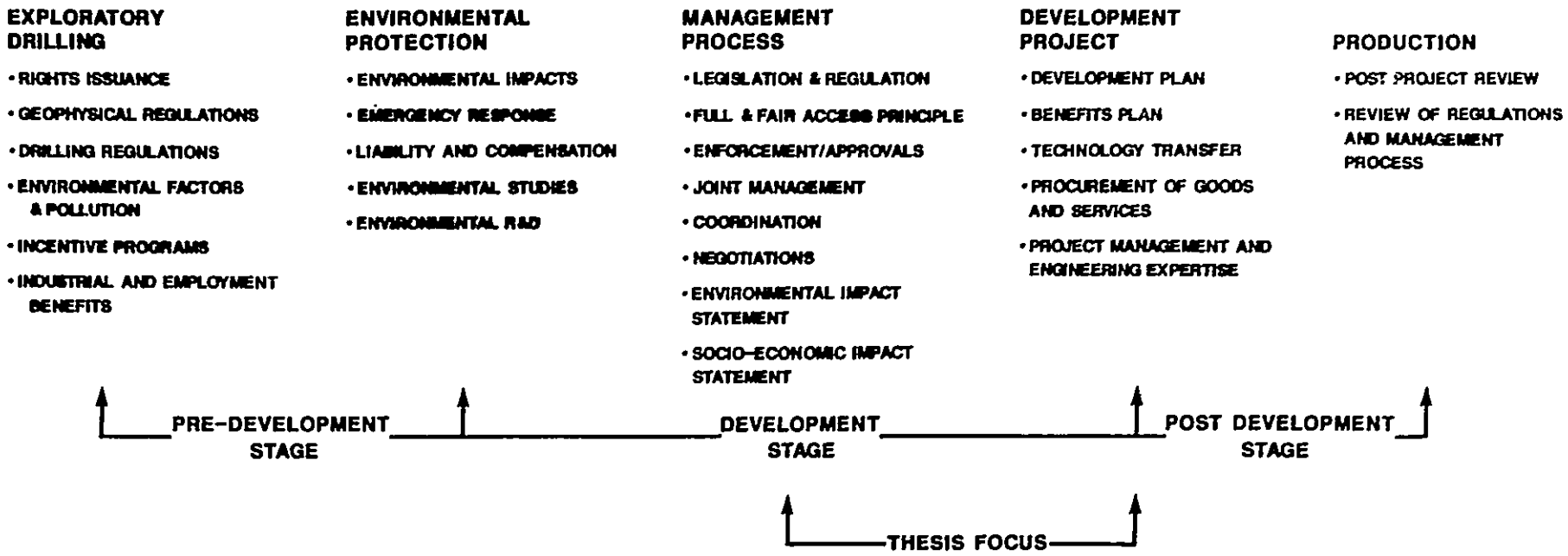
approvals can be done concurrently. For example the review of the draft Development Plan and the draft Benefits Plan can be done at the same time as different branches and officials of the review Agencies would be responsible.

The above process suggests that offshore hydrocarbon development is a complex interrelated process with at least five distinct socio-economic research areas: exploratory drilling, environmental protection, management process, project development and production (Figure II.2). For example research under exploratory drilling could focus on rights issuance, incentive programs and industrial and employment benefits. Research in the environmental protection area could involve environmental impacts or liability and compensation issues. Under management a researcher could examine the legislation and regulatory process, the application of the full and fair access principle or the coordination of development policies and programs in different frontier areas. Development Project related research could examine development and benefits plans, or technology transfer and project management and engineering expertise; and how these help or hinder a country from developing its offshore industry.

Production related research could review how well the regulatory and management process worked for a particular field development, such as Hibernia. Some issues, like industrial and employment benefits, are common to all five areas and cannot exclusively be restricted to one area. Thus, this thesis while touching on all five areas focused more on the management and project development areas as they relate to capital equipment sourcing.

FIGURE II.2

OFFSHORE HYDROCARBON DEVELOPMENT: SOCIO-ECONOMIC RESEARCH AREAS



CHAPTER III

CONCEPTUAL FRAMEWORK AND EMPIRICAL METHODOLOGY

1. INTRODUCTION

Major investments for capital equipment create economic ripples throughout the national economy. The extent to which an investment signal is picked up from areas of development will depend on the industrial base of the regional and national economy and the spatial clustering of manufacturing establishments. The capacity, productivity and competitiveness of the sectors and subsectors of the economy also play a key role in the provision of equipment requirements and regional development.

The following discussion is an attempt to draw together the preceding points in a more concise manner from the viewpoint of the process of regional development. On the basis of the framework articulated, an empirical methodology is presented as a means of identifying sectors which are most likely to be impacted, and thus, would create employment and business opportunities. The framework has been designed to compensate for some of the limitations of the methodologies employed. Therefore, for the purpose of this thesis the methodologies should be considered together.

2. DATA SOURCES AND CONSTRAINTS

Almost every research project is constrained by the availability of "appropriate" data, and this study is no exception. None of the three main data sources used in this study could provide complete information. These sources are government - Statistics Canada, and other government departments; oil companies and offshore suppliers. The choice of data used in the study was dictated by two factors - comparability and consistency. These factors were selected to ensure that year by year comparison of trends would be possible.

For reasons of confidentiality, detailed project specific information could not be obtained from the sponsors of the Hibernia project, Mobil Oil and its partners. Besides, at the time of the impact simulation detailed engineering and technical studies were still going on and the final production mode had not been selected. For this reason detailed public procurement information could not be obtained.

The review of the performance of the Ocean industry was also limited by the absence of a single standard industrial classification for the industry. This means there is no single grouping by Statistics Canada, of data relating to the several products manufactured by the industry. One possible solution was to request the information directly from the various companies, possibly as part of a questionnaire survey. This approach was ruled out because of lack of funding for the study and the large number of companies which had to be surveyed across the country. It is also unlikely that companies would provide confidential corporate information for research that would eventually become public. Moreover, a questionnaire survey would have had to be supplemented with elite interviews if more pertinent information was to be obtained. It was also doubtful whether a survey would have provided all the statistical information necessary.

Government sources were the most useful. In addition to the information obtained from the now defunct Department of Industry Trade and Commerce (ITC) and the Canada Oil and Gas Lands Administration (COGLA), officials at Statistics Canada were of great assistance. For example, to overcome the problem of confidentiality, Statistics Canada agreed to run the correlation and location quotient analyses without necessarily making available the absolute figures. However, the problem of confidentiality was not completely resolved without extensive aggregation. This meant the results of the analyses could only be published at the Standard Industrial Classification three digit level. Even at this level of aggregation some of the results could not be published particularly for Atlantic Canada with its limited number of manufacturing establishments. Thus, attempts to further examine

interregional linkage differences, using correlation analysis, between such variables as shipment and capital investment, labour force, and research and development expenditures had to be abandoned.

Notwithstanding these constraints the data used in computing the capital availability ratio (CAR) and the capital constraint index (CCI) enabled reasonable conclusions to be drawn about the direction and performance of manufacturing establishments in Canada. I believe such information could be useful in developing appropriate regional development strategies.

3. INDUSTRIAL STRUCTURE AND REGIONAL DEVELOPMENT

Regional development is a complex inter-related process; availability of marketable resources, regional economic diversity, industry mix and industry location, input requirements, market share and commodity prices are all critical factors which influence regional economic development. Technological changes, import substitution, introduction of new projects and changes in life style and taste, as well as cultural factors cannot easily be discounted either in any analysis of regional development. Thus, a region's relative economic advantage, as a result of the interplay of these factors, may be due to an evolutionary process whereby the seeds of future development have been sown in the past and rooted in present activities and decisions (Richardson 1969: 342).

The strength and ability of an investment stimulus to create spinoff effects may be measured by the backward and forward linkages of the regional and national economy. For example an investment to manufacture a blowout preventor will induce inputs needed for this equipment. The forward linkage effects will induce the use of the blowout preventor as an input on a drilling rig to drill an offshore well. The impact of the stimulus on the regional economy could be substantial if several components of the blowout preventor are manufactured in the region. In addition, the production function would also require labour inputs in proportion to the kind of production process used. On the other hand, a

region with a different industry-mix and limited manufacturing base may have to obtain its inputs from one or more regions. Consequently, the stimulus will leak from the region. The extent of the leakage will depend on the strength of the backward and forward linkages.

A knowledge of the direction and magnitude of leakages is fundamental to the design and implementation of regional economic development programs and policies. The proposition may therefore be put forward that sectoral and regional impacts of the exploitation of Hibernia hydrocarbon resources off Canada's East Coast could effectively be analysed within a linkage-leakage framework.

4. INPUT-OUTPUT ANALYSIS AND LINKAGE STRUCTURE

A detailed technical review of input-output analysis is not intended in this study. The methodology employed is taken from already published sources. Reference is made, however, to detailed accounts presented elsewhere in the literature: Leontief (1966), Isard (1960, 1975), Miernyk (1965) and Statistics Canada (1981). Furthermore, the purpose of this study is not to develop a new method of regional analysis but to use an existing methodology in an alternative framework under different development assumptions. The maximization of industrial benefits from ocean resources, it has been suggested, may not require new approaches in geography but a "significant adaptation and adjustment of tried and tested methodologies" (Harrison 1980a). The relationship between input-output analysis and industrial linkage structure is discussed briefly below. A detailed description of Canada's interprovincial input-output accounting framework which was used for the impact analysis, and the mathematical structure can be found in the Statistics Canada User's Guide (Statistics Canada 1981: Chapter 7).

Industrial linkage structure is important to the regional development process, for the extent to which development stimuli will remain within a region depends on the relations between that region and other regions and with export markets. Disparities between regions would be greater if

there were significant leakages from regional economies to other regions. This is particularly true in cases where inputs needed in the construction and production of natural resource developments have to be imported from outside the regions because these projects take place away from large industrial centres. There is therefore the possibility that the potential for the related economic growth and employment opportunities would be reduced within the region but increased elsewhere. From a policy perspective the leakages from a regional economy redistribute wealth often at the expense of the region where the development is taking place. The interregional input-output model, by showing the structural relationship between regions, makes it possible to analyse these leakages (Richardson 1969). While it may not be necessary in a rearview study, forward looking research must be able to take into consideration a broad range of factors which could have potential impact if the results are to be useful for policy development. Forward looking research should not only be able to determine the impact of a given project investment but should also be able to project the employment and income output of such an investment. The input-output model ensures that projections for industries and sectors will equal the Gross Natural Product (GNP) assuming the structural relations of the economy do not change over the period of projection (Miernyk 1965:33). Thus the interprovincial input-output method of analysis is chosen for this study for two main reasons. First it is an accepted method of examining economic impacts of regional development. Second it is also a useful method for indicating trends which are essential to policy formulation and the design of supportive regional development program (Steele 1972).

There are two main types of national input-output models - an industry-by-industry model and a commodity-by-industry model. Although the statistics Canada's commodity-by-industry model was used in analysing the impact of Hibernia development a brief review of both models are presented below. Discussion of the industry-by-industry model is based on Yan (1969) and Miernyk (1965). Statistics Canada Users Guide (1981) on the other hand provides a detailed discussion of the commodity-by-industry model. Table III.1 shows a hypothetical flow of goods and services in physical units. The figures in a row show the distribution of output to various sectors. The figures in a column show

TABLE III.1

HYPOTHETICAL INPUT-OUTPUT TABLE (IN PHYSICAL UNITS)

OUTPUT TO / INPUT FROM	Intermediate use			FINAL USE	GROSS OUTPUT
	AGRICULTURE	MANUFACTURES	SERVICES		
Agriculture	80	160	0	160	400
Manufactures	40	40	20	300	400
Services	0	40	10	50	100
Labor	60	100	80	10	250

TABLE III.2

TECHNICAL INPUT-OUTPUT COEFFICIENTS

OUTPUT TO / INPUT FROM	AGRICULTURE	MANUFACTURES	SERVICES
Agriculture	.2	.4	0
Manufactures	.1	.1	.2
Services	0	.1	.1
Labor	.15	.25	.8

SOURCE: TABLES III.1 and III.2, Yan, Chiou-Shuang (1969) Introduction to Input-Output Economics New York: Holt, Rinehart and Wintson: 6, 17.

the sources of input needed for production. In an industry-by-industry model, the output absorption for any industry can be represented by the expression:

$$X_i = X_{i1} + X_{i2} + X_{i3} + \cdots\cdots X_n + y_i \qquad (3.1)$$

$$X_i = \sum_{k=1}^{n} X_{ik} + y_i \qquad (3.2)$$

Where: X_i = gross output of industry i

X_{ik} = intermediate demand

y_i = final demand for the product of industry i

Applying matrix notation to include all sectors in Table III.1 but deleting the last row and column, we obtain the matrix T which indicates the intersectoral flow of transactions[1].

$$T = \begin{pmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{31} & X_{32} & X_{33} \end{pmatrix} = X_{ij} \qquad (3.3)$$

Each column of T indicates the input structure of a sector. If T_i is the ith column vector of T then, T_i can be expressed as

$$T_i = \begin{pmatrix} X_{1i} \\ X_{2i} \\ X_{3i} \end{pmatrix} \qquad (3.4)$$

---

1 Upper case letters are used to represent matrices and lower case letters to represent vector or scalars.

Similarly, the final product vector Y and the gross output produced by all sectors vector X can also be expressed as follows:

$$Y = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} \tag{3.5}$$

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \tag{3.6}$$

Thus, the basic row relations of all sectors in the national economy can be represented as:

$$X = T_1 + T_2 + T_3 + \cdots T_n + Y_1 \tag{3.7}$$

An important assumption that is made about input-output relations is that of "fixed proportional of factor inputs" --- that is a change in the inputs requirements is proportional to the change in the level of output (Yan 1969:17). The importance of this assumption is that it makes it possible to calculate, from the data in a single input-output table, the input requirements of various output levels by using the technical input-output coefficients. The technical coefficients can be computed by dividing the various inputs of each sector by the gross output of that sector. Table III.2 represents the technical coefficients derived from Table III.1. If aij is the technical coefficient indicating the amount of product i required to produce a unit of product j then, aij can be expressed as:

$$a_{ij} = \frac{x_{ij}}{x_j} \tag{3.8}$$

$$x_{ij} = a_{ij}x_j \tag{3.9}$$

An intersectoral technical Matrix A can also be constructed to correspond to the intersectoral transaction Matrix T:

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \end{pmatrix} = \begin{pmatrix} x_{11}/x_1 & x_{12}/x_2 & x_{13}/x_3 \\ x_{21}/x_1 & x_{22}/x_2 & x_{23}/x_3 \\ x_{31}/x_1 & x_{32}/x_2 & x_{33}/x_3 \end{pmatrix} \quad (3.10)$$

The gross output or sales of sector i can be obtained by substituting equation (3.9) into (3.1):

$$x_i = \sum_{j=1}^{n} x_{ij} + Y_i = \sum_{j=1}^{n} a_{ij}x_j + Y_i \quad (3.11)$$

The output vector of the economy on the other hand can be expressed as:

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_n \end{pmatrix} = \begin{pmatrix} \sum_{j=1}^{n} a_{1j}x_j \\ \sum_{j=1}^{n} a_{2j}x_j \\ \sum_{j=1}^{n} a_{3j}x_j \\ \vdots \\ \sum_{j=1}^{n} a_{nj}x_j \end{pmatrix} + \begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \\ \vdots \\ Y_n \end{pmatrix} \quad (3.12)$$

The rule of matrix multiplication allows a matrix to be multiplied either by a number or by another matrix thus:

$$\begin{pmatrix} \sum_{J=1}^{n} a_{1|x|} \\ \sum_{J=1}^{n} a_{2|x|} \\ \sum_{J=1}^{n} a_{3|x|} \\ \vdots \\ \sum_{J=1}^{n} a_{m|x|} \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \\ \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & a_{n3} \end{pmatrix} \begin{pmatrix} X_1 \\ X_2 \\ X_3 \\ \vdots \\ X_n \end{pmatrix} + \begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \\ \vdots \\ Y_n \end{pmatrix} \qquad (3.13)$$

$$X = AX + Y \qquad (3.14)$$

$$Y = X - AX \qquad (3.15)$$

$$Y = IX - AX \qquad (3.16)$$

$$Y = (I - A)X \qquad (3.17)$$

$$Y = (I - A)^{-1}Y \qquad (3.18)$$

where: I = nxn identity matrix

$(I-A)^{-1}$ = inverse matrix

The usefulness of the inverse matrix, also referred to as Leontief's inverse matrix, is that it shows both the direct and indirect output requirements of final demand.

One of the limitations of a national input-output table for regional impact analysis is that exports and imports are all grouped together in one sector irrespective of their destinations or origins. This makes it impossible for optimal allocation of resources among regions. Furthermore, national input-output tables identify sectors only by their products and not their geographic locations. However, this problem can be resolved by constructing interindustry transaction tables for each region. The interregional input-output model can be derived from the

above national model by identifying the region r. Thus, xi becomes rxi where rxi represents the total output (x) of industry i in region r. The flow of goods and services from industry i in region r to industry j in region s may be represented as rsxij where s=1,2...n. As a result of these transformations, the relationship between inputs and outputs in any industry in the interregional model can be expressed as:

$$rx_i = \sum_{s=1}^{n} \sum_{j=1}^{m} rsx_{ij} + ry_i \qquad (3.19)$$

where:

ry_i = final demand for the products of industry i in region r

The interregion production coefficient on the other hand can be expressed as

$$\frac{rsx_{ij}}{rx_i} = rsa_{ij} \qquad (3.20)$$

where:

rsa_{ij} = inputs from industry i in region r to industry j in region s.

The above expression describes the interdependency and linkage between regions. In the productive process the input provision or the backward linkage effects will induce supply of the inputs needed in the production of a particular product. Similarly, the output utilization or forward linkage effects will induce the use of the outputs as inputs in some production. Hirschman (1961) has pointed out that forward linkage is not an independent inducement mechanism but rather an effective reinforcement to backward linkage. The anticipation of demand is a necessary condition for forward linkage effects to manifest themselves. If this is the case, then regional development programmes and policies must be directed to enhancing backward linkage effects as most of the raw materials needed by local suppliers is likely to come from the area.

The Statistics Canada's commodity-by-industry input-output model, a rectangular accounting framework, differs from the traditional industry-by-industry square model to the extent that it "abandons" the one-to-one relationship between industries and commodities. In the commodity-by-industry model each industry can produce more than one commodity and each commodity may be produced in more than one industry (Statistics Canada 1981 Chapter 4:1). Two matrices "U" and "V" form the basis of Statistics Canada's model. The "U" matrix shows the use of commodities by industries as current inputs. The "V" matrix on the other hand shows the outputs of commodities by industries. The combination of the two matrices determines the final demand similar to that generated by industry-by-industry model.

The Statistics Canada's model makes a distinction between "marketing or supply relationship" (fixed market share), and "technological or input relationships". Regarding industrial technology relationships the model assumes that, the primary inputs and current intermediate inputs into each industry are proportional to the output of the industry. This relationship is expressed as:

$$u_{ij} = b_{ij}\, g_j \qquad (3.21)$$

where: u_{ij} = input of the ith commodity into the jth industry

g_j = vector of industry j's output

b_{ij} = input of commodity i required to produce a unit of output by industry j.

In matrix notation the relationship can be rewritten as:

$$U_{(g)} = B\hat{g} \qquad (3.22)$$

where: U = matrix of commodity inputs

B = matrix of input coefficients

g = vector of total outputs

$\hat{g}$ = diagonalization of vector g

With respect to the industry technology assumption Statistics Canada points out that inputs into an industry do not change with the combination of commodities produced in that industry.

Total domestic demand for commodities produced by industries is allocated, under the commodity-by-industry model, among industries based on the assumption that market shares are fixed. The allocation can be expressed as:

$$V_{ij} = d_{ij} q_i \tag{3.23}$$

where: V_{ij} = output of the ith commodity by industry j

d_{ij} = jth industry's market share of production of the ith commodity

q_i = total domestic output of ith commodity

Expressed in matrix notation the relationship can be rewritten as:

$$V_{(q)} = D_{\dot{q}} \tag{3.24}$$

where: D = nxm matrix of domestic market share coefficients

q = vector of total domestic outputs of commodities

$\dot{q}$ = diagonalization of vector

Although the market share assumption implies that imports of a commodity represent a fixed proportion of domestic demand and that exports of a commodity are supplied solely by domestic industries. But exports may contain imported parts used as intermediate inputs. Thus, regional economic diversification policies should encourage both the development of backward and forward linked industries especially in areas with limited manufacturing base. Such policies could result in the establishment of branch plants which may not necessarily use inputs produced in the region. Such branch plants could form the basis for future diversification of the region.

5. EMPIRICAL METHODOLOGY

Capital equipment sourcing for offshore hydrocarbon development is a complex process of technology and know-how transfer, joint ventures, licensing agreements, subcontracting, and a desire to obtain a greater share of the offshore supply business and thereby increase the national and regional content levels. This complex process is further compounded by the uncertainty and size of the market share, demand for specialized equipment and intensive competition among suppliers. An input-output analysis could enable an analyst to examine the linkage-leakage forces which may influence the economic activities of a region while at the same time take into consideration the regional growth experience, the industry mix, the location characteristics and the readjustments needed to reallocate resources to improve regional prosperity (Richardson, 1969:345-347).

The economic impacts of capital equipment expenditures for offshore hydrocarbon development could be noted in two ways; first in the form of linkage effects with suppliers and second through the growth induced effects because of the payments to labour in the form of wages and salaries. These impacts set in motion a multiplier process whereby the initial capital expenditures are passed back through the backward linked activities and non-capital goods sectors. The result is a total amount of production far greater in size than the initial investment. The absence of important supply sectors within a region or the size of the region could however, influence the economic impacts for leakages are fewer and the multiplier higher if wages are higher, the net profit greater and the region bigger (Archer and Owen 1972).

Input-output analysis has been used in other studies to examine the economic impacts of offshore hydrocarbon development. In the United States for example Harris' modified input-output model has been used by the Department of Interior to analyse the economic impacts required for the Environmental Impact Statements (EIS) in the Offshore Leasing

Process (Harris and Hopkins 1974). Grigalunas (1975) has also used input-output analysis to examine the potential impacts on New England States of offshore hydrocarbon development. In Canada, input-output analysis has been employed in a number of unpublished and published studies to assess the impacts of development activities on the East Coast. The published studies known to the author dealing with Canada's East Coast hydrocarbon activities which have utilized input-output analysis include DREE (1972) and Harrison et al (1981). However these studies either did not use the more detailed Department of Industry, Trade and Commerce's equipment items and cost estimates or examined only the general impacts of the potential offshore oil and gas development. The specific equipment sourcing issues were not examined.

a) Questions

The preceeding discussion raises several questions. These questions may be distilled into the following:

- What would be the impact of Hibernia capital equipment sourcing on the Atlantic region and the rest of Canada?

- Which sectors of the regional and national economy would be most impacted?

- In view of the mixed results of previous federal resource based regional development programs, what initiatives have to be taken if Hibernia development is to succeed as an essential engine of regional economic development?

To help answer these questions, I will briefly describe the input-output model and some of its limitations. The production process generates a long chain which links material, human, and technological resources available in a regional or a national economy. There is therefore a strong interconnection of many industries in the process of production. These interconnections make possible the study of technological interdependence as well as the tracing of a manufacturing activity through the economic system.

Statistics Canada interprovincial input-output model consisting of 602 commodities and 191 industries is highly disaggregated. Many of the entries in the matrices are therefore confidential. For this reason, the results of the calculations for public use are usually published at two levels: level S and level M. Level S consists of 16 industries and 49 commodities. Level M on the other hand consists of 43 industries and 100 commodities. The results of this study were produced at the M level. The interprovincial model is formulated to trace firm by firm transactions across provincial boundaries in response to specified demand conditions. For example, production in one province may require inputs from a second and in turn that input may be drawn from industries in other provinces. The model also allows an industry to produce more than one commodity. The model provides a comprehensive and detailed presentation of the origin and deposition of individual commodities and their cost structures. The accounting relationships embodied in the model describe the structure of demand and productive activity for a particular year; in this case 1974. At the time the computer simulations were done the 1979 coefficients had not been finalized. Apart from the cost, however, I believe the results which the 1979 input-output model will give would not change significantly, the direction and magnitude of the impacts.

Statistics Canada interprovincial input-output model is available in two forms: the "open" model and the "closed" model. The open model is formulated to trace demand throughout the business sector of the economy. The incomes generated in the business sector which accrue to the household sectors as wages, the government sector as taxes, and the foreign sector as profits, are modelled as "leakages". The open model assumes that the project investment will not stimulate an increased demand for consumer goods and services. While such an assumption is unrealistic, the open model has the advantage of making it possible to analyse a specific sector of the economy and how it responds to investment stimulus.

The closed model on the other hand, assumes that incomes accruing to the household during the production process are re-spent on consumer goods and services, taxed or saved. In this model personal income,

taxes, and savings are leakages from the household. The main difference between the open and the closed model is that in the closed model transactions between the household sector and the other sectors of the economy, for example unemployment insurance benefits, old age pensions, family allowances and personal taxes are not consolidated but shown separately (Statistics Canada 1981:15). Thus, households are treated as an industry producing labour and capital services which are intermediate inputs into industries. The closed model was chosen for this study because it corresponds more to the real situation in Atlantic Canada particularly during the initial period of offshore hydrocarbon development. Because of the seasonality of employment in the fishing and forestry industries, workers in Newfoundland, for example, rely on unemployment insurance payments to supplement their annual income. The Hibernia project would affect the total unemployment insurance payments in the Province as most of the workers in seasonal jobs who are now under employed would be expected to find employment in the offshore oil and gas sector or related sectors and work year round. The region also has a limited manufacturing base and taxes are relatively high compared to Ontario or Alberta. The disposable income of the residents, and therefore their demand for goods and services, could be limited by high taxes. High taxes could also affect the impacts of both the indirect and induced effects on a regional economy.

The Statistics Canada interprovincial input-output model, like all input-output models, has certain limitations. Because the linkages traced are dated, and the relationships give a map of the economy for a single year, the application of the model assumes that future economic growth will be chanelled along identical lines. For this reason the model permits only a very narrow statistical and historical approach to the estimation of subsequent rounds of expenditure generated by an initial investment injection. Developing policies and programs based solely on the results of a model that provides a snapshot of the inner workings of a complex and changing economy or on the economic relationships that existed in 1974 may not produce the desired results. For these reasons the input-output results are supplemented with other empirical analyses in order to gain a better insight into the regional and national economy.

The offshore oil and gas industry in Canada is in its infancy, or exploratory stage. It is therefore not sufficiently incorporated into the Statistics Canada interprovincial input-output model. While an attempt was made to graft the dynamics of the offshore oil and gas industry onto the 1974 model, assumptions had to be made about the pattern of secondary demands generated. Furthermore, the confidence associated with the Atlantic Canada data used in calculating interprovincial coefficients is low. This is due in part to the sampling procedures. While the low provincial multipliers for Atlantic Canada may suggest high leakages it is likely that the leakages may be reduced once development starts; or they may be influenced by local procurement requirements that some provinces insist on. Thus, there is the possibility that the full impact of the huge investment for Hibernia on Atlantic Canada may be underestimated.

Another critical limitation is that input-output models are linear and proportional. This implies that supply of intermediate and primary factors are perfectly elastic and that there are no additions to capital stock. Proportional relationships are also assumed for all goods which might enter as inputs into the production of good X or as inputs into X's inputs. The stability of the relationships between inputs and outputs is therefore very important to impact analysis. It must also be kept in mind that input-output models do measure increased demand for government supplied goods and services which may result from increased tax earnings and in a province like Newfoundland, this may be very important.

Input-Output models, when used for impact analysis provide three different sets of results about the way in which project investments affect the economy: direct effects, indirect effects and induced effects. The direct effects are felt by the particular industries whose output is used in developing the project. The net results of the direct effects are the income generated and the existing employment sustained or additional employment created in producing the goods and services purchased for the project. The indirect effects are created by industries which supply inputs to the industries whose production are

purchased by the project sponsors. Induced effects generally represent the increase in economic activity generated over and above the project spending. The induced effects are generated as a result of the spending of household income generated in the process of supplying goods and services to the project or inputs to the production of goods and services demanded by the project. For example, casing purchases would represent a direct effect, the steel industry purchasing coking coal to produce steel an indirect effect, and the purchase of local produce by a catering company to prepare restaurant meals an induced effect. In general the indirect and induced effects are often larger and thus more important to a regional economy than the direct effects. Since this study was not funded, the results of the indirect and induced effects have been grouped together to reduce the number of simulations and cost.

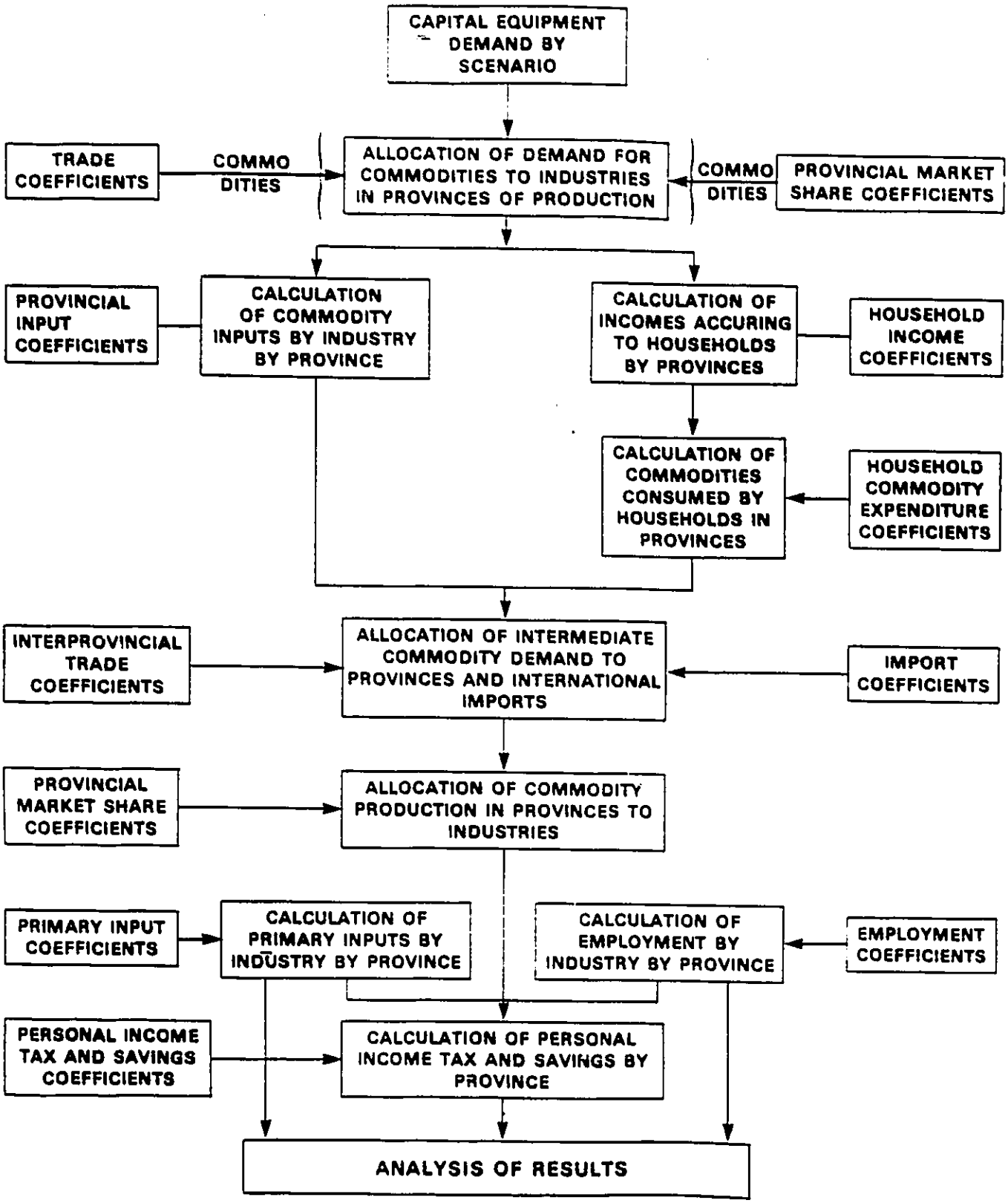
For the purpose of this study, the analyses of regional impacts begin after the final decision to develop the Hibernia field has been made. For this reason, environmental and social factors are not directly taken into consideration in the empirical framework. The argument being made is that the environmental and social concerns and mitigating measures are best addressed during the environmental impact assessment review process.

6. ANALYSIS

To answer the above questions the 1974 Statistics Canada interprovincial input-output model was employed. Figure III.1 summarizes the stages in the analysis. The capital equipment expenditure profile for Hibernia, prepared by the Department of Industry, Trade and Commerce, was allocated to the model's industrial categories. Newfoundland was specified as the initial source of supply. The allocation was done based on the advice of offshore oil and gas engineers and procurement experts. Following the allocation the model then assigned final demand for commodities produced to the industries in the province that produce the commodities in question. Commodities required as inputs in industries in each province is then calculated by multiplying the vectors of input coefficients by the corresponding activity level of each industry in each province.

FIGURE III - 1

INTERPROVINCIAL INPUT - OUTPUT - ANALYTICAL METHODOLOGY



SOURCE: BASED ON STATISTICS CANADA (1981), USERS'GUIDE: STRUCTURAL ECONOMIC MODELS, OTTAWA : STATISTICS CANADA.

The next stage is the calculation of incomes in the business sectors that accrue to provincial households, in the form of wages and salaries, by multiplying the level of activity of industries in provinces by a corresponding household income coefficient. Incomes accruing to households from outside the business sector, for example transfer payments, are treated by the model as an exogenous variable. The demand for consumer goods and services in each province is calculated as a function of household income in each province. The household expenditure coefficients are computed by dividing the provincial consumer expenditure sectors by the corresponding incomes.

By multiplying the total use of a commodity in a province by the corresponding set of interprovincial trade coefficients or the international import coefficients, the model then allocates the demand for commodities in provinces to the provinces that produce the commodities or to international imports. Using the provincial market share coefficients the model then assigns the production of commodities in provinces to the industry within each province.

The final stage involves multiplying the activity levels in each province by corresponding primary inputs coefficients to calculate the primary inputs by industry by province. Employment coefficients are computed by dividing estimates of employment by industry in each province by the levels of provincial industry output. With these coefficients the model then calculates employment in person-years by industry by province. Finally the model calculates personal income taxes and savings by province. The results of the input-output analysis are discussed in Chapter V.

7. INDEX ANALYSIS

Indices have been employed in a variety of studies over the years; as a measure of welfare and price stabilization (Rogerson 1980), as an indication of the degree of rurality (Cloke 1976), as a measure of

regional variation in industrial performance (Strong 1983) as a measure of input, output and productivity (Caves, Christensen and Diewert, 1982) and as an indication of the earning capacity and financial power of stock companies (Hecker 1978). Indices have also been used to indicate changes in consumer prices (Cagan and Moore 1981), (Afriat 1977) and (Fisher and Shell 1972). Statistics Canada also publishes a monthly report of consumer price index. Stock Markets use indices as a measure of stock trading - New York Stock Market's Dow Jones Index and the Toronto Stock Exchange 300 Composite Index being two examples.

The use of index numbers is reported to have originated in 1764 when it was first used to measure changes in purchasing power of money (Mudgett 1951). Allen (1975) however, points out, in his excellent book on the subject, Index Number in Theory and Practice, that the serious use of index numbers as an analytical technique began with the classical works of Edgeworth in the 1880's and Bowley in the 1920's. It is little wonder then, given its long history and extensive use, that some economists make the argument that all empirical work in economics involves data that has been generated by "applying index numbers for either deflation procedures and/or aggregation purposes" (Eichhorn et al 1978 :207).

Although the term "index" is sometimes restricted to ratios or absolute figures used to express economic facts in a concentrated form (Hecker 1978), it is also used as a practical construct to measure:

> "... changes in the magnitude from one situation to another. The two situations compared are in no way restricted; they may be two time periods (e.g. two years), or two situations in a spatial sense (e.g. two regions of a country) or two groups of individuals (e.g. one or two-pensioner families)." Allen 1975 :2).

An index number can also be used to indicate an increase or decrease of a magnitude which may not directly be observed but which definitely influence other observable quantities or ratio of price levels. (Afriat 1977).

Despite their wide use indices have a number of shortcomings. For example there is a great deal of political significance attached to the Consumer Price Index (CPI) partly because of its use in wages and salaries negotiations. However, the CPI does not allow for substitution of lower priced products which go with the basket of goods and services nor does it cover income taxes and savings, (Cagan and Moore 1981). Strong (1983) in his study of regional variations in industrial performance in the United States identified antoher shortcoming of the use of indices in empirical analysis. Strong points out, after examining the cyclical behaviour of four industries from 1947 to 1980, that regional industries appeared to be least affected by recessions or expansions if the data were highly disaggregated spatially, an issue also raised by Cloke (1976); or sectorally, and concludes that:

> "Given the difficulty of targeting countercyclical policies to specific firms, the regional aggregates may also provide the best available basis for assessing stabilization needs" (Strong 1983 :443)

Other factors which also have to be taken into consideration in index analysis are weighting and testing of the formulae used. Allen (1975) and Fisher (1967) together address in great detail these and other issues related to index analysis. Since my objective here is to apply the index analysis technique in examining regional manufacturing capacity of industries these factors, and other technical aspects of indices are not discussed in this study. The question that I want to address here, however, is what is the fundmental purpose of using indices for this part of the empirical analysis? The best answer to this question was provided by Fisher (1967) who stated that:

> "The fundamental purpose of an index number is that it shall fairly represent, so far as one single figure can, the general trend of the many diverging ratios from which it is calculated. It should be the "just composite" among conflicting elements, the "fair average", the golden mean" (Fisher 1967 :10).

In this sense the index method is employed for the following empirical analyses to indicate a general trend and/or a magnitude of change - increase of decrease, as well as a proxy measure of the capacity of regional industries to respond to sourcing intentions.

8. LOCATION QUOTIENT

The location quotient has been used by a number of researchers as the principal technique for disaggregating national input coefficients to the regional level. According to Isard (1967) location quotient analysis can be used to study a region's share of an industry with respect to the portion of the industry's household market using income data; or labour productivity using value added; or welfare conditions as per capita distributions using population; or orientation of companies or geographic linkages using employment. Apart from Isard other researchers including -- Weiss and Gooding (1968), Garrison (1972), Gordon (1973), Mayer and Pleeter (1975), Archer (1976), Isserman (1977), Steele (1977), Gibson and Worden (1981), Miernyk (1982, 1965), and Norcliffe (1983) have examined the theoretical basis, technical aspects and strengths and weaknesses of location quotient methodology. Isard (1967) defines the location quotient for a given industry (i) as:

$$\frac{\text{number of wage earners in industry i in a given state}}{\text{number of wage earners in manufacturing industry i in the nation}}$$

$$\frac{\text{number of wage earners in all manufacturing in the state}}{\text{number of wage earners in all manufacturing in the nation}}$$

Isard goes on to define a simple interregional trade multiplier as:

$$\frac{\text{region's income}}{\text{region's investment plus export}}$$

This compares with input - output multipliers by being an expenditure multiplier. However, input - output multipliers are specific for each sector or industry, whereas economic base multipliers are for the entire region and therefore insensitive to differences among industries.

It is this basic formula, or variations of it, that has been used in location quotient studies; using bases such as income, value added or population. The location quotient is a useful analytical tool for showing differences in industrial structure and the degree of specialization between ares (miernyk 1982;16). It can be used to show whether a particular region (province) has a greater share of the market than would be expected if manufacturing activities were evenly distributed across the country. A region with a location quotient of less than unity means that region has less than its 'fair' or proportionate share of the particular industry; while a region with a location quotient greater than one means that region has more than a proportionate share of the production of that industry. In this study the location quotient is used as an indication of the relative economic or industrial specialization in each province (Jenkin 1983). The use of shipments, rather than employment, in analyzing industrial specialization of provinces is intended to further emphasize interprovincial manufacturing linkages.

One of the reasons why location quotient analysis has been used extensively in regional impact studies is that it can be computed inexpensively with considerably less data and calculation. However, the location quotient has a number of limitations and should not be used in isolation as the results can be meaningless if factors such as differences in taste, industrial mixes and production consumption patterns are not taken into consideration. Norcliffe (1983) has used a modified location quotient method to estimate the economic base and trade flow between provinces which incorporates both patterns of production and consumption. Norcliffe's approach was an attempt to take into

consideration the open nature of the Canadian economy which has a significant surplus in primary products trade and a deficit in manufacturing trade. In addition federal equalization payments and public sector employment are significant components of some provincial economy. The results of Norcliffe's study suggest that the use of consumption measure increased the size of the location quotient in the core provinces and reduced it in the periphery provinces (Norcliffe 1983 : 165). Another limiting factor is that industries vary in their purchases, salary and other expenditure levels from other industries in the region; thus, their impacts may vary. This fact may be ignored because of the aggregate nature of the multiplier.

The result and accuracy of location quotient analysis are also affected by factors such as cross-hauling, disaggregation, consistency, and stability of the data used. Mayer and Pleeter (1975) have pointed out that the general assumption that average income in all regions must be the same in order to use location quotient analysis is incorrect. They argue that a location quotient can correctly indicate the export orientation of the region provided there are no differences in taste or brand preferences. Cross-hauling often exists where a region does not consume only the local production of the products it exports. Often, a region may import and export the same products because of brand preferences or an industry may import some products while exporting others. The difficulty with respect to location quotient analysis and cross-hauling arises because import and export data are not always disaggregated but are often included in the same category in the industry data. This is a problem of industrial classification and selection of appropriate regions and sectors for which data is available (Isard 1967: 326). When data used in computing location quotients for a region include imports in a category which the region also exports, the location quotient will underestimate exports and overestimate the multiplier. The multiplier is lower when a lower level Standard Industrial Classification is used. Isserman (1977) illustrated the sensitivity of the multiplier to

the level of aggregation of the data used by reporting that at the three digit level (SIC 201) the multiplier for the meat products industry in Philadelphia, was less than one; and no export activity for the industry was identified in 1972. When the data for the meat products industry was disaggregated to the four digit level (SIC 2013) 2165 export jobs in sausages and other meat products were identified. Thus, the results from the disaggregated data showed that at the three digit level of data Philadelphia did not have more than its share of employment in the meat products industry but at the four digit level of disaggregation Philadelphia had its share of the market in sausages and other meat products.

Norcliffe (1977) has also examined the issue of disaggregated data in analyzing variations in regional productivity. While acknowledging that disaggregated data would have been preferred for his analysis, if it had been available, the use of the 'imperfect' classification did provide considerable insights into provincial productivity variations (Norcliffe 1977:399).

Another factor which affects the sensitivity of location quotient analysis especially where there are cyclical fluctuations in interregional imports and exports is the stability of disaggregated data over time. In small geographically depressed regions with a limited number of establishments or limited demand the opening or closing of a major manufacturing establishment or a significant increase or decrease in income can set off cyclical expansion or contraction in all regions. The effects of such cyclical changes may be delayed because of the method of data collection and reporting. In such situations it is difficult to explain quantitatively, sudden swings or jumps in results of analyses. The size of the region, geographic scale of operation of the industries

within the region, the type of manufactured goods, durable or nondurable, the existence of growing or declining industries, the rate of regional growth and degree of diversification are factors which can affect the stability of the data in location analysis or the channelling of these factors in a fused framework (Isard 1967 :629).

9. CAPITAL AVAILABILITY

It is often difficult, because of business confidentiality, to find out whether sufficient manufacturing capacity exists in a region where major capital development projects are being undertaken for industries to participate in the development without plant expansion or purchase of new equipment. Lack of sufficient or excess capacity may also affect a region's industry ability to meet delivery schedules. Inadequate manufacturing capacity can result in a contract being awarded to a company in another region or to an international competitor. For these reasons a knowledge of manufacturing capacity particularly in economically depressed areas would be a useful tool in helping to target government assistance programs to industries which could benefit most from such programs and thereby provide long-term employment in the region. This information could also help to better manage the boom-bust cycles which often characterize regional economic development. The capital availability method is presented as one technique for analyzing the availability of manufacturing stocks and as a proxy indicator of manufacturing capacity.

Statistics Canada uses the perpetual inventory method to formulate capital stock data. Under this method assets are depreciated in equal amounts over a ten-year period. This is comparable to a tax depreciation method since in practice capital assets are present and in useful economic production, particularly in economically depressed regions, long after they are 'retired' for accounting purposes. The Canadian average service life

for manufacturing assets is 50 years for engineering construction, 45 years for building construction and 21 years for machinery and equipment (Statistics Canada 1987 : xvii - xx). Under the perpetual inventory method the net assets for an industry in 1962, for example, are composed of nine-tenths of the undepreciated assets from 1961 plus the assets acquired in 1962. The remaining 1961 assets are then carried forward until they are fully depreciated by 1970.[I] The capital availability calculation is being used in this study as an index to measure changes in the magnitude or trend of capital stocks for different periods in different provinces. It is a simple percentage, based on net capital, and is defined as:

$$CA = \frac{\text{NET CAPITAL IN INDUSTRY X IN PROVINCE Y}}{\text{NET CAPITAL IN INDUSTRY X IN THE NATION}}$$

The net capital stock represents the total monetary value of both building, construction related engineering and machinery and equipment at the end of the year. The reason for using net capital stocks rather than gross stocks is that Canadian suppliers would have to bid on contracts quickly and within a limited lead time for Hibernia related business when tenders are awarded, or would have to be re-qualified on existing capacity to undertake a contract. This would allow little chance to build up capacity in the short run. Clearly, any anticipatory capacity creation would appear in the net assets data.

The capital availability ratio, as used in this study, indicates a general trend in the increase or decrease in capital assets in various sectors in the different provinces. It is a simple way of identifying a region's share of capital assets or its comparative ability to

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respond to short run increases in manufacturing demand. It differs from the basic location quotient formula in one respect, that is, it is not weighed by a ratio of total assets in all manufacturing in the province to the total manufacturing assets in the nation.

10. CAPITAL CONSTRAINT INDEX (CCI)

Although input-output models by themselves are useful tools for impact analysis they do not address the impact of a stimulus to investment which might result from an increase in business earnings or from the demands on capacity of manufacturing establishments reaching their limits. The models also do not account for new opportunities for import substitution arising as a result of a project investment expanding the Canadian market for a particular good or service because of changing economics of scale.

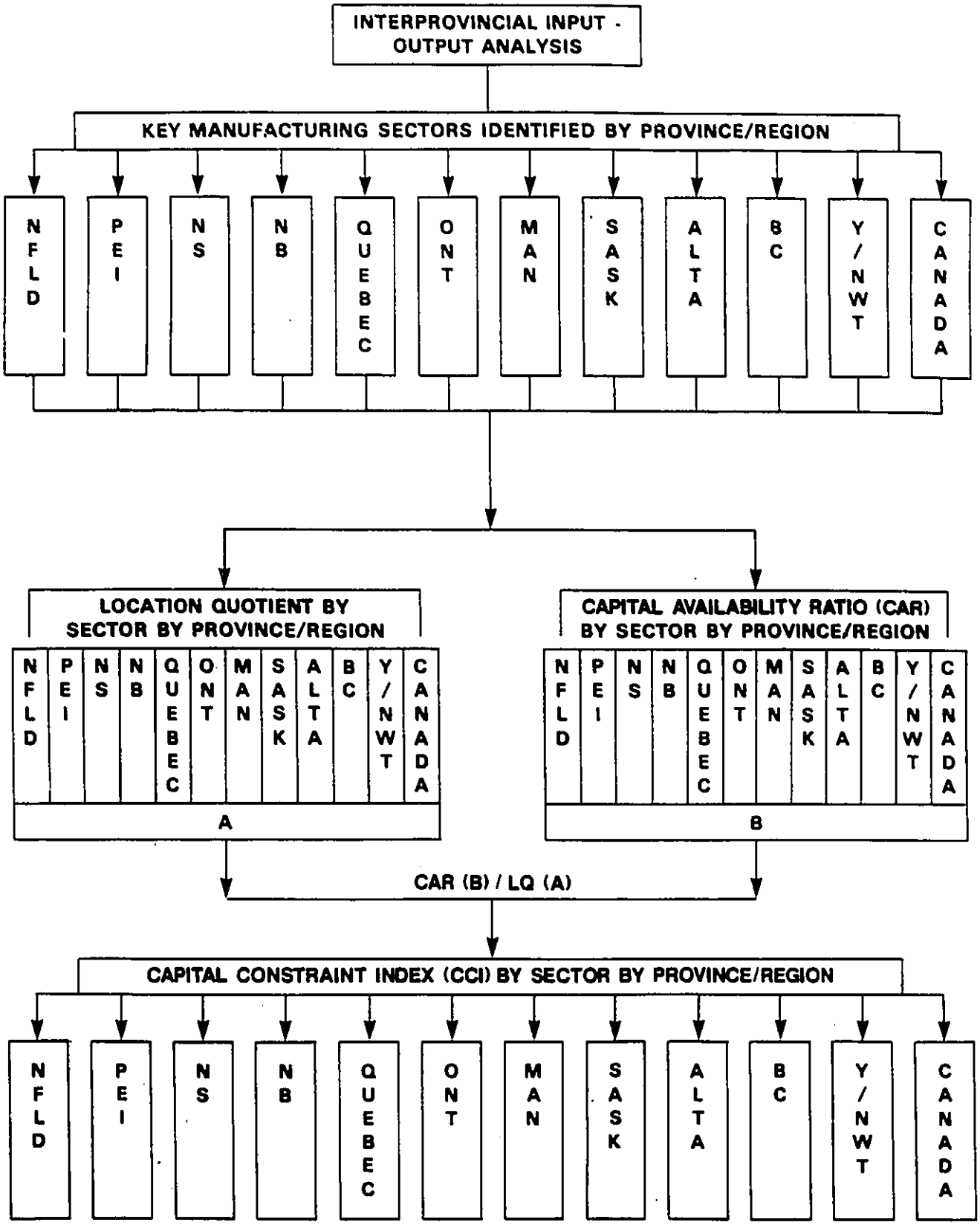
The input-output analysis and the identification of key sectors of the economy critical to the development of Hibernia offshore hydrocarbons is only part of the capital equipment sourcing equation. The other side of the equation is the ability of national and local industries to compete for a share of the offshore oil and gas supply market. The ability of Canadian firms in this regard will depend on existing and potential capacity, present market share, the adaptive capacity of the firms and past performance. In recognition of these important factors, Gaston and Bedard (1980) have suggested that the Canadian interprovincial input-output model be used in conjunction with the knowledge of capacity, sources of supply and markets for regional economies with limited manufacturing base and where a significant growth would lead to major structural changes

The capital constraint Index (CCI), which is used here as an indication of a manufacturing establishment's ability to respond to capital equipment sourcing opportunities, is presented as one possible method of incorporating these factors into a regional development framework. This method brings together the concepts and results of the input-output analysis, the location quotient analysis and the capital availability ratio analysis into a single decision-making process, Figure III.2. The CCI is defined as the ratio of the capital availability to the location quotient. The importance of the use of the concept of capital availability lies in its relationship to actual output. The gap between actual output of an industry or an economy in general and its potential output can be measured in terms of operating or utilization rates. High operating rates should, other things being equal, induce firms to add to their capacity through investment (Zohar 1982:16).

Thus, the capital constraint index is a resultant which shows a "bundle" of goods, that is capital assets, which can be used to manufacture or create new assets. Existing capacity is used to produce new shipments. Given the core-periphery dichotomy of the Canadian economic structure, the core with its greater demand and diversified markets is likely to use its capacity more quickly that the periphery. Besides, the core has greater ability to replace or acquire more capital in view of the concentration of the markets there. Additions to capital in the periphery regions are not likely to be gradual and sustained but rather sudden and in response to major investment stimuli. Also, downturn in economic activities in the periphery would have a greater impact on industries. For these reasons one would expect wide fluctuations in the graph due to expansion or contraction in assets of industries in the periphery than in the core.

FIGURE III - 2

CONCEPTUAL FRAMEWORK - CAPITAL EQUIPMENT SOURCING



The capital constraint index indicates the use of existing assets to produce shipments in a given province from 1961 to 1981. Hence, the specific threshold, upper or lower bound, has not much significance in this study. What is important is the overall trend and whether, over time, excess capacity sectors eventually shift into "constrained" capacity. The trend could also be viewed as an indication of shifts in investment cycles. The underlying assumption here is that without demand for goods and services (shipments) from a particular sector there would be no new investments and the assets would be fully depreciated by the end of the tenth year of the analysis. This however was not the case. It is also worth pointing out that as the index increases, capacity is less constrained and responses to investment stimuli are more easy to make; as it decreases the opposite is the case.

II. DATA SELECTION

In order to apply an index technique in examining regional manufacturing specialization and the capacity of regional industries to meet the capital equipment demand of development projects, such as Hibernia, two sets of data were used. Location quotient ratios were computed using the monetary values of goods shipped by the industry in the province. The problem with the use of this kind of data is that one cannot determine the destination of the shipments. What is of greater interest in this analysis is the industrial capacity available in the region, the question of destination is secondary. Capital availability ratios were derived using the monetary values of the net capital stocks of manufacturing industries in each province. The use of monetary values rather than the quantity of goods produced or the number of workers employed was to overcome the problem of regional differences in productivity per worker or in the quantity of labour.

Statistics Canada conducts an annual census of manufacturers using detailed questionnaires mailed to manufacturing establishments in Canada. The manufacturing census data are then supplemented with information obtained from the records filed by the companies with Revenue Canada (Statistics Canada 1983a). The data used to compute the location quotient ratios were collected in this way. A manufacturing establishment, which is either a factory, plant or mill, is defined as:

> The smallest unit which is a separate operating entity capable of reporting the following principal statistics: materials and supplies used, goods purchased for resale as such, fuel and power consumed, number of employees and salaries and wages, man-hours worked and paid, inventories, shipments or sales (Statistics Canada 1979a:11).

Although most establishments conduct their production activity at a single location, in certain cases some manufacture in more than one municipality or more than one province. To facilitate the reporting of geographical statistics for subprovincial areas and provinces; Statistics Canada requests all manufacturing establishments to report principal manufacturing statistics for each operating location or plant.

On the basis of gathering and reporting I believe the data used for the empirical analyses could provide results to draw inferences about provincial industrial sectors. The empirical analyses cover the period 1961 to 1981. This period was selected to cover both boom and bust economic times, as well as, the energy crisis of the 1970's; a crisis that significantly affected many industries.

As Appendix VI.1 shows, there were no significant changes in the Standard Industrial Classification for the industries selected for the empirical analyses. At the three digit level the classification was the same for 1970 and 1980. A review of the 1960 list also showed no changes. For boiler and heat exchange, machine shop, shipbuilding and repair, boatbuilding and repair and ready-mix concrete industries the classifications were the same at both the three and four digit levels. The level of aggregation of the analysis is important as Isserman (1977) has demonstrated that using Standard Industrial Classification data at three and four digit levels helps to improve the accuracy of location quotient. Thus, any shift in the time series analysis cannot be attributed to changes in the classification or make up of the selected industries.

Statistics Canada also publishes for each province at the three digit level of the Standard Industrial Classification (SIC) fixed capital stocks for manufacturing industries. The data, which are published for construction-building and related engineering, and machinery equipment were used in deriving the capital availability ratios (CAR). Statistics Canada uses the "perpetual inventory" method to formulate the Capital Stock data. This method has three basic components - the initial capital stock estimates by industry and province, annual investment by industry obtained from the manufacturing census, and estimates of average economic lives of the assets used in the various industries. The wear and tear and obsolescence the assets undergo during their service life, which is assumed to be ten years, are accounted for in this method (Statistics Canada 1982h, :111). The assets are depreciated in equal amounts over the production life. As there are no data on the average economic lives of provincial capital stocks adjustments are made to reflect provincial situations.

The assets of a manufacturing plant would be determined in part by the size of the operation, the size of the region of operation, and the size and distribution of its market. The reason for this is that large-scale manufacturing establishments in general are able to undertake greater investment in machinery and specialized equipment. This enables them to spread the capital costs over a large number of units of output. However, such establishments need a certain minimum level of efficient

production to benefit from scale economies. Large-scale establishments or clustering of establishments, such as the clustering of ocean industry establishments discussed in Capter V, generate economies of scale through backward linkages. Consequently, these establishments are able to obtain preferential terms from their suppliers because of the volume of the orders. Large-scale establishments may also be able to obtain favourable freight rates on large consignment of full carloads resulting from the volume of their purchases.

These factors should therefore be kept in mind in using capital availability ratios to draw conclusions, as Ontario and Quebec capital stock retirement patterns would have influenced those of the other provinces. Another limitation in using the Capital Stock data is that the method used in deriving the estimates assumes that each province has equal access to the same technology. In practice this assumption is unrealistic because manufacturing establishments in Ontario and Quebec would have a greater ability to raise capital, and have the economies of scale which would make it easier to have greater access to more advanced and latest technology compared to establishments in Newfoundland or Prince Edward Island for example.

Statistics Canada is prohibited by law from publishing any statistics which would identify a business in areas where there are fewer than three companies or at least three of these establishments are dominated by one of two companies without the written consent of that business. For competitive business reasons companies are reluctant to give such consent or provide the information themselves for research. In order to provide systematic publication of data while at the same time avoid disclosure of competitive detailed information Statistics Canada produces for public use aggregated or summary data. The publication of this data takes into account the economic significance of the industry in the province or region of manufacture and the maintenance of historical continuity of the

order, for example two-digit SIC groups, data over higher order four-digit groups.

The confidentiality rules which govern Statistics Canada's data publication mean the data published have to be aggregated or tables have to be incomplete have been the major criticisms against empirical analyses which use such information. I would therefore like to address this issue now. The point which is often over-looked with Statistics Canada's data is that the aggregation is based on the basic information submitted to the Agency in accordance with legislation. The issue then is not the aggregated data per se but whether the data is appropriate for the analysis being undertaken. There are times when no meaningful conclusions can be drawn from very disaggregated data because the information cannot be generalized. The main objective of the location quotient and capital constraint analyses is to find out the magnitude and direction of regional manufacturing specialization and whether capital assets are available, using the best available indicator, which would enable regional industries to manufacture capital equipments for major development projects such as Hibernia. I believe the three-digit level of aggregation is appropriate for such analyses.

Apart from the issue of disaggregation, there is also the question of the experience, resources, and the credibility of the Agency publishing the data. Statistics Canada have been publishing statistical data for decades now and have developed over the years the resources and expertise, usually not available to any single researcher, in collecting, analyzing and publishing statistical data. In my view there is no other central Agency, apart from Revenue Canada; from which it also obtains supplementary information, specializing in data gathering, verification and analysis which is better qualified, in the country. By having access

CHAPTER IV
REGIONAL ECONOMIC DEVELOPMENT IN CANADA

1. INTRODUCTION

There has been over 50 years of regional development policy in Canada; beginning with the Prairie Farm Rehabilitation Act (PFRA) of 1935, revamped with the major federal policy endorsing large-scale natural resource development (Weaver and Guntor 1982), to the recent announcement regarding the establishment of a new Department of Industry, Science and Technology; the Atlantic Canada opportunities Agency (ACOA) and the Western Diversification Office (Office of the Prime Minister 1987a, 1987b and 1987c). However it was not until the early 1960s that the federal government, in an attempt to address persistent regional disparities in the country, began an intensive effort to promote regional development in Canada.

As Canadian regional development policy has been shaped by a number of theories this chapter begins with a review of some of these theoretical frameworks. This review is followed by a discussion of federal-regional development policies and programs which have had impact on Atlantic Canada. Like all major natural resource development, the Hibernia project is expected to generate business and employment opportunities not only for the area of operation but also for surrounding regions. Because of its scale and the magnitude of the investment, the Hibernia project will act as a lead industry exerting "growth generating" forces on the Atlantic regional economy; through structural interdependence linkages and income multiplier linkage networks (Erickson 1974). For this reason, Chapter IV ends with an analysis of regional manufacturing specialization and regional differentiation in manufacturing capacity. Such an analysis provides an indication of the industrial sectors likely to respond to Hibernia capital equipment sourcing both in the Atlantic region and other parts of Canada. It also provides a basis for developing policies which would target government development assistance to industrial sectors which would benefit most.

2. APPROACHES TO REGIONAL DEVELOPMENT IN CANADA

Several theories, either singularly or in combination have directly or indirectly been used to explain the process of or to provide a framework for regional economic development in Canada. These theories include staple, neoclassical and regional science (Economic Council of Canada 1977, Drugge 1987, Courchene 1986, and Savoie 1986). The range of theoretical approaches to regional development in Canada stems in part from the number of factors which have over the years combined to shape the Canadian economy including the shift in manufacturing activities from the primary to the service sectors, rapid unbanization, and the pattern of ownership of resources and manufacturing activities. Consequently, regional development policies have reflected the various theoretical constructs (Drugge 1987). However, the development of natural resources has and continues to have a major influence on Canadian economic development and thus, the economic and social well being of Canadians.

Neoclassical regional theory emphasizes the role of free market forces and interregional factor mobility in balancing differentiated regional development. Neoclassical theory envisages no government role in addressing such regional development issues such as declining economic activities, income disparities and high unemployment. The proponents of neoclassical theory which include Borts (1960), Siebert (1969) and Courchene (1986) believe market forces and economic growth, given time, will solve regional development problems. The neoclassical approach with its emphasis on micro analysis and the aggregation of micro relationships in formulating macro policies stresses the flexibility of prices and wages and the mobility of labour and capital. The suggested solution to addressing regional disparities is the creation of an environment in which market forces can work better (Economic Council of Canada, 1977:26). Others have also indicated that what needs to be discouraged are government policies and programs, such as transfer payments, which make economic depressed provinces dependent on government (Courchene and Melvin 1986). Regional differences in income, unemployment and economic well being can be explained according to neoclassical economics by the limited capacity of market forces to solve regional development

problems. Neoclassical views in the form of the importance placed on the effective functioning of market forces and in particular on the role of relative prices, wages, and labour mobility support measures; have influenced Canadian regional development policies in attempting to narrow regional disparities.

Growing concerns with the federal government deficits and pre-occupation with the inability of Canadian companies to compete more effectively on international markets in the 1980s have led to a resurgence and debate of neoclassical approaches to, as well as a concentration, by policy makers, on "effeciency" instead of "equity" in regional economic development policy. Savoie (1986) points out some of the major problems with the neoclassical approach within the Canadian context. For example the neoclassical approach not only dismisses the historical underpinnings that have shaped Canada's current economic structure which has not only enabled Quebec and Ontario to acquire protected industries; but also exacerbates regional disparity by encouraging outmigration of the younger, better educated, and greater risk takers, the very people a region such as Atlantic Canada would need in its regional economic development. The neoclassical model also fails to recognize political reality and the cultural costs associated with moving from one region to another. The model also places greater emphasis on people prosperity or "individual welfare" over place prosperity or geographical collectivities welfare.

The staple theory originated from the works of Innis (1933), Meir (1953), Andrews (1953), North (1955), Baldwin (1956) and Watkins (1963). The main tenet of the staple theory is the concept of multiplier effects of export base through backward, forward and final demand linkages. These staple theorists argue that the prosperity of a region can be explained by the demand for the region's marketable resources. Such a demand results in subsequent demand for labour, increase in wages, and in-migration to the region. The initial multiplier effect creates new regional demands. The increased purchasing power in the region's labour force induces the establishment of other economic activities; as well as,

the construction of new houses, and other infrastructure. Another development brought about as a result of the change in regional development is the expansion in retail and service activities. Regional economic disparities in Canada, it is argued, can be explained by the varying availability and marketability of natural resources.

The use of marketable natural resources as an engine of regional development is therefore not really a new concept in Canada. An increase in wages, growing labour force, capital and firms will often result from the development of marketable resources. Staple exports as the leading sector of a regional economy sets in motion an initial spread effect and later as the economy grows, this is followed by a diversification around the staple export. However, the demand for inputs will determine the range of development opportunities in the domestic and export markets. In essence, export staples act as the carriers of economic change. Regions with fewer marketable natural resources will be more susceptible to changes than diversified regions (North, 1955:250). However, it is debatable whether natural resource endowment by itself is an important cause of or a solution to regional economic disparities in Canada (Copithorne 1979).

Canada's economic development has been associated with the exploitation of natural resources, particularly in frontier areas. The production and export of staples dates back to pre-Confederation years with cod fishing from offshore Atlantic Canada, fur from the North, and timber in British Columbia and Atlantic Canada. Following Confederation, pulp, paper and wheat emerged as Canada's main export staples. Because Canadian economic development has been stimulated by a succession of marketable staples and an uneven endowment of natural resources, regional economic growth has not only been unevenly spread across the country but has also gone through several business cycles. The size, geography, climate and settlement patterns of the country have resulted in an uneven distribution and growth of economic activities.

Although Canada and in particular Atlantic Canada is endowed with natural resources: fisheries, lumber, coal and now oil and gas; the availability of marketable resources may partly explain the regional disparities and regional economic growth. Transportation costs, variations in labour cost and quality, population distribution, size of the market, economies of scale and the level of technology could by themselves or in combination also account in part, for persistent regional disparities, high unemployment and relatively low wages. The persistence of regional differences in these areas clearly indicated the need for a more comprehensive approach to regional development.

An approach which takes a broader view of regional development is regional science. A broader viewpoint it is suggested is a prerequisite to understanding the complexities of regional development issues (Mitchell 1973). It may also be argued that a regional science approach which is a synthesis of an array of variables and their interrelationship; and employs a diverse combination of analytical and empirical research (Isard 1975) is better suited to addressing the complex regional development issues in Canada. The main advantage of the regional science approach over the others is that it draws upon many economic concepts and employs a mix of analytical and empirical techniques. It also recognizes the appropriate role of government intervention in regional economic development.

A specific regional science concept which has been widely used in Atlantic Canada is the concept of the growth pole. Economic activities tend to concentrate in certain areas either because of historical, geographical, or initial advantages. The result of such a concentration is the development of internal and external agglomeration economies and cumulative growth. This body of thinking has developed from the growth pole theory (Perroux 1950), development pole or growth centre theory (Isard and Schooler 1959), cumulative causation theory (Myrdal 1957), unbalanced growth theory (Hirschman 1961) and the core-periphery theory (Friedmann 1967). In certain instances the concentration of economic activities takes place in urban centers. In situations where this

happens a change in the urban population is often accompanied by a vertical and horizontal diffusion of innovation from the larger to the smaller centres. The result is a filtering and an inter-related process of "market searching" of new opportunities, "trickle-down" of less productive economic activities to smaller centers and "imitation-effect" or wholesale adaptation of innovations in large centers by smaller centres (Berry 1972, Pederson 1970).

The number of theories or approaches which have been applied to regional development in Canada is an indication that no one theory fully explains all the complexities of regional development issues. Nevertheless, the multitude of approaches are in some cases complementary and not necessarily opposing; for example, the staple theory is considered a variation of the growth pole theory (Savoie 1986: 21).

3. FEDERAL REGIONAL DEVELOPMENT POLICIES AND PROGRAMS

The Atlantic Provinces are generally considered to be Canada's problem area (Walker 1980) and have been the beneficiaries of most of the benefits of federal regional development programs. Despite the persistent high unemployment rates, limited economic opportunities, and low income level in Atlantic Canada, since the establishment of confederation in 1867, the thrust of federal policies has by and large been national economic development (Francis and Pillai 1976). Nevertheless, the early 1960s marked the first major federal commitment to addressing regional disparities in Canada. A wide range of regional development programs and policies were introduced in the 1960s (Copes and Steed 1975:95). Although most of these policies were national in scope, they did indicate an important attempt by the federal government at solving the persistent economic problems in Atlantic Canada.

In 1961 the federal government enacted the Agricultural Rehabilitation and Development Act (ARDA). This Act was designed to increase farm productivity by providing joint federal-provincial funding for land consolidation schemes and soil and water conservation projects. Later the ARDA program was expanded to deal with the broader question of

rural poverty by increasing employment opportunities in rural areas including the Atlantic region. Another major initiative by the federal government was the establishment of the Atlantic Development Board (ADB) in 1962. Initially, the ADB provided economic development advice to the Maritimes, but in 1963 its role was extended to provide funding for social and economic infrastructure in Atlantic Canada. The ADB was later repalced by an advisory council, the Atlantic Development Council. The passage of the Area Development Act (ADA) in 1963, made it possible to provide tax concessions to companies located in special designated areas with high unemployment. In addition, the ADA made it possible to undertake programs and projects for economic development and for helping industries to adjust in designated areas.

Other important regional development initiatives taken by the federal government in the mid-1960s were the Area Development Incentives Act (ADIA) 1965, Fund for Rural Economic Development (FRED) 1966, and the establishment of the Cape Breton Development Corporation (DEVCO) in 1967. The FRED program provided funding for the preparation of regional plans and the coordination of government investment decisions. Projects funded under this program included infrastructure development, industrial expansion and research and manpower training. The next important regional development initiative taken was in 1969 with the formation of the Department of Regional Economic Expansion (DREE). The formation of DREE was a further attempt to coordinate more effectively all the existing federal-regional development policies and programs. During this time, two more programs were introduced, the Regional Development Incentive Act (RDIA) and the Special Area (SA) program. Under the SA program, seven categories of special areas were designated for infrastructure and industrial incentives assistance.

Under the Regional Development Incentives Act (RDIA) of 1969, 11 centres in Atlantic Canada were designated as special areas or growth poles. The centres designated included Halifax-Dartmouth, Nova Scotia and St. John's, Newfoundland. The main reason for designating these centres was to enhance their economic attractiveness as location centres

by concentrating available funds into them (Walker 1975). From these self-sustaining centres of economic activity it was argued, growth would diffuse to the surrounding areas. However, the successful transmission of growth impulses from the centre to surrounding areas could take up to 25 years (Nichols 1969). A possible explanation for this delayed effect is that the net spillovers are not created for a while after the designation of the growth pole centre (Richardson 1976). Selection of an appropriate centre as a growth pole, channelling of capital resources and the ability of the pole to stimulate area-wide development, because of the strength of the pole's links to national and international economics, could also limit the regionalized effects of growth pole strategies. There is also the possibility that the transmission of growth impulses to surrounding areas could be truncated by political and bureaucratic impatience and the resulting tinkering with growth pole based policies and programs.

Following a review of DREE's program in 1973, a new joint federal-provincial approach to regional development was announced. Savoie (1984) and Walker (1975) provide an interesting and detailed evaluation of DREE's programs. The main objective of the new joint approach was to facilitate a better cooperation between federal and provincial governments in the creation of long term employment and economic opportunities in depressed areas. The main elements of the federal-provincial cooperative approach to regional development were the General Development Agreements (GDAs) and the Subsidiary Agreements. The federal share of the costs of any project carried out under these agreements ranged from 50 to 90 percent. Weaver and Gunton (1982) have pointed out that all the subsidiary agreements which had been signed by April 1980 amounted to $3.7 billion. Out of this amount the federal government share totalled $2.3 billion. The subsidiary agreement expenditures were directed at developing growth centres and supporting staple industries in rural areas (Weaver and Gunton 1982:199).

The latest phase of the federal regional development process began in January 1982 with the formation of a new Department of Regional Industrial Expansion (DRIE) and the renaming of the Ministry of State for Economic Development (MSED) to the Ministry of State for Economic and Regional Development (MSERD). DRIE is an amalgamation of the Department of Regional Economic Expansion and the Department of Industry Trade and Commerce (IT&C). The merger of the two departments was intended to eliminate bureaucratic conflicts and to improve coordination. This would enable the federal government, it was argued, to put greater emphasis on regional development. A significant consequence of the DREE and IT&C reorganization is the abolition of the GDAs and thus the end of the federal-provincial cooperative approach to regional development as defined under this initiative. MSERD on the other hand was intended to ensure a stronger federal presence in the regions, with the appointment of senior Federal Economic Development Coordinator (FEDC) in each province; with the responsibility to coordinate federal economic programs, to engage the provincial government in discussions, to win trust for the federal government, and to work out relationships with senior provincial colleagues (Thorburn 1984:115). By decentralizing MSERD, it was further argued, the federal government would be able to better coordinate federal regional development programs and thereby minimize red tape for:

> A principal feature of the reorganization was the creation of a new central agency designed to elevate "regional concerns ... to a priority position in all economic decision-making by Cabinet"[30] The agency, the Ministry of State for Economic and Regional Development (MSERD), placed senior executives in each province. Supported by a staff of between seven or twelve depending on the province, these senior executives were asked to "ensure coordination of federal departments on the ground and to give Cabinet direct and immediate access to information on regional needs and opportunities".[31] ...

> The "decentralized central agency" was to provide a greatly improved regional information base. That information base would be built from federal sectoral departments in the regions and from on-site research and analysis. It would not, as was the case with DREE, be based on federal-provincial discussions under the GDA approach (Savoie 1984: 334).

In 1984 MSERD was abolished and its functions taken over by DRIE.

There have been several reviews of federal regional development programs. These reviews can be classified into two broad groups: supportive reviews and critical reviews. Yeates and Lloyd (1970) reviewed the impact of the ADA program on southern Georgian Bay region of Ontario. This study concluded that in areas where there are signs of incipient economic growth, the availability of manufacturing capital can in the short term at least, result in an increase in regional investment, a rise in regional wages and personal incomes and significant improvement in the regional export base. The importance of regional development programs in influencing the location, size, and timing of manufacturing establishments was also examined by the Atlantic Provinces Economic Council (APEC). The APEC study of new establishments in and outside the Atlantic region, which had accepted incentive grants under the RDIA program by March 1971, showed that 57.5 percent would not have expanded or built a new facility if the grants were not available (APEC 1971:97). Another interesting result of the APEC's study was that 91 percent of the firms outside the region did not consider a location in the Atlantic region.

The APEC finding raises a greater question - do incentive programs attract manufacturing investments to slow growth areas like Atlantic Canada? To answer this question, DREE examined 329 projects supported by the RDIA program and concluded that 70 percent of the jobs supported would not have been created, and 75 percent of the related investments would not have been made if the program did not exist (DREE 1973:42).

Other reviews, however, have been more critical of the federal regional development programs; Usher (1974, 1975), Woodward (1974a, 1974b, 1975) and Walker (1975). These studies have argued that investments made under the RDIA program did not lead to a significant creation of jobs in Quebec and the Maritimes and the jobs created under the program would have been created regardless of the program (Usher, 1974). Examining the effectiveness of the incentive grants (Woodward 1975) concluded that DREE's locational subsidies granted under the RDIA program favoured corporate expenditures on capital more than on labour; as the grants did not only fail to generate the greatest number of jobs but also incurred a higher cost per new job created.

In an evaluative survey of the Federal Government's regional economic development policies, since 1947, recently carried out for the MacDonald Royal Commission Lithwick (1986) indicated that most of the federal efforts have gone into "compensatory programs" and that real disparities have actually worsened for all the poorer provinces except Quebec whose position has remained stagnant during the period 1973 to 1981. Lithwick gives two reasons for this:

> "...The first is that progress with regard to regional development appears to be dependent on the broader context of national economic development. In periods when the Canadian economy has prospered, disparities have diminished and the regional issue has become relatively quiescent. Recessions, and particularly the post - 1973 stagnation, have exacerbated the regional problem. ...
>
> The second... is that regional development policy cannot be pursued in the absence of a clear understanding of how the regions relate to the national economy. Attempts to solve the problem via the "foreign aid" approach, transferring spending power from richer to poorer provinces, may in most

> circumstances actually make matters worse, by delaying necessary adjustments in the poorer areas and by taxing efficient behaviour in the more prosperous regions" (Lithwick, 1986: 142-143).

The federal regional development programs have produced mixed results for a variety of reasons. The programs by and large were designed as "blanket welfare" programs to increase employment in areas with very high unemployment; and were not tailored to the specific needs and potentialities of individual areas. Establishments supported in some areas had potential but lacked capital to expand. Other establishments were already declining industries. Thus, within some areas the incentives should have been different for different establishments. Although one of the objectives of DREE was to coordinate the regional development programs it is debatable whether the Department carried out any effective planning for the structural or spatial effects of the grants provided. If this was done, probably existing establishments would not have received the highest proportion of the grants (Walker 1975: 207).

Most of the small establishments which were labour intensive and presumably, possessed the entrepreneural or innovative capability essential to development either could not find out about incentive grants without very active search or did not have the resources to devote to examining the programs best suited to their peculiar needs. For example, The Assistance to Business in Canada catalogues over 140 support programs ranging from business financing, market development, manpower and management development to research and development assistance programs (Ministry of State Economic Development 1981). Consequently, small establishments in the regions were not able to take full advantage of the several programs available to them.

It appears regional development policies in Canada are formulated by an ongoing political process (Martin 1982) as the constant changes leave one with the impression that the federal government is muddling through

or does not learn from past experiences (Crowley 1982). Each successive government or Minister does not want to be associated with the "failures" of its predecessors; even though the policy may be sound and needs a longer gestation period to produce the desired results. The latest era in this ongoing political process of regional policy formulation began with the announcement of the creation of the Atlantic Canada Opportunities Agency (ACOA), (Prime Ministers office, 1987a). The Atlantic opportunities Agency has its headquarters in Moncton, N.B. and offices in each of the four provincial capitals. The Agency has a budget of $1.05 billion over five years and a staff of 300 including a President, and a Vice President for each of the provinces. The estabishment of an advisory board composed of representatives from the public and private sectors is expected to ensure an active role for the provinces and the private sector in the design, implementation, and coordination of federal activities with provincial and local governments.

The ACOA will have a mandate for the coordination and planning of all federal activities with respect to economic growth, procurements, training and skills development, job creation, technology, infrastructure development and local investment promotion in Atlantic Canada. The Agency will also have responsibility for federal small and medium size business and industrial development policies and program. Given its range of responsibilities and limited budget it is unlikely that ACOA would be able to deal effectively with the persistent regional development issues in the region.

In early August 1987 the creation of the Western Diversification Office (WDO) and a new Department of Industry, Science and Technology (DIST) were announced (Prime Minister's Office August 1987). The WDO will have a fund of $1.2 billion. It will be headed by a Deputy Minister, have its headquarters in Edmonton, with sub-offices in Vancouver, Saskatoon and Winnipeg. The WDO will coordinate and communicate all federal programs and activities that contribute to economic development and diversification in Western Canada. The office will also support business infrastructure, undertake activities that will

facilitate the creation of new enterprises, and represent the interest of Western Canada in the development of national policies and the design of national programs.

With the regional development functions of the Department of Regional Industrial Expansion (DRIE) now transferred to ACOA and WDO, it is expected that the new DIST will focus on the development of national industrial policies and the promotion of competitive new "knowledge-based" industries. If the creation of DIST, ACOA and WDO continue to produce mixed results as previous regional development policies and program have, then the latest initiatives would be viewed as more of the same old mandate with new titles. If the underlying causes of regional inequalities in Altantic Canada are policy induced as others have argued then the solution would be to introduce new policies. Unfortunately the underlying causes of regional differences in Canada are varied and require a combination of policies some of which such as illusory differences may require no actions while others such as structural and market imprefections may require regional subsidization (Melvin 1987).

4. CANADIAN MANUFACTURING

Canada is usually considered to be one of the advanced industrial nations. However, its share of manufacturing is relatively low compared to other Western countries. In comparison to Western Europe, the Canadian economy has shown a "strong specialization in primary manufacturing industries and is largely geared to the processing of natural resources (Britton and Gilmour 1978). Tables IV.1 and IV.2 show the regional breakdown of manufacturing activities in Canada. The manufacturing core of Ontario and Quebec together account for 83.1 percent of manufactured end products and 55.7 percent of the unprocessed materials and semi processed resource products in 1974. The Atlantic provinces together produced 3.6 percent of manufactured end products and 6.7 percent of unprocessed materials and primary goods. Within the Atlantic region, Nova Scotia produced more manufactured end products in

TABLE IV.1

DISTRIBUTION OF INTERPROVINCIAL AND FOREIGN TRADE IN MANUFACTURED END PRODUCTS
1974 (PERCENTAGES)

Province	(1) Within province	(2) Within region	(3) Rest of Canada	(4) 2 + 3	(5) Exports abroad	(6) Total	(7) End products as percentage of province's total shipments	(8) Per cent of all Canadian end products shipments
Newfoundland	31.6	2.6	14.5	(18.1)	51.2	100	32.8	.7
Prince Edward Island	74.6	20.4	4.6	(25.0)	.4	100	10.9	.0
Nova Scotia	48.5	14.8	21.6	(36.4)	15.2	100	49.7	1.9
New Brunswick	52.8	16.9	18.0	(34.9)	12.3	100	26.7	1.0
Quebec	52.9	-	34.8	-	12.3	100	55.3	27.4
Ontario	47.7	-	26.0	-	26.3	100	62.5	55.7
Manitoba	51.0	18.9	16.0	(34.9)	14.2	100	34.5	2.4
Saskatchewan	73.6	19.1	4.4	(23.7)	2.8	100	15.1	1.4
Alberta	64.3	17.0	6.0	(23.0)	12.7	100	31.0	4.9
British Columbia	76.6	10.0	4.2	(14.2)	9.3	100	24.7	4.8
Yukon/NWT	100.2	-	-	-	-	100	5.9	0.0
								100.00

Unpublished data, Interprovincial Trade Project, Structural Analysis Division, Statistics Canada

Source: Jenkin, M. (1983), The Challenge of Diversity: Industrial Policy in the Canadian Federation, Hull: Canadian Government Publishing Centre: 40

TABLE IV.2

DISTRIBUTION OF INTERPROVINCIAL AND FOREIGN TRADE IN UNPROCESSED MATERIALS AND PRIMARY MANUFACTURED GOODS, 1974 (PERCENTAGES)

Province	(1) Within province	(2) Within region	(3) Rest of Canada	(4) 2 + 3	(5) Exports abroad	(6) Total	(7) End products as percentage of province's total shipments	(8) Per cent of all Canadian end products shipments
Newfoundland	20.2	0.2	3.6	(3.8)	76.0	100	67.2	1.6
Prince Edward Island	43.5	18.2	28.9	(47.1)	9.3	100	89.1	0.3
Nova Scotia	42.5	8.2	16.7	(24.9)	32.6	100	50.3	2.0
New Brunswick	32.1	5.5	20.9	(26.4)	41.4	100	73.3	2.8
Quebec	54.7		20.0	-	25.3	100	44.7	22.0
Ontario	65.2		17.0	-	17.7	100	37.5	33.7
Manitoba	43.7	6.3	24.0	(30.3)	26.0	100	65.5	4.6
Saskatchewan	18.2	10.6	19.7	(30.3)	51.1	100	84.7	6.8
Alberta	30.1	12.7	20.0	(32.7)	37.3	100	69.0	11.0
British Columbia	42.7	5.4	4.7	(10.1)	47.2	100	75.3	14.8
Yukon/NWT	2.6	11.0	7.1	(18.1)	79.3	100	94.1	0.5
								100.0

Unpublished data, Interprovincial Trade Project, Structural Analysis Division, Statistics Canada

Source: Jenkin, M. (1981), The Challenge of Diversity: Industrial Policy in the Canadian Federation, Hull: Canadian Government Publishing Centre 39

1974 than the other provinces however, New Brunswick processed more primary goods. For both primary and end goods Newfoundland ranked third in the region. There is hardly any manufacturing done in Prince Edward Island. In Western Canada, British Columbia ranked second, in the manufacture of end products, to Alberta with 4.8 percent but first in primary goods manufactured.

The pattern of interprovincial distribution reveals the extent of the leakages in and the structure of the Canadian economy. For end products Newfoundland exports more abroad than the other provinces (51.2 percent), compared to Ontario (26.3 percent) and Nova Scotia (15.2 percent). Ontario and Quebec use at least 31 percent of their manufactured end products. The core provinces use about 52 percent of their manufactured goods within the province. The periphery provinces except Nova Scotia and Newfoundland use between 51 and 76 percent of their manufactured end products within their provinces.

There are structural differences within the manufacturing heartland. The relative abundance of capital in Ontario and labour in Quebec have resulted in specialized manufacturing activities in the two provinces. Relatively, Quebec has more labour intensive industries while Ontario's industries are more capital intensive. Investment per employee in manufacturing in Ontario increased from $1362 in 1961 to $2368 in 1969 compared to $1058 in 1961 to $1676 in 1969 in Quebec (Norcliffe and Stevens 1979:43). Several other explanations have been provided for the structural divergence between Ontario and Quebec. Gilmour and Murricane have suggested that:

> Ontario's success stemmed from a wider diversity in export industries, which in comparison to Quebec had involved a greater proportion of the population, and from the fact that agriculture had been able, unlike in Quebec, to play a central role in development. The export industries had generated more income than in Quebec, and that income had been better distributed, promoting many more linkage effects...

> Ontario built on her initial advantages in the metal-working industries and acquired considerable strength in transportation equipment, electrical products and other industries that reflected the new technology of the twentieth century. Quebec fell behind in these, but strengthened her hold on labour-intensive industries at the same time as the hydroelectric and pulp and paper industries grew by leaps and bounds (Gilmour and Murricane 1973:14,17).

Two main issues are often raised when the topic of Canadian manufacturing is debated: productivity and foreign ownership. In a detailed study of Canadian manufacturing from 1946-1977 Zohar (1982) concluded that declining productivity in Canadian manufacturing relates more to inefficiencies in the use of capital than labour. Zohar further argued that:

> What emerges from these figures is that one reasonable explanation for the stall or decline in productivity growth in the manufacturing sector is that the stock of capital in some industries is depleted. Depleted capital stock signifies outdated technology, which in turn lowers the level of labour productivity or at least precludes an increase from prevailing levels...
>
> A related factor is that not only does the quantity of capital replacement affect advances in productivity, but also the quantity of such capital determines to a large extent the resultant increase in productivity (Zohar 1978a:81).

Based on this argument, Zohar believes that Canadian industrial strategy should aim to promote higher productivity in capital and labour. This brings into the debate the second issue of foreign

ownership of manufacturing firms in Canada. The impact of foreign, particularly United States, ownership of manufacturing firms in Canada has widely been debated in the literature, Safarian (1969), Globerman (1979), Britton and Gilmour (1978) and, Saunders (1980). The impact ranges from provincial competition for foreign investment, restricted product mandates to truncated firms. Foreign ownership has also been suggested as partly responsible for decreased productivity. The significance of foreign ownership of manufacturing firms to regional development lies in the suggestion that foreign owned firms do not purchase their inputs from local source and thus, do not support directly the growth of local supply firms (Marshall 1979). It is also noted in the literature that foreign ownership is not always detrimental to regional or national economies. Thomas (1980) for example has suggested that technical change is the main element of growth of multinational firms and their parent companies; and while foreign subsidiaries may not participate in research and development activities undertaken by their parent companies they do eventually benefit particularly if they are located in technologically advanced countries.

A third issue which must also be kept in mind in any discussion of Canadian manufacturing activities is the barriers to interprovincial trade and the movement of goods and services. All provinces have procurement policies designed to give preference to goods and services with high provincial content or produced within their provinces (Safarian 1980). It has been estimated that between 15 and 20 percent of goods and services produced in Canada is distorted by these Provincial Procurement Policies (Whalley 1983:77). Recent moves by both Newfoundland and Nova Scotia to limit Offshore hydrocarbon related employment opportunities for non residents and to increase provincial content of purchases indicate what provinces may do to maximize opportunities for their provinces (Globe and Mail February 22, 1980: 1-2).

5. REGIONAL MANUFACTURING SPECIALIZATION AND DEVELOPMENT OPPORTUNITIES

It has been suggested in the literature that lead industries generate significant growth in regional economies and that such growth is driven by structural interdependence linkages. This is because lead industries transmit, through structural interdepence and multiplier linkages, growth generating forces to other sectors of the regional economy.

In a study of the regional impact of the Boeing Company as a lead firm in Puget Sound and Washington State Erickson (1974) suggested that lead industries induce regional growth through an interrelated system of linkages: technological system, capital goods system and lateral-induced system. As the output in lead industries expand the forward and backward linkages with regional firms are increased thereby increasing the total output of regional firms. The technological system results from the interindustry linkages which exist between a lead firm and other regional firms. Consequently, the introduction of a new technology by the lead firm or industry could have a reverberating influence on other firms because of the backward and forward linkages. An increase in income as a result of an upturn in economic activities associated with the lead industry could also cause regional firms, residents and local governments to increase their demand for goods and services from regional producers - lateral induced growth. The third interdependent linkage system is the capital goods system. As lead industries respond to demand for capital goods existing productive capacity could be fully utilized. If this happens then additional capital stocks and related investments would be required.

The Hibernia development project, given its magnitude of investment and location, would be a "lead industry" in the region and most likely induce similar interrelated systems of linkages. The capital equipment requirements for the project are expected to produce significant regional growth as a result of increased purchases from regional suppliers. However, in the case of the aerospace industry the backward technological

linkages were found to be weak (smaller multipliers during the initial phase of the industry's rapid growth (Erickson 1974: 131-134). In Atlantic Canada there could be significant expenditure leakages out of the regional economy because the regional multipliers are small. Although small multipliers are indicative of significant leakages (Steele 1972) it has also been suggested that depending on the structure of the regional economy and the distribution of expenditures across the various sectors, project expenditures can leak directly out without generating any income to the residents of the region (Archer 1976).

It is against this concept of linkage-leakage analysis that regional specialization in manufacturing and the performance of various industrial sectors are examined below. The main purpose of this examination is to identify key sectors which can be used as a basis in designing a self-sustaining regional development strategy for Atlantic Canada. The period 1961-1981 has been selected for the examination of industrial sector performance in Canada because it covers both periods of economic upturns and downturns; thus providing a good indication of how the different sectors respond to changes in the economy.

Manufacturing in Canada falls into two distinct spatial groupings: the manufacturing core of Ontario and Quebec and the Atlantic and Western peripheries. For the purpose of this study the Atlantic Periphery is made up of the four provinces of New Brunswick, Newfoundland, Nova Scotia and Prince Edward Island (PEI). Alberta, British Columbia, Manitoba and Saskatchewan constitute the Western manufacturing Periphery. Tables IV.3 to IV.5 provide further indication of the regional manufacturing specialization in Canada. These tables represent a series of location quotients for 31 industries using total shipments as a measure. Location quotient is defined as the ratio of the proportion of a province's activity accounted for by an industry, to the proportion of the country's activity which is accounted for by the industry using shipments as a base. An industry in a province with a location quotient of one

indicates that that province has the expected share if shipments in that industry are evenly distributed across the country. A location quotient of less than one indicates that the Province's share of shipment is below the expected level; and a location quotient greater than one shows an over specialization by that particular industry in that province. The assumption here is that a location quotient with a value greater than one means that the industry in that province is an exporter, or an importer if the location quotient is less than one (Greenberg 1972). This assumption is important for year by year comparison since Statistics Canada only surveys the destination of shipments every five years. Moreover, it is this five-year survey result which is used in computing the Inter-provincial input-output coefficients.

In 1961 Ontario had more than its share of manufacturing shipments in 15 of the 31 industries examined, Table IV.3. These industries included iron and steel mills, steel pipe and tube mills, metal rolling and casting, metal stamping, metal fabricating, machinery and equipment and electrical industrial equipment. The only industry that Ontario significantly lagged behind in 1961 was shipbuilding and repair with a location quotient of 0.310. In the remaining industries Ontario had close to its expected share of the shipments.

Quebec on the other hand, had more than its share of the shipments in nine industrial sectors in 1961. These sectors included, smelting and refining, copper alloy and casting, boiler and plate works, wire products and shipbuilding and repairs. Except in copper casting and wire products industries where Ontario and Quebec both had more than their expected share of the shipments there was no overlap in areas of manufacturing where both core provinces had more than their share of shipments in 1961.

There were no significant changes in the relative share of industrial shipments in Ontario and Quebec over the years and by 1971 Ontario's dominance in manufacturing shipments had increased to 21 industrial sectors, Table IV.4. The additions were boiler and plate works,

communication equipment, electrical industrial equipment, wire products and scientific and professional equipment. At the same time Quebec's industrial dominance decreased from nine to seven sectors. Dominance in wire products and ready mix concrete were lost. The dominance of the core provinces in the respective industrial sectors of 1961 had been restored by 1981 Table IV.5.

Table IV.3 shows that in 1961 the manufacturing base of the Atlantic region was very limited; Nova Scotia and New Brunswick being the main manufacturing centres in the region. Newfoundland had more than its share of manufacturing shipments in only the concrete products industry. PEI had slightly more than its share of cement manufacturing shipments in 1961. New Brunswick had more than its share of manufacturing shipment in machine shops, and stone products in 1961. Nova Scotia's manufacturing specialization in 1961 was in machine shops, shipbuilding and repairs, boatbuilding and repairs and stone products. The location quotients were significantly higher for the shipbuilding and repairs industry 6.740 and boatbuilding and repair industry 4.295 in Nova Scotia.

From 1961 to 1971 Nova Scotia and New Brunswick expanded their areas of regional manufacturing dominance to include concrete products, ready mix concrete and machine shop. Nineteen seventy one appears to be the best year for the shipbuilding and repair industry in Nova Scotia. The shipbuilding and repairs industry's location quotient was 7.144. In 1981 Nova Scotia and New Brunswick had less than their share of the manufacturing shipment in the machine shop industries, however Newfoundland and PEI had more than their share of the machine shop industry shipments. The analysis of manufacturing specialization in

Table IV.3

LOCATION QUOTIENTS FOR MANUFACTURING
(SHIPMENTS) 1961

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Iron and Steel Mills					0.193	1.692				0.250
Steel Pipe and Tube Mills					0.393	1.203			5.601	
Iron Foundries					0.743	1.302	1.194		1.131	0.446
Smelting and Refining					1.673	0.594				
Aluminium Roll., Castings and Extrud.						1.145			0.027	
Copper, Copper Alloy, Roll. Cast					1.428	1.045				
Metal Rolling, Cast. and Ext.						1.482	1.553			0.507
Boiler and Plate Works					1.109	0.985		0.244	2.680	0.311
Fabricated Structural Metal					0.998	0.942	1.273	1.217	1.682	0.802
Metal Stamping, Pressing and Coating					0.828	1.240	1.141	0.887	0.676	0.767
Wire and Wire Products					1.152	1.185	0.029		0.169	0.608
Heating Equipment					0.896	1.245	1.913		0.329	0.389
Machine Shops		1.523	1.667		0.936	0.626	1.863	0.812	3.412	1.731
Misc. Metal Fabricating					0.552	1.422	1.305	0.511	0.258	0.373
Misc. Machinery and Equipment		0.320			0.804	1.365	0.470	0.182	0.287	0.612

Table IV.3 ... continued

LOCATION QUOTIENTS FOR MANUFACTURING
(SHIPMENTS) 1961

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Comm. Refrigeration & Air Cond. Equip.						1.725	1.409			
Shipbuilding and Repairs		6.740			1.480	0.310				2.692
Boat Building and Repairs		4.295			0.493	0.886	0.803			2.859
Small Electric Applicance					0.369	1.740				
Major Applicances: Elect. & Non-Elect.					0.695	1.544				
Communication Equipment										
Electric Industrial Equipment					0.294	1.775				0.194
Electrical Wire and Cable					1.554	0.966				
Electrical Products										
Cement Manufact.				1.011	0.680					
Stone Products		1.552	2.098		1.276	0.747	3.096			0.528
Concrete Products	1.515	0.571	0.471		0.853	0.997	1.590	1.441	2.643	0.613
Ready Mix Concrete					1.052	0.777	1.412	1.953	2.788	0.936
Lime Manufacturing					0.751	0.950	4.753			
Petroleum Refineries					1.049	0.636	1.336	4.059	2.252	1.108
Scientific and Professional Equip.										

Source: Statistics Canada; Analysis and Development Section, Based on Unpublished Data, 1983

Atlantic Canada indicates that while the region has a limited manufacturing base it had more than its share of the business in the manufacturing sectors it has specialized.

Although the four western provinces have been grouped together as the Western manufacturing periphery for the purpose of this study, the emphasis will be on Alberta and British Columbia. Over the years Alberta has developed a strong landbased oil and gas supply industry which in some sectors have served as a springboard from which other companies have used to branch out to supply the offshore oil and gas industry. Thus, an understanding of the manufacturing specialization in Alberta from 1961-1981 could provide some useful indication of how the offshore oil and gas industry would mature in Atlantic Canada. The emphasis on British Columbia stems in part from the concentration of ocean industries and the potential competition from the province for a share of Hibernia development related supply business.

In 1961 Manitoba had more than its share of manufacturing shipment in 13 industrial sectors, Saskatchewan in four, Alberta in eight, and British Columbia in four, Table IV.3. By 1981 the number of industrial sectors in which Manitoba had more than its share of manufacturing shipment had reduced to nine. Alberta and British Columbia share had increased in nine and eight respectively, and Saskatchewan remained in four sectors. In general there were no significant changes, in provincial specialization and in the number of industrial sectors within the Western periphery. A detailed examination however, reveals certain interesting structural changes particularly in Alberta and British Columbia. In 1961 Alberta's manufacturing specialization included such industrial sectors as steel pipe and tube mills, iron foundries, boiler and plate works, fabricated structural metal and machine shops. British Columbia's specialization in 1961 included machine shop, shipbuilding and repairs, and boatbuilding and repairs. The period 1961 to 1981 saw

Table IV.4

LOCATION QUOTIENTS FOR MANUFACTURING
(SHIPMENTS) 1971

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Iron and Steel Mills					0.436	1.513				
Steel Pipe and Tube Mills						1.192			3.543	
Iron Foundries					0.686	1.321	0.828		0.925	0.549
Smelting and Refining					1.930	0.424				
Aluminium Roll., Castings and Extrud.					1.211	1.164				
Copper, Copper Alloy, Roll. Cast						1.132				
Metal Rolling, Cast. and Ext.					0.485	1.471	1.516			0.557
Boiler and Plate Works					1.147	1.100			1.297	0.262
Fabricated Structural Metal					0.796	0.853		1.795	1.964	1.712
Metal Stamping, Pressing and Coating		0.106	0.286		0.734	1.284	1.085	0.420	0.664	0.686
Wire and Wire Products					0.989	1.214			0.305	0.901
Heating Equipment					1.249	1.076	2.113			
Machine Shops		1.010	1.625		0.992	0.676	1.605	1.613	2.624	1.825
Misc. Metal Fabricating					0.546	1.394	1.574		0.319	0.437
Misc. Machinery and Equipment					0.630	1.373			0.611	0.755

Table IV.4 ... continued

LOCATION QUOTIENTS FOR MANUFACTURING
(SHIPMENTS) 1971

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Comm. Refrigeration & Air Cond. Equip.					0.672	1.498				
Shipbuilding and Repairs		7.144			1.823					1.795
Boat Building and Repairs		3.396	1.199		0.490	0.907	1.771		0.293	2.895
Small Electric Applicance						1.701				
Major Applicances: Elect. & Non-Elect.						1.391				
Communication Equipment					1.002	1.238	0.097		0.270	0.441
Electric Industrial Equipment					0.550	1.491			0.209	0.290
Electrical Wire and Cable					1.528	0.861				
Electrical Products					0.949	1.293				0.197
Cement Manufact.					0.889	0.708				
Stone Products		3.905	2.142			1.858				
Concrete Products		0.909	1.374	0.401	0.964	0.858	1.620	1.799	3.031	0.703
Ready Mix Concrete		1.416	0.886		0.819	0.825	1.378	1.954	2.179	1.718
Lime Manufacturing					0.996	1.079				
Petroleum Refineries		3.095				0.635		3.751		
Scientific and Professional Equip.		0.596			0.404	1.535			0.628	

Source: Statistics Canada; Analysis and Development Section, Based on Unpublished Data, 1983

Table IV.5

LOCATION QUOTIENTS FOR MANUFACTURING
(SHIPMENTS) 1981

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Iron and Steel Mills					0.510	1.628				0.094
Steel Pipe and Tube Mills						0.962			3.968	
Iron Foundries		0.237			0.778	1.289	1.043		1.194	0.421
Smelting and Refining					2.036					2.099
Aluminium Roll., Castings and Extrud.					1.360	1.133				
Copper, Copper Alloy, Roll. Cast										
Metal Rolling, Cast. and Ext.					0.570	1.511	1.681			0.602
Boiler and Plate Works					0.944	1.269		0.331	1.396	0.176
Fabricated Structural Metal			0.907		1.122	0.612	2.556	2.964	1.627	1.409
Metal Stamping, Pressing and Coating					1.163	1.060	1.544	0.348	0.764	0.679
Wire and Wire Products		0.357			1.068	1.179				1.168
Heating Equipment					0.581	1.321	2.737		1.003	0.277
Machine Shops	1.389	0.632	0.689	1.380	0.774	0.847	1.691	2.291	2.127	1.367
Misc. Metal Fabricating		0.035			0.566	1.463	0.596		0.750	0.599
Misc. Machinery and Equipment			0.256		0.679	1.241			1.574	0.842

Table IV.5 ... continued

LOCATION QUOTIENTS FOR MANUFACTURING (SHIPMENTS) 1981

	Newfoundland	Nova Scotia	New Brunswick	P.E.I.	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Comm. Refrigeration & Air Cond. Equip.					0.553	1.636				
Shipbuilding and Repairs		2.951			1.075	0.452				3.094
Boat Building and Repairs		3.040			0.799		0.986		0.207	2.610
Small Electric Applicance					0.489	1.761				
Major Applicances: Elect. & Non-Elect.					0.894	1.516				0.043
Communication Equipment		0.576			1.040	1.247	0.968		0.449	0.330
Electric Industrial Equipment					0.615	1.493	1.266		0.359	0.333
Electrical Wire and Cable					1.151	1.165				0.474
Electrical Products					1.041	1.353			0.215	
Cement Manufact.						0.607				
Stone Products	3.385	2.159			2.109	0.275	1.933		0.650	0.330
Concrete Products					0.716	0.755	0.876	2.451	3.633	1.077
Ready Mix Concrete	2.309	1.175	1.105		0.681	0.582	1.664	3.439	2.942	2.045
Lime Manufacturing					0.799	1.178				
Petroleum Refineries					1.018	0.723				
Scientific and Professional Equip.					0.401	1.575			0.576	0.392

Source: Statistics Canada; Analysis and Development Section, Based on Unpublished Data, 1983

significant additional manufacturing specialization in Alberta and British Columbia in fabricated structural metal, Scientific and Professional equipment, heating equipment, machinery equipment, smelting and refining, and wire and wire products.

6. REGIONAL DIFFERENTIATION IN CAPITAL ASSETS

In addition to regional manufacturing specialization, there is also the question of capital assests of manufacturing establishments. Sectors with depleted or obsolete assets would require new ones if they are to compete effectively for a greater share of the offshore supply business. This could require some form of government assistance as has been the case in the past. The capital availability ratios (CAR) is one method which can be used to determine which industries would benefit from such an assistance and thereby enable the design of a tailored financial assistance program.

It was pointed out in Chapter three that because of confidentiality rules empirical analyses using Statistics Canada data often have incomplete tables. This study is no exception to this rule. Consequently, seven industrial sectors have been selected in discussing regional differences in manufacturing assets. These sectors are: communications, boiler and plate works; machine shops, miscellaneous metal fabrication, ready mix concrete, shipbuilding and repair and boatbuilding and repair. These industries were selected because they would be among the first to respond to Hibernia-related development demand. For example the shipbuilding and boatbuilding, metal fabrication and machine shops sectors would be involved in the fabrication of modules and pallets; and the ready mix concrete sector in the construction of the gravity base structure and the building of new houses and roads. The Communications sector which cover a number of the ocean industries subgroups would also be involved in the manufacture of communications and instrumentation equipment.

Tables IV.6 to IV.12 show the capital availability ratios for industries in manufacturing core of Quebec and Ontario and the periphery regions of the east and the west using equation (3.26). Table IV.6A presents the capital availability ratio results for the machine shop industry using equation (3.25), Table IV.6A is discussed here to show the differences in results using the two sets of equations. Appendices IV.1 to IV.7 show the total capital assests for each of the seven industrial sectors from 1961-1981. Appendix IV.1A shows the net additions to capital stock for the machine shop industry. Table IV.6A shows that Quebec and Ontario had more than their share or close to their fair share of assets of the machine shop industry. The industry in Quebec in 1961 had capital availability ratio of 1.229 and by 1970 the ratio had decreased to 1.080 from 1971 to 1980 the ratio for Quebec was less than one. For Ontario the ratio was less than one from 1961 to 1968 and greater than one from 1969 to 1981. From 1961 to 1972 the industry in Nova Scotia had a ratio of between .378 and .097; and between 1.022 and 2.447 from 1973 to 1981. In Alberta the ratio from 1961 to 1967 ranged from 1.100 to 1.484. From 1968 to 1981 the ratio was less than one. The trend for the industry in Alberta was reversed in British Columbia. From 1961 to 1974 the ratio was less than one and greater than one from 1975 to 1981.

In comparing capital availability ratios for the machine shop industry in Nova Scotia and Ontario for example, one observes a ratio ranging from 0.000 in 1961 to a high of 0.003 in 1980 for Nova Scotia Table IV.6. For Ontario the ratio ranged from 0.248 in 1961 to a high of 0.381 in 1973. In Nova Scotia the yearly net assets ranged from a low of $8,000 in 1972 to a high of $298,000 in 1980 (Appendix IV.1). New Brunswick had a ratio of 0.044 in 1961. This figure increased to 0.054 in 1964 and then decreased to 0.025 in 1981. The yearly assets for the machine shop industry ranged from a low of $10.1 million in 1961 to a high of $36.8 million in 1975. In Quebec the ratio ranged from a high of 0.353 in 1961 to a low of 0.242 in 1980. During the period of analysis Alberta was the only western province with a significant share of the assests, Alberta's capital availability ratio was 0.203 in 1961 from where it declined gradually to 0.122 by 1979. The ratio increased to 0.132 in 1980 and 0.130 in 1981.

TABLE IV.6

MACHINE SHOPS
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C
1961		0.000	0.044		0.353	0.248	0.039	0.004	0.203	0.107
1962		0.000	0.052		0.347	0.251	0.040	0.004	0.196	0.106
1963		0.000	0.053		0.339	0.268	0.043	0.003	0.187	0.105
1964		0.000	0.054		0.32	0.283	0.051	0.003	0.181	0.107
1965		0.000	0.052		0.315	0.287	0.068	0.002	0.166	0.108
1966		0.000	0.046		0.346	0.277	0.067	0.002	0.161	0.098
1967		0.000	0.041		0.333	0.305	0.068	0.002	0.151	0.098
1968		0.000	0.049		0.318	0.339	0.064	0.002	0.136	0.089
1969		0.000	0.046		0.319	0.348	0.068	0.001	0.132	0.084
1970		0.000	0.043		0.31	0.363	0.065	0.002	0.122	0.093
1971		0.000	0.043		0.285	0.368	0.061	0.016	0.127	0.099
1972		0.000	0.042		0.283	0.364	0.062	0.018	0.126	0.103
1973		0.001	0.038		0.273	0.381	0.059	0.017	0.122	0.107
1974		0.001	0.036		0.268	0.376	0.056	0.018	0.128	0.116
1975		0.002	0.032		0.277	0.371	0.052	0.019	0.124	0.121
1976		0.002	0.031		0.271	0.369	0.051	0.020	0.120	0.136
1977		0.002	0.029		0.26	0.368	0.050	0.019	0.123	0.148
1978		0.003	0.028		0.259	0.367	0.049	0.019	0.125	0.148
1979		0.002	0.027		0.251	0.376	0.048	0.018	0.122	0.153
1980		0.003	0.026		0.242	0.374	0.046	0.017	0.132	0.159
1981		0.003	0.025		0.244	0.376	0.044	0.017	0.130	0.158

TABLE IV.7

SHIPBUILDING AND REPAIR
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	N S	ONT	B C
1961	0.220	0.456	0.323
1962	0.224	0.435	0.339
1963	0.217	0.426	0.356
1964	0.216	0.417	0.366
1965	0.199	0.439	0.361
1966	0.195	0.425	0.379
1967	0.191	0.422	0.386
1968	0.193	0.425	0.381
1969	0.201	0.416	0.384
1970	0.201	0.404	0.394
1971	0.205	0.405	0.389
1972	0.213	0.410	0.376
1973	0.238	0.397	0.364
1974	0.242	0.365	0.391
1975	0.262	0.358	0.379
1976	0.242	0.402	0.354
1977	0.243	0.390	0.366
1978	0.245	0.391	0.363
1979	0.316	0.344	0.339
1980	0.327	0.325	0.346
1981	0.299	0.326	0.374

TABLE IV.8

BOATBUILDING AND REPAIR
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	N S	QUE	ONT	MAN	B C
1961	0.254	0.016	0.686	0.011	0.031
1962	0.237	0.015	0.707	0.011	0.028
1963	0.233	0.016	0.707	0.011	0.032
1964	0.222	0.021	0.711	0.010	0.033
1965	0.188	0.038	0.731	0.009	0.031
1966	0.169	0.034	0.755	0.008	0.031
1967	0.164	0.045	0.748	0.008	0.033
1968	0.159	0.082	0.712	0.007	0.037
1969	0.143	0.087	0.727	0.006	0.035
1970	0.142	0.081	0.734	0.006	0.035
1971	0.127	0.070	0.750	0.005	0.046
1972	0.119	0.066	0.758	0.005	0.051
1973	0.111	0.062	0.770	0.007	0.048
1974	0.104	0.061	0.776	0.010	0.046
1975	0.099	0.059	0.781	0.012	0.047
1976	0.094	0.065	0.776	0.016	0.046
1977	0.090	0.067	0.774	0.020	0.048
1978	0.087	0.066	0.771	0.020	0.053
1979	0.084	0.068	0.759	0.030	0.058
1980	0.078	0.077	0.729	0.052	0.062
1981	0.069	0.078	0.709	0.050	0.093

TABLE IV.9

READY - MIX CONCRETE
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	NFLD	N B	QUE	ONT	MAN	SAS	ALB	B C
1961	0.018	0.019	0.144	0.259	0.128	0.029	0.098	0.302
1962	0.017	0.017	0.123	0.225	0.118	0.027	0.084	0.386
1963	0.017	0.017	0.114	0.209	0.118	0.027	0.076	0.421
1964	0.015	0.017	0.102	0.189	0.101	0.026	0.068	0.482
1965	0.011	0.016	0.091	0.170	0.081	0.024	0.061	0.543
1966	0.010	0.016	0.082	0.154	0.076	0.023	0.054	0.582
1967	0.010	0.016	0.074	0.139	0.075	0.023	0.049	0.611
1968	0.010	0.016	0.067	0.125	0.073	0.023	0.044	0.640
1969	0.009	0.015	0.057	0.107	0.066	0.022	0.038	0.683
1970	0.008	0.014	0.049	0.093	0.059	0.020	0.032	0.722
1971	0.007	0.013	0.041	0.078	0.053	0.019	0.027	0.760
1972	0.014	0.011	0.168	0.404	0.025	0.015	0.058	0.203
1973	0.018	0.013	0.261	0.436	0.027	0.009	0.112	0.122
1974	0.016	0.012	0.296	0.404	0.033	0.012	0.109	0.117
1975	0.023	0.011	0.294	0.393	0.038	0.017	0.110	0.112
1976	0.022	0.013	0.294	0.365	0.045	0.021	0.115	0.123
1977	0.021	0.013	0.289	0.360	0.048	0.025	0.117	0.125
1978	0.022	0.012	0.278	0.358	0.045	0.024	0.136	0.123
1979	0.019	0.011	0.271	0.355	0.044	0.024	0.152	0.121
1980	0.020	0.011	0.282	0.335	0.041	0.023	0.172	0.114
1981	0.019	0.011	0.281	0.325	0.039	0.025	0.187	0.110

TABLE IV.10

MISC. METAL FABRICATING
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	N B	QUE	ONT	MAN	SAS	ALB	B C
1961	0.021	0.249	0.673	0.025	0.003	0.008	0.019
1962	0.022	0.263	0.661	0.023	0.003	0.007	0.018
1963	0.021	0.164	0.662	0.023	0.003	0.007	0.019
1964	0.018	0.264	0.665	0.021	0.003	0.006	0.020
1965	0.017	0.257	0.673	0.021	0.003	0.006	0.021
1966	0.015	0.258	0.676	0.019	0.003	0.005	0.021
1967	0.015	0.245	0.680	0.020	0.004	0.005	0.021
1968	0.012	0.307	0.619	0.034	0.003	0.004	0.018
1969	0.009	0.270	0.665	0.030	0.002	0.003	0.016
1970	0.008	0.258	0.680	0.028	0.002	0.003	0.018
1971	0.008	0.256	0.683	0.026	0.002	0.003	0.018
1972	0.009	0.248	0.691	0.025	0.002	0.003	0.018
1973	0.008	0.248	0.687	0.026	0.002	0.005	0.022
1974	0.008	0.242	0.690	0.027	0.002	0.006	0.023
1975	0.007	0.248	0.697	0.029	0.002	0.009	0.024
1976	0.006	0.247	0.682	0.028	0.002	0.010	0.023
1977	0.006	0.242	0.686	0.026	0.001	0.011	0.025
1978	0.008	0.243	0.683	0.024	0.001	0.011	0.027
1979	0.008	0.257	0.671	0.024	0.001	0.010	0.027
1980	0.009	0.251	0.670	0.024	0.001	0.010	0.032
1981	0.011	0.241	0.673	0.023	0.001	0.015	0.034

TABLE IV.11

BOILER AND PLATE WORKS
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	QUE	ONT	ALB	B C
1961	0.378	0.558	0.048	0.015
1962	0.379	0.556	0.048	0.014
1963	0.383	0.556	0.047	0.013
1964	0.373	0.571	0.042	0.012
1965	0.355	0.594	0.039	0.010
1966	0.385	0.568	0.036	0.009
1967	0.394	0.558	0.037	0.009
1968	0.396	0.554	0.038	0.009
1969	0.391	0.559	0.039	0.009
1970	0.364	0.589	0.037	0.009
1971	0.349	0.606	0.035	0.009
1972	0.335	0.623	0.032	0.008
1973	0.316	0.645	0.029	0.007
1974	0.323	0.640	0.029	0.006
1975	0.313	0.641	0.040	0.005
1976	0.297	0.626	0.072	0.004
1977	0.295	0.628	0.071	0.004
1978	0.288	0.635	0.071	0.004
1979	0.269	0.662	0.064	0.003
1980	0.243	0.650	0.103	0.002
1981	0.268	0.626	0.095	0.010

TABLE IV.12

COMMUNICATION EQUIPMENT
CAPITAL AVAILABILITY RATIOS 1961 - 1981

	QUE	ONT	MAN	ALB	B C
1961	0.408	0.504	0.001	0.003	0.010
1962	0.434	0.548	0.001	0.003	0.012
1963	0.410	0.572	0.001	0.002	0.012
1964	0.397	0.575	0.001	0.002	0.022
1965	0.389	0.583	0.001	0.002	0.022
1966	0.386	0.587	0.001	0.002	0.022
1967	0.371	0.603	0.000	0.004	0.019
1968	0.365	0.609	0.000	0.004	0.019
1969	0.364	0.611	0.000	0.003	0.018
1970	0.372	0.604	0.001	0.003	0.018
1971	0.376	0.599	0.001	0.003	0.018
1972	0.358	0.617	0.001	0.003	0.019
1973	0.352	0.622	0.001	0.003	0.020
1974	0.354	0.618	0.001	0.003	0.021
1975	0.360	0.611	0.001	0.003	0.022
1976	0.361	0.609	0.001	0.003	0.024
1977	0.356	0.609	0.003	0.006	0.025
1978	0.354	0.611	0.003	0.006	0.024
1979	0.353	0.613	0.002	0.005	0.025
1980	0.343	0.625	0.002	0.004	0.023
1981	0.333	0.625	0.002	0.007	0.031

TABLE IV.6A

MACHINE SHOPS

CAPITAL AVAILABILITY RATIOS 1961- 1981 (NET ADDITIONS TO CAPITAL)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C
1961		0.378	1.174		1.229	0.712	0.716	0.336	1.484	0.889
1962		0.357	1.384		1.208	0.721	0.778	0.318	1.432	0.881
1963		0.323	1.391		1.181	0.768	0.777	0.290	1.369	0.879
1964		0.289	1.428		1.115	0.812	0.927	0.259	1.324	0.887
1965		0.248	1.373		1.098	0.824	1.237	0.224	1.211	0.900
1966		0.207	1.228		1.205	0.796	1.225	0.187	1.179	0.818
1967		0.162	1.093		1.160	0.876	1.241	0.194	1.100	0.817
1968		0.136	1.296		1.108	0.975	1.164	0.169	0.997	0.748
1969		0.115	1.218		1.111	1.000	1.239	0.145	0.965	0.697
1970		0.097	1.145		1.080	1.042	1.184	0.176	0.894	0.776
1971		0.082	1.145		0.991	1.056	1.115	1.222	0.926	0.829
1972		0.074	1.134		0.986	1.045	1.120	1.383	0.925	0.861
1973		1.022	1.020		0.952	1.094	1.070	1.345	0.891	0.890
1974		1.123	0.955		0.934	1.078	1.011	1.431	0.933	0.969
1975		1.296	0.856		0.964	1.066	0.938	1.535	0.910	1.010
1976		1.323	0.814		0.945	1.059	0.919	1.567	0.880	1.130
1977		1.322	0.769		0.906	1.055	0.910	1.519	0.905	1.230
1978		2.003	0.746		0.903	1.054	0.901	1.507	0.912	1.235
1979		1.632	0.726		0.874	1.079	0.880	1.446	0.892	1.273
1980		2.447	0.679		0.844	1.074	0.830	1.367	0.966	1.320
1981		2.412	0.652		1.000	1.078	0.809	1.396	0.953	1.323

In the case of the shipbuilding and repair industry Nova Scotia capital availability ratio for eight of the twenty one years, 1974 to 1981 was between 0.327 and 0.242. Ontario relatively had a higher ratio which ranged from a low of 0.325 in 1980 to a high of 0.456 in 1961. In British Columbia the ratio ranged between a low of 0.323 to a high of 0.394 (Table IV.7). In the boatbuilding and repair industry, Ontario had the highest ratios which ranged from 0.686 in 1961 to 0.781 in 1975. Ontario was followed by Nova Scotia and British Columbia. Manitoba recorded the lowest ratios (Table IV.8). Table IV.9 shows the capital availability ratios for the ready-mix concrete industry. In Newfoundland the ratio declined from 0.018 in 1961 to a low of 0.007 in 1971; it then increased gradually and by 1981 the ratio was 0.019. In Quebec the ratio for the industry in 1961 was 0.144. The lowest ratio for the industry in Quebec was 0.041 in 1971; since then the ratio increased steadily and by 1981 was 0.281. For Ontario the lowest ratios were recorded between 1965 and 1971. The ratio jumped from 0.078 in 1971 to 0.404 in 1972 and 0.436 in 1973. The ratio then decreased slowly to 0.325 by 1981. The industry in Alberta recorded a ratio of 0.098 in 1961 and by 1971 the ratio had decreased to 0.027. From 1972 the ratio increased gradually reaching a high of 0.187 in 1981. The trend shown by the industry in Alberta was reversed in British Columbia. The ratio increased from 0.302 in 1961 to a high of 0.760 in 1971. From 1971 the ratio decreased steadily to 0.110 in 1981.

For the ready-mix concrete industry 1971 seems to be a critical year. The ratios increased or decreased after 1971. Appendix IV.4 shows that there was a sudden increase in capital assets for the industry by all provinces. For example in Newfoundland assets in the ready-mix concrete industry increased by over 200 percent, from $43,000 in 1971 to $429,000 in 1972. In Quebec the assets increased from $240,000 in 1971 to $4,871,000 in 1972. There was also a similar significant increase in Ontario from $459,000 in 1971 to $11,686,000 in 1972. The industry assets increased by 270 percent in Alberta, from $158,000 in 1971 to $4,570,000 in 1972. The lowest increase, 32 percent, in assets was

recorded in British Columbia where the assets increased from $4,114,000 in 1971 to $4,448,000 in 1972. As Appendix VI.2 shows there was neither a reclassification of the ready-mix concrete industry nor a change in the industry at the three and four digit levels. Moreover, the sudden increase in assets cannot be explained on the basis of the accounting method since assets were depreciated on a straight line basis. Since the increase in the industry assets was right accross the country a possible explanation could be that the industry was positioning itself for the boom in construction in the 1970's.

Capital availability ratio for the miscellaneous metal fabrication industry in Alberta ranged from a low of 0.003, 1969 to 1972, to a high of 0.015 in 1981 (Table IV.10). In British Columbia, the ratio was greater than in Alberta with a low of 0.016 in 1969 and a high of 0.034 in 1981. Ontario had the highest range of ratios for the industry with a low of 0.619 and a high of 0.697. Ontario was followed by Quebec with ratios ranging from a low of 0.166 in 1963 to a high of 0.307 in 1968. The ratio for Quebec from 1969 to 1981 was about 0.240. The ratio for the industry in New Brunswick was between 0.021 in 1961 and 0.012 in 1968. From 1969 to 1981 the ratio ranged between 0.006 and 0.011.

Because of the limited number of manufacturing establishments in the eastern periphery and Statistics Canada's restriction on publication of data for less than three establishments in a geographic region; no ratios could be calculated for any of the provinces in eastern Canada for the boiler and plate works and the communication equipment industries. For these two industries comparison is made between the core and the western periphery. The boiler and plate works industry ratios for Ontario increased steadily from 0.558 in 1961 to 0.662 in 1979. From 1979 the ratio decreased to 0.650 in 1980 and to 0.626 in 1981 (Table IV.11). In the case of Alberta the ratios fluctuated between a low of 0.029 in 1974 and a high of 0.103 in 1980. The ratios were higher in Quebec than in British Columbia. The highest ratio of 0.396 for the industry in Quebec was recorded in 1968 and the lowest of 0.243 was in 1980. In British Columbia the ratio decreased from 0.015 in 1961 to 0.002 in 1980. In

1981 it increased slightly to 0.010. In the case of the communication equipment industry the ratios were higher in Ontario and Quebec than in Alberta and British Columbia. In Ontario highest ratio of 0.625 was recorded in 1980 and 1981 and the lowest of 0.504 was in 1961. The ratios for Quebec were about half of Ontario's values. The highest ratio in Quebec of 0.434 was recorded in 1962. From 1962 onwards the ratio decreased reaching a low of 0.333 in 1981 (Table IV.12).

It was pointed out in Chapter III that not much significance can be attached to the threshold values of the capital availability ratios since disaggregated data could not be used in the analysis. What is important in this study is that the ratio did indicate changes from one time period to another. And also the analysis did show changes in magnitude which may have influenced shipments in different sectors in the provinces. The relationship between the changes in the capital availability and the location quotient are presented in Chapter VI.

CHAPTER V

HIBERNIA DEVELOPMENT IMPACT AND CAPITAL EQUIPMENT SOURCING

1. INTRODUCTION

The first objective of this dissertation is to analyse the spatial impacts of the capital equipment expenditures which would be required to develop the Hibernia field. The third objective, on the other hand, is to examine the locational dynamics of the ocean industry in Canada. This chapter deals with both objectives.

This chapter begins with a review of the capital equipment demand profiles for the Hibernia field development. This is followed by a discussion of the results of the interprovincial input-output analysis. Also examined are ways of increasing the domestic share of the equipment sourcing through import substitution. The input-output analysis indicates that the impacts of the equipment expenditures would be spread over several industrial sectors throughout the country. To bring all the industrial sectors into focus, Chapter V ends by examining the locational dynamics of the ocean industry in Canada. The major ocean industry clusters which would be impacted first and from which development opportunities could spread to surrounding areas are also discussed.

2. CAPITAL EQUIPMENT DEMAND PROFILES

Several studies have been carried out to identify the capital equipment demand requirements for the development of Hibernia oil and gas reserves. However, most of these studies were carried out by consultants and only a few are public documents. (Department of Industry, Trade and Commerce 1981 and Government of Newfoundland and Labrador 1980). In comparison to the Government of Newfoundland and Labrador study, the Department of Industry, Trade and Commerce Hibernia Supply and Demand Study provides a more detailed breakdown of the equipment requirements for the four main development scenarios: floating-tanker system,

floating-pipeline system, gravity-tanker system and gravity-pipeline system. For the purpose of this thesis, the equipment requirements for the floating-tanker system and gravity-tanker system were used in the analysis of economic impacts because either of the two is the most likely development system to be used for the East Coast.

The Department of Industry, Trade and Commerce study of capital equipment demand costs reflect both equipment costs for the field development and the cost of installing the production equipment. The main advantage of using these particular cost profiles is that they treat capital equipment from the point of manufacturing to installation and thus provide a more realistic economic indication of development effects. The equipment requirements for the Floating-Tanker system scenario comprise of the production equipment - semi-submersible production platform, storage vessel, semi-submersible drilling rigs, one million barrels semi-submersible storage vessel, tanker vessels and supply vessels, at a total cost of $9,454.7 million for a two-year field phasing Table V.1. Equipment items include steel $739 million, diesel engines $405.8 million, and shaft and propellers $501.1 million. Table V.2 and V.2a give the item by item breakdown for the Gravity-Tanker system scenario. This system would be made up of a gravity structure, tanker vessels and supply vessels at a total cost of $7,495.1 million: $5,379.3 million for the gravity structure and $2,115.8 million for the tankers and supply vessels. The time profiles in both tables could also be read as first, second, third, etc. year of development.

3. CAPITAL EQUIPMENT SOURCING: INTERPROVINCIAL INPUT-OUTPUT SIMULATION

The Government of Newfoundland and Labrador views the Hibernia development project as a great opportunity to provide jobs, directly from the project and from the economic spinoffs, and thereby reduce the high unemployment and under-employment in the province. The Provincial Government has therefore from the very beginning, expressed a strong preference for a gravity mode of production. The province sees the gravity mode of production as resulting in the least leakages out of the province compared to a floating system of production. Mobil and its

TABLE V.1

CAPITAL EQUIPMENT DEMAND PROFILE, FLOATING SYSTEM/TANKER OPTION
2 YEAR FIELD PHASING

ITEM	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
					($MILLION)						
STEEL (SHIP BUILDING)	11.2	39.2	99.3	111.1	106.2	88.7	90.4	102.3	66.9	23.7	739
DIESEL ENGINES	8	28	60.9	60.2	55.6	44.2	45.3	52.6	36.3	14.7	405.8
SHAFTS AND PROPELLORS	11	38.5	73.4	72.1	68.1	50.1	51.9	64.4	46.7	24.9	501.1
WINCHES	1.4	4.9	9.7	8.8	7.9	6	6.2	7.4	5.2	2.3	59.8
BOILERS (PIPES & FITTINGS)	3.3	11.5	21.9	21.8	20.9	15.2	15.7	19.8	14.6	8.1	152.8
LIVING QUARTERS	3.1	10.8	32.6	41.3	46.1	35.1	36.4	45.9	33.7	18.9	303.9
PUMPS	0.1	0.3	8.2	13.8	17.3	13.6	14.1	17.8	13.1	7.3	105.6
COMPRESSORS, FANS, BLOWERS	0.1	0.3	8.2	13.8	17.3	13.6	14.1	17.8	13.1	7.3	105.6
VALVES	0.1	0.3	8.2	13.8	17.3	13.6	14.1	17.8	13.1	7.3	105.6
GENERATORS	0.1	0.3	0.7	0.8	0.8	0.6	0.6	0.8	0.6	0.3	5.6
SWITCH GEAR	3	10.5	21.7	22.9	22.9	16.9	17.5	22.1	15.2	9.1	162.8
POWER TRANSFORMERS	5	17.5	33.5	33.4	32.2	23.4	24.3	30.6	22.5	12.6	235
WIRE & CABLE	1.9	6.6	8.2	4.9	2.4	1.1	1.2	1.5	1.1	0.6	29.5
ELECTRONICS	5.6	19.6	25.7	17	10.2	5.8	6	7.6	5.6	3.1	106.2
FIREFIGHTING & SAFETY EQUIPMENT	0.8	2.8	6.5	7.4	7.8	5.8	6	7.6	5.6	3.1	53.4
DRILLING PACKAGE	14	49	56	28	7	0	0	0	0	0	154
GAS\OIL\SEPARATORS SCRUBBER	0	0	8.6	14.9	18.9	14.9	15.5	19.5	14.3	8	114.6
OILFIELD EQUIPMENT	0	0	3.3	5.8	7.4	5.8	6	7.6	5.6	3.1	44.6
MISCELLANEOUS	39.5	138.2	313.7	323.4	313	250.4	256.5	299.4	204.8	85.7	2230.6
LABOUR & OVERHEAD	61.8	216.3	491.4	502.6	471.3	379	387.8	449.2	307.2	122.8	3389.4
SUBSEA EQUIPMENT	0	0	33.7	58.5	74.2	58.5	60.7	76.5	56.2	31.5	449.8
TOTAL	170	594.6	1325.4	1382.3	1324.8	1042.3	1070.3	1268.2	882.4	394.4	9454.7

SOURCE: CANADA, DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE, HIBERNIA SUPPLY/DEMAND STUDY, SEPTEMBER 21, 1981, (OTTAWA: ITC)

TABLE V.2

CAPITAL EQUIPMENT DEMAND PROFILE, GRAVITY SYSTEM/TANKER OPTION
GRAVITY STRUCTURES

ITEM	1984	1985	1986	1987	1988	1989	1990	TOTAL
				$ MILLION				
LIVING QUARTERS	2.0	4.0	5.0	6.0	6.0	5.0	4.0	32.0
POWER GENERATION	5.3	10.7	13.3	16.1	16.1	13.5	10.7	85.7
UTILITIES	2.6	5.3	6.6	8.0	8.0	6.7	5.3	42.5
SEPARATION	10.0	20.1	25.0	30.3	30.3	25.4	20.2	161.3
TEST SEPARATION	3.0	6.0	7.5	9.0	9.0	7.6	6.0	48.1
WATER TRAETMENT	4.3	8.7	10.8	13.1	13.1	11.0	8.7	69.7
OIL TRANSFER	3.0	7.4	9.1	11.1	11.1	9.3	7.4	58.4
WATER INJECTION	4.3	8.7	10.8	13.1	13.1	11.0	8.7	69.7
WELLHEAD	3.0	6.0	7.5	9.0	9.0	7.6	6.0	48.1
DIESEL STORAGE	0.3	0.6	0.8	1.0	1.0	0.8	0.6	5.1
CRANES	0.3	0.6	0.8	1.0	1.0	0.8	0.6	5.1
FLARES	0.3	0.6	0.8	1.0	1.0	0.8	0.6	5.1
TRANSPORTATION	0.6	1.3	1.6	2.0	2.0	1.6	1.3	10.4
LOAD UP	2.6	5.3	6.6	8.0	8.0	6.7	5.3	42.5
HOOK UP (LABOUR)	24.1	48.4	60.1	72.7	72.7	61.1	48.5	387.6
O/H & ADMINISTRATION	6.0	12.1	15.0	18.1	18.1	15.2	12.1	96.6
INSURANCES	1.6	3.3	4.1	5.0	5.0	4.2	3.3	26.5
CONTINGENCY	18.4	37.0	45.9	55.6	55.6	46.6	37.0	296.1
SITE PREPARATION	24.8	49.8	61.8	74.8	74.8	62.8	49.8	398.6
CONSTRUCTION	16.1	32.3	40.1	48.5	48.5	40.7	32.3	258.5
CONCRETE REBAR/FOR	109.8	220.0	273.3	330.5	330.5	277.6	220.3	1762.0
STRUCTURAL STEEL	7.3	14.8	18.3	22.2	22.2	18.6	14.8	118.2
TOWING & PLACING	4.7	9.4	11.7	14.1	14.1	11.8	9.4	75.2
CONTINGENCIES	24.1	48.4	60.1	72.7	72.7	61.1	48.5	387.6
ENGINEERING & MANAGEMENT	18.4	37.0	45.9	55.6	55.6	46.6	37.0	296.1
CONTRACTORS MARK-UP 20%	36.9	74.0	91.9	111.2	111.2	93.3	74.1	592.6
TOTAL	333.8	671.8	834.4	1009.7	1009.7	847.4	672.5	5379.3

Source: Canada, Department of Industry, Trade and Commerce, Hibernia Supply/Demand Study, September 21, 1981 (Ottawa:ITⅅC)

TABLE V.2a

CAPITAL EQUIPMENT DEMAND PROFILE, GRAVITY SYSTEM/TANKER OPTION
TANKERS/SUPPLY BOATS

ITEM	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
					($ M.)						
STEEL (SHIPBUILDING)	0	0	9	18	18	18	18	18	9	0	108
DIESEL ENGINES	3	10.5	21.3	24	20.5	18	18.1	19.2	10.8	2.1	147.5
SHAFTS AND PROPELLERS	1.5	5.2	8.5	7.7	5.9	4.7	4.7	5.3	3.2	1	47.7
WINCHES	0.6	2.1	4	4.2	3.5	3	3.1	3.3	1.9	0.4	26.1
MISCELLANEOUS	19.5	68.2	121.8	122.7	100.2	83.7	84.7	91.5	53.5	13.6	759.3
LABOUR & OVERHEAD	18	63	139.6	167.6	146.9	131.6	132.5	138.8	76.6	12.6	1027.2
TOTAL	42.6	149	304.2	344.2	295	259	261	276.1	155	29.7	2115.8

partners, on the other hand, indicated an initial preference for a floating system, taking into account cost, early production and environmental factors. Consequently, the company carried out engineering studies for both production modes. By carrying out both studies it could be argued Mobil was keeping its options open as part of the negotiating strategy to obtain favourable royalties and other development conditions and incentives. It must be pointed out that it is not unusual for companies, particularly multinational firms, to take into account political and non-economic factors in their decision-making.

The Canada Newfoundland Offshore Petroleum Board (CNOPB 1986) has now decided that the gravity base system will be used for the development of the Hibernia field. However the question still remains, which system of production would offer the maximum employment and business opportunities. To help answer this question the results of the interprovincial input-output analysis for both the gravity system and the floating system are presented below.

a) Floating-Tanker System

Tables V.3 to V.6 summarize purchases for the floating system which would cost $9.4 billion. In the first year of sourcing $276.6 million would be spent. The largest purchase of $1.38 billion would be made in 1985 or the fourth year of development, and in the last year of sourcing 1991 $394.4 million (Table V.3). Major expenditure items would be steel plates, machinery, ships, and generators. A total of $4.8 billion would be spent in Newfoundland, mostly in 1985 (Table V.4), compared to $2.0 billion that would be used to purchase goods and services from the rest of Canada. Goods and services imported would cost $2.5 billion. This represents 26.6 per cent of total purchases. Most of the purchases in Newfoundland would be for air and water transport and cafeteria supplies. A breakdown of all goods and services within Canada and the provinces is shown in Appendix V.1. Figures V.1 to V.3 summarize, graphically, the purchases.

TABLE V.3

SUMMARY TOTAL PURCHASES 1982 - 1991 ($000)
CAPITAL EQUIPMENT DEMAND PROFILE : FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
SERVICES INCIDENTAL TO MINING	7900	27640	62740	65880	62600	50080	51300	59880	40960	17140	446120
STEEL PLATES, NOT FABRICATED	11200	39200	99300	111100	106200	88700	90400	102300	66900	23700	739000
OIL COUNTRY GOODS			3300	5800	7400	5800	6000	7600	5600	3100	44600
LINE PIPE, STEEL, FOR OIL & GAS	7900	27640	67795	74655	73730	58855	60405	71355	49390	21865	513590
PIPES, & FITTINGS, CAST IRON			16850	29250	37100	29250	30350	38250	28100	15750	224900
PLATES, STEEL, FABRICATED			5055	8775	11130	8775	9105	11475	8430	4725	67470
BOILERS, MARINE TYPE	3300	11500	21900	21800	20900	15200	15700	19800	14600	8100	152800
VALVES	100	300	8200	13800	17300	13600	14100	17800	13100	7300	105600
MUNICIPAL EQUIPMENT	800	2800	6500	7400	7800	5800	6000	7600	5600	3100	53400
PUMPS, COMPRESSORS, BLOWERS, ETC.	200	600	16400	27600	34600	27200	28200	35600	26200	14600	211200
CONVEYORS, HOISTING, MACHINERY	1400	4900	9700	8800	7900	6000	6200	7400	5200	2300	59800
INDUSTRY-SPECIFIC MACHINERY	14000	49000	64600	42900	25900	14900	15500	19500	14300	8000	268600
PARTS, ASSEMBLIES FOR SHIPS, BOATS	14100	49300	106000	113400	114200	85200	88300	110300	80400	43800	805000
TELEVISION, RADIO, AUDIO EQUIPMENT	2200	7800	10300	6800	4100	2300	2000	3000	2200	1100	41800
ELECTRONIC EQUIPMENT COMPONENTS	5000	17500	33500	33400	32200	23400	24300	30600	22500	12600	235000
MOTORS, GENERATORS, ENGINES, NES	8100	28300	61600	6100	56400	44800	45900	53400	36900	15000	356500
ELECTRICAL EQUIPMENT, NES	3000	10500	21700	22900	22900	16900	17500	22100	16200	9100	162800
WIRE & CABLE INSULATED	1900	6600	14940	16600	17240	12800	13340	16800	12340	6900	119460
MEASURING CONTROL INSTR.	3400	11800	15400	10200	6100	3500	4000	4600	3400	2000	64400
AIR TRANSPORTATION	1975	6910	15685	16470	15650	12520	12825	14970	10240	4285	111530
WATER TRANSPORTATION	118500	41460	94110	98820	93900	75120	76950	89820	61440	25710	775830
CAFETERIA SUPPLIES	9875	34550	78425	82350	78250	62600	64125	74850	51200	21425	557650
WAGES & SALARIES	61800	216300	491400	502600	471300	379000	387800	449200	307200	122800	3389400
TOTAL	276650	594600	1325400	1327400	1324800	1042300	1070300	1268200	882400	39400	9506450

TABLE V.4

SUMMARY OF PURCHASES NEWFOUNDLAND 1982 - 1991 ($000'S)
CAPITAL EQUIPMENT DEMAND PROFILE : FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
SERVICES INCIDENTAL TO MINING	7900	27640	62740	65880	62600	50080	51300	59880	40960	17140	446120
STEEL PLATES, NOT FABRICATED											
OIL COUNTRY GOODS											
LINE PIPE, STEEL, FOR OIL & GAS											
PIPES & FITTINGS, CAST IRON											
PLATES, STEEL, FABRICATED			1554	2697	3421	2697	2799	3527	2591	1452	20738
BOILERS, MARINE TYPE											
VALVES											
MUNICIPAL EQUIPMENT											
PUMPS, COMPRESSORS, BLOWERS, ETC.											
CONVEYORS, HOISTING, MACHINERY											
INDUSSTRY-SPECIFIC MACHINERY	634	2218	2924	1942	1172	674	702	883	647	362	12158
PARTS, ASSEMBLIES FOR SHIPS, BOATS	4745	16590	35670	38160	38429	28670	29714	37117	27055	14739	270889
TELEVISION, RADIO, AUDIO EQUIPMENT											
ELECTRONIC EQUIPMENT COMPONENTS											
MOTORS, GENERATORS, ENGINES	29	103	223	221	204	162	166	193	134	54	1489
ELECTRICAL EQUIPMENT	1	3	6	7	7	5	5	7	5	1	49
WIRE & CABLE, INSULATED											
MEASURING CONTROL INSTR.											
AIR TRANSPORTATION	379	1326	3010	3161	3004	2403	2461	2873	1965	822	21404
WATER TRANSPORTATION	2274	7957	18062	18966	18022	14417	14769	17239	11792	4934	128432
CAFETERIA SUPPLIES	9875	34550	78425	82350	78250	62600	64125	74850	51200	21425	557650
WAGES & SALARIES	61800	216300	491400	502600	471300	379000	387800	449200	307200	122800	3389400
TOTAL	87637	306687	694014	715984	676409	540708	553841	645769	443549	183731	4848329

TABLE V.5

SUMMARY OF PURCHASES REST OF CANADA 1982 - 1991 ($000'S)
CAPITAL EQUIPMENT DEMAND PROFILE : FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
SERVICES INCIDENTAL TO MINING											
STEEL PLATES, NOT FABRICATED	18	62	158	117	169	141	144	163	106	38	1176
OIL COUNTRY GOODS											
LINE PIPE, STEEL, FOR OIL & GAS											
PIPES & FITTINGS, CAST IRON			15513	26928	34155	26928	27941	35214	25870	14560	207049
PLATES, STEEL, FABRICATED			3488	6054	7679	6054	6282	7917	5816	3269	46559
BOILERS, MARINE TYPE	3300	11500	21900	2800	20900	15209	15700	19800	14600	8100	133809
VALVES	74	221	6093	10253	12854	10105	10476	13225	9733	5424	78460
MUNICIPAL EQUIPMENT	718	2513	5834	6641	7000	5205	5385	6821	5026	2782	47925
PUMPS, COMPRESSORS, BLOWERS, ETC.	110	329	8980	15113	18946	14894	15441	19493	14346	7994	115646
CONVEYORS, HOISTING, MACHINERY	648	2269	4492	4075	3658	2778	2871	3427	2408	1065	27691
INDUSTRY-SPECIFIC MACHINERY	7398	25895	34139	22671	13687	7874	8191	10305	7557	4228	141945
PARTS, ASSEMBLIES FOR SHIPS, BOATS	1824	6378	13713	14670	14773	11022	11423	14269	10401	5666	104139
TELEVISION, RADIO, AUDIO EQUIPMENT	975	3458	4567	3015	1818	1020	887	1330	975	488	18533
ELECTRONIC EQUIPMENT COMPONENTS	3316	11607	22219	22152	28356	15520	16117	20295	14923	8357	155862
MOTORS, GENERATORS, ENGINES	2595	9067	19737	19545	18071	14354	14707	17110	11823	4806	131815
ELECTRICAL EQUIPMENT	1073	3754	7759	8188	8188	6042	6257	7702	5792	3254	58209
WIRE & CABLE, INSULATED	1807	6278	14211	15789	16398	12175	12689	15980	11737	6563	113627
MEASURING CONTROL INSTR.	3017	10470	13664	9050	5412	3105	3549	4081	3017	1775	57140
AIR TRANSPORTATION	1596	5584	12675	13309	12646	10117	10364	12097	8275	3463	90126
WATER TRANSPORTATION	9576	33503	76048	79854	75878	60703	62181	72581	49648	20776	540748
CAFETERIA SUPPLIES											
WAGES & SALARIES											
TOTAL	38045	132890	285150	280284	293588	223237	230605	282010	203653	102519	2071441

TABLE V.6

SUMMARY OF PURCHASES REST OF WORLD 1982 - 1991 ($000'S)
CAPITAL EQUIPMENT DEMAND PROFILE : FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
SERVICES INCIDENTAL TO MINING											
STEEL PLATES, NOT FABRICATED	11182	39138	99142	110923	106031	88559	90256	102187	66793	23662	737873
OIL COUNTRY GOODS			3300	5800	7400	5800	6000	7600	5600	3100	44600
LINE PIPE, STEEL, FOR OIL & GAS	7900	27640	67795	74655	73730	58855	60405	71355	49390	21865	513590
PIPES & FITTINGS, CAST IRON			1337	2322	2945	2322	2409	3036	2230	1250	17851
PLATES, STEEL, FABRICATED			14	24	30	24	24	31	23	13	183
BOILERS, MARINE TYPE											
VALVES	26	77	2107	3547	4446	3495	3624	4575	3367	1876	27140
MUNICIPAL EQUIPMENT	82	287	666	759	800	595	615	779	574	318	5475
PUMPS, COMPRESSORS, BLOWERS, ETC.	90	271	7420	12487	15654	12306	12759	16107	11854	6606	95554
CONVEYORS, HOISTING, MACHINERY	752	2631	5208	4725	4242	3222	3329	3973	2752	1235	32109
INDUSTRY-SPECIFIC MACHINERY	5968	20888	27537	18287	11041	6352	6607	8312	6096	3410	114498
PARTS, ASSEMBLIES FOR SHIPS, BOATS	7531	26332	56617	60570	60997	45508	47163	58914	42944	23395	429971
TELEVISION, RADIO, AUDIO EQUIPMENT	1225	4342	5733	3785	2282	1280	1113	1670	1225	612	23267
ELECTRONIC EQUIPMENT COMPONENTS	1684	5893	11281	11248	10844	7880	8183	10305	7577	4243	79138
MOTORS, GENERATORS, ENGINES	5475	19130	41640	41234	38125	30284	31027	36097	24943	10140	278095
ELECTRICAL EQUIPMENT	1926	6743	13935	14705	14705	10852	11238	14192	10403	5844	104543
WIRE & CABLE, INSULATED	93	322	729	811	842	625	651	820	603	337	5833
MEASURING CONTROL INSTR.	383	1330	1736	1150	688	395	451	519	383	225	7260
AIR TRANSPORTATION											
WATER TRANSPORTATION											
CAFETERIA SUPPLIES											
WAGES & SALARIES											
TOTAL	44317	155024	346197	367032	354802	278354	285854	340472	236797	108131	2516980

FIGURE V.1

PURCHASES NEWFOUNDLAND

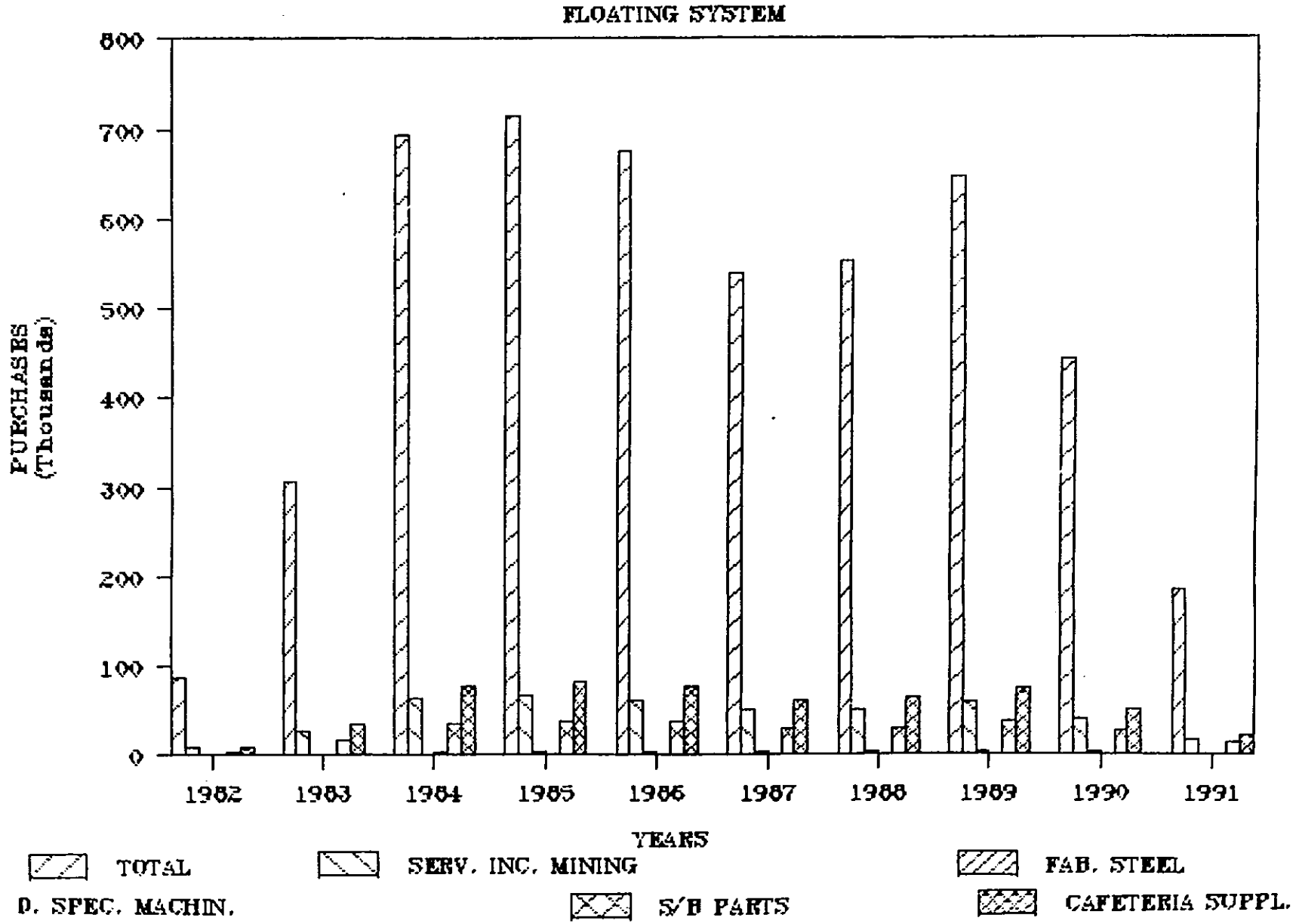


FIGURE V.2

PURCHASES REST OF CANADA

FLOATING SYSTEM

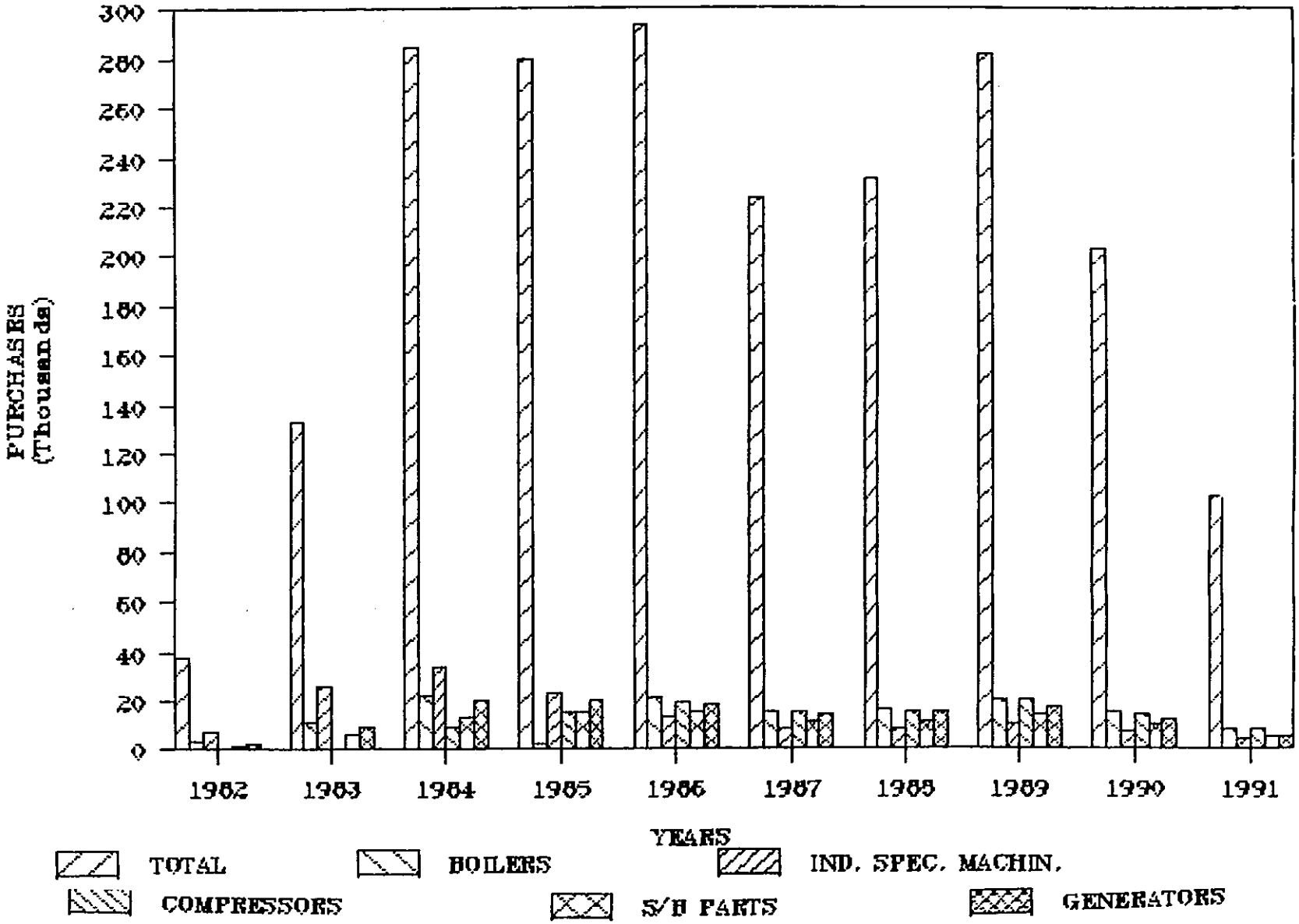
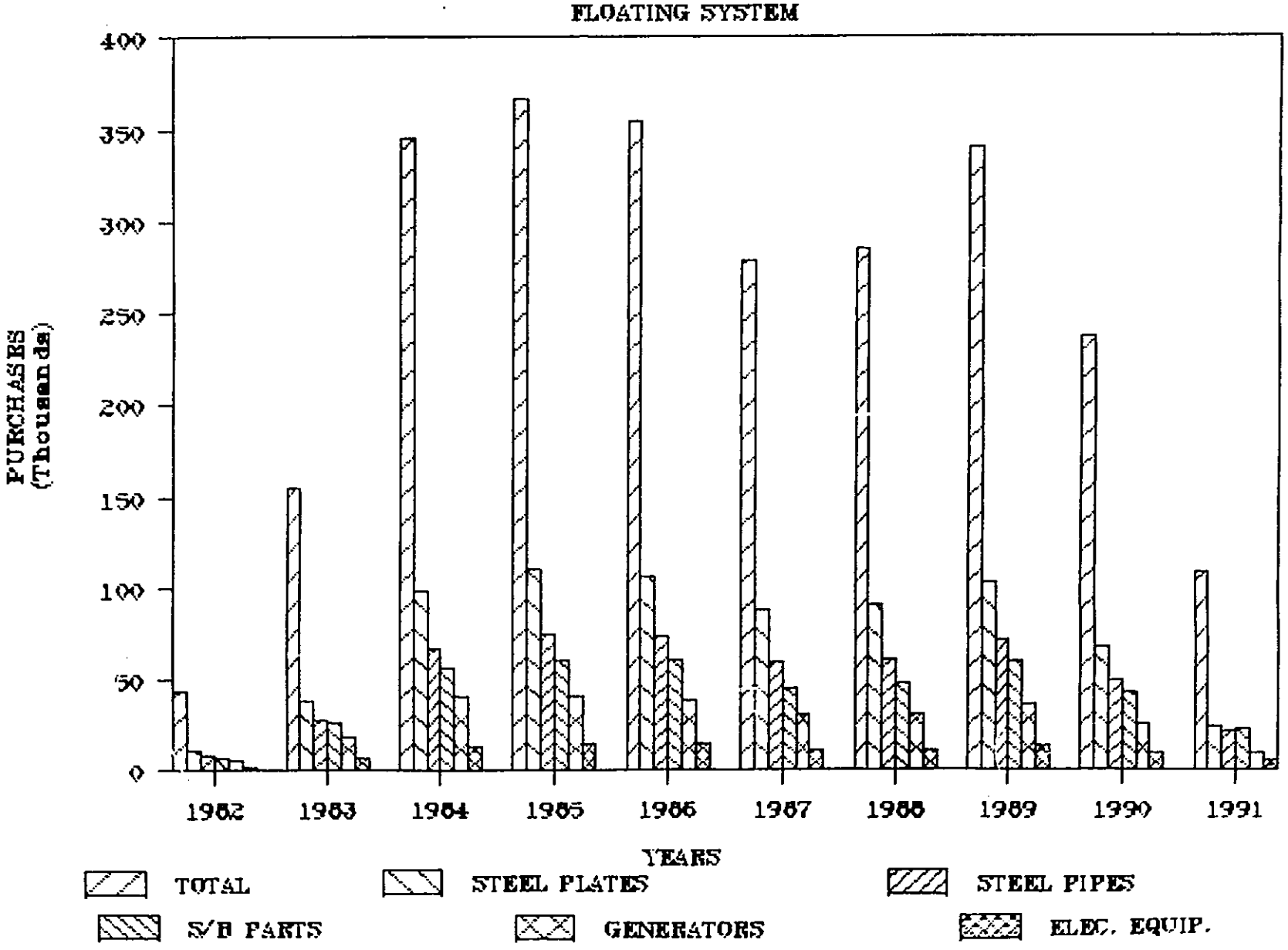


FIGURE V.3

PURCHASES REST OF WORLD



Total, direct, and indirect and induced employment associated with the floating - Tanker system, over the project life, in person years would be in the order of 303,000; 53,000 (Table V.7) or 17.6 per cent direct and 250,000 or 82.4 per cent indirect and induced employment. Total employment generated in Newfoundland in person years would be 28.5 per cent, Ontario 37.6 per cent, Quebec 23 per cent, and in Nova Scotia 5.2 per cent. Table V.8 shows the distribution of direct employment would be Ontario 36.7 per cent, Newfoundland 32.6 per cent, Quebec 21.5 percent and Nova Scotia 6.2 per cent. Each of the remaining provinces would receive less than two per cent of the total direct employment. Table V.9, total indirect and induced employment, shows the same pattern of distribution as Table V.8, with Ontario receiving 37.9 per cent, Newfoundland 27.7 per cent, Quebec 23.4 per cent and Nova Scotia 5 per cent. Figures 4, 5 and 6 present the distribution of employment graphically.

b. Gravity-Tanker System

Tables V.10 to V.13 summarize the total purchases that would be required for the gravity system. Total project purchases of $7.4 billion increase from $191 million in 1982, peaks at $2.3 billion in 1984 and declines to $857 million by 1990. Of the total capital equipment purchases that would be made $3.7 billion, or 50.5 percent would be sourced in Newfoundland, $2.3 billion or 30.5 percent sourced from the rest of Canada and $1.4 billion, or 19 percent would be imported. Purchases in Newfoundland would include office and stationery supplies $1.2 million, ships, vessels and parts $70 million, and oil and gas facilities construction $724 million and concrete products $1.1 billion. Figures V.7 to V.9 summarize graphically the purchases.

Gross Domestic Product (GDP) measures the value of all goods and services produced within a country or region and is an important indicator of how well the economy is doing. Appendix V.2 shows the Canadian and Provincial GDP distribution. The lack of a strong and

TABLE V.7

TOTAL DIRECT, INDIRECT AND INDUCED EMPLOYMENT IN PERSON YEARS 1982 - 1991
CAPITAL EQUIPMENT DEMAND PROFILE: FLOATING SYSTEM - TANKER OPTOIN

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL	%
NEWFOUNDLAND	1557.3	5449	12241.7	12718.8	12113.8	9604.3	9851	11583.5	8008.3	3460.2	86587.9	28.5
P.E.I.	31	108.6	245.9	255.5	242	193.5	198.2	231.3	158.6	66	1730.6	0.6
NOVA SCOTIA	272.3	952.4	2161.8	2297.6	2245.9	1753.1	1803.7	2161	1519.3	712.8	15879.9	5.2
NEW BRUNSWICK	115.1	402.1	954.6	1030.5	1011.6	800.4	822.4	976.5	681	307.3	7101.5	2.3
QUEBEC	1253.2	4380.7	9695	10131.2	9789	7626.4	7850.3	9385.2	6593.6	3070.2	69774.8	23
ONTARIO	2161.4	7554.6	16134.2	16605.6	15920.5	12284.5	12649.7	15208.7	10738.3	5108.2	114365.7	37.6
MANITOBA	38.1	133	301.2	317.4	307.6	241.3	248.1	295.4	206.6	94.3	2183	0.7
SASKATCHEWAN	19.6	68.6	154.1	160.1	152.2	120.8	123.9	145.4	100.4	43.1	1088.2	0.4
ALBERTA	42.4	148.2	323.6	333.2	316.4	248.4	255.2	302.1	210.1	93.6	2273.2	0.8
BRITISH COLUMBIA	51.1	178.5	385.6	396.7	378	294.6	302.9	360.9	252.5	115.8	2716.6	0.9
YUKON & NORTHWEST TERRITORIES	0.1	0.4	0.9	1	1.1	0.8	0.8	1	0.7	0.4	7.2	0
CANADA	5541.4	19376.2	42598.8	44247.6	42478	33163	34106.1	40650.9	28469.7	13071.9	303703.6	100

TABLE V.8

SUMMARY OF DIRECT EMPLOYMENT IN PERSON YEARS 1982 - 1991
CAPITAL EQUIPMENT DEMAND PROFILE: FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL	%
NEWFOUNDLAND	309.3	1082	2408	2539.6	2456.6	1921	1975.1	2356.6	1647.1	761.2	17456.5	32.6
P.E.I.	1.7	5.9	13.3	14	13.3	10.6	10.9	12.7	8.7	3.6	94.7	0.2
NOVA SCOTIA	54.7	191.3	435.4	473.5	475.9	364.1	376	460.7	330.3	168.8	3330.7	6.2
NEW BRUNSWICK	14.4	50.1	133.7	155.8	161.8	127	131	158.7	112.6	55.2	1100.3	2.1
QUEBEC	206.2	720.3	1565.7	1648.3	1618	1236.3	1277.7	1555.6	1111	556.7	11495.8	21.5
ONTARIO	394.1	1376.6	2785.4	2828.4	2719.7	2040.6	2109.2	2592.4	1866.4	963.5	19676.3	36.7
MANITOBA	0.4	1.3	4.7	6.1	6.9	5.3	5.5	6.9	5	2.7	44.8	0.1
SASKATCHEWAN	0	0	0	0	0	0	0	0	0	0	0	0
ALBERTA	0.8	2.7	3.6	2.4	1.4	0.8	0.9	1.1	0.8	0.4	14.9	0
BRITISH COLUMBIA	6.9	24.1	49.2	49.6	46.9	35.8	36.9	44.6	31.6	15.4	341	0.6
YUKON & NORTHWEST TERRITORIES	0	0	0	0	0	0	0	0	0	0	0	0
CANADA	988.4	3454.4	7399.1	7717.6	7500.5	5741.6	5923.2	7189.4	5113.6	2527.5	53555.3	100

TABLE V.9

TOTAL INDIRECT AND INDUCED EMPLOYMENT IN PERSON YEARS 1982 - 1991
CAPITAL EQUIPMENT DEMAND PROFILE: FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL	%
NEWFOUNDLAND	1248	4367	9833.7	10179.2	9657.2	7683.3	7875.9	9226.9	6361.2	2699	69131.4	27.7
P.E.I.	29.3	102.7	232.6	241.5	228.7	182.9	187.3	218.6	149.9	62.4	1635.9	0.6
NOVA SCOTIA	217.6	761.1	1726.4	1824.1	1770	1389	1427.7	1700.3	1189	544	12549.2	5
NEW BRUNSWICK	100.7	352	820.9	874.7	849.8	673.4	691.4	817.8	568.4	252.1	6001.2	2.4
QUEBEC	1047	3660.4	8129.3	8482.9	8171	6390.1	6572.6	7829.6	5482.6	2513.5	58279	23.4
ONTARIO	1767.3	6178	13348.8	13777.2	13200.8	10243.9	10540.5	12616.3	8871.9	4144.7	94689.4	37.9
MANITOBA	37.7	131.7	296.5	311.3	300.7	236	242.6	288.5	201.6	91.6	2138.2	0.8
SASKATCHEWAN	19.6	68.6	154.1	160.1	152.2	120.8	123.9	145.4	100.4	43.1	1088.2	0.4
ALBERTA	41.6	145.5	320	330.8	315	247.6	254.3	301	209.3	93.2	2258.3	0.9
BRITISH COLUMBIA	44.2	154.4	336.4	347.1	331.1	258.8	266	316.3	220.9	100.4	2375.6	0.9
YUKON & NORTHWEST TERRITORIES	0.1	0.4	0.9	1	1.1	0.8	0.8	1	0.7	0.4	7.2	0
CANADA	4553	15921.8	35199.7	36530	34977.5	27421.4	28182.9	33461.5	23356.1	10544.4	250148.3	100

FIGURE V.4

TOTAL DIRECT EMPLOYMENT

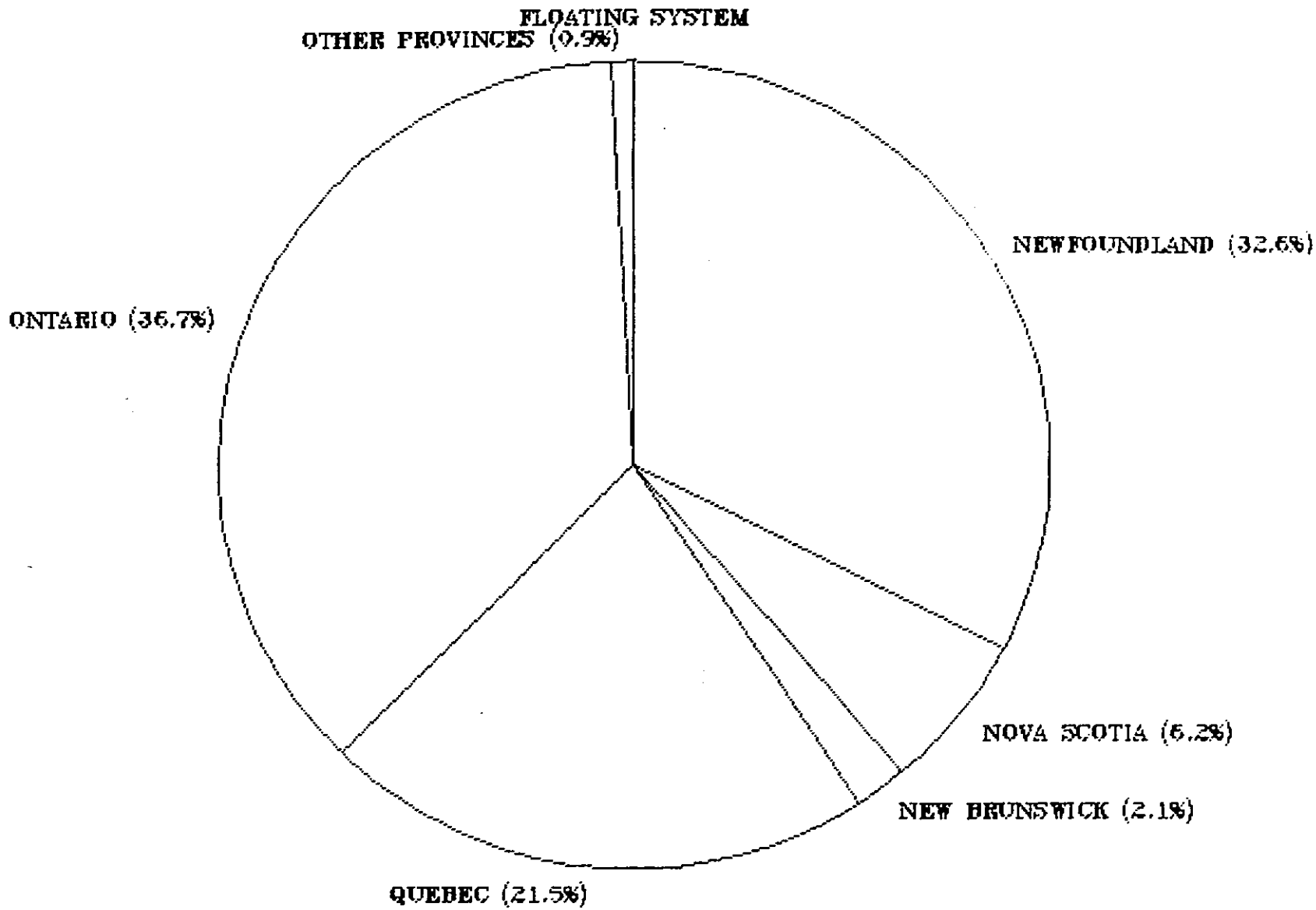


FIGURE V.5

TOTAL DIRECT,INDIREC.,INDUC. EMPL. P/Y

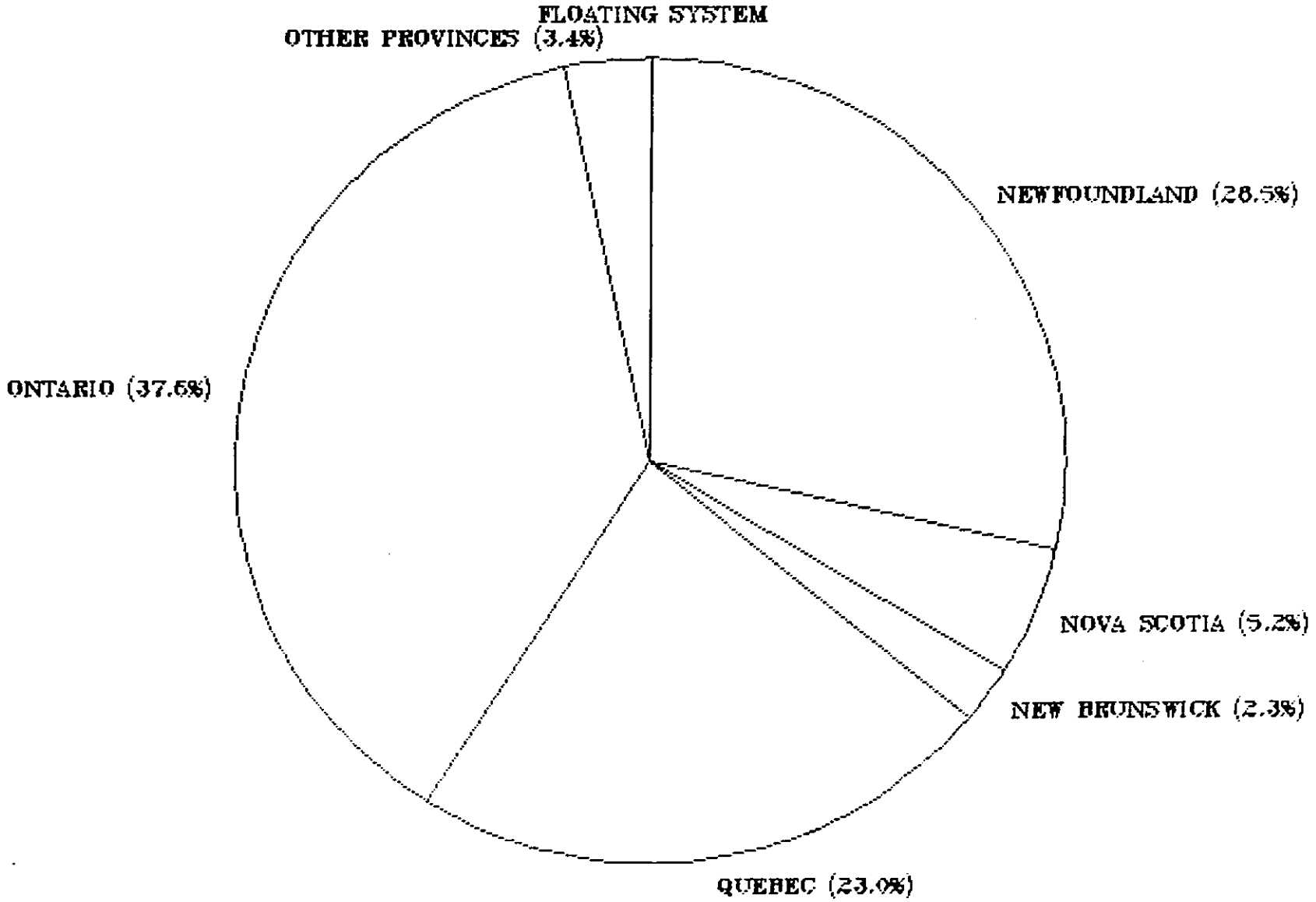


FIGURE V.6

INDIRECT AND INDUCED EMPLOYMENT P/Y

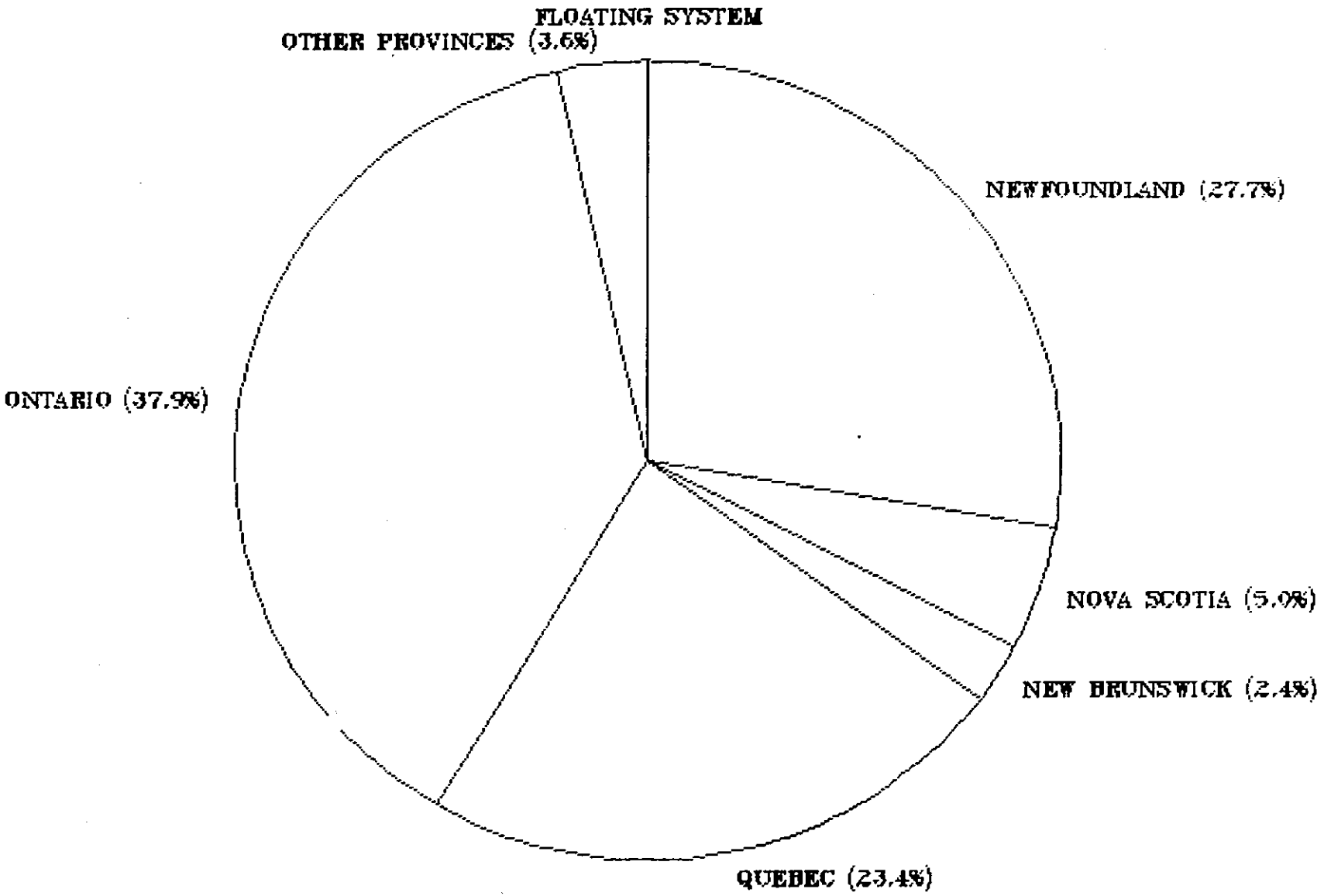


TABLE V.10

SUMMARY OF TOTAL PURCHASES 1982 - 1990 ($000's)
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
HOSE AND TUBING		12989	25202	25451	9234	72876
OFFICE AND STATIONERY SUPPLIES		5652	10324	10386	3775	30137
STEEL BARS AND RODS		94674	173340	174586	63254	505854
STEEL PLATES, NOT FABRICATED		93588	108129	106181	28337	336235
LINE PIPE, STEEL FOR OIL AND GAS		3710	6793	6834	2471	19808
PIPES AND FITTINGS, CAST IRON		3710	6793	6834	2471	19808
TANKS		1124	2246	2246	749	6365
STRUCTURAL STEEL FABRICATED		25377	46507	46855	16998	135737
VALVES		3822	6999	7041	2546	20408
PUMPS, COMPRESSORS, BLOWERS		16238	29818	30067	10856	86979
CONVEYORS, HOISTING MACHINERY	13040	30268	21813	21132	8685	94938
AIR CLEANING MACHINERY		16238	29818	30067	10856	86979
INDUSTRY-SPECIFIC MACHINERY		48840	89579	90230	32693	261312
PARTS ASSEMBLIES FOR SHIPS, BOATS	32359	65412	45668	44988	19952	208379
MOTORS, GENERATORS, ENGINES	65201	180536	152539	146997	57616	602889
ELECTRICAL EQUIPMENT		9868	18215	18339	6613	53035
CONCRETE BASIC PRODUCTS		284022	520021	523758	189761	1517562
HOUSEHOLD OBJECTS		1124	2246	2246	749	6365
GAS OIL FACILITY CONSTRUCTION		135560	248262	250020	90495	724337
AIR TRANSPORTATION		949	1797	1797	646	5189
WATER TRANSPORTATION		17614	32322	32438	11769	94143
REAL ESTATE, FINANCIAL SERVICES		6121	11353	11478	4118	33070
OTHER RENT		16957	30972	31158	11324	90411
SERVICES TO BUSINESS MANAGEMENT		171976	314942	317137	114896	918951
WAGES AND SALARIES	81000	407628	462399	456565	156333	1563925
TOTAL	191600	1653997	2398097	2394801	857197	7495692

TABLE V.11

SUMMARY OF PURCHASES NEWFOUNDLAND 1982 - 1990 ($000's)
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
HOSE AND TUBING						
OFFICE AND STATIONERY SUPPLIES		243	445	447	163	1298
STEEL BARS AND RODS		4846	8872	8936	3238	25892
STEEL PLATES, NOT FABRICATED						
LINE PIPE, STEEL FOR OIL AND GAS						
PIPES AND FITTINGS, CAST IRON						
TANKS		508	1016	1016	339	2879
STRUCTURAL STEEL FABRICATED		367	673	678	246	1964
VALVES						
PUMPS, COMPRESSORS, BLOWERS						
CONVEYORS, HOISTING MACHINERY						
AIR CLEANING MACHINERY						
INDUSTRY-SPECIFIC MACHINERY		2211	4054	4082	1480	11827
PARTS ASSEMBLIES FOR SHIPS, BOATS	10889	22012	15368	15139	6714	70122
MOTORS, GENERATORS, ENGINES	236	654	553	533	209	2185
ELECTRICAL EQUIPMENT		3	5	5	2	15
CONCRETE BASIC PRODUCTS		217689	398571	401435	145442	1163137
HOUSEHOLD OBJECTS		15	30	30	10	85
GAS OIL FACILITY CONSTRUCTION		135560	248262	250020	90495	724337
AIR TRANSPORTATION		182	345	345	125	997
WATER TRANSPORTATION		3381	6203	6226	2259	18069
REAL ESTATE, FINANCIAL SERVICES		1175	2179	2203	790	6347
OTHER RENT		3254	5944	5980	2173	17351
SERVICES TO BUSINESS MANAGEMENT		33006	60444	60865	22051	176366
WAGES AND SALARIES	81000	407628	462399	456656	156333	1564016
TOTAL	92125	832734	1215363	1214596	432069	3786887

TABLE V.12

SUMMARY OF PURCHASES REST OF CANADA 1982-1990 ($000"s)
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
HOSE AND TUBING		12793	24821	25066	9094	71774
OFFICE AND STATIONERY SUPPLIES		1638	2992	3010	1094	8734
STEEL BARS AND RODS		74399	136218	137197	49707	397521
STEEL PLATES, NOT FABRICATED		149	172	169	45	535
LINE PIPE, STEEL FOR OIL AND GAS		3415	6254	6292	2275	18236
PIPES AND FITTINGS, CAST IRON		613	1224	1224	408	3469
TANKS		2442	4475	4508	1636	13061
STRUCTURAL STEEL FABRICATED		2840	5200	5232	1891	15163
VALVES		8892	16327	16463	5944	47626
PUMPS, COMPRESSORS, BLOWERS	6039	14016	10101	9786	4022	43964
CONVEYORS, HOISTING MACHINERY		1425	2983	3008	1086	8702
AIR CLEANING MACHINERY		25010	47339	47667	17277	138093
INDUSTRY-SPECIFIC MACHINERY	4186	8462	5908	5820	2581	26957
PARTS ASSEMBLIES FOR SHIPS, BOATS	20891	57844	48874	47098	18461	193168
MOTORS, GENERATORS, ENGINES		3528	6513	6557	2365	18963
ELECTRICAL EQUIPMENT		65844	120555	121422	43992	351813
CONCRETE BASIC PRODUCTS		1093	2184	2184	728	6189
HOUSEHOLD OBJECTS		14767	1452	1452	524	18195
GAS OIL FACILITY CONSTRUCTION		14234	26118	26213	9510	76075
AIR TRANSPORTATION		4946	9174	9275	3328	26723
WATER TRANSPORTATION		13702	25028	25179	9151	73060
REAL ESTATE, FINANCIAL SERVICES		138970	254498	256272	92845	742585
OTHER RENT						
SERVICES TO BUSINESS MANAGEMENT						
WAGES AND SALARIES						
TOTAL	31116	472022	758410	761094	277964	2300606

TABLE V.13

SUMMARY OF PURCHASES REST OF THE WORLD 1982-1990 ($000's)
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
HOSE AND TUBING		196	381	385	140	1102
OFFICE AND STATIONERY SUPPLIES		3771	6887	6929	2518	20105
STEEL BARS AND RODS		15429	28250	28453	10309	82441
STEEL PLATES, NOT FABRICATED		93439	107957	106012	28292	335700
LINE PIPE, STEEL FOR OIL AND GAS		3710	6793	6834	2471	19808
PIPES AND FITTINGS, CAST IRON		294	539	542	196	1571
TANKS		3	6	6	2	17
STRUCTURAL STEEL FABRICATED		22567	41359	41668	15116	120710
VALVES		982	1799	1810	654	5245
PUMPS, COMPRESSORS, BLOWERS		7347	13491	13603	4912	39353
CONVEYORS, HOISTING MACHINERY	7002	16252	11712	11346	4663	50975
AIR CLEANING MACHINERY		14614	26835	27058	9770	78277
INDUSTRY-SPECIFIC MACHINERY		20819	38185	38450	13936	111390
PARTS ASSEMBLIES FOR SHIPS, BOATS	17284	34939	24392	24029	10657	111301
MOTORS, GENERATORS, ENGINES	44074	122037	103112	99366	38947	407536
ELECTRICAL EQUIPMENT		6337	11697	11777	4247	34058
CONCRETE BASIC PRODUCTS		489	895	901	326	2611
HOUSEHOLD OBJECTS		16	32	32	11	91
GAS OIL FACILITY CONSTRUCTION						
AIR TRANSPORTATION						
WATER TRANSPORTATION						
REAL ESTATE, FINANCIAL SERVICES						
OTHER RENT						
SERVICES TO BUSINESS MANAGEMENT						
WAGES AND SALARIES						
TOTAL	68360	363241	424322	419201	147167	1422291

diversified economic structure in the Atlantic region is reflected in the high leakages shown by the above tables. The general trend, as indicated by these tables is a redistribution of benefits from the less developed economics of Newfoundland and Atlantic Canada to the more developed economics of Ontario and Quebec.

Tables V.14, V.15 and V.16 provide the distribution, by province, of the total direct, and indirect and induced employment respectively. Table V.17 shows the industry breakdown of the indirect and induced employment for Canada. The employment distribution are also presented by Figures V.10 to V.12. From 1982 to 1990 over 339,000 jobs would be created across Canada if a gravity based system mode of production is used. Total direct employment would be 84,000 or 24.9 percent and indirect and induced employment of 255,000, or 74.1 percent. Of the total employment 32.5 percent would be in Newfoundland, 31.3 percent in Ontario, 19.8 percent in Quebec and 10.2 percent in Nova Scotia. The other provinces together receive less than one percent of the employment (Table V.14).

4. BUSINESS AND EMPLOYMENT OPPORTUNITIES: FLOATING SYSTEM VERSUS GRAVITY SYSTEM

The ongoing debate, particularly in Newfoundland, has centered on the choice of production mode, and the type which would provide the maximum and appropriate kinds of opportunities from offshore hydrocarbon development. Of the two production systems which one would generate most benefits? The gravity system would create a total of 110,000 employment in Newfoundland, 32,000 direct, and 77,000 indirect and induced. For the province of Nova Scotia, total employment would be 34,000, 10,000 direct and 24,000, indirect and induced.

Business opportunities which would be created by the gravity system would be concentrated in such sectors, as construction - a labour intensive area, concrete products, shipbuilding, specialized machinery

TABLE V.14

TOTAL DIRECT, INDIRECT AND INDUCED EMPLOYMENT IN PERSON YEARS 1982 - 1990
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL	%
NEWFOUNDLAND	1440.5	22411.1	36599.4	36736.3	13257	110444.3	32.5
P.E.I.	19.6	251.6	394.7	395.5	141.5	1202.9	0.4
NOVA SCOTIA	357.1	6870.1	11629.5	11689.2	4251.2	34797.1	10.2
NEW BRUNSWICK	78.1	2569.7	4458.9	4482.7	1619.9	13209.3	3.9
QUEBEC	1280.1	14048.9	22023.1	22059.4	8004.7	67416.2	19.8
ONTARIO	1664	21777.9	34996.2	35081	12710.5	106229.6	31.3
MANITOBA	36.7	327.1	489.3	489.4	176.9	1519.4	0.4
SASKATCHEWAN	14.1	139	208.6	208.6	74.7	645	0.2
ALBERTA	30.3	330.3	511.2	511.7	184.4	1567.9	0.5
BRITISH COLUMBIA	38.5	527.5	853.7	856.5	310.3	2586.5	0.8
YUKON & NORTHWEST TERRITORIES	0.1	0.8	1.2	1.2	0.4	3.7	0
CANADA	4959.1	69254.3	112165.9	112511.5	40732.1	339622.9	100

TABLE V.15

TOTAL DIRECT EMPLOYMENT IN PERSON YEARS 1982 - 1990
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL	%
NEWFOUNDLAND	207.5	6279.7	11022.2	11691.1	4.4..	32243.4	38..
P.E.I.	0	25.8	47.2	47.3	. .1	..7.3	..
NOVA SCOTIA	102.8	1962.4	3348.7	3367.6	..1 ..	10.....	11..
NEW BRUNSWICK	3.3	712.3	1296.4	13.5.3	473	3	..
QUEBEC	244.1	2639.3	4565.9	4576.8	1675.7	13901.8	16.5
ONTARIO	365.5	4661.4	7839.1	7868.9	2667.7	25892.1	27.8
MANITOBA	2.6	9.2	10.2	10.1	3.8	35.9	0
SASKATCHEWAN	0	0.2	0.3	0.3	0.1	..9	0
ALBERTA	0	3.2	6	6	2.2	17.4	0
BRITISH COLUMBIA	4.2	94.8	163.5	164.5	60	487	..
YUKON & NORTHWEST TERRITORIES	0	0	0	0	0	0	
CANADA	829.9	16588.4	28299.7	2844..2	1 37..7	84836.9	1..

TABLE V.16

TOTAL INDUCED AND INDIRECT EMPLOYMENT IN PERSON YEARS 1982-1990

CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL	%
NEWFOUNDLAND	1233	16131.4	25577.1	25643.1	9216.3	77800.9	30.5
PRINCE EDWARD ISLAND	19.6	225.8	347.5	347.9	124.3	1065.1	0.4
NOVA SCOTIA	254.3	4907.7	8280.8	8321.6	3021.5	24785.9	9.7
NEW BRUNSWICK	74.8	1857.4	3162.5	3177.4	1146.9	9419	3.7
QUEBEC	1036	11209.6	17457.2	17482.6	6329	53514	21
ONTARIO	1398.5	17116.5	27157.1	27212.1	9842.8	82727	32.4
MANITOBA	34.1	317.9	479.1	479.3	173.1	1483.5	0.6
SASKATCHEWAN	14.1	138.8	208.3	208.3	74.6	644.1	0.3
ALBERTA	30.3	327.1	505.2	505.7	182.2	1550.5	0.6
BRITISH COLUMBIA	34.3	432.7	690.2	692	250.3	2099.5	0.8
YUKON & NORTHWESR TERRITORIES	0.1	0.8	1.2	1.2	0.4	3.7	0
CANADA TOTAL	4129.2	52665.9	83866.2	84071.3	30361.4	255094	100

TABLE V.17

TOTAL INDIRECT AND INDUCED EMPLOYMENT IN PERSON YEARS IN CANADA 1982-1990
CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
AGRICULTURE	78.2	677	981.1	979.9	349.2	3065.4
FORESTRY	12.9	144.9	224	224.4	80.7	686.9
FISHING, HUNTING & TRAPPING	3.6	32	46.7	46.6	16.6	145.5
METAL MINES	10.6	152.2	248.9	249.7	90.8	752.2
MINERAL FUELS	6.5	672.5	1211.9	1220	441.9	3552.8
NON-METAL MINES & QUARRIES	2	218.8	394.5	397.2	143.8	1156.3
SERVICES INCIDENTAL TO MINING	1.5	737.3	1345.8	1355.2	490.5	3930.3
FOOD & BEVERAGE INDUSTRIES	197.9	1685.7	2429.5	2425.9	863.7	7602.7
TOBACCO PRODUCTS INDUSTRIES	8.6	73.5	106.2	106.1	37.8	332.2
RUBBER & PLASTIC PRODUCTS INDUSTRIES	26.2	418.6	703.6	707	255.3	2110.7
LEATHER INDUSTRIES	15.9	151.2	225.5	225.5	80.8	698.9
TEXTILE INDUSTRIES	42.5	387.9	574.9	574.8	205.8	1785.9
KNITTING MILLS	18.7	168.2	246.8	246.7	88.1	768.5
CLOTHING INDUSTRIES	75.6	679.8	997	996.3	355.8	3104.5
WOOD INDUSTRIES	20.8	186.5	278	278.1	100.2	863.6
FURNITURE & FIXTURE INDUSTRIES	32.3	274.2	397.9	397.5	142.1	1244
PAPER & ALLIED INDUSTRIES	45.2	509.7	790.4	791.5	284.4	2421.2
PRINTING & PUBLISHING	63.7	683.6	1049.4	1050.5	377.4	3224.6
PRIMARY METAL INDUSTRIES	63.4	1728	2989.6	3005.5	1091.5	8878
METAL FABRICATING INDUSTRIES	134.4	1042.6	1559.6	1561.6	572	4870.2
MACHINERY INDUSTRIES	275.2	1197.5	1462	1449.5	544.3	4928.5
TRANSPORTATION EQUIPMENT INDUSTRIES	285.2	883.4	918.1	910.4	355.1	3352.2
ELECTRICAL PRODUCTS INDUSTRIES	213.8	895.8	1048.3	1034.9	385.7	3578.5
NON-METALLIC MINERAL PROD. IND.	15.8	4831.8	8798.4	8860.2	3209.5	25715.7
PETROLEUM & COAL PRODUCTS IND.	8.9	114.5	181.3	181.7	65.4	551.8
CHEMICAL & CHEMICAL PRODUCTS IND.	41.9	436.3	668.5	669.1	240.7	2056.5
MISC. MANUFACTURING INDUSTRIES	31.3	347.4	538.1	538.7	193.2	1648.7
CONSTRUCTION INDUSTRIES	67.2	2042	3524.4	3542.7	1279	10455.3
TRANSPORTATION & STORAGE	185.9	2924.3	4782.3	4795.5	1731.6	14419.6
COMMUNICATION	149.2	1565.5	2391.4	2393.5	859.6	7359.2
ELECTRICAL POWER, GAS, OTHER UTILITIES	39.7	467.9	733.3	734.6	264.7	2240.2
WHOLESALE TRADE	411.7	4668.7	7314.7	7328.6	2649.7	22373.4
RETAIL TRADE	730.9	6784.8	10043.8	10040.1	3590.1	31189.7
OTHER FINANCE, INSURANCE & REAL EST.	230.2	2770.1	4341.9	4349.9	1564.3	13256.4
EDUCATION & HEALTH SERVICES	28.5	277.9	417.2	417.2	149.6	1290.4
AMUSEMENT & RECREATION SERVICE	32.9	350.9	539.4	539.8	193.5	1656.5
SERVICE TO BUSINESS MANAGEMENT	156.6	8046.1	14249.3	14333.8	5187.6	41973.4
ACCOMMODATION & FOOD SERVICES	293.4	2730.6	4045.3	4043.9	1446.4	12559.6
OTHER PERSONAL & MISC. SERVICES	70.3	706.6	1067.3	1067.7	382.8	3294.7
TOTAL	4129.1	52666.3	83866.3	84971.8	30361.2	255094.7

usually of the type built by machine shops, fabrication and business management Table V.11. Manufacturing benefits which would accrue to the rest of Canada would mostly be concentrated in such areas as machinery, engines, structural steel and financial services.

For the floating system the employment benefits breakdown clearly shows the dominance in manufacturing of the core provinces for the total employment, direct employment, and indirect and induced employment. Quebec and Ontario together receive 60 per cent or more of the employment generated. The interesting thing, however, is that Newfoundland with a limited manufacturing base places second to Ontario in employment with over 27 per cent of the employment. Nova Scotia's share of the employment is about 5 per cent. Although Newfoundland receives 51 per cent of the purchases, these purchases are made in only nine sectors (Table V.4). Tables V.5 and V.6 show that the distribution of equipment purchase from rest of Canada and imports are very similar, except for marine boilers which according to the simulation would all be purchased in Canada. The results also show that no item would be imported from the air and water transport and cafeteria supplies sectors. Appendices V.3 and V.4 show the value of goods and services that would be produced by each industry within each province depending on the production mode. For example, the construction industry in Newfoundland would produce more goods and services ($238.8 million) under a gravity based production system compared to $36.5 million under a floating production system. The metal fabricating industry in Nova Scotia on the other hand, would produce more goods and services $22.3 million under a floating production system (Appendix V.3) than under a gravity based system $5.9 million (Appendix V.4).

Based on the foregoing discussion it appears that for the short term, Newfoundland would benefit more from a gravity system with over $3.7 billion of purchases and over 110,000 total employment. There are a number of reasons why the gravity system would generate maximum benefits for Newfoundland. The gravity system has a large construction

FIGURE V.7

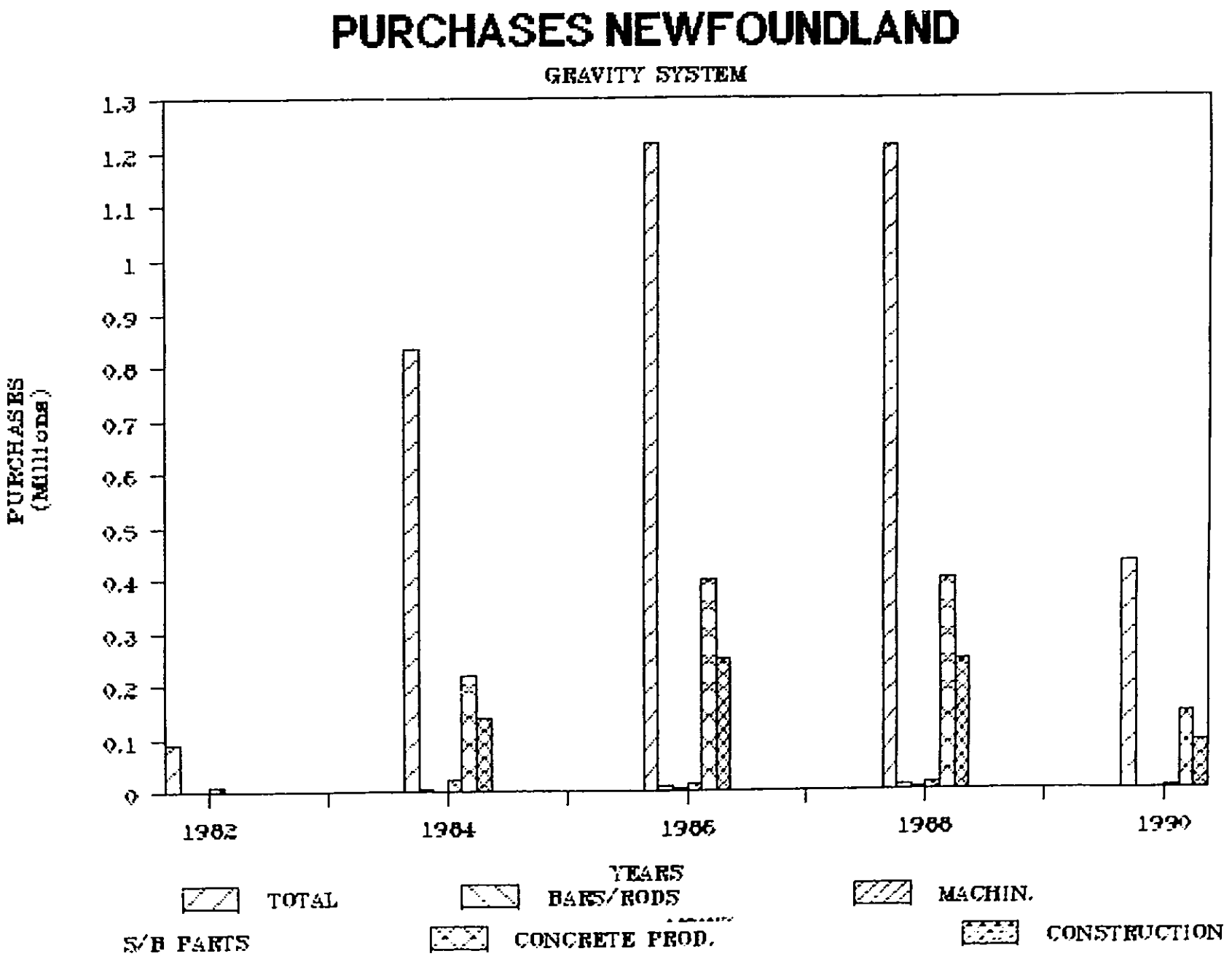

PURCHASES NEWFOUNDLAND
GRAVITY SYSTEM
PURCHASES (Millions)
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1982
1984
1986
1988
1990
YEARS
TOTAL
BARS/RODS
MACHIN.
S/B PARTS
CONCRETE PROD.
CONSTRUCTION

FIGURE V.8

PURCHASES REST OF CANADA

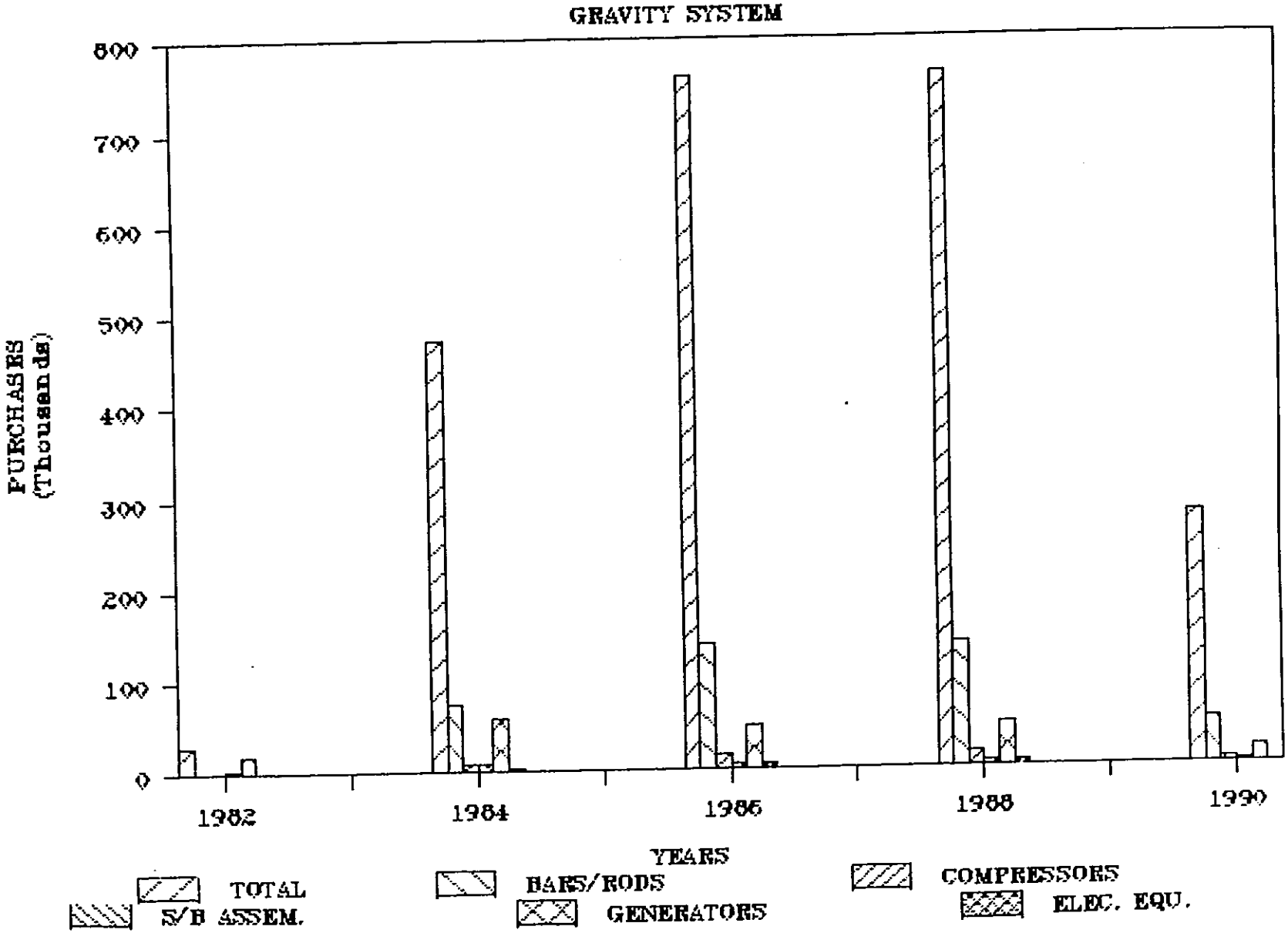


FIGURE V.9

PURCHASES REST OF WORLD

GRAVITY SYSTEM

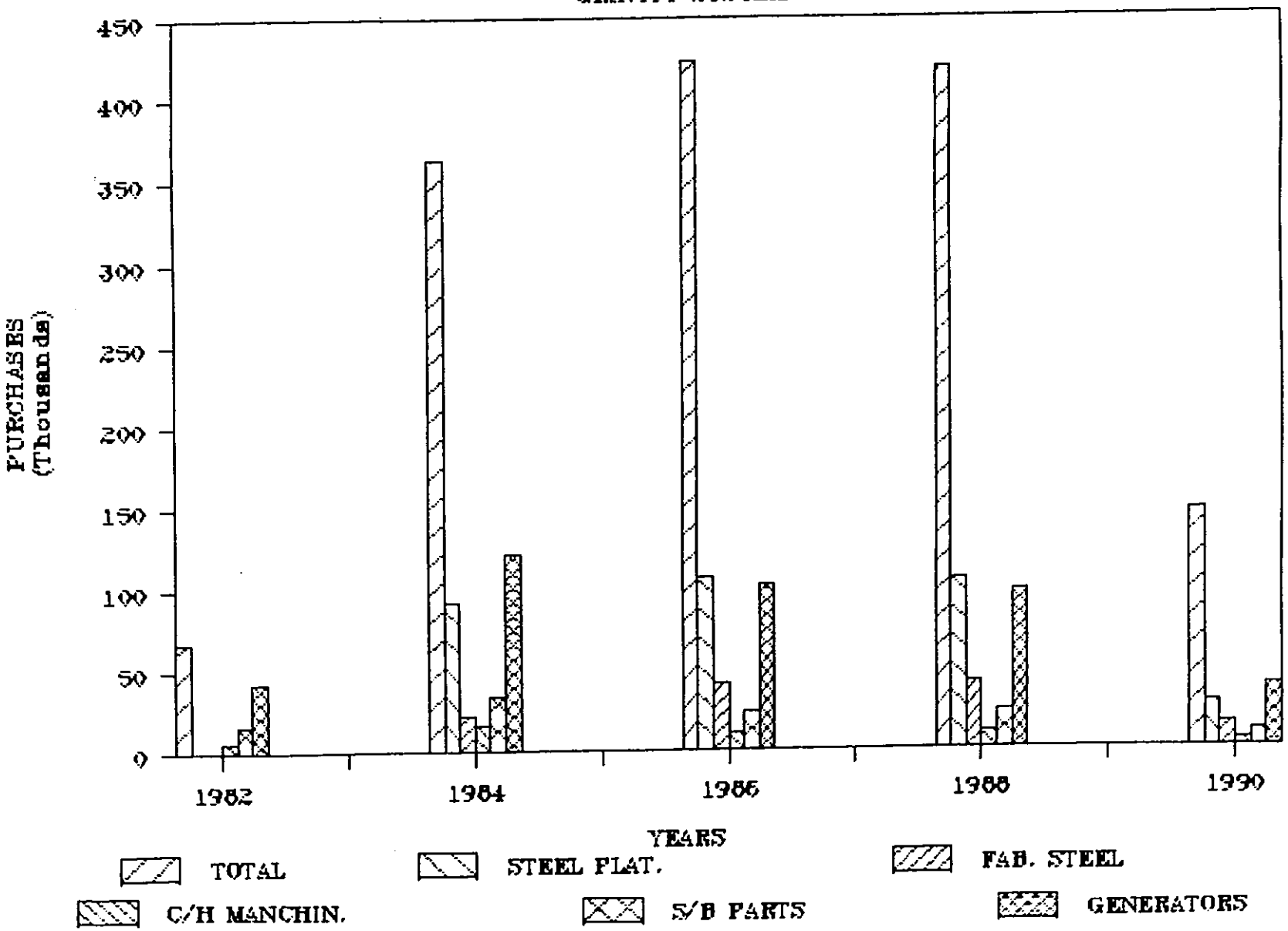


FIGURE V.10

TOTAL DIRECT EMPLOYMENT P/Y

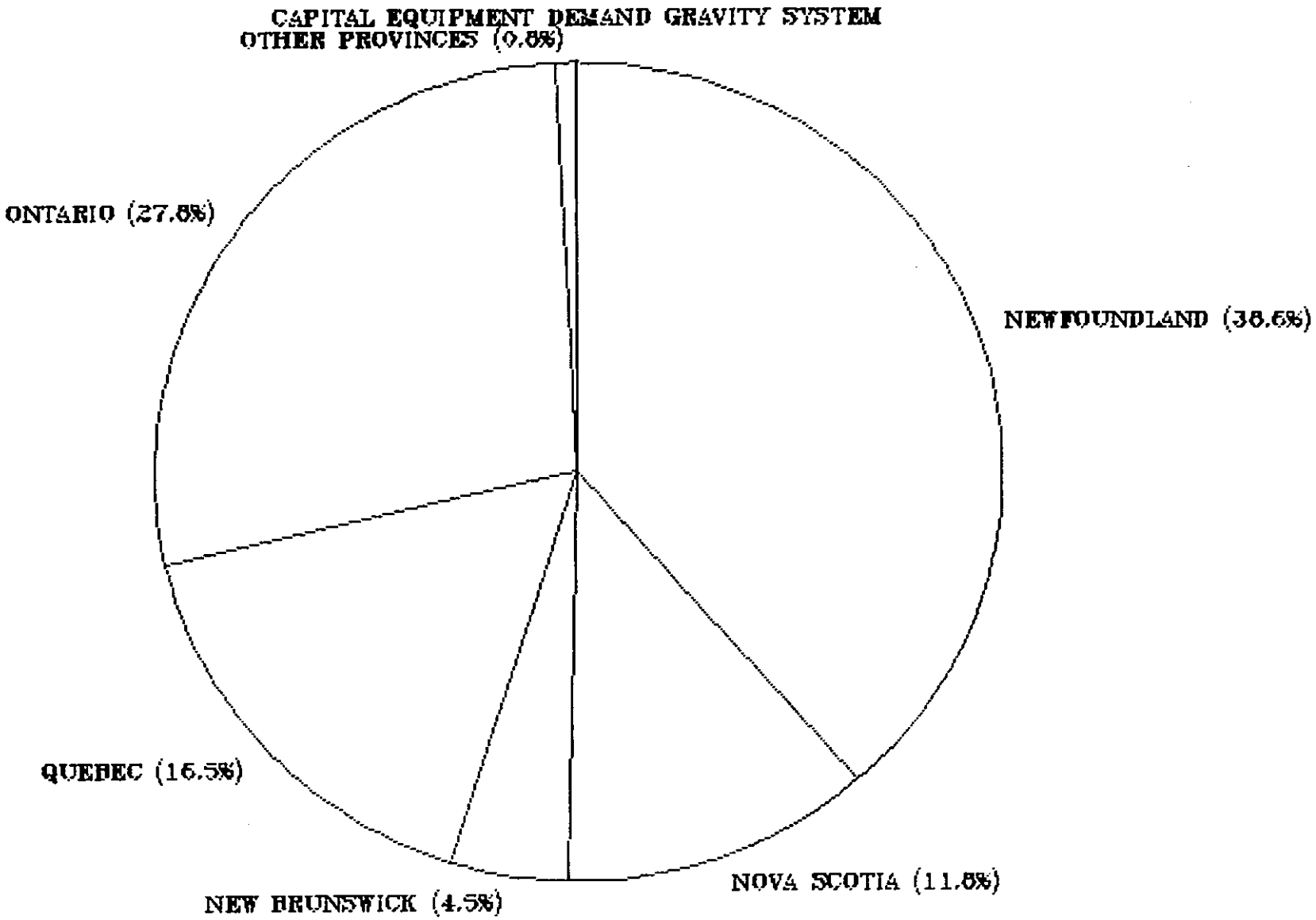


FIGURE V.11

TOTAL DIREC. INDIREC. & INDUC.EMPLP/Y

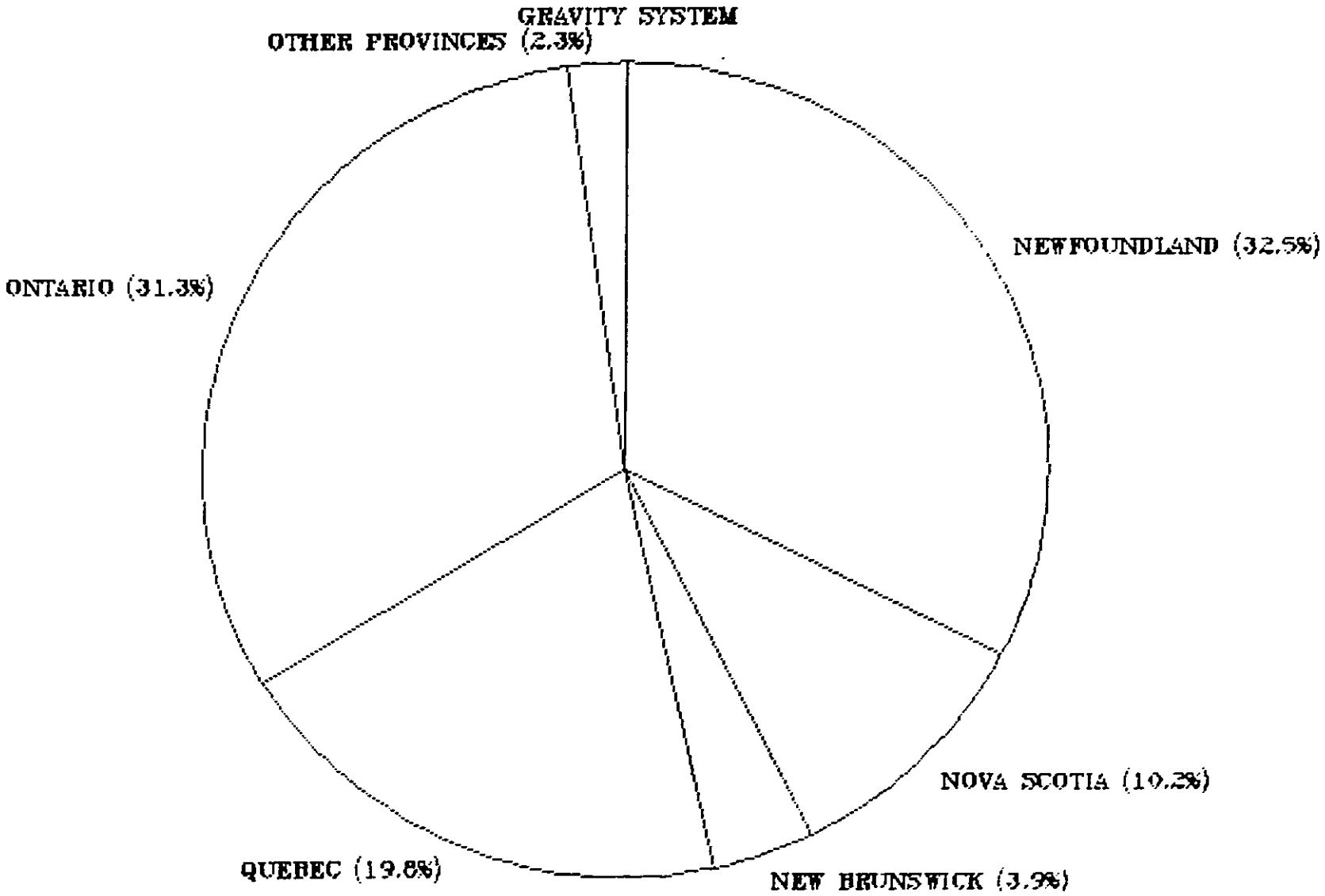
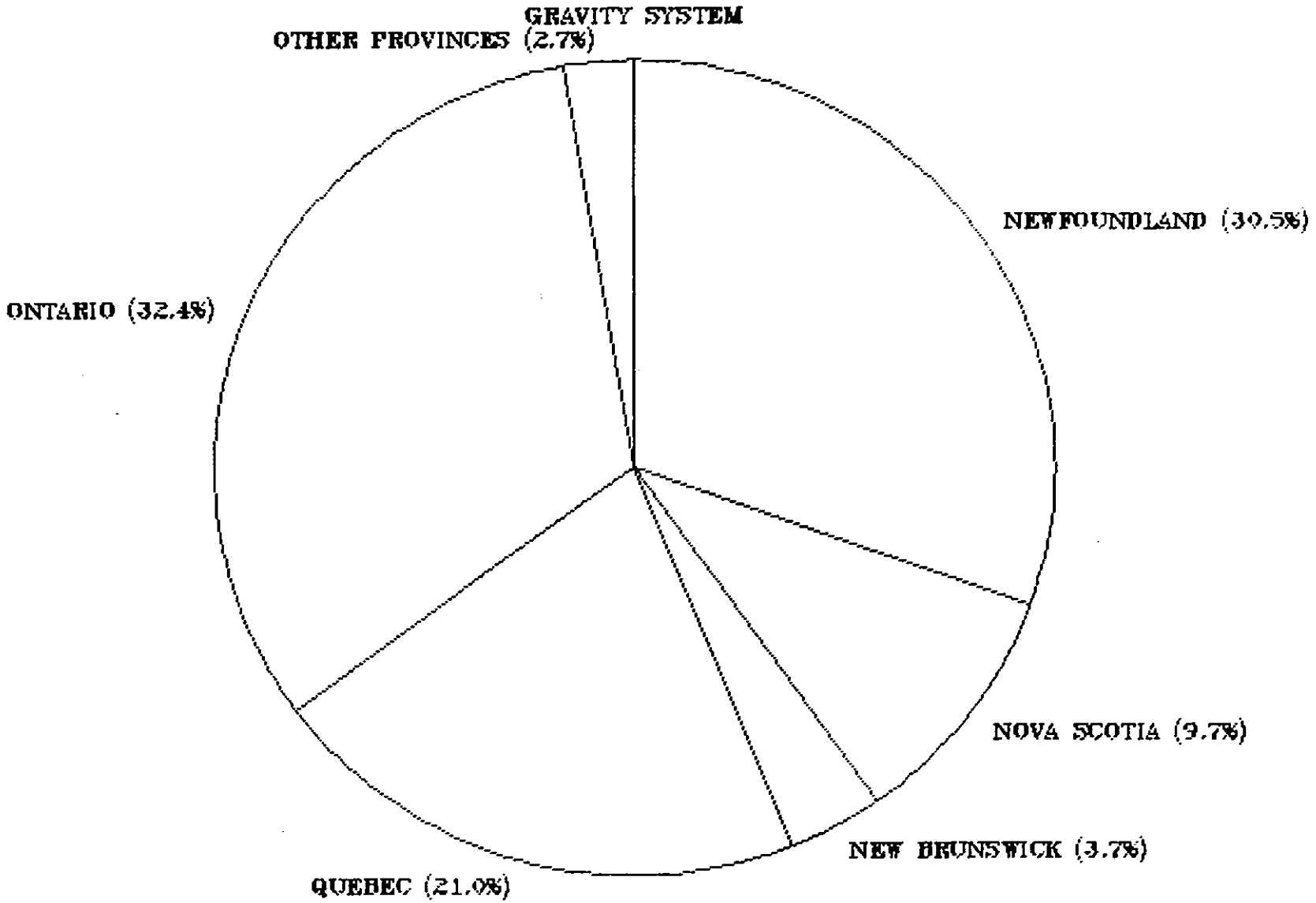


FIGURE V.12

TOTAL INDUCED & INDIRECT EMPL P/Y



component. Although there will be some migration of workers to the province, most of the labour force will be hired locally. Another reason is that local raw materials will be used because of the size of the country and the location of the project, the weight of the raw materials and transport costs. However, the gravity system would not significantly lead to a diversification of the provincial economy unless new sectors are created in Newfoundland as most of the purchases are made from the traditional sectors of the provincial economy. From a regional or national perspective, the Atlantic region would also receive more employment, 47 per cent of the total, 55.1 per cent of the indirect and induced employment if a gravity system of production is selected. However, the core provinces would be better off with a floating system for example, Ontario receives 37.6 per cent of the total employment 36.7 per cent of the direct and 37.9 per cent of the indirect and induced employment associated with a floating system compared to 31.3 per cent, 27.8 per cent, and 32.4 per cent respectively of the employment associated with the gravity system. Given the concentration of manufacturing activities in Ontario and Québec, this is not surprising.

By the very nature of the Hibernia development project it is recognized that the development impacts would be concentrated in certain local communities. For example the project administration and management engineers and senior staff would be based in the St. John's area; the construction of the gravity base in the come-by-chance area; the deck and topsides assembly and hook-up in the Argentia area; and the fabrication of the ice clearing vessel and subsea component in the Marystown area. Because the model used is an interprovincial model these local area impacts are not discussed.

5. IMPORT SUBSTITUTION

Tables V.6 and V.13 summarize equipment that would be imported for the Floating system and the Gravity system respectively. Imports for the floating system would peak in the fourth year of development in 1985 and in 1986 for the Gravity system. Major items that would be imported for

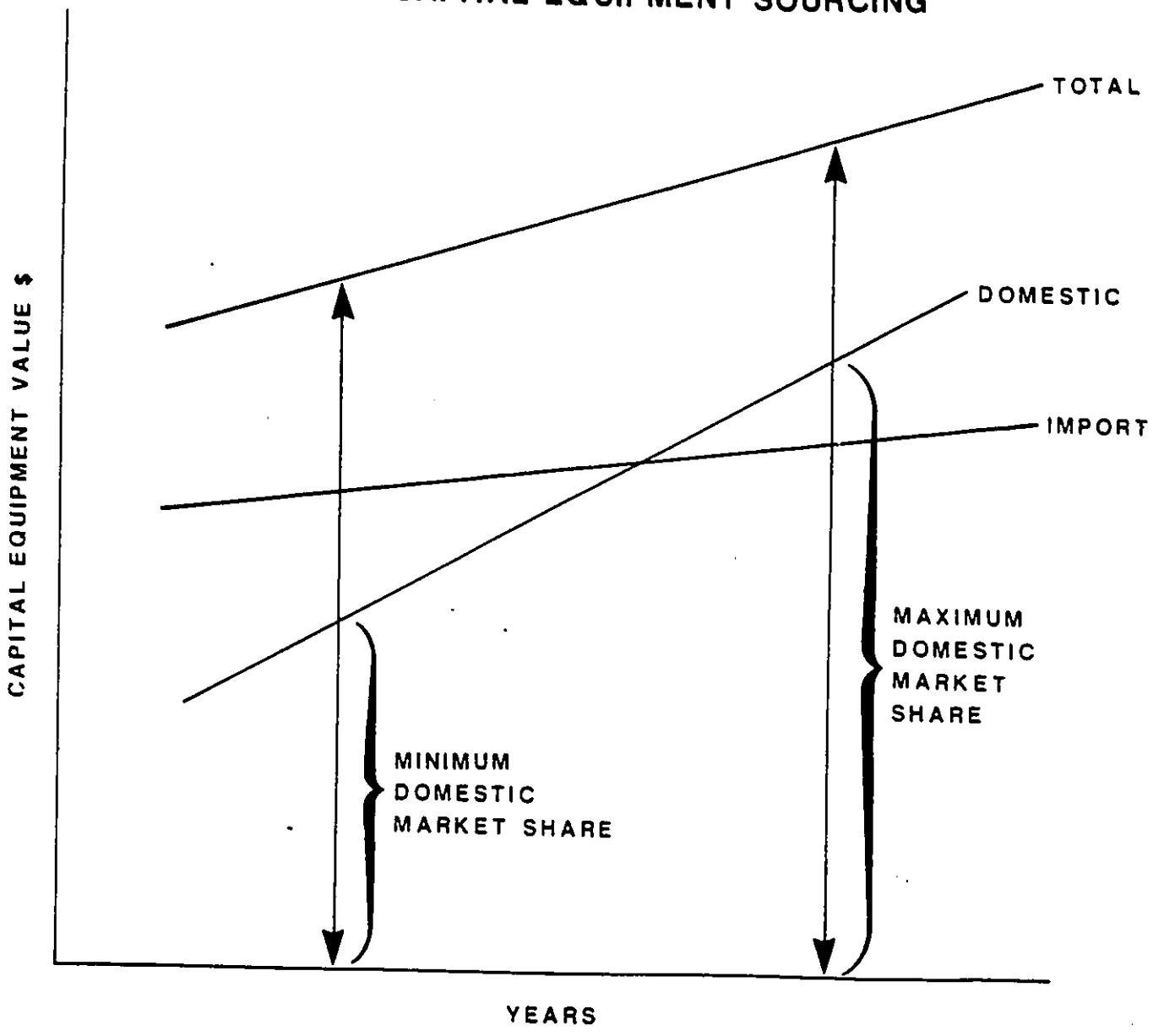
the Gravity system may include generators, engines, machinery and steel. For the Floating System the major imports would include steel plates, compressors, and ship parts. The domestic share of the supply market for Hibernia development could be increased if Canadian suppliers manufacture these items.

In most countries, the size of internal markets usually restricts the establishment of efficient sized manufacturing companies. The capacity of establishments and the resulting short production runs also make it difficult for industries to attain sufficient economics of scale. While economies of scale are related to productivity, small sized industries can be productive if they utilize high quality labour, capital and innovative technology. The possibility of substituting domestically produced goods and services for imported ones is one way Canadian suppliers can improve their economies of scale and thereby become more competitive.

Some industries may not be able to respond to the demand requirements of Hibernia for a variety of reasons. A company's share of an industry's current baseload demand could be sufficient to keep it operating at full capacity or it could be prevented from competing for additional business because of obsolete capital stock or because of delivery schedule. Other industries would require a longer time to adjust their production runs. Thus, Canada's share of the offshore supply market could be lower than imports during the early years of Hibernia development, but increase over time as more domestically produced goods and services are substituted for imports. Consequently, the proportion of imports would decrease over time. Figure V.13 shows this generalized relationship between imports, and domestic goods and services. The extent to which domestically produced goods could be substituted for imports would depend on licensing and joint venture arrangements, delivery schedules and equipment repackaging.

FIGURE V.13

IMPORT SUBSTITION FOR HIBERNIA CAPITAL EQUIPMENT SOURCING



6. THE OCEAN INDUSTRY IN CANADA

Economically depressed regions could provide business and employment opportunities if they can attract productive investments, and thereby create appropriate industrial centres. Such centres would in turn act as growth poles. While growth centre strategies were used in Atlantic Canada by the Department of Regional and Economic Expansion (DREE) in their regional development efforts, they were not designed for the specific needs of a single industry nor were they directed to capture benefits from the development of a single major project. Whether a growth centre strategy tailored to a specific project would work depends on the spatial association (Britton 1969), concentration of the industries involved (Gilmour 1971) and whether the industries are mobile (footloose) or new establishments. Mobile industries with their already developed linkages tend to extend rather than break existing ties with suppliers and consumers (Thwaites 1978). Moreover, mobile plants usually, are not technologically innovative and tend to impede self-sustained regional growth. New plants on the other hand form short backward linkages, introduce new concepts and stimulate diversification and self-sustained growth (Lever 1974). The problem depressed regions face, however, is that their initial choices may be limited or they may be tempted to encourage and support the location of industries which may not contribute to the long-term and sustained growth of an area because of the pressure to reduce high unemployment. The development of the Hibernia oil and gas reserves which will require the use of cold ocean technology could be the catalyst in attracting a combination of mobile and new establishments to the Atlantic region.

The ocean industry in Canada has been defined as a blend of manufacturing, service, contracting and consulting companies which provide goods and services for the exploitation of Ocean resources particularly, for the offshore oil and gas industry (Nickerson, 1979). For this reason the offshore hydrocarbon reserves have been viewed as the "carrot" which has encouraged Canada's ocean industry. In essence, all

the manufacturing and service sectors identified by the input-output simulation belong to the Ocean Industry group. The history of the ocean industry in Canada is very brief. Many of the companies were established within the last 16 years, mainly to meet the evolving requirements of the Offshore oil and gas exploration. Although the industry has been producing goods and services since 1969 there is very little public data. Besides, the goods and services produced by the industry are classified under several Standard Industrial Classification (SIC) groupings, and this makes it difficult to provide a single focus for deriving information on the industry. The lack of published data limits detailed analysis of the industry. Nevertheless, I believe it is possible to draw tentative conclusions, based on the limited public information, about the ocean industry in Canada.

There are over 160 Ocean industry establishments in Canada in all Provinces except Saskatchewan and the Territories. The majority of the establishments (51) are located in British Columbia. The rest are in Ontario 33, Quebec 27, Nova Scotia 16 and Alberta 15. Each of the remaining provinces has not more than three establishments. By product type 57 percent of the establishments manufacture general marine and ocean equipment, 18 percent are engaged in vessel and rig construction, 13 percent in the manufacture of instrumentation equipment, 8 percent drilling equipment and the remaining 4 percent produce pollution control and survey equipment Table V.18. Ocean industry sales increased from $5 million in 1969 to $200 million in 1976. This amount represents about three percent of the estimated total world yearly sale of $6 billion. About $70 million of the Canadian sales in 1976 were exported. The Ocean industry in 1976 also employed about 3200 highly skilled people. Most of the Ocean industry establishments are largely Canadian owned (Nickerson 1979).

Spiegelman (1976) defines manufacturing clusters as a concentration of establishments at a single location which could not reasonably be expected to happen by the operation of the laws of

chance. Using this definition several distinctive regional clusters of Ocean industry establishments can be identified across Canada, (Figure V.14). The three major cluster with 20 or more establishments are Vancouver-Burnaby, British Columbia; Toronto-Hamilton, Ontario; and Montreal, Quebec. The remaining five clusters are Victoria, Calgary, Edmonton, Ottawa and Halifax-Dartmouth.

Appendix V.5 shows product specialization by regional clusters and selected manufacturers of the respective products. Establishments within the Vancouver-Burnaby cluster manufacture a wide range of products including propellers, oceanographic instruments, subsea production systems, and control and measuring instruments. Establishments within the Edmonton cluster manufacture drilling and drilling related equipment. The products manufactured in the Edmonton cluster include pressure control switches, drilling equipment, derricks, masts, and valves. This range of products reflects the presence of the land based oil and gas industry in Alberta.

Establishments within the Toronto-Hamilton and the Montreal regional clusters manufacture a diversified range of ocean industry equipment. Generators, blowout preventers, transformers, compressors, oceanographic instruments and communication instruments are manufactured within the Toronto-Hamilton cluster. The Montreal regional cluster's production include diesel engines, communication equipment, propulsion systems, turbines and propellers. Control and measuring instruments and communication equipment are the main items produced by the Ottawa regional cluster.

While only ten percent of the Ocean industry establishments are located in Nova Scotia, the Province products cover four of the six industry groupings (Table V.18). Some of the products manufactured by the Halifax-Dartmouth regional cluster are valves, winches, and meteorological and oceanographic instruments (Appendix V.5).

FIGURE V.14

OCEAN INDUSTRY REGIONAL CLUSTERS IN CANADA

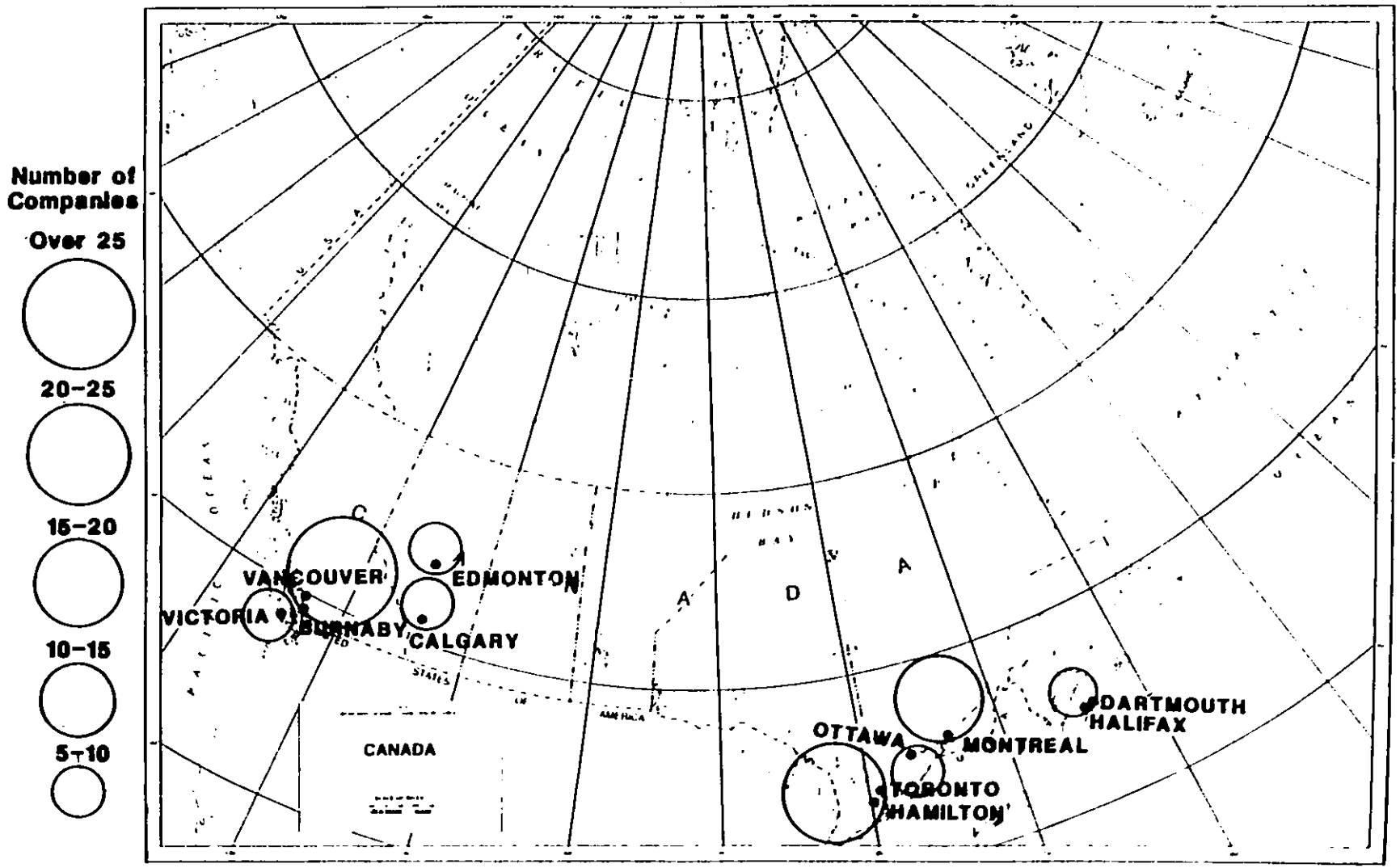


TABLE V.18

DISTRIBUTION OF CANADA'S OCEAN INDUSTRY (01)
BY PROVINCE & PRODUCTS

	Total No of Companies	General Marine and Ocean Equipment	Instrumentation Equipment	Drilling Equipment	Pollution Control Equipment	Survey Equipment	Vessel Construction, Repair, Etc.
ALBERTA	15	8	-	6	1	-	-
BRITISH COLUMBIA	51	28	6	-	2	1	14
MANITOBA	1	1	-	-	-	-	-
NEW BRUNSWICK	3	-	-	-	-	-	3
NEWFOUNDLAND	3	2	-	-	-	-	1
NOVA SCOTIA	16	6	3	3	-	-	4
ONTARIO	48	28	10	5	1	1	3
PRINCE EDWARD ISLAND	1	-	-	-	-	-	1
QUEBEC	27	21	2	-	-	-	4
TOTAL	165	94	21	14	4	2	30

Source: Canada, Department of Industry, Trade and Commerce, Canada's Offshore Petroleum and Oceanology Capability; and Canadian Ocean Industries Directory (Ottawa: Ocean Industries Division, IT&C)

The manufacture of meteorological and oceanographic instruments is an area where establishments within the Halifax-Dartmouth regional cluster could carve a market for themselves. Over $64 million of instrumentation equipment would be needed for a floating system (Table V.3), and over 80 percent or $54 million would be sourced in Canada (Table V.5). This demand would be in addition to the annual demand for instrumentation equipment in Canada which has been estimated to be about $1 billion (CMOP 1984:35). The special appeal of the ocean industry sector, particularly the instrumentation subsector, is that it requires skilled labour, it is labour intensive, and is made up of a number of small to medium size companies; an important factor when it comes to the consideration of the mobility of companies. The industry could also arrange to manufacture some of the equipment under licensing agreements or through joint ventures. Thus, through joint ventures regional firms could quickly gain access to international markets. Although the instrumentation industry requires research and development support and skilled and trained workforce, the universities in the region would be able to provide the research environment as well as the skilled engineers and technicians needed.

Cluster analysis can be used for both inductive and deductive generalization (Loviscek 1982). Cluster analysis can also suggest strong interindustry linkages and the forces of agglomeration at work, such as those presented in input-output tables. Manufacturing linkages as described by input-output analysis are of three types - local supply link of a firm with its main input, local supply link for any input and the demand link to another local firm. The supply linkages indicate the degree to which procurement requirements tie an industry to a local economy. The demand linkage on the other hand shows manufacturing industries which benefit from the demands of the local economic system (Karaska 1969). It is therefore possible that a selective targeting of meteorological and oceanographic products manufacturing would help, through the supply and demand linkage effects, in forming the basis for further diversification of the Atlantic regional economy.

The Ocean industries in Atlantic Canada are small to medium size and may be at a disadvantage in competing for a greater share of Hibernia related businesses. However it may be argued that the Halifax-Dartmouth regional cluster, and the likelihood that St. John's could soon emerge as another regional cluster, may achieve the scale and influence of larger firms with extensive marketing capabilities to compete aggressively as well as identify new opportunities. The agglomerative forces resulting from regional clusters in Atlantic Canada could also exert a significant influence on the growth of the regional economy.

Ontario with 30 percent of the ocean industries, mostly producing marine and ocean equipment would receive 37.6 per cent of the Hibernia related employment. Nova Scotia with nine percent of the ocean industry establishments receives five percent of the employment. In general it appears the distribution of ocean industries in Canada provides additional empirical explanation of the the results of the interprovincial input-output analysis, which showed a high leakage from the Atlantic economy particularly with a floating system of production. The case of British Columbia is, however, surprising. With 31 percent of the ocean industry establishments, British Columbia receives less than one percent of the total employment associated with the floating system. Two possible explanations may be offered. The results may partly reflect the distance decay associated with the Atlantic Offshore supply market beyond west of the Ontario border. Other possible explanations are either the British Columbia Ocean Industry sector is not fully integrated into the interprovincial input-output model, or by and large the Vancouver-Victoria establishments are not very oil and gas related.

There are policy implications of the ocean industry cluster analysis. The distribution of the manufacturing companies providing goods to the offshore oil and gas industry is such that the business

and employment opportunities would be restricted, at least initially, to few areas. Thus, programs would have to be developed to make residents in other areas, particularly in Newfoundland to benefit from the development project. If this is not done, residents in surrounding areas would be left out of the "prosperity" and the whole economic future of the region undermined significantly. Because of the structure of the Canadian economy there will be significant leakages from the Atlantic region. To compensate for the leakages, regional development assistance coul[a] be redirected from elsewhere to the Atlantic region. Also, in situations where procurement from manufacturing establishments in Ontario, for example, would result in significant expansion of capacity, government assistance could be provided to such companies to establish a new plant in one of, or away from, the ocean industry clusters in the Atlantic region depending on the policy objectives. Chapter VI also looks at targetting economic assistance to regional industries from the perspective of additions to capital assets.

CHAPTER VI

HIBERNIA CAPITAL EQUIPMENT SOURCING OPPORTUNITIES AND OFFSHORE HYDROCARBON DEVELOPMENT SOURCING APPROACHES

1. INTRODUCTION

Major development projects create high expectations particularly if a region has been starving for employment and business opportunities for years. Such expectations combined with the direct, indirect and induced demand associated with major development projects could overheat a resource based regional economy causing boom-bust cycles. Factors which contribute to upswings in regional economies include in-migration of workers to the region looking for employment, demand for housing, schools and social servies, and high salaries and wages pulling professionals and skilled labour from other sectors and thereby setting in motion a push-pull process.

Although boom-bust cycles are characteristic of resource based regional economies, the cycles could be better managed and the opportunities evenly spread over a longer period. One way this could be done is to have phased-in projects, but not necessarily of the same scale of development or level of investment. Another way is to get regional industries to cooperate with government to ensure that economic assistance provided is directed to industries which would continue to create employment after the boom. The distinction being made is that the traditional government regional development programs, or interventionist programs as the neoclassists prefer to characterize them, do not involve the regional business community in their design and implementation. Government-industry cooperation in the development of regional economic assistance programs however, implies that regional development subsidies would not necessarily go to high profile, uneconomic sectors, which could create short term jobs for political expediency. An understanding of the manufacturing assets and the condition of the assets of the industries in the region is a necessary requirement if economic development assistance

programs are to be targeted to the sectors that could create and sustain the jobs in the region; and if government-industry cooperation is to function effectively. The capital constraint index is presented as one method of targeting economic assistance programs. It is worth noting that the capital stock analysis does not necessarily relate to quality and therefore productivity of capital but rather to its "size".

2. SOURCING OPPORTUNITIES

In discussing the results of the capital constraint index (CCI) in this section it is useful to keep in mind some of the earlier points regarding the importance of the direction of the resultant. The specific threshold value by itself may not mean very much but the ranges of the threshold indicate the stability of the data. The lower threshold values could also be viewed as an indication of the minimum level assets needed to carry out manufacturing activity for that particular sector in that province for shipments. Wide fluctuations in the index reduce the degree of confidence that can be placed on the results and the conclusions that may be drawn from this study. This is important since confidential rules did not make it possible to examine the absolute data. Furthermore, the lack of disaggregated data in carrying out the analysis at the four digit level of Standard Industrial Classification means that one cannot fully explain the fluctuations were the result of the volatility in the subsector data or the geographic units. Interestingly enough, the temporal analysis for Ontario, Quebec and British Columbia, the graphs which showed the greatest fluctuations for the ready mix concrete industry, (Figure VI.7) did not show any truncation in the Standard Industrial Classification (see Appendix VI.1). Because of these caveats conclusions that are drawn from this study are based on the general direction of the resultant rather than on specific threshold values.

Figure VI.I shows the capital constraint index for the machine shop industry from 1961 to 1981. Alberta had an index ranging from a low of 0.047 in 1970 to a high of 0.069 in 1975. British Columbia's index was slightly higher than Alberta's. In 1961 the machine shop industry in British Columbia had a capital constraint index of 0.062. By 1969 the index had decreased to 0.050. The index increased from this value slowly and reached a high of 0.115 in 1981. Nova Scotia's index of 0 in 1961 increased to 0.001 by 1974 and to a high of 0.005 by 1981.

The shipbuilding and repair industry in British Columbia registered a Capital Constraint Index (CCI) of about 0.100 Figure VI.2. The index for the industry in Nova Scotia fluctuated between a low of 0.026 in 1970 and a high of 0.129 in 1978. By 1981 the index had decreased to 0.101. However, the industry in Ontario with a ratio greater than one had the assets to respond to new businesses. Figure VI.3 also shows that the manufacturing assets for the boatbuilding and repair industry are in the core manufacturing region of Quebec and Ontario with an index greater than 0.100. For British Columbia there is a gradual increase in the index from 0.009 in 1965 to 0.035 in 1981. The index for the industry in Nova Scotia showed a greater yearly fluctuation; particularly between 1974 and 1981, an indication of a possible lack of long term investment planning.

FIGURE VI.1

CAPITAL CONSTRAINT INDEX (CCI)1961-1991

MACHINE SHOPS INDUSTRY

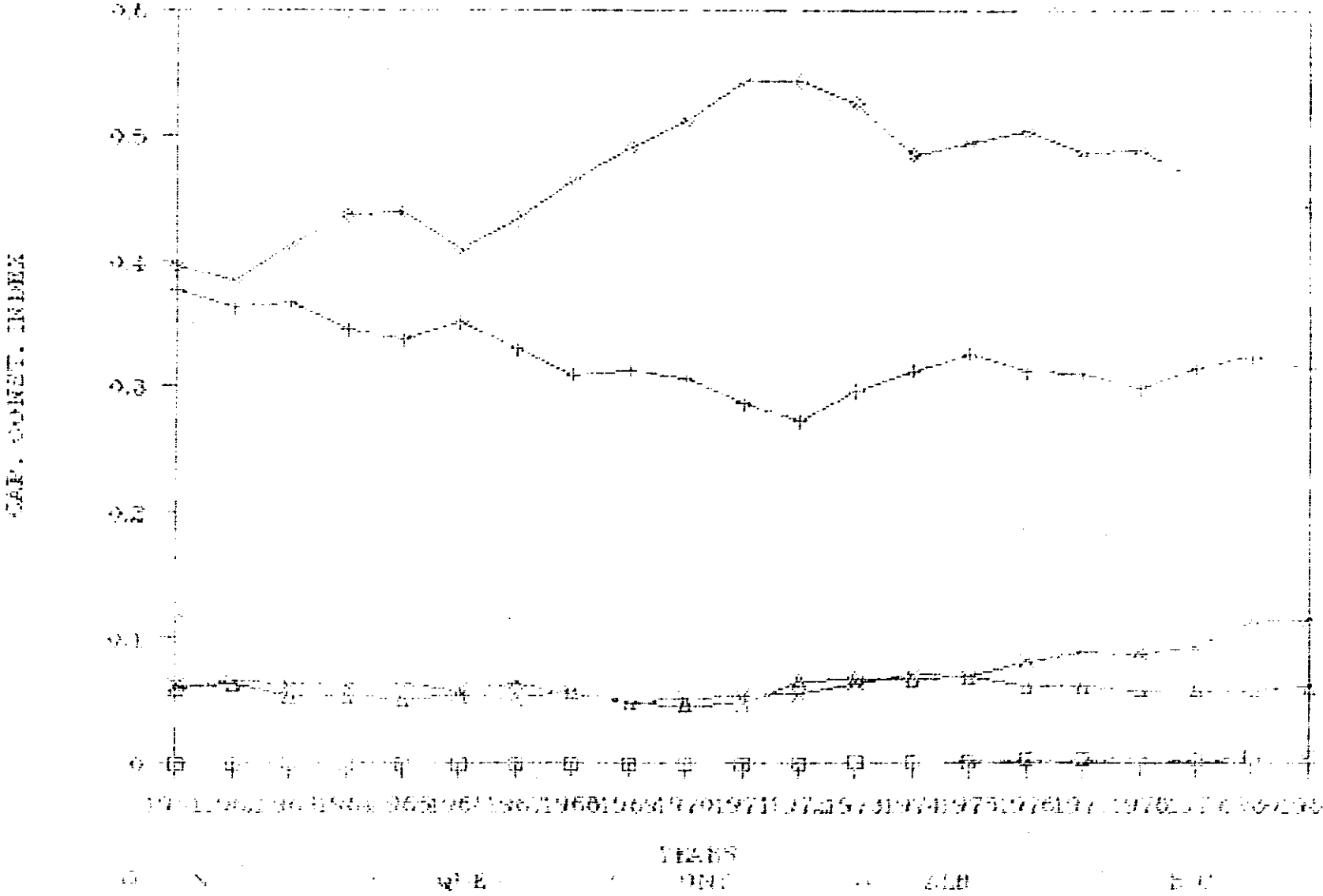


FIGURE VI.2

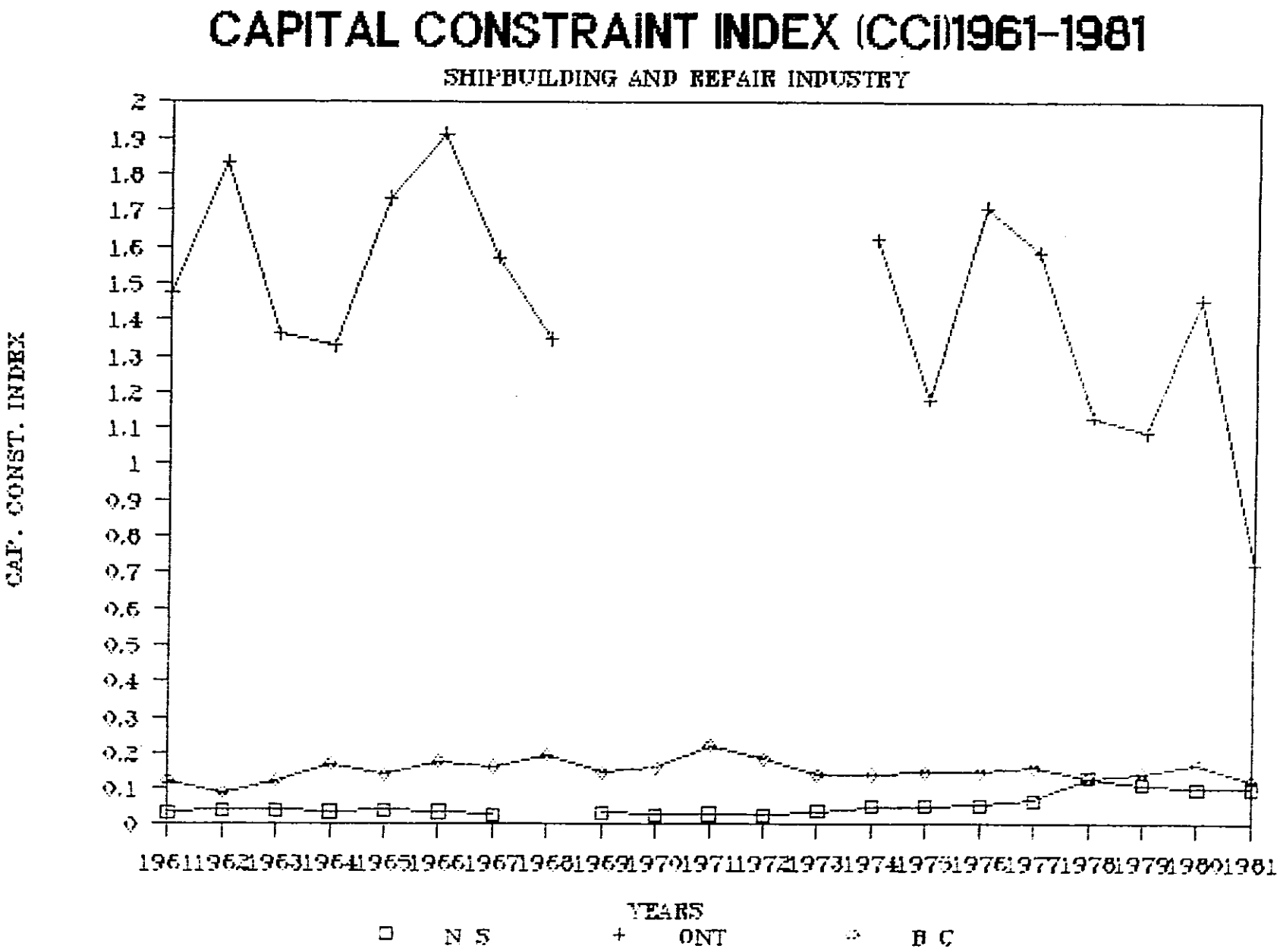

CAPITAL CONSTRAINT INDEX (CCI)1961-1981
SHIPBUILDING AND REPAIR INDUSTRY
CAP. CONST. INDEX
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981
YEARS
N S
ONT
B C

FIGURE VI.3

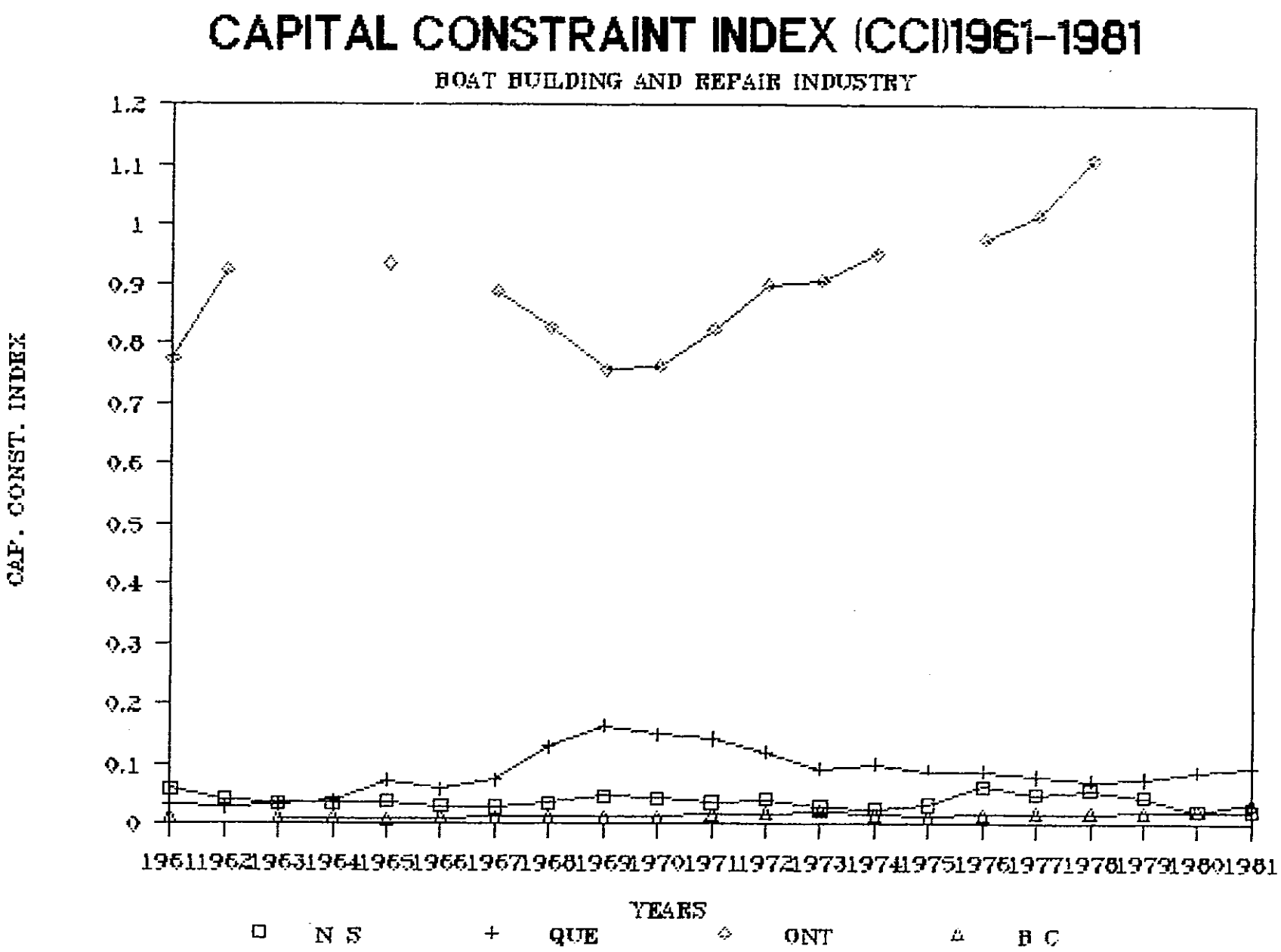
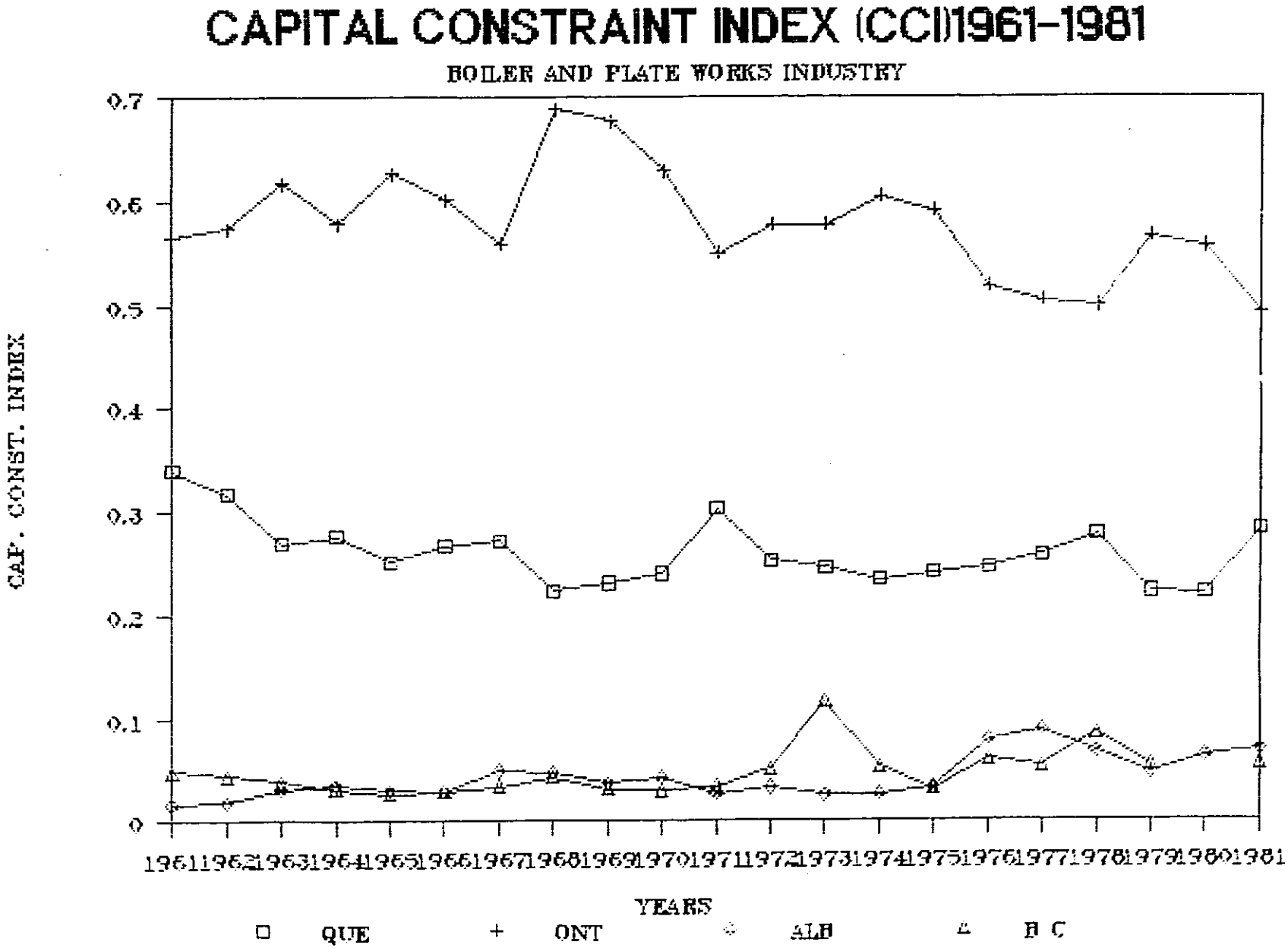

CAPITAL CONSTRAINT INDEX (CCI)1961-1981
BOAT BUILDING AND REPAIR INDUSTRY
CAP. CONST. INDEX
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981
YEARS
N S
QUE
ONT
B C

FIGURE VI.4


CAPITAL CONSTRAINT INDEX (CCI)1961-1981
BOILER AND PLATE WORKS INDUSTRY
CAP. CONST. INDEX
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981
YEARS
QUE
ONT
ALB
B C

For the boiler and plate works industry British Columbia would appear not to have the manufacturing assets since it had an index of 0.116 or less from 1961 to 1981 Figure VI.4. The manufacturing core region of Ontario and Quebec appear to have the assets. Of the four provinces examined, the miscellaneous metal fabrication industry registered an index of between 0.3 and 0.6 in Quebec and Ontario and between 0.004 and 0.077 in Alberta and Quebec. (Figure VI.5).

The dominance of Ontario and Quebec also extends to the communication manufacturing industry where the industry registered an index of at least 0.319 from 1970 to 1981 (Figure VI.6). The index for the industry in Alberta was between 0.007 and 0.015 from 1970 to 1981 and for British Columbia between 0.039 and 0.094 from 1970 to 1981. Quebec and Ontario have the manufacturing assets in the ready-mix concrete industry from 1972 to 1981 with an index greater than 0.194. For this period the industry in British Columbia registered an index of between 0.130 and 0.054. From 1961 to 1981 the industry in Alberta had a CCI of between 0.012 and 0.064. Figure VI.7 shows the Capital Constraint Index from 1961 to 1981 for the ready-mix concrete industry. The sharp drop in the index for British Columbia could be explained partly by the decrease in the capital availability ratio from 0.760 in 1971 to 0.203 in 1972. From 1961 to 1971 British Columbia by far had the largest proportion of the industry assets in the country. However, in 1972 the other provinces acquired more assets combined than British Columbia; and this consequently reduced the province's capital availability ratio which in turn affected the index. This trend containued from 1972 to 1981. Tables VI.1 to VI.7 show the Location Quotient, Capital Availability, the Capital Constraint Index ratios for each of the seven industries examined.

The capital constraint index (CCI) analysis shows that over time constraint assets sectors shift to excess assets sectors or vice versa. That is, each condition does not persist indefinitely because of business opportunities. Thus, the capital constraint index could provide an indication of investment cycles for each industrial sector. It is worth noting however, that industrial sectors in Ontario and Quebec with

FIGURE VI.5

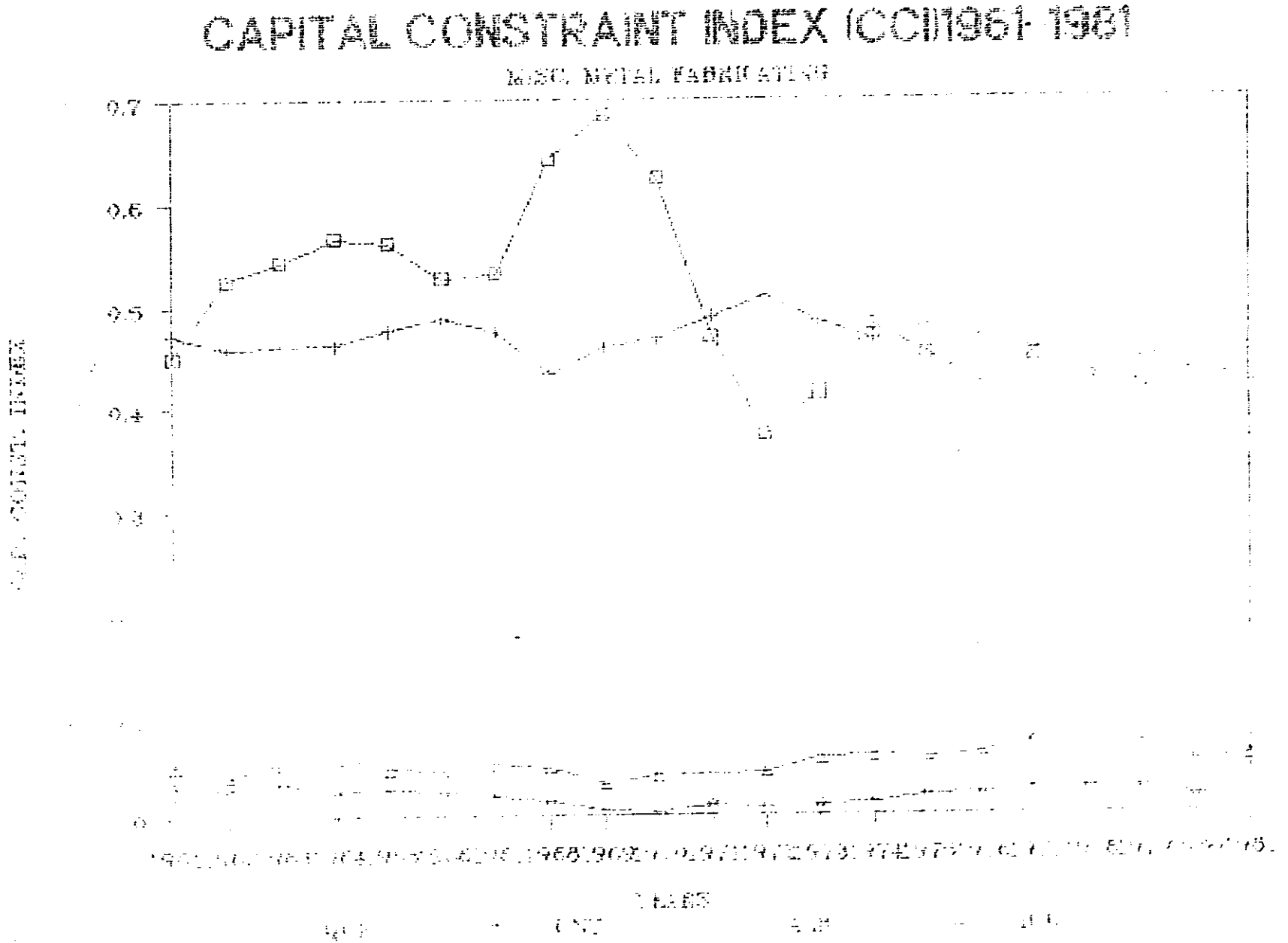

CAPITAL CONSTRAINT INDEX (CCI)1961-1981
MISC. METAL FABRICATING
0.7
0.6
0.5
0.4

FIGURE VI.6

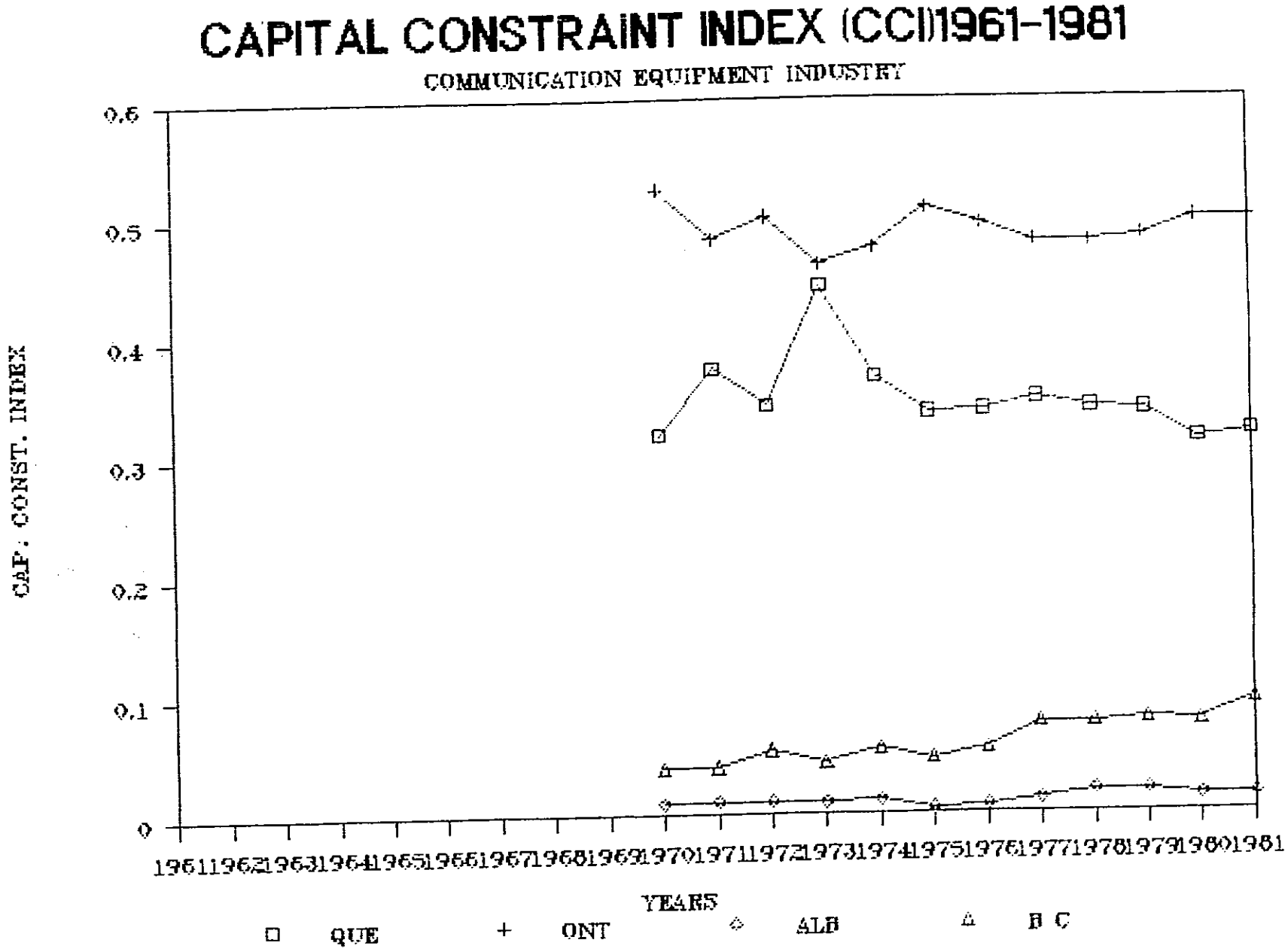

CAPITAL CONSTRAINT INDEX (CCI)1961-1981
COMMUNICATION EQUIPMENT INDUSTRY
CAP. CONST. INDEX
0.6
0.5
0.4
0.3
0.2
0.1
0
1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981
YEARS
QUE
ONT
ALB
B C

FIGURE VI.7

CAPITAL CONSTRAINT INDEX (CCI)1961-1981

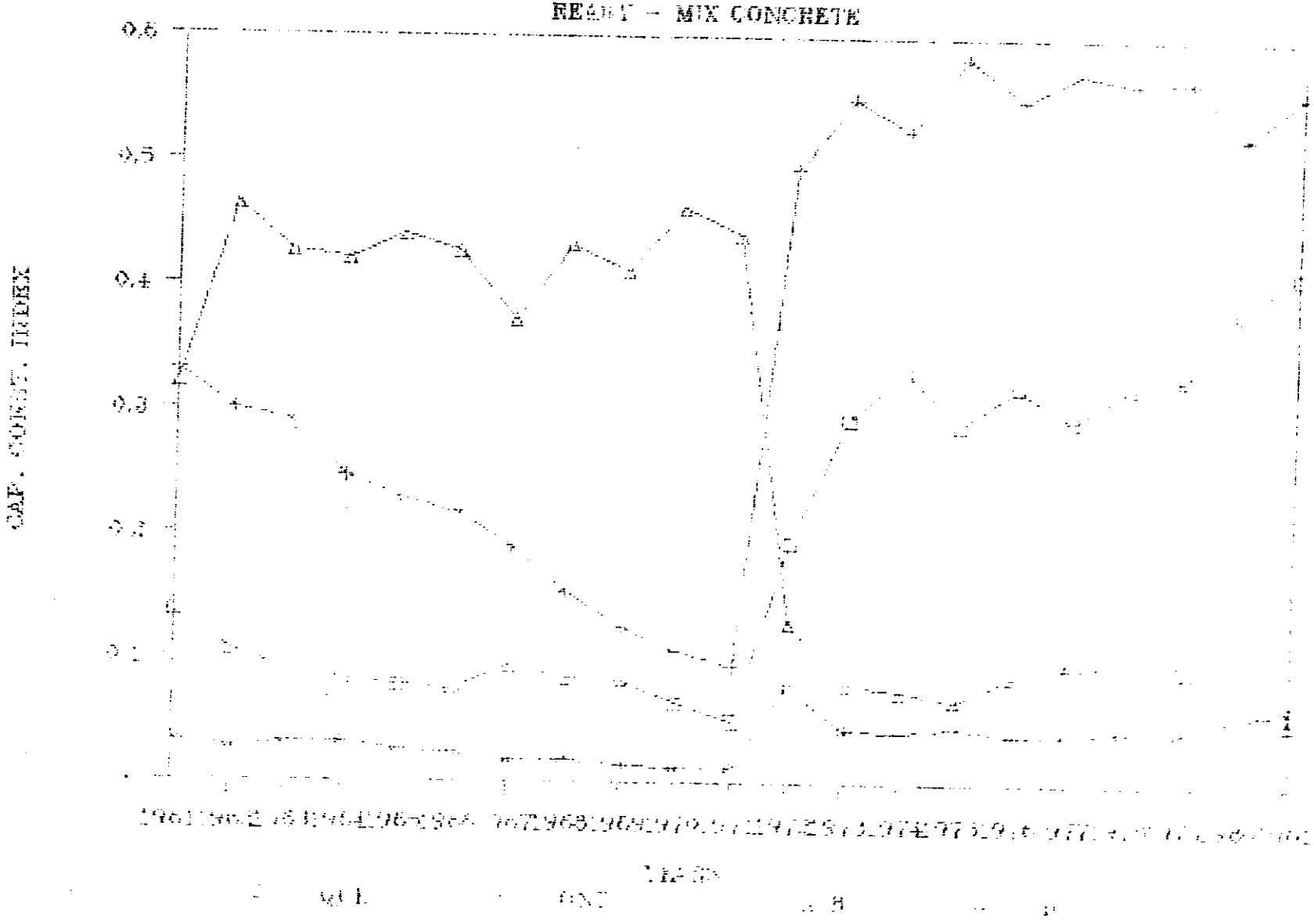


TABLE VI.1

CAPITAL CONSTRAINT INDEX
MACHINE SHOPS

	N S			QUE			ONT			ALB			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	1.523	0	0	0.935	0.353	0.377	0.626	0.248	0.396	3.413	0.203	0.059	1.731	0.107	0.062
1962	1.565	0	0	0.956	0.347	0.363	0.651	0.251	0.385	3.083	0.196	0.063	1.617	0.106	0.065
1963	1.141	0	0	0.924	0.339	0.367	0.646	0.268	0.414	3.455	0.187	0.054	1.660	0.105	0.063
1964	0.989	0	0	0.925	0.32	0.346	0.645	0.283	0.438	3.373	0.181	0.053	1.686	0.107	0.063
1965	0.968	0	0	0.931	0.315	0.338	0.650	0.287	0.441	3.223	0.166	0.051	1.696	0.108	0.063
1966	0.921	0	0	0.981	0.346	0.352	0.673	0.277	0.411	2.949	0.161	0.054	1.669	0.098	0.058
1967	0.915	0	0	1.008	0.333	0.33	0.702	0.305	0.434	2.898	0.151	0.052	1.531	0.098	0.064
1968	0.938	0	0	1.029	0.318	0.309	0.729	0.339	0.465	2.356	0.136	0.057	1.569	0.089	0.056
1969	0.684	0	0	1.018	0.319	0.313	0.709	0.348	0.491	2.662	0.132	0.049	1.679	0.084	0.050
1970	0.731	0	0	1.008	0.310	0.307	0.708	0.363	0.512	2.571	0.122	0.047	1.799	0.093	0.052
1971	1.010	0	0	0.992	0.285	0.287	0.676	0.368	0.544	2.624	0.127	0.048	1.825	0.099	0.054
1972	1.106	0	0	1.036	0.283	0.273	0.669	0.364	0.544	1.897	0.126	0.066	1.852	0.103	0.055
1973	1.172	0.001	0.001	0.919	0.273	0.297	0.723	0.381	0.527	1.781	0.122	0.068	1.653	0.107	0.064
1974	1.007	0.001	0.001	0.856	0.268	0.313	0.773	0.376	0.486	1.907	0.128	0.067	1.612	0.116	0.071
1975	0.901	0.002	0.002	0.846	0.277	0.327	0.750	0.371	0.494	1.772	0.124	0.069	1.747	0.121	0.069
1976	0.733	0.002	0.003	0.869	0.271	0.312	0.730	0.369	0.505	1.964	0.120	0.061	1.649	0.136	0.082
1977	0.732	0.002	0.003	0.837	0.26	0.311	0.753	0.368	0.488	2.004	0.123	0.061	1.640	0.148	0.090
1978	0.580	0.003	0.005	0.868	0.259	0.298	0.751	0.367	0.489	2.130	0.125	0.058	1.668	0.148	0.088
1979	0.593	0.002	0.003	0.798	0.251	0.314	0.807	0.376	0.466	2.089	0.122	0.058	1.644	0.153	0.093
1980	0.606	0.003	0.005	0.746	0.242	0.324	0.843	0.374	0.443	2.263	0.132	0.058	1.376	0.159	0.115
1981	0.632	0.003	0.005	0.774	0.244	0.315	0.847	0.376	0.444	2.100	0.13	0.061	1.368	0.158	0.115

TABLE VI.2

CAPITAL CONSTRAINT INDEX
SHIPBUILDING & REPAIR

	N S			QUE			ONT			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	6.740	0.22	0.033				0.310	0.456	1.471	2.651	0.323	0.122
1962	5.719	0.224	0.039				0.237	0.435	1.835	3.712	0.339	0.091
1963	5.550	0.217	0.039				0.313	0.426	1.361	2.928	0.356	0.121
1964	6.010	0.216	0.036				0.314	0.417	1.328	2.186	0.366	0.167
1965	4.798	0.199	0.041				0.253	0.439	1.735	2.619	0.361	0.137
1966	5.281	0.195	0.036				0.222	0.426	1.914	2.178	0.379	0.174
1967	6.714	0.191	0.028				0.268	0.422	1.574	2.412	0.386	0.160
1968		0.193					0.315	0.425	1.349	1.967	0.381	0.194
1969	5.939	0.201	0.034					0.416		2.648	0.384	0.145
1970	7.639	0.201	0.026					0.404		2.476	0.394	0.159
1971	7.144	0.205	0.029					0.405		1.755	0.389	0.221
1972	7.447	0.213	0.028					0.410		2.044	0.376	0.184
1973	6.316	0.238	0.038					0.397		2.630	0.364	0.138
1974	4.844	0.242	0.050				0.225	0.365	1.622	2.783	0.391	0.140
1975	5.234	0.262	0.050				0.303	0.358	1.181	2.608	0.379	0.145
1976	4.575	0.242	0.053				0.235	0.402	1.710	2.431	0.354	0.146
1977	3.634	0.243	0.067				0.246	0.390	1.585	2.336	0.366	0.157
1978	1.901	0.245	0.129				0.346	0.391	1.130	2.811	0.363	0.129
1979	2.886	0.316	0.109				0.317	0.344	1.085	2.383	0.339	0.142
1980	3.298	0.327	0.099				0.223	0.325	1.457	2.074	0.346	0.166
1981	2.952	0.299	0.101				0.452	0.326	0.721	3.096	0.374	0.121

TABLE VI.3

CAPITAL CONSTRAINT INDEX
BOAT BUILDING & REPAIR

	N S			QUE			ONT			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	4.295	0.254	0.059	0.492	0.016	0.032	0.886	0.686	0.774	2.860	0.031	0.011
1962	5.657	0.237	0.042	0.530	0.015	0.028	0.764	0.707	0.925		0.028	
1963	6.409	0.233	0.036	0.480	0.016	0.033		0.707		3.014	0.032	0.01
1964	6.210	0.222	0.035	0.540	0.021	0.039		0.711		3.030	0.033	0.011
1965	4.877	0.188	0.038	0.522	0.038	0.073	0.782	0.731	0.935	3.309	0.031	0.009
1966	5.548	0.169	0.030	0.563	0.034	0.06		0.755		3.008	0.031	0.010
1967	5.502	0.164	0.029	0.600	0.045	0.075	0.841	0.748	0.889	2.751	0.033	0.012
1968	4.439	0.159	0.036	0.629	0.082	0.13	0.86	0.712	0.828	2.812	0.037	0.013
1969	3.067	0.143	0.047	0.532	0.087	0.163	0.959	0.727	0.758	2.832	0.035	0.012
1970	3.288	0.142	0.043	0.538	0.081	0.15	0.960	0.734	0.764	2.843	0.035	0.012
1971	3.396	0.127	0.037	0.490	0.07	0.143	0.907	0.750	0.827	2.895	0.046	0.016
1972	2.839	0.119	0.042	0.548	0.066	0.12	0.841	0.758	0.901	2.755	0.051	0.018
1973	3.823	0.111	0.029	0.667	0.062	0.093	0.847	0.770	0.909	2.104	0.048	0.023
1974	3.907	0.104	0.027	0.603	0.061	0.101	0.808	0.771	0.954	2.769	0.046	0.017
1975	2.949	0.099	0.033	0.662	0.059	0.089		0.781		3.509	0.047	0.013
1976	1.456	0.094	0.064	0.742	0.065	0.088	0.792	0.776	0.979	2.793	0.046	0.016
1977	1.833	0.090	0.049	0.835	0.067	0.08	0.760	0.774	1.018	2.508	0.048	0.019
1978	1.493	0.087	0.058	0.885	0.066	0.074	0.694	0.771	1.111	2.776	0.053	0.019
1979	1.865	0.084	0.045	0.893	0.068	0.076		0.759		2.817	0.058	0.02
1980	3.343	0.078	0.023	0.877	0.077	0.088		0.729		2.777	0.062	0.022
1981	3.041	0.069	0.022	0.799	0.078	0.098		0.709		2.612	0.093	0.035

TABLE VI.4

CAPITAL CONSTRAINT INDEX
READY MIX CONCRETE

	QUE			ONT			A_E			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	1.052	0.144	0.137	0.777	0.259	0.333	2.797	0.098	0.135	[illegible]	[illegible]	[illegible]
1962	1.150	0.123	0.197	0.742	0.225	0.301	2.827	0.084	0.029	[illegible]	[illegible]	[illegible]
1963	1.240	0.114	0.091	0.713	0.209	0.293	2.316	0.076	0.073	[illegible]	[illegible]	[illegible]
1964	1.203	0.102	0.085	0.760	0.189	0.248	2.077	0.068	0.032	[illegible]	[illegible]	[illegible]
1965	1.149	0.091	0.079	0.735	0.170	0.231	2.246	0.061	[illegible]	[illegible]	[illegible]	[illegible]
1966	1.069	0.052	0.076	0.703	0.154	0.219	2.189	0.054	0.024	[illegible]	[illegible]	[illegible]
1967	0.793	0.074	0.094	0.726	0.139	0.191	2.532	0.049	0.019	[illegible]	[illegible]	[illegible]
1968	0.784	0.967	0.085	0.814	0.125	0.153	2.323	0.044	0.016	1.476	0.64	0.433
1969	0.671	0.057	0.084	0.850	0.107	0.126	2.608	0.038	0.014	1.657	0.653	0.412
1970	0.747	0.049	0.065	0.866	0.093	0.107	2.418	0.032	0.013	1.557	0.722	1.463
1971	0.919	0.041	0.05	0.825	0.078	0.094	2.179	0.027	0.012	1.718	0.76	0.442
1972	0.866	0.165	0.194	0.813	0.404	0.495	[illegible]	0.158	0.079	1.566	0.203	0.130
1973	0.885	0.261	0.294	0.729	0.436	0.552	2.479	0.112	0.045	1.499	0.122	[illegible]
1974	0.896	0.296	0.334	0.766	0.404	0.527	2.690	0.109	0.042	1.553	[illegible]	[illegible]
1975	1.005	0.274	0.291	0.670	0.393	0.556	2.371	0.110	0.046	1.624	[illegible]	[illegible]
1976	0.915	0.294	0.321	0.552	0.365	0.551	2.896	[illegible]	0.039	1.796	[illegible]	[illegible]
1977	0.982	0.289	0.294	0.625	0.360	0.577	2.952	0.117	0.039	1.316	0.125	[illegible]
1978	0.866	0.278	0.321	0.633	0.359	0.565	3.160	0.175	0.043	1.264	[illegible]	[illegible]
1979	0.822	0.271	0.329	0.624	0.355	0.565	3.474	0.152	0.044	1.274	[illegible]	[illegible]
1980	0.775	0.262	0.383	0.549	0.335	0.573	3.111	0.172	0.055	1.628	0.114	[illegible]
1981	0.682	[illegible]	0.412	0.583	0.325	0.557	2.904	0.187	0.064	[illegible]	[illegible]	[illegible]

TABLE VI.5

CAPITAL CONSTRAINT INDEX
BOILER & PLATE WORKS

	QUE			ONT			ALB			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	1.109	0.378	0.34	0.985	0.558	0.566	2.680	0.048	0.017	0.311	0.015	0.048
1962	1.193	0.379	0.317	0.968	0.556	0.574	2.490	0.048	0.019	0.320	0.014	0.044
1963	1.421	0.383	0.269	0.900	0.556	0.618	1.500	0.047	0.031	0.331	0.013	0.039
1964	1.351	0.373	0.276	0.985	0.571	0.579	1.200	0.042	0.035	0.376	0.012	0.032
1965	1.406	0.355	0.252	0.947	0.594	0.627	1.296	0.039	0.03	0.369	0.010	0.027
1966	1.439	0.385	0.267	0.943	0.568	0.602	1.240	0.036	0.029	0.302	0.009	0.029
1967	1.442	0.394	0.273	0.996	0.558	0.56	0.746	0.037	0.049	0.260	0.009	0.034
1968	1.766	0.396	0.224	0.803	0.554	0.689	0.793	0.038	0.047	0.206	0.009	0.043
1969	1.681	0.391	0.232	0.824	0.559	0.678	1.045	0.309	0.037	0.276	0.009	0.032
1970	1.507	0.364	0.241	0.934	0.589	0.63	0.859	0.037	0.043	0.291	0.009	0.030
1971	1.147	0.349	0.304	1.100	0.606	0.551	1.297	0.035	0.027	0.262	0.009	0.034
1972	1.315	0.335	0.254	1.077	0.623	0.578	0.980	0.032	0.033	0.156	0.008	0.051
1973	1.275	0.316	0.247	1.115	0.645	0.578	1.135	0.029	0.025	0.060	0.007	0.116
1974	1.371	0.323	0.235	1.056	0.64	0.606	1.071	0.029	0.027	0.112	0.006	0.053
1975	1.294	0.313	0.242	1.082	0.641	0.592	1.207	0.040	0.033	0.154	0.005	0.032
1976	1.201	0.297	0.247	1.204	0.626	0.519	0.893	0.072	0.080	0.066	0.004	0.060
1977	1.138	0.295	0.259	1.243	0.628	0.505	0.793	0.071	0.089	0.075	0.004	0.053
1978	1.036	0.288	0.278	1.270	0.635	0.5	1.058	0.071	0.067	0.047	0.004	0.085
1979	1.204	0.269	0.223	1.166	0.662	0.567	1.395	0.064	0.046	0.055	0.003	0.054
1980	1.095	0.243	0.221	1.166	0.65	0.557	1.621	0.103	0.063		0.002	
1981	0.945	0.268	0.283	1.270	0.626	0.492	1.378	0.095	0.069	0.176	0.01	0.056

TABLE VI.6

CAPITAL CONSTRAINT INDEX
MISC. METAL FABRICATING

	QUE			ONT			ALB			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961	0.552	0.249	0.451	1.422	0.673	0.473	0.258	0.008	0.031	0.373	.019	.051
1962	0.500	0.263	0.526	1.442	0.661	0.458	0.237	0.007	0.029	.429	.018	.041
1963	0.485	0.264	0.544	1.435	0.662	0.461	0.209	0.007	0.033	.356	.018	.051
1964	0.465	0.264	0.567	1.437	0.665	0.462	0.221	0.006	0.027	.344	.017	.050
1965	0.457	0.257	0.562	1.413	0.673	0.477	0.229	0.006	0.026	.353	.017	0.046
1966	0.488	0.258	0.528	1.380	0.676	0.489	0.204	0.005	.024	.366	.017	.045
1967	0.461	0.245	0.532	1.429	0.68	0.475	0.262	0.005	0.019	.317	.013	0.041
1968	0.477	0.307	0.643	1.429	0.619	0.433	0.257	0.004	.015	.311	.013	.041
1969	0.393	0.270	0.687	1.452	0.665	0.458	0.527	0.007	0.005	0.496	0.016	0.032
1970	0.413	0.258	0.624	1.455	0.68	0.467	0.620	0.003	0.004	0.456	0.018	0.039
1971	0.546	0.256	0.469	1.394	0.683	0.489	0.319	0.002	0.006	0.430	0.018	0.041
1972	0.567	0.249	0.439	1.364	0.691	0.506	0.429	0.003	0.007	0.415	0.018	0.043
1973	0.606	0.248	0.413	1.402	0.687	0.483	0.449	0.005	0.011	0.395	0.022	0.055
1974	0.504	0.241	0.48	1.478	0.69	0.466	0.500	0.006	0.012	0.394	.023	.058
1975	0.556	0.248	0.451	1.455	0.697	0.479	0.476	0.009	0.019	1.429	0.024	.057
1976	0.587	0.247	0.421	1.455	0.682	0.468	0.441	0.010	0.022	1.373	0.027	.061
1977	0.539	0.241	0.448	1.509	0.686	0.457	0.435	0.011	0.025	1.331	0.025	.075
1978	0.553	0.241	0.43.	1.504	0.683	0.454	0.438	0.011	0.025	1.349	0.027	.077
1979	0.506	0.237	0.468	1.510	0.671	0.444	0.465	0.010	0.027	0.357	0.027	.075
1980	.579	0.251	.433	1.499	1.670	0.449	0.557	0.010	0.018	0.810	0.031	0.052
1981	0.567	0.241	0.425	1.465	0.670	0.457	0.741	0.015	0.020	0.690	0.034	0.050

TABLE VI.7

CAPITAL CONSTRAINT INDEX
COMMUNICATION EQUIPMENT

	QUE			ONT			ALB			B C		
	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI	LQ	CAR	CCI
1961		0.408			0.504			0.003			0.010	
1962		0.434			0.548			0.003			0.012	
1963		0.410			0.572			0.002			0.012	
1964		0.397			0.575			0.002			0.022	
1965		0.389			0.583			0.002			0.022	
1966		0.386			0.587			0.002			0.022	
1967		0.371			0.603			0.004			0.019	
1968		0.365			0.609			0.004			0.019	
1969		0.364			0.611			0.003			0.018	
1970	1.165	0.372	0.319	1.150	0.604	0.525	0.290	0.003	0.01	0.460	0.018	0.039
1971	1.002	0.376	0.375	1.238	0.599	0.483	0.270	0.003	0.011	0.441	0.018	0.04
1972	1.042	0.358	0.343	1.231	0.617	0.501	0.269	0.003	0.011	0.332	0.019	0.054
1973	0.794	0.352	0.443	1.347	0.622	0.461	0.278	0.003	0.01	0.459	0.020	0.043
1974	0.963	0.354	0.367	1.301	0.618	0.475	0.238	0.003	0.012	0.381	0.021	0.055
1975	1.071	0.36	0.336	1.203	0.611	0.508	0.551	0.003	0.005	0.465	0.022	0.047
1976	1.067	0.361	0.338	1.229	0.609	0.495	0.412	0.003	0.007	0.432	0.024	0.055
1977	1.017	0.354	0.348	1.267	0.609	0.48	0.482	0.006	0.012	0.329	0.025	0.076
1978	1.041	0.354	0.340	1.274	0.611	0.479	0.314	0.006	0.019	0.313	0.024	0.076
1979	1.043	0.353	0.338	1.264	0.613	0.484	0.260	0.005	0.019	0.314	0.025	0.079
1980	1.095	0.343	0.313	1.252	0.625	0.499	0.282	0.004	0.014	0.295	0.023	0.077
1981	1.041	0.333	0.319	1.249	0.625	0.5	0.444	0.007	0.015	0.330	0.031	0.094

significant capital assets exhibited less cyclical variations compared to the sectors in Nova Scotia or British Columbia. An alternative interpretation which may be advanced is that if a capital constraint index is relatively high then that sector in that province will attract business, however, depending on how high or cyclical the index is over time, a decision could be made to target specific industries for economic assistance. If on the other hand the capital constraint index is low then without additional investment or displacement of other output, that sector in that province cannot take on business or respond to new input-output demand opportunities. For example, the analyses indicate that the shipbuilding and repair industry would have no assets to build vessels; but this does not mean the shipyards could not fabricate modules or pallets for the topsides. Another advantage of the capital constraint index is that it can provide an indication of the level of investment that would be required if a decision is made to optimize regional or national benefits beyond what would be captive. For example, it would not be a good decision to target the machine shop industry in Ontario for grants Figure VI.1 if the objective is to increase employment in the highly skilled industry sector. To achieve such an objective, economic assistance should be directed instead to the communication industry in Ontario.

3. OFFSHORE OIL AND GAS EQUIPMENT SOURCING APPROACHES

Based on the preceeding analyses the point could be made that market forces alone will not result in any significant diversification of the manufacturing base in Atlantic Canada, particularly Newfoundland and Nova Scotia the two main provinces in the region heavily involved in offshore oil and gas exploration and development at the present time. There is therefore a need for joint corporate - government sourcing initiatives if coastal provinces are to participate effectively in manufacturing capital equipment for Hibernia and other offshore oil and gas development. This section reviews the sourcing approaches in Norway and Britain, the two Western countries which have had a joint corporate - government policies

for offshore development. The intent of this review is to suggest possible modifications to the present approach being used in Canada. This section is not intended as a critical assessment of the sourcing policies of these three countries. Such an assessment is outside the objectives of this dissertation.

Norway has had an interventionist sourcing policy from the very inception of its offshore oil and gas development. The Norwegian Policy of full and fair opportunity was intended to increase Norwegian participation in the supply of offshore goods and services; to employ Norwegians in offshore activities; and to promote the competitiveness of Norwegian industry through technical cooperation and research and development contracts from the oil companies. To accomplish these objectives the Norwegian Government required oil companies to disclose procurement information to show that Norwegian firms were having full and fair opportunity to obtain contracts. The onus was therefore on the oil companies. The Government also stipulated that at least 75 per cent of all workers employed on offshore activities should be Norwegians (Cook and Surrey 1983: 47). Since 1979, the government of Norway has required oil companies to place substantial research and development contracts with Norwegian firms and research institutions. This is a significant departure from the earlier requirement that oil companies finance research and development projects.

In general the Norwegian sourcing policy appears to have achieved the intended objectives, particularly in rigs and production platforms for:

> The rising Norwegian share after 1976 appears to have been influenced by preferential procurement - through the preference given by Statoil and the opportunities for Norwegian firms to submit revised bids. Norwegian firms built eight out of fourteen concrete platforms installed in the North sea (including the UK sector) and obtained all the Jacket contracts through

> competitive bidding... by 1979 there were some activities in which Norwegian industry was competitive, some where it might never be economic for Norwegian firms to manufacture specialized equipment outside their normal product range (eg. certain process equipment) and some activities (eg. steel fabrication) in which the Norwegian share could be enhanced only at substantial economic cost through preferential procurement (Cook and Surrey 1983: 47, 48).

Besides the use of Statoil as an instrument for offshore goods and services sourcing and thereby influence, the apparent success of the Norwegian sourcing policy has also been attributed in part to the oil companies' early realization of commercial benefits that may be derived from being a good corporate citizen and by supporting government policies. In a country with a population of about four million a strong corporate profile and local presence cannot easily be missed. Most oil companies therefore hired Norwegian engineering firms who provided advice on Norwegian industrial capability so that companies could be invited to bid on contracts. This advisory role was possible because of the small number of Norwegian firms with specialized offshore expertise. The small number of firms involved in the offshore supply industry also made it possible for the Norwegian Government to provide industrial assistance. Furthermore, it may be argued that the Norwegian policy of gradual development enabled effective integration and participation by supply firms in offshore oil and gas development.

In comparing Norwegian and Danish North Sea development policies (Archer, 1977) concluded that the Norwegians have attempted a more rational form of policy or tapestry while the Danish have relied on incrementalism or patchwork quilt form of policy. The main reason he gives for the more active and effective approach to development by Norwegians is that decision markers in Norway give greater political

weight to North Sea development. I believe this is something that Canadian decision makers would have to take into consideration particularly when it comes to justifying the need for government financial grants for Hibernia development. The necessary national "political weight" may not be given to the development if it cannot be demonstrated that the procurement related benefits would spread to other provinces especially the manufacturing core provinces of Quebec and Ontario.

British sourcing policy began in 1973 (Jenkin 1981). Before then there was no government intervention in the offshore supply industry and the sourcing policy was one of "laissez-faire". The formulation of Britain's full and fair sourcing policy followed a detailed analysis of British industrial sectors by the consulting firm of International Management and Engineering Group of Britain Limited (IMEG). IMEG concluded from their study that in general British industry often lacked specific plant and facilities and relevant design and construction experience. This was viewed as a serious handicap given oil companies' emphasis upon suppliers' track record and the fact that contractors in the United States with extensive experience in the Gulf of Mexico were developing technologies appropriate to North Sea conditions. (IMEG 1972). There was also the concern that the lead held by foreign contractors was growing in all areas except in fabrication (Government of Britain, Department of Trade and Industry 1972).

Britain's approach to sourcing relies heavily on "unorthodox" policy instruments (Jenkin 1981). The main policy instruments are the Memorandum of Understanding between the Department of Energy and the United Kingdom Offshore Operators Association Limited, and the accompanying Code of Practice for the purchase of goods and services for oil related activities. The provisions of these two instruments enabled the Offshore Supplier Office (OSO) to audit quarterly procurement returns submitted by the oil companies, to monitor the performance of British firms, and to persuade the oil companies to consider British firms judged by OSO to have the necessary capabilities to supply the goods and services.

Like Norway, British supply companies appear to have specialized in certain sectors. For example British yards built 13 of the 17 fixed steel production platforms and three of the seven concrete gravity based platforms installed in the British sector of the North Sea between 1974 and 1979 (EIU 1984: 32-33). In addition to specializing in Steel Platforms, British firms have also gained expertise in underwater vehicles and tools manufacture, communication equipment, underwater instrumentation, and monitoring and control of production systems and inspection. Britain's share of the orders and content figures, however, have not been as high as originally claimed. Besides, most of the contracts won by British companies have been "soft" contracts such as onshore fabrication which has limited or no export potential. Research and Development is another area where results to date has fallen behind expectation. Recently, the British Government has taken steps to ensure the establishment of a stronger indigenous technology base for future projects. Oil companies have been asked to demonstrate a greater commitment to Research & Development by involving British industry in the generation of new offshore technology (Offshore Engineer, September 1985).

Britain's approach to sourcing has produced mixed results. While there have been successes in some areas, it is clear that more could have been achieved. The reasons for the limited success include:

> British government policy, which has concentrated on getting manufacturing done in Britain with little concern for ownership or the promotion of large projects designed to obtain expertise and know-how and little emphasis on lead firms... underestimation of the duration of the opportunities both in the UK Continental Shelf and elsewhere; failure to move quickly against incoming and strong and experienced competition; a limited entrepreneurial response to major opportunities; competition from some foreign firms who received support from their governments;

> difficulties in finding the right point of entry and a "product champion", the government policy of maintaining the open nature of the British economy (recently reaffirmed) while Norway and France allow a more interventionist approach; extreme diversity of standards, commercial and technical practices in North Sea business, which grew up so fast that standards and common practices had little chance to develop. (EIU 1984: 38-40).

From 1982 to 1985 the provisions of the Canada Oil and Gas Act (1982) have shaped Canada's approach to the sourcing of offshore oil and gas goods and services. For all Exploration Agreements (EAs) negotiated during this period oil companies were required to submit a plan satisfactory to the Minister of Energy, Mines and Resources (or Minister of Indian and Northern Affairs as appropriate), which will provide Canadian manufacturers, consultants, contractors and service companies with full and fair opportunity to participate competitively in the supply of goods and services used in any work program on Canada Lands. A Canada Benefits Plan and a Designated Item Review process are the main sourcing instruments. A Canada Benefits Plan, which contains specific programmes designed to provide national and regional employment and industrial opportunities, is negotiated with operators of Exploration Agreements before the commencement of work programmes. The Plan also contains specific supplier development initiatives which operators agree to undertake as part of their benefits commitments. These initiatives may include joint ventures with Canadian companies, technology and know-how transfers, and licensing arrangements. For the duration of the Canada Benefits Plan, usually four to five years, operators have to submit an Annual Report of their benefits performance for review. The Canada Oil and Gas Lands Administration (COGLA) is the federal agency responsible for the negotiation of the Plan and the review of the Annual Report. It is also doubtful whether the political will exist to fully exercise the Canada benefits provisions of the Act. There is a realization among

officials involved in administering the Canada benefits process that in the final analysis a Minister would not be prepared to stop a multi-million dollar program because an operator has not fully met its Canada benefits obligations. Consequently, officials have relied more on moral suasion to optimize Canada benefits.

The designated item review, which covers about ten products and services, is a two part process, (Appendix VI.8 shows the list of products and services and the rationale for each). The first part is the notification process where operators inform COGLA of their intent to source a particular item and provide a desired list of bidders. At this stage additional Canadian suppliers may be added to the bid list. COGLA also circulates the list to other federal and provincial departments. At the second stage of the review process COGLA may respond to the operator regarding the successful or desired bidder before the bidder is informed. Although the selection of the final bidder is up to the operator, the two stage process allows the government to make its particular concerns known. The main advantage of the designated item process is that it ensures all qualified canadian suppliers, who would not otherwise be considered by the operator, are given full and fair opportunity to bid on contracts.

Canada's approach can be described as a "limited" government involvement in the sourcing of products and services. This approach appears to have satisfied neither the operators nor the suppliers, particularly regional suppliers. The reasons for the mixed reactions are due in part to the high expectations raised by the Canada benefits process. Canadian suppliers expected Canada benefits to be a major criterion in bid reviews. Other criteria -- technical, delivery schedule, and track record and price have been given greater weighting than Canada benefits. Operators on the other hand see the process as an unnecessary government interference in corporate business decision making. Another reason is that the selection of the designated items was based more on "rationale" and not on a detailed analysis of canadian

industrial capability. For example drilling rigs and support vessels were designated because of their high value and the expressed interest of Canadian Shipyards to enter into this business (Appendix VI.2). There have also been instances where companies added to the bid list were no longer in business, did not produce the particular item or could not bid on the contract because of tight delivery schedules.

The Canadian approach to sourcing, which is a hybrid of both the British and Norwegian approaches, may not have pleased everyone but appears to have been a reasonable course of action at this early stage of offshore exploration and development. Offshore oil and gas activities in Canada are still at the exploration stage and oil companies will be fully committed to the Canadian offshore play only when they have developed a number of fields and have substantial investments tied to the region. Until such time however, it would not be appropriate to send the wrong signal to the industry by adopting a direct interventionist approach to sourcing. Furthermore, the Canadian Offshore is competing with other major fields elsewhere in the world to be developed. Nevertheless, the level of activity on Canada Lands has been sustained largely by government incentives. Thus, it is not unreasonable if Canadian suppliers expect to benefit from offshore activities. Other factors accounting for Canada's approach to products and services sourcing include the existence of an onland oil and gas industry anxious to expand operations into the offshore supply area, and the concern about the traditional sourcing practices of multinational oil and gas companies of buying from suppliers with known track record. These practices tend to prevent new or domestic companies from entering the offshore supply market. Conditions have changed since 1982 and there is now a greater degree of understanding and cooperation between the government, the oil and gas industry, and the coastal Provinces.

4. New Joint Management Boards and the Evolving Approach to Sourcing

It is during this period of growing understanding and cooperation that the Canada-Newfoundland Atlantic Accord was signed between the

Government of Canada and the Government of Newfoundland and Labrador on February 11, 1985. The Atlantic Accord has brought about the concept of joint management of and the sharing of revenues from the exploitation of offshore oil and gas resources off Newfoundland and Labrador. The Canada-Newfoundland Offshore Petroleum Board (CNOPB) is charged with the responsibility of managing the offshore oil and gas resources and administering the other provisions of the Accord. The CNOPB consists of seven members, three each appointed by the Government of Canada and the Government of Newfoundland and Labrador, and a jointly appointed Chairman. Under the provisions of the Accord the CNOPB shall among other things:

- keep the government of Canada and Newfoundland and Labrador informed of its decision in a timely manner,
- require applicants, permittees and licencees to concurrently file copies of all material filed with the Board with both Governments,
- report promptly and concurrently to the designated departments or Agency of both governments any significant event or information received by the Board,
- prepare an annual report and submit it to both governments which shall be tabled in the House of Commons and the House Assembly,
- make all decisions relating to the regulations and management of Petroleum-related activities including: declarations of discoveries, production licences compliance functions, administration of good oilfield practices regulations and emergency powers regarding safety, spills and conservation,
- transmit to both governments notice of fundamental decisions affecting pace and mode of exploration, and pace of production before the decision becomes final, and
- conduct a public review for any prospective development.

Certain offshore management decisions of the CNOPB are subject to the direction of Federal Ministers, Provincial Ministers or both the Federal and Provincial Ministers. For example, decisions relating to Canadianization policy, legislation not specifically related to oil and gas explorations and productions (e.g. Immigration Act, Fisheries Act) and application of federal taxes are subject to the direction of Federal

Ministers. Decisions relating to royalty regime and Provincial-type revenues and social legislations such as occupational health and safety are subject to the directions of Provincial Ministers. Decisions which are subject to both Federal and Provincial directions relate to the pace and mode of explorations and pace of production, the Public review Process, Canada and Newfoundland benefits, and studies and provisions of policy advice.

In addition to federal involvement in the management of offshore oil and gas activities in these specific areas, a number of government departments and agencies continue to have responsibilities in the offshore area for environmental and safety regulations and emergency measures. To ensure effective coordination and minimum duplication the Accord requires the CNOPB to conclude Memoranda of Understanding (MOU) with these government departments and agencies. The key elements of the Atlantic Accord are expected to form the basis for the joint management of other frontier lands.

Apart from the Atlantic Accord there is also another policy instrument, The Canada Petroleum Resources Act (CPRA), which is influencing the evolving approach to sourcing. The CPRA which repealed the Canada Oil and Gas Act states that:

> 21. Before the commencement of any work or activity on any frontier lands that are subject to an interest, a benefit plan shall be submitted to and approved by the Minister...
> Unless the Minister waives that requirement...,
>
> 3.4.(1) ..."benefits Plan" means a Plan for the employment of Canadians and for providing Canadian manufacturers, consultants, contractors, and service companies with a full and fair opportunity to participate on a competitive basis in the supply of goods and services used in any proposed work or activity referred to in the benefits Plan.
>
> (2) Before the Minister may approve any development Plan ..., a benefit Plan shall be submitted to and approved by the Minister, unless the Minister directs that such requirement need not be complied with.

> (3) The Minister (of Energy, Mines and Resources) may require that any benefit Plan submitted Pursuant to subsection (2) include Provisions to ensure that disadvantage individuals or groups have access to training and employment opportunities and to enable such individuals or groups or corporations owned as cooperatives operated by them to participate in the supply of goods and services used in any proposed work or activity referred to in the benefits Plan.
>
> 3.5(1) The Minister may issue and publish, in such manner as the Minister deems appropriate guidelines and interpretation notes with respect to the application and administration of sections 3.2 to 3.4... (Bill C-92, 1986:10; 69-70).

One can say, based on federal initiatives since 1986 which was a year of transition, that the approach which seems to be evolving is one of legislative requirement but with the flexibility of Ministerial discretion where warranted. While there is a devolution of powers and responsibilities from the federal government to independent management boards, federal involvement is still maintained in the process through the need to inform and advise Federal Ministers. The benefits Plan is also maintained and will continue to be a key aspect of the sourcing process. However, under the evolving system the benefit Plan is supplemented by guidelines. The guidelines have two key components, a statement of Principles and Procedures; a broad policy objective to which all operators on frontier lands will adhere, and Action Plans, which would be specific initiatives each operator will undertake to meet its benefit obligations.

The CPRA and the Atlantic Accord establish the Policy framework for offshore goods and services sourcing. The specific details of the evolving approach will take some time. However, the recent Hibernia Canada-Newfoundland Benefits Plan and the Hibernia Development Plan Decision Report (1986) by the CNOPB provide some indication of the specifics that the management boards would adopt. The CNOPB approved the Hibernia benefits Plan subject to Mobil meeting the following five conditions. Mobil will:

- o consider reasonable alternatives to provide for maximum Canadian participation in shuttle tanker construction,
- o submit a training and staffing Plan reflecting the maximum employment and training of Newfoundland residents,
- o re-examine the feasibility of assembling and outfitting the Main Support Frame (MSF) in Newfoundland,
- o provide to the CNOPB for review, comprehensive listing of all major contracts and purchase orders anticipated, and
- o provide advance notice of and information on major contracts and purchase orders to enable the CNOPB conduct its review.

The CNOPB Decision Report retains the two key concepts which were used under the 1982-1986 approach - review and monitoring of major contracts and purchase orders. What is interesting about the use of these concepts, is that they were proposed by Mobil even though the oil and gas industry has argued against the perceived government involvement in corporate procurement decision making. It must be pointed out that the CNOPB's review process will only apply to yet to be defined major contracts and purchase orders while the Designated Item review process covered ten products and services. The evolving approach to offshore oil and gas goods and services supply is one which allows management boards, acting as "single windows", to review and monitor demand side procurement activities; and governments through supply initiatives, such as assistance programs or funding for infrastructure projects, to create the environment which would enable Canadian suppliers to compete effectively for a share of the offshore supply market. There is, however, the need to ensure consistency in the application of regulations and policies on Canadian frontier lands by Management Boards, otherwise the single window concept could be undermined and oil and gas companies would be faced with a plethora of guidelines, regulations and policies.

Canadian offshore oil and gas sourcing policy may not contribute significantly to the maximization of regional economic growth in Atlantic Canada. However, the full and fair aspect of the policy would not only assist Canadian suppliers, engineering, construction and consulting firms to overcome barriers, created by multinational oil and gas companies, to full participation in offshore oil and gas development; but also ensure that these firms, through the experience and expertise acquired, are positioned to compete for a greater share of the international market.

CHAPTER VII
SUMMARY AND CONCLUSIONS

1. INTRODUCTION

This thesis has attempted to address three objectives. First to analyze the spatial impacts of the development expenditures for the Hibernia Field; secondly, to examine structurally, the performance of selected industries which would be involved directly or indirectly in the capital equipment sourcing, from 1961 to 1981; and thirdly, to analyze the locational dynamics and the role the Ocean industry can play in Offshore oil and gas development. The analyses were to be carried out within a linkage-leakage framework using a variety of methods.

2. MAJOR RESOURCE DEVELOPMENT AND ECONOMIC SPILLOVER

Regionally, the immediate impacts of Hibernia hydrocarbon development will be localized mainly in St. John's, Argentia, Come-by-Chance, Marystown and Halifax. However, there will be a national spillover of economic activities. This is due in part to the pattern of distribution of manufacturing industries and clusters of ocean industries, and in part to their interregional linkages. The economic ripples that Hibernia related investment will create could be "picked" up as far as Victoria, British Columbia.

With a floating system of production a total of 86,000 cumulative jobs would be created in Newfoundland, 17,000 direct and 69,000 indirect and induced. Corresponding Canadian employment would be 303,000 total, 53,000 direct and 250,000 indirect and induced. The gravity system on the other hand would generate a total of 110,000 jobs in Newfoundland, 32,000 direct and 77,000 indirect and induced. The breakdown of Canadian employment associated with the gravity system would be 339,000 total employment, 84,000 direct and 255,000 indirect and induced. The interprovincial input-output analysis indicates that the difference in total employment, in Newfoundland, by the two production systems is about

23,000. Nationally, the difference would be about 36,000. Most of the employment would be created during the construction phase of the development.

The most important finding is that while the Hibernia offshore hydrocarbon development could be a start as an engine of regional economic development it will not be the panacea for the region's economic and unemployment problems nor would it be enough to sustain economic development in Atlantic Canada. Regional opportunities could be enhanced and extended if a long term view to East Coast offshore hydrocarbon development is taken. The argument being advanced here is that a floating system mode of production could be better adapted to the development of marginal fields of between 200,000 and 500,000 barrels.

A Floating Production System is considered to be the fastest way to get oil out of the ground, accumulate it, process it and transport it to markets. For this reason a growing number of floating production systems are in operation around the world, and continue to be deployed in deeper and harsher waters (Keating 1986). If a floating production mode of development had been selected it is likely that the decision to proceed with the project would have been made earlier and royalties would be flowing into the provincial treasury by now, money that could have been used to further diversify the provincial economy and usher in a new generation of manufacturing companies supplying the project. As the input-output analysis indicates the decision to use a gravity base system of production would impact mostly on the traditional industrial sectors in Newfoundland. This would suggest that most of the benefits would accrue to the Province during the boom and the construction period, and no foundation for the restructure of the provincial economy to provide the future skilled jobs would be made. Thus, the gravity base mode of development would not make any significant impact on the research and technology intensive industrial sectors in the province which may have longer gestation period but in the long run create the jobs that last.

If Newfoundland's preference for a gravity base system was dictated by lack of a diversified manufacturing establishments in the province to support a floating production system, then the Brazilian experience with floating production system does not support this position. Brazil has shown that a domestic manufacturing capability can be developed, where none exists, with appropriate policies and programs. In 1977 Brazil started the development of the Campos Basin oil fields with entirely imported steel floating production system and equipment from the United States. By 1986, ninety three percent of the goods and services for the country's floating production system were provided by Brazilian suppliers (Booth 1987:38). The main reason for this remarkable achievement of domestic content, in such a relatively short time, is Brazil's policy of standardization of equipment use and the encouragement and support given to domestic suppliers by the National Oil Company Petrobras. Even with limited manufacturing base one would expect that Newfoundland could achieve comparable domestic content.

There is no indication from a review of the public information that Newfoundland examined the use of a concrete floating production system which would have resulted in building on the province's comparative advantage. The concrete floating production system is better suited to harsh marine environment, short construction schedules, use of unskilled labour, and low inspection, maintenance and repair costs. Furthermore, a concrete floating production system would have provided the kinds of manufacturing opportunities that Newfoundland based companies or joint venture companies could compete for while at the same time enable the province to lay the foundation, provide for the transfer of technology and know-how, as well as develop the skilled labour force for a diversified economy. Indications are the federal government did not play an active role in the choice of the production system. The federal government may have taken the position that the choice of the production mode should either be made by the proponent or a political price it was willing to pay if, the province decided to influence the proponent to go with its preference. The unfortunate thing about the federal position, if this was indeed the case is that the manufacturing benefits would have

been spread widely, with Central Canada getting a greater share of the contracts rather than foreign suppliers. If this had happened, it would have probably been easier to justify why incentives - grants, royalties and tax concessions, would have to be provided to a multinational company like Mobil Oil to develop the project.

The present Newfoundland government of Mr. Peckford fought hard and long for a gravity base mode of production. Therefore, politically it would be difficult for the Province to request Mobil to reverse the development option decision. Such a reversal would also trigger a new socio-economic impact review and there by delay the project further. However, it is interesting to note that the floating production system option is now actively being advocated for Newfoundland offshore oil development (Ferreira, 1987, Keating 1986, Lefflor, 1987, Nygaard 1987, and Valenchior et al. 1987). In addition two of the operators active in offshore Newfoundland, Husky Bow/Valley and Petro-Canada are actively considering the use of a steel floating production system for the development of the Ben Nevis and Terra Nova fields respectively.

3. THE CANADA - UNITED STATES FREE TRADE AGREEMENT: POTENTIAL IMPACT ON OIL AND GAS DEVELOPMENT

A critical review of the potential impact of the recently concluded Canada - United States Free Trade Agreement (FTA) on the development of major development projects such as Hibernia is outside the scope of this thesis. Moreover, all the details of the Agreement are not yet known and may very well change by the time it is ratified by the U.S. Senate and approved by the Parliament of Canada. However, given the significance of the Agreement the following preliminary observations would appear to be in order. The provisions of the Canadian Petroleum Resources Act (CPRA) and the Oil and Gas Production and Conservation Act (OGPCA) conform to the General Agreements on Tariffs and Trade (GATT) as there has not been any reported challenge to the two energy legislation. At the very begining of the Agreement, in the preamble and the objectives sections, the negotiators took pains to emphasize that the FTA is consistent with

the provisions of GATT. The FTA points out that Canada and the United States as contracting parties to GATT can negotiate such an Agreement. The Agreement also contains provisions which allow Canada and U.S. to "grandfather" some existing non-conforming laws, regulations, policies and practices.

As pointed out in chapter 2, the development Benefits Plan Spells out the project proponents' commitment to ensuring employment and business opportunities would accrue to Canadians and the residents of the region. The Benefits Plan usually has three basic elements:

- o preference for locally or Canadian produced goods;
- o preference for Canadian service companies e.g. drilling constractors and consulting services; and
- o preferential training and employment opportunities for local residents, other Canadians and members of designated groups (disabled persons, natives, etc.)

To what extent does the Free Trade Agreement (FTA) impact on these basic elements? A preliminary review of the Agreement (Department of External Affairs 1987b) indicates that there appears to be seven specific provisions which would have some impact on major oil and gas development projects and the basic elements of a Benefits Plan. These provisions are:

- o Border measures, chapter Four - as they relate to tariff elimination and import and export restriction on capital equipment such as supply vessels and rigs;
- o Energy, Chapter Nine - particularly the regulatory measures and government incentives for energy resource development;

- o Exception for trade in goods, chapter Twelve;
- o Services, Chapter Fourteen;
- o Temporary Entry for Business Persons, Chapter Fifteen;
- o Investment, Chapter Sixteen; and
- o Binational Dispute Settlement in Antidumping and Countervailing Duty Cases, Chapter Nineteen - as it applies to subsidies for regional develpment and social welfare programs.

Under the provisions of Chapter Four and Chapter Twelve the United States retains the right to restrict marine transportation as provided for under the Jones Act. Consequently, Canada has reserved the right to apply "quantitive restrictions" on U.S. vessels until such time as the United States removes its restriction on Canadian vessels. The impact of this restriction is that the cost of oil and gas exploration and development activities could remain high as drilling rigs and support vessels entering Canadian waters will continue to attract duty. Consequently, operators would not be able to take advantage of competitive day rates for these vessels in the Gulf of Mexico for example. Furthermore, the existence of duty on marine transportation equipment has not resulted in significant increase of orders for Canadian Shipyards. However, it could also be argued that the existence of the duty may have helped to ensure the present level of orders for the shipyards. When the Agreement comes into force:

> "Neither party shall maintain or introduce any tax, duty or charge on the export of energy good to the other party, unless such tax, duty or charge is also maintained or introduced on such energy good when destined for domestic consumption...

> If either party considers that energy regulatory actions by the other party would directly result in discrimination against its energy goods or persons inconsistent with the principles of this Agreement, that party may initiate direct consultations with the other party... an "energy regulatory action" shall include any action, in the case of Canada, by the National Energy Board, or its successor, and in the case of the United States of America, by either the Federal Energy Regulatory Commission or the Economic Regulatory Administration or their successors... (Department of External Affairs 1987b: 146-147).

The above provisions coupled with Article 906, which deals with existing or future government incentives for oil and gas exploration and development activities in order to maintain the reserve base of these resources could stimulate greater activity in the industry.

The services provisions, chapter Fourteen, and chapter Fifteen the temporary entry for persons, are two sections which could have a great impact on two of the three elements of the Benefits Plan. Canada and the United States have agreed to extend the "principle of national treatment" to providers of services including oil and gas services; building, developing and general contracting services; insurance services; and professional services such as engineering and survey services, and management consulting services. This provision will cover new but not existing laws and practices. Thus, the Atlantic and the Canada - Nova Scotia Accords implementation legislation are exempted but future Accords would not.

One way significant opportunities for transfer of technology and know-how to Canadians can be achieved is by having Canadians occupy senior management and technical positions on development projects. These positions are however, often filled with companies' employees transferred from other international projects. Such corporate practices have been a real concern with respect to the Hibernia project and it is for this reason that Mobil Oil was asked to indicate its commitments to the principle of technology transfer through such means as joint venture

formation, and "other appropriate mechanisms" (CNOPB 1987:17). Notwithstanding this commitment, it would now appear that under the intra-company transfer provisions of the FTA, chapter Fifteen, Mobil would be able to fill senior management and technical positions with its American employees, if these employees have worked for Mobil, its affiliate or subsidiary for a period of one year and if they would be providing managerial or executive services or the services involves specialized knowledge (Department of External Affairs: 1987b: 223).

Another section of the Free Trade Agreement which would likely have significant impact on capital equipment manufacturing related to future oil and gas development Projects is investment. Chapter 16, of the Agreement exempts existing non-conforming laws, policies and practices from the investment requirements (Article 1607). Thus, American investors in oil and gas sectors will continue to be subjected to the provisions of the energy legislation requiring a Benefits Plan for the procurement of goods and services. As well American investors will continue to be subjected to the fifty percent Canadian Ownership of a production licence requirement.

Both countries, for future laws, policies and regulations however, have agreed not to impose export, local content and import substitution requirements on each others' investors; nor place such requirements on third country investors when this would result in a significant impact on American or Canadian trade. Investment related performance with respect to negatiation of product mandate, research and development and technology transfer are also prohibited (Article 1603). Provincial benefits provisions in Benefits Plans intended to encourage local supplier development, and thereby address supply gaps probably cannot be replicated in future Benefits Plans. To confuse the situation further the two governments have agreed to establish a new regime to address problems of dumping and subsidization, as well as subsidies codes. Chapter Nineteen also goes on to say that "... Canada's capacity to persue regional development and social welfare programs remains unimpaired. Indeed, it has been strengthened". (Department of External

Affairs 1987b: 270). Subsidies in the form of direct cash grants or indirect low interest export credit guarantees have been the key aspect of regional development policies and programs. It is therefore difficult to understand how Canada's "Capacity" to continue regional economic development assistance to depressed regions can be strenghtened without subsidies; particularly when over twenty five years of regional developments assistance have produced limited results.

The creation of the Canada-Nova Scotia Development Fund in 1984 and the Canada-Newfoundland Development Fund in 1986 for the development of infrastructure directly or indirectly related to offshore activities, I believe, is an acknowledgement by both the federal and provincial governments that market forces alone would not be sufficient to bring about the optimization of regional and local benefits. Both funds are designed to respond to provincial needs and priorities. Consequently, projects for funding are proposed by the provincial Minister and approved by the federal Minister of Energy, Mines and Resources.

Although some existing laws, regulations policies and practices are "grandfathered" the Canada - United States Free Trade Agreement would have an impact on oil and gas development projects such as Hibernia. Project Proponents could be required under existing energy legislation to give preferential or first consideration training and employment opportunities to Canadians, local residents and members of designated groups. Oil and Gas companies could also staff their senior management and technical positions with American employees working on international projects as "intra-company transferees" and thereby deny Canadians the opportunity of acquiring such expertise. Oil and gas companies could also be required to give <u>full</u> and <u>fair</u> opportunity but not <u>preferential</u> treatment to Canadian firms supplying goods and services. Notwithstanding the "grandfathered" and phase-in provisions, I believe in the short term at least, it is the "stand still" understanding which would have the greatest impact on the conduct of oil and gas activities and the formulation of related policies. Both countries have agreed to

exercise their discretion not to do anything that would jeopardize the approval process or undermine the spirit and mutual benefits before the Free Trade Agreement comes into force.

It is also doubtful whether the recently established Atlantic Canada Opportunities Agency (ACOA) can play any significant role in optimizing business and employment opportunities from the Hibernia development project. If one uses Crowley's (1982) criteria of "clout" and "turf" then the conclusion may be drawn that the government has not learned from experience in the design of government policy agencies in the creation of ACOA.

4. THE QUESTION OF CONTRIBUTION

Very often the formulation of regional economic development policies, in the short to medium term, is constrained by time, resources, availability of meaningful data and lack of current knowledge. In cases where information is collected it quickly becomes dated. Thus policies are often formulated and made based on assumptions and conventional wisdom, and less on detailed empirical analysis of market opportunities and the structure of industries. However, regional development policies and programmes can be effective if their formulation and implementation are guided by studies which examine the structure of the linkage-leakage effects (Pred 1976).

This dissertation is seen as one contribution in terms of incorporating selected notions of resource development, linkage-leakage analysis, capital availability and equipment sourcing (capital constraint index) into an analysis of regional development and structural adaptions of industries. The CCI is presented as a sifting mechanism whereby a range of development opportunities can be narrowed down to a selected few with the most potential. Such a sifting will then allow limited resources to be directed to detailed review of the selected industrial sectors. The empirical methodology as a whole could be used in location

audits (Otterbeck 1973) as it emphasizes the importance of ongoing functional activities rather than variables geared solely to the evaluation of sites or the selection of new sites. Here the focus is on regional clusters and their relationship with the surrounding environment. Such a focus moves input-output analysis from a static and spaceless exercise into a dynamic and spatial analysis of regional development. The study attempts to initiate further resource based regional development research along this line of thinking.

5. FURTHER RESEARCH

For any research to even attempt to make a modest contribution it must first examine other established research. From such a base one can then branch out to explore new directions. The concepts incorporated into the conceptual framework presented in this dissertation have been abstracted from theories of regional development. The key aspect of this framework is the intrinsic argument that micro-considerations, which often require detailed empirical analysis, are necessary first and fundamental part of any macro strategies for resource-based regional economic development. The framework is therefore presented as one means of reflecting micro-consideration in macro strategies, of analyzing regional economic development and structural change, and also as a basis for assessing the impact of regional development policies.

The conceptual framework and empirical methodology no doubt need further refinement. The capital constraint indices as a sifting mechanism would have to be tested over a longer time period and with different industrial sectors and at a higher level of disaggregation. The analysis of ownership patterns and the effect of relocation of manufacturing establishments on depressed regional economies would also help in developing appropriate support programmes. Ocean industry clusters is also another interesting research area where a lot can be learned about the industry and it spatial characteristics. Further

development of this dissertation will address these shortcoming more directly, and thus shed a little light on another dimension of linkage-leakage analysis and resource based regional development.

6. CONCLUSION

Regional development theories in general develop a framework around an isolated aspect of economic activity. In following with this pattern, this dissertation isolates capital equipment sourcing and the related impacts as one aspect, out of several viewpoints, of resource-based regional economic development.

The framework developed and the empirical analysis performed are closely interlinked. Similarly, the regions of Canada are economically linked through backward and forward linkages. Development in one part of the country creates economic ripples right across the country. Thus, it is concluded there is the need to adopt a broader regional and national, but selective, sourcing approach to the development of Hibernia if employment and business opportunities are to be optimized. This presupposes that there is a clear understanding of the industrial sectors and companies which will form the corner stone of regional economic development policies and programs. Such an approach will encourage sourcing of local and national goods and services.

The framework presented in this dissertation is one way of identifying the regional and national sectors which could generate the most benefits. The offshore supply market, particularly the ocean industry sector, though fragmented provides an opportunity for regional development in Atlantic Canada. The companies making up this market require a skilled labour force, are small to medium size and therefore do not necessarily need large start-up capital, and above all are labour intensive. For these reasons the development of supply oriented policies and programs should also encourage the formation of joint ventures between Canadian and foreign companies and the transfer of technology and know-how to Canadians.

Policies and Programs should also support multi-sector infrastructure projects and not specifically restricted to the offshore oil and gas industry. This will enable the region to adjust to economic changes. Unfortunately, Hibernia development related benefits cannot be optimized without some government intervention in the promotion of regional economic development. Such intervention could be in the form of subsidy programs or by ensuring the project proponent guarantee a percentage of the benefits content for Canada, but not for a specific region. This percentage should include engineering design and manufacturing of capital equipment as these sectors would result in the transfer of know-how and technology to the country. This would allow Canadian establishments to compete for a share of the business, as well as enable government assistance to be directed to helping regional industries improve their competitiveness. Such government intervention, however, may not be possible in an era of a Free Trade Agreement.

APPENDIX 1

LIST OF OFFICIALS INTERVIEWED FOR THIS THESIS

I Federal Government

(a) Canada Oil and Gas Administration (COGLA)

- o Paul Simard, Supervising Engineer, Exploration
- o Ibrahim Konuk, supervising Engineer, Production Facilities

(b) Office of Industrial and Regional Benefits (OIRB) Department of Regional Industrial Expansion (DRIE)

- o W.A. Andrews, Manager, Offshore Projects
- o R.G. Schulte, Manager, Policy and Analysis Division

(c) Statistics Canada

- o Nugent Miller, Chief, Input-Output Division
- o Robert Algie, Analyst, Input-Output Division
- o K. Young, Acting Chief Analysis, Development Section, MAPID
- o D. Wallace, Analyst, Science, Technology and Capital Stock Division.

II Government of Newfoundland and Labrador

(a) Department of Development

- o W.J. Smith, Senior Development Officer, Offshore Business

(b) Petroleum Directorate

- o Ira J. Bridger, Industrial Benefits Coordinator

III Government of Nova Scotia

- o F. Sommerville, Senior Manager, Industrial Benefits Office

IV Industry

(a) Mobil Oil Canada Ltd.

- o P. Tsui, Canada Benefits manager, St. John's
- o W. Rama, Manager Facilities Engineering

(b) Petro-Canada

- o F.F. Atkinson, Purchasing Administrator, Material Management Department
- o M.P.F. Collins, Senior Analyst Canada Benefits

V City of St. John's, Newfoundland

- o M. Shrimpton, Research Director, City Planning Office

VI Memorial University of Newfoundland

- o Dr. K. Storey, Associate Professor, Department of Geography, NOTE: At time of interview Dr. Storey was working as a Consultant for Mobil Oil on the company's Socio-Economic Impact Statement.

APPENDIX IV.1

MACHINE SHOPS
NET CAPITAL STOCK 1961 - 1981 ($* 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961		20	1817		14457	10170	1616	177	8324	4372	40953
1962		19	2158		14312	10369	1768	169	8090	4365	41250
1963		18	2269		14648	11558	1847	161	8091	4559	43151
1964		17	2462		14622	12914	2330	152	8272	4865	45634
1965		16	2593		15766	14362	3407	144	8293	5407	49988
1966		15	2606		19443	15588	3791	135	9073	5523	56174
1967		13	2566		20722	18981	4249	155	9359	6098	62133
1968		12	3339		21702	23171	4371	148	9312	6131	68186
1969		11	3411		23656	25826	5059	138	9795	6202	74098
1970		10	3457		24788	29004	5212	181	9784	7448	79884
1971		9	3687		24276	31381	5234	1340	10810	8491	85228
1972		8	3597		23772	30572	5180	1494	10638	8681	83942
1973		117	3419		24251	33812	5229	1535	10818	9486	88667
1974		136	3388		25191	35246	5228	1728	11986	10929	93832
1975		166	3208		27484	36862	5127	1960	12366	12038	99211
1976		167	3009		26557	36083	4949	1972	11782	13278	97797
1977		165	2812		25174	35548	4849	1890	11979	14290	96707
1978		242	2638		24285	34371	4647	1814	11690	13888	93575
1979		194	2526		23112	34633	4461	1713	11249	14076	92064
1980		298	2422		22877	35321	4315	1659	12478	14965	94335
1981		284	2248		22311	34271	4065	1639	11903	14501	91222

APPENDIX IV.1A

MACHINE SHOPS
NET ADDITIONS TO CAPITAL STOCK 1961-1981 ($'000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961		20	1817		14457	10170	1616	177	8324	4372	40953
1962		19	2158		14312	10369	1768	169	8090	4365	41250
1963		18	2269		14648	11558	1847	161	8091	4559	43151
1964		17	2462		14622	12914	2330	152	8272	4865	45634
1965		16	2593		15766	14362	3407	144	8293	5407	49988
1966		15	2606		19443	15588	3791	135	9073	5523	56174
1967		13	2566		20712	18981	4249	155	9359	6098	62133
1968		12	3339		21702	23171	4371	148	9312	6131	68186
1969		11	3411		23656	25826	5059	138	9795	6202	74098
1970		10	3457		24788	29004	5212	181	9784	7448	79884
1971		9	3687		24276	31381	5234	1340	10810	8491	85228
1972		8	3597		23772	30572	5180	1494	10638	8681	83942
1973		117	3419		24251	33812	5229	1535	10818	9486	88667
1974		136	3388		25191	35246	5228	1728	11986	10929	93832
1975		166	3208		27484	36862	5127	1960	12366	12038	99211
1976		167	3009		26557	36083	4949	1972	11782	13278	97797
1977		165	2812		25174	35548	4849	1890	11979	14290	96707
1978		242	2638		24285	34371	4647	1814	11690	13888	93575
1979		194	2526		23112	34633	4461	1713	11249	14076	92064
1980		298	2422		22877	35321	4315	1659	12478	14965	94335
1981		284	2248		22311	34271	4065	1639	11903	14501	91222
TOTAL		2037	59632		453396	550043	86934	20304	216092	189593	1578031

APPENDIX IV.2

SHIPBUILDING AND REPAIR
NET CAPITAL STOCK 1961 - 1981 ($* 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961		8955				18500				13107	40562
1962		9183				17820				13904	40907
1963		9027				17672				14765	41464
1964		9017				17335				15215	41567
1965		9010				19844				16297	45151
1966		9076				19760				17628	46464
1967		8758				19327				17651	45736
1968		8581				18891				16948	44420
1969		8812				18197				16670	43679
1970		8736				17559				17134	43429
1971		8773				17323				16607	42703
1972		9612				18527				16959	45098
1973		11038				18436				16899	46373
1974		11977				18042				19292	49311
1975		13802				18807				19913	52522
1976		14235				23655				20837	58727
1977		14656				23564				22059	60279
1978		14868				23644				21974	60486
1979		21572				23533				23134	68239
1980		24202				24066				25636	73904
1981		23818				25892				29806	79516

APPENDIX IV.3

BOATBUILDING AND REPAIR
NET CAPITAL STOCK 1961 - 1981 ($" 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961		2438			158	6580	114			300	9590
1962		2344			148	6973	111			284	9860
1963		2252			155	6828	108			313	9656
1964		2160			212	6908	105			321	9706
1965		2072			418	8023	102			349	10964
1966		1992			406	8862	99			367	11726
1967		1910			525	8669	96			388	11588
1968		1944			1001	8656	93			458	12152
1969		2014			1232	10221	91			492	14050
1970		2040			1166	10507	88			504	14305
1971		1973			1101	11672	85			719	15550
1972		1862			1036	11887	83			801	15669
1973		1754			980	12191	122			769	15816
1974		1640			966	12231	169			737	15743
1975		1548			922	12151	193			742	15556
1976		1447			1003	11892	258			713	15313
1977		1350			1003	11519	287			720	14879
1978		1255			952	11016	293			769	14285
1979		1165			945	10525	417			812	13864
1980		1079			1069	10086	722			863	13819
1981		993			1122	10245	726			1347	14433

APPENDIX IV.4

READY - MIX CONCRETE
NET CAPITAL STOCK 1961 - 1981 ($* 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961	110		114		855	1539	757	173	586	1790	5924
1962	106		110		765	1392	731	166	517	2386	6173
1963	102		105		682	1251	706	160	455	2513	5974
1964	88		102		609	1124	601	155	403	2869	5951
1965	70		98		545	1011	485	143	361	3228	5944
1966	63		95		486	906	446	138	322	3418	5874
1967	62		92		428	799	433	134	284	3503	5735
1968	57		89		372	698	404	130	247	3556	5553
1969	52		87		319	599	368	123	213	3798	5559
1970	46		84		280	532	335	117	185	4114	5693
1971	43		81		240	459	311	113	158	4448	5853
1972	429		335		4871	11686	718	447	4570	5877	28933
1973	1338		915		18546	30957	1920	670	8002	8688	71036
1974	1675		1206		30620	41811	3442	1267	11290	12119	103430
1975	2942		1373		36265	48328	4688	2051	13505	13866	123018
1976	3199		1820		41800	51926	6423	3027	16388	17562	142145
1977	3247		1957		43521	54207	7234	3750	17529	18792	150237
1978	3413		1954		43590	56211	7127	3811	21313	19337	156756
1979	3142		1858		43818	57237	7200	3919	24451	19563	161188
1980	3478		1920		47425	56381	6981	3833	28956	19117	168091
1981	3298		1911		48606	56187	6815	4249	32357	19008	172431

APPENDIX IV.5

MISC. METAL FABRICATING
NET CAPITAL STOCK 1961 - 1981 ($* 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961			2284		26685	72029	2690	373	870	2093	107024
1962			2447		28938	72726	2617	360	841	2016	109945
1963			2325		29287	73417	2557	344	799	2084	110813
1964			2188		30893	77812	2467	428	766	2397	116951
1965			2161		31344	82054	2594	408	761	2568	121890
1966			2020		33688	88315	2602	422	737	2800	130584
1967			2082		3492	92976	2801	535	720	2904	136610
1968			1917		48238	97219	5411	510	670	2962	156927
1969			1777		49781	122424	5669	500	657	3044	183852
1970			1643		50636	133307	5484	471	619	3706	195866
1971			1749		51438	136846	5382	447	655	3751	200268
1972			1905		50186	139709	5234	461	736	3835	202066
1973			1751		51588	142871	5424	488	1067	4703	207892
1974			1746		53466	152301	5969	537	1477	5157	220653
1975			1695		56388	154004	6557	514	2198	5580	226936
1976			1486		57354	158419	6528	494	2412	5470	232163
1977			1435		58006	164270	6388	446	2668	6139	239352
1978			2067		59216	166431	5994	401	2685	6597	243391
1979			2204		65181	170215	6140	362	2664	6860	253626
1980			2609		66211	176598	6424	326	2751	8430	263430
1981			2989		65374	182530	6391	293	4214	9389	271180

APPENDIX IV.6

COMMUNICATION EQUIPMENT
NET CAPITAL STOCK 1961 - 1981 ($* 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961					63637	66796	237		436	1357	132463
1962					64760	81691	245		470	1837	149003
1963					64379	89714	251		470	2028	156842
1964					65760	95312	248		495	3724	165539
1965					70718	105872	234		505	4032	181361
1966					83500	126900	220		556	4830	216006
1967					92603	150556	206		1136	4829	249330
1968					96298	160403	235		1108	5106	263150
1969					104683	175403	261		1064	5413	286824
1970					110852	179847	312		1074	5484	297569
1971					116653	185635	329		1066	5832	309515
1972					113066	194818	378		1076	6128	315466
1973					116570	206080	416		1162	6728	330956
1974					123313	214999	476		1240	7409	347437
1975					128241	217342	447		1240	7943	355213
1976					131575	221521	439		1357	8826	363718
1977					131272	224434	1114		2250	9084	368154
1978					130264	225151	1121		2232	9128	367896
1979					132878	230379	1115		2126	9308	375806
1980					139488	254025	1065		2003	9747	406328
1981					151853	284443	1008		3397	14110	454811

APPENDIX IV.7

BOILER AND PLATE WORKS
NET CAPITAL STOCK 1961 - 1981 ($ " 000)

	NFLD	N S	N B	PEI	QUE	ONT	MAN	SAS	ALB	B C	TOTAL
1961					13533	19973			1741	540	35787
1962					13460	19732			1730	508	35430
1963					13357	19368			1644	464	34833
1964					13370	20463			1529	430	35792
1965					14223	23787			1573	426	40009
1966					16487	24298			1556	417	42758
1967					17294	24468			1617	433	43812
1968					17065	23861			1670	415	43011
1969					16727	23896			1685	422	42730
1970					16399	26507			1670	406	44982
1971					15771	27390			1604	422	45187
1972					15410	28581			1490	390	45871
1973					15033	30648			1409	354	47444
1974					16234	32114			1456	335	50139
1975					17447	35631			2271	305	55654
1976					17518	36870			4231	273	58892
1977					17198	36598			4170	252	58218
1978					16498	36308			4087	236	57129
1979					16240	39948			3858	209	60255
1980					16147	43158			6833	185	66323
1981					19218	44910			6820	726	71674

APPENDIX V.1

GROSS DOMESTIC PRODUCT (GDP) $000s CANADA 1982 - 1991
CAPITAL EQUIPMENT DEMAND PROFILE: FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
AGRICULTURE	6471	22637	50866	52774	50093	39834	40838	47867	32989	14046	358415
FORESTRY	336	1176	2421	2401	2222	1729	1775	2101	1463	651	16275
FISHING, HUNTING & TRAPPING	246	862	1904	1953	1836	1460	1496	1749	1202	505	13213
METAL MINES	691	2411	5441	5893	5938	4512	4670	5750	4147	2154	41607
MINERAL FUELS	1090	3812	8460	8805	8426	6625	6805	8062	5611	2510	60206
NON-METAL MINES & QUARRIES	145	509	1095	1121	1063	830	853	1013	707	320	7656
SERVICES INCIDENTAL TO MINING	5884	20586	46665	48971	46526	37204	38112	44500	30450	12761	331659
FOOD & BEVERAGE INDUSTRIES	6486	22693	50984	52812	50066	39841	40840	47826	32947	13962	358452
TOBACCO PRODUCTS INDUSTRIES	320	1121	2512	2590	2455	1949	1999	2345	1620	692	17603
RUBBER & PLASTICS PRODUCTS INDUSTRIES	624	2181	4814	4984	4767	3737	3840	4559	3183	1436	34125
LEATHER INDUSTRIES	218	763	1698	1753	1668	1316	1351	1593	1106	484	11950
TEXTILE INDUSTRIES	846	2959	6577	6780	6436	5088	5221	6147	4260	1850	46164
KNITTING MILLS	262	917	2049	2114	2007	1590	1631	1917	1327	571	14385
CLOTHING INDUSTRIES	986	3448	7713	7958	7556	5987	6142	7218	4996	2151	54155
WOOD INDUSTRIES	404	1414	3090	3179	3029	2371	2436	2893	2020	912	21748
FURNITURE & FIXTURE INDUSTRIES	504	1764	3902	4016	3816	3007	3086	3643	2532	1112	27382
PAPER & ALLIED INDUSTRIES	1955	8338	14457	14557	13604	10648	10933	12912	8968	3955	160327
PRINTING & PUBLISHING	1573	5502	12097	12440	11805	9295	9544	11267	7827	3446	84796
PRIMARY METAL INDUSTRIES	1894	6610	18478	22357	24145	18572	19227	23872	17335	9258	161748
METAL FABRICATING INDUSTRIES	3989	13918	34145	38969	40669	30992	32040	39773	28886	15355	278736
MACHINERY INDUSTRIES	3269	11416	23036	23169	22239	16632	17194	21185	15298	7907	161345
TRANSPORTATION EQUIPMENT INDUST.	3078	10763	23172	24315	23884	18159	18752	22946	16443	8355	169867
ELECTRICAL PRODUCTS INDUSTRIES	3844	13446	27427	27845	26836	20148	20790	25595	18433	9486	193850
NON-METLLIC MINERAL PROD. IND.	495	1730	3718	3789	3580	2800	2878	3610	2378	1067	25845
PETROLEUM & COAL PRODUCTS IND.	860	3010	6750	7000	6655	5280	5415	6361	4394	1889	47614
CHEMICAL & CHEMICAL PROD. IND.	1441	5039	11174	11568	11043	8687	8922	10559	7350	3268	79051
MISC. MANUFACTURING INDUSTRIES	1588	5528	9136	7789	6384	4641	4876	5745	4060	1950	51697
CONSTRUCTION INDUSTRIES	1990	6961	15517	16069	15316	12089	12409	14642	10166	4462	109621
TRANSPORTATION & STORAGE	12870	45017	101470	106235	101444	80499	82573	97097	67016	29015	723236
COMMUNICATION	3837	13418	29683	30629	29139	22958	23571	27836	19343	8525	208939
ELECTRICAL POWER, GAS, UTILITIES	2783	9735	21718	22512	21499	16947	17400	20562	14300	6318	153774
WHOLESALE TRADE	10196	35651	76093	77712	73866	57326	58972	70423	49427	22869	532535
RETAIL TRADE	11637	40712	90487	93165	88312	69891	71681	84302	58361	25185	633733
OWNER OCCUPIED DWELLINGS	5319	18609	41612	42899	40693	32261	33088	38863	26887	11541	291772
OTHER FINANCE, INSURANCE & REAL EST.	9179	32104	71013	73342	69844	54989	56464	66733	46405	20526	500599
EDUCATION & HEALTH SERVICES	1083	3786	8429	8706	8285	6542	6714	7917	5496	2404	59362
AMUSEMENT & RECREATION SERVICE	639	2235	4948	5109	4864	3831	3933	4648	3232	1428	34867
SERVICE TO BUSINESS MANAGEMENT	3100	10841	23804	24562	23405	18364	18868	22359	15584	6981	167868
ACCOMMODATION & FOOD SERVICES	3655	12787	28487	29382	27904	22073	22649	26652	18468	8004	200061
OTHER PERSONAL & MISC. SERVICES	1103	3858	8600	8893	8465	6687	6863	8090	5613	2451	60623
HOUSEHOLDS	3904	13656	30549	31513	29911	23707	24316	28571	19772	8502	214401
TOTAL	120794	483923	936191	977630	931695	731698	751167	891503	621997	280244	6721262

APPENDIX V.2

GROSS DOMESTIC PRODUCT (GDP) 1982-1990 ($000's) CANADA

CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
AGRICULTURE	4553	40174	58599	58541	20891	182758
FORESTRY	267	2949	4585	4571	1645	13997
FISHING, HUNTING & TRAPPING	151	1360	1984	1982	705	6182
METAL MINES	634	6903	10857	10877	3961	33232
MINERAL FUELS	746	12861	21265	21341	7712	63925
NON-METAL MINES & QUARRIES	96	8609	15466	15567	5636	45374
SERVICES INCIDENTAL TO MINING	52	26340	48081	48417	17524	140414
FOOD & BEVERAGE INDUSTRIES	4860	41676	60217	60135	21422	188310
TOBACCO PRODUCTS INDUSTRIES	349	2998	4335	4330	1543	13555
RUBBER & PLASTIC PRODUCTS INDUSTRIES	601	9868	16662	16744	6049	49924
LEATHER INDUSTRIES	224	2109	3141	3140	1125	9739
TEXTILE INDUSTRIES	850	7835	11630	11628	4163	36106
KNITTING MILLS	279	2516	3694	3691	1318	11498
CLOTHING INDUSTRIES	1047	9423	13821	13811	4932	43034
WOOD INDUSTRIES	428	3841	5730	5732	2067	17798
FURNITURE & FIXTURE INDUSTRIES	524	4643	6447	6440	2302	20156
PAPER & ALLIED INDUSTRIES	1481	16836	26159	26197	9418	80091
PRINTING & PUBLISHING	1464	15695	24092	24116	8665	74032
PRIMARY METAL INDUSTRIES	1859	33509	56225	56463	20530	168586
METAL FABRICATING INDUSTRIES	3100	25875	39182	39237	14335	121729
MACHINERY INDUSTRIES	6651	29266	35892	35588	13352	120749
TRANSPORTATION EQUIPMENT INDUSTRIES	6018	19518	20890	20733	8028	75187
ELECTRICAL PRODUCTS INDUSTRIES	4911	20803	24486	24183	9006	83389
NON-METALLIC MINERAL PROD. IND.	449	148275	270117	272016	98537	789394
PETROLEUM & COAL PRODUCTS IND.	691	8890	14042	14071	5056	42750
CHEMICAL & CHEMICAL PRODUCTS IND.	1418	14725	22571	22592	8132	69438
MISC. MANUFACTURING INDUSTRIES	591	6568	10074	10086	3619	30878
CONSTRUCTION INDUSTRIES	1881	59771	103454	103999	37555	306660
TRANSPORTATION & STORAGE	5234	77110	125067	125386	45260	378057
COMMUNICATION	3691	38727	59220	59273	21299	182210
ELECTRICAL POWER, GAS, OTHER UTILITIES	2778	30546	47081	47138	16937	144480
WHOLESALE TRADE	9275	103322	161397	161682	58458	494134
RETAIL TRADE	11736	109622	162581	162534	58137	504610
OWNER OCCUPIED DWELLINGS	5666	50226	73292	73220	26120	228524
OTHER FINANCE, INSURANCE & REAL EST.	8541	105696	166520	166853	60039	507649
EDUCATION & HEALTH SERVICES	1102	10552	15763	15762	5646	48825
AMUSEMENT & RECREATION SERVICE	625	6654	10221	10228	3665	31393
SERVICE TO BUSINESS MANAGEMENT	2792	175744	313184	315103	11406	818229
ACCOMMODATION & FOOD SERVICES	3770	35603	51853	51834	18544	161064
OTHER PERSONAL & MISC. SERVICES	1092	10833	16321	16325	5853	50424
HOUSEHOLDS	4159	37290	54615	54570	19480	170114
TOTAL	106636	1374901	2190793	2196136	690672	6558538

APPENDIX V.3

GROSS PRODUCTION BY INDUSTRY (SHIPMENTS) $000'S CANADA 1982-1991
CAPITAL EQUIPMENT DEMAND PROFILE: FLOATING SYSTEM - TANKER OPTION

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
AGRICULTURE	11082	38771	87146	90424	85831	68261	69980	82018	56519	24052	614084
FORESTRY	692	2421	5001	4970	4608	3586	3683	4359	3035	1351	33706
FISHING,HUNTING & TRAPPING	394	1377	3041	3120	2933	2333	2391	2794	1920	806	21109
METAL MINES	1075	3752	8394	9043	9073	6894	7133	8775	6325	3275	63739
MINERAL FUELS	2042	7142	15856	16505	15797	12421	12758	15115	10520	4707	112863
NON-METAL MINES & QUARRIES	229	801	1731	1778	1691	1370	1357	1614	1128	513	12162
SERVICES INCIDENTAL TO MINING	8012	28032	63544	66685	63355	50661	51898	60597	41464	17377	451625
FOOD & BEVERAGE INDUSTRIES	26849	93934	211166	218932	207666	165238	169386	198409	136671	57997	1486248
TOBACCO PRODUCTS INDUSTRIES	951	3328	7481	7692	7292	5789	5936	6964	4813	2054	52280
RUBBER & PLASTICS PRODUCTS INDUSTRIES	1503	5257	11610	12024	11501	9018	9766	11000	7679	3461	87319
LEATHER INDUSTRIES	569	1990	4426	4570	4348	3432	3523	4154	2884	1262	31158
TEXTILE INDUSTRIES	2281	7979	17734	18285	17362	13724	14083	16581	11493	4994	124516
KNITTING MILLS	701	2452	5483	5656	5369	4254	4364	5129	3550	1529	38487
CLOTHING INDUSTRIES	2455	8589	19215	19828	18824	14918	15302	17982	12446	5356	134915
WOOD INDUSTRIES	1012	3541	7744	7973	7599	5948	6112	7258	5069	2288	54544
FURNITURE & FIXTURE INDUSTRIES	1243	4349	9616	9897	9403	7411	7606	8978	6239	2739	67481
PAPER & ALLIED INDUSTRIES	4786	16741	35623	35997	33719	26427	27133	32033	22244	9796	244499
PRINTING & PUBLISHING	2913	10189	22397	23034	21860	17209	17670	20864	14497	6387	157020
PRIMARY METAL INDUSTRIES	6371	22231	57842	67770	71857	55036	56985	70658	51256	27256	487262
METAL FABRICATING INDUSTRIES	8882	30985	75904	86482	90112	68723	71034	88094	63929	33871	618016
MACHINERY INDUSTRIES	7687	26845	54118	54422	52230	39048	40371	49755	35934	18593	379003
TRANSPORTATION EQUIPMENT INDUST.	8511	29763	64269	67349	65988	50327	51941	63369	45297	22766	469580
ELECTRICAL PRODUCTS INDUSTRIES	9095	31807	65303	66596	64390	48377	49918	61478	44272	22787	464023
NON-METLLIC MINERAL PROD. IND.	1001	3501	7532	7687	7266	5681	5840	6922	4828	2169	52422
PETROLEUM & COAL PRODUCTS IND.	7167	25070	56198	58287	55420	43956	45084	52970	36802	15758	396512
CHEMICAL & CHEMICAL PROD. IND.	4012	14031	31108	32212	30760	24190	24845	29411	20479	9119	220167
MISC. MANUFACTURING INDUSTRIES	4186	14577	23962	20348	16620	12048	12671	14934	10565	5100	135011
CONSTRUCTION INDUSTRIES	3820	13362	29782	30841	29396	23202	23817	28103	19512	8564	210399
TRANSPORTATION & STORAGE	30900	108091	243996	255565	243742	193771	198702	233257	160673	69034	1737731
COMMUNICATION	4712	16480	36465	37625	35793	28204	28957	34191	23757	10463	256647
ELECTRICAL POWER, GAS, UTILITIES	3348	11708	26103	27087	25903	20393	20943	24781	17253	7668	185187
WHOLESALE TRADE	14309	50033	106790	109062	103664	80452	82763	98833	69367	32094	747367
RETAIL TRADE	16959	59332	131898	135812	128742	101893	104502	122898	85077	36708	923821
OWNER OCCUPIED DWELLINGS	9419	32952	73685	75963	72058	57127	58591	68818	47612	20438	516663
OTHER FINANCE, INSURANCE & REAL EST.	15731	55019	121867	125863	119816	94410	96931	114478	79556	35072	858743
EDUCATION & HEALTH SERVICES	1358	4748	10558	10910	10390	8196	8413	9930	6899	3030	74432
AMUSEMENT & RECREATION SERVICE	1309	4580	10144	10470	9965	7852	8061	9520	6618	2916	71435
SERVICE TO BUSINESS MANAGEMENT	4222	14765	32819	33447	31868	25005	25692	30442	21216	9500	228576
ACCOMMODATION & FOOD SERVICES	6559	22943	51099	52709	50064	39594	40628	47820	33142	14379	358937
OTHER PERSONAL & MISC. SERVICES	1679	5874	13090	13535	12886	10177	10445	12315	8546	3736	92283
TRANPORTATION MARGINS	4266	14914	33585	35413	34425	26884	27660	33074	23239	10812	244272
OPERATING, OFFICE, LAB & FOOD	18421	64437	144911	151646	144715	114807	117762	138481	95556	41386	1032122
TRAVEL & ADVERTISING, PROMOTION	5488	19187	41721	42825	40667	31857	32742	38801	27051	12135	292474
HOUSEHOLDS	144853	506734	1133894	1169659	1110082	879995	902589	1060332	733695	315238	7957071
TOTAL	413054	1444614	3215431	3335993	3187050	2510049	2577468	3048289	2120427	940536	22792911

APPENDIX V.4

GROSS PRODUCTION BY PROVINCE AND INDUSTRY (SHIPMENTS) $000' CANADA 1982-1990

CAPITAL EQUIPMENT DEMAND PROFILE: GRAVITY SYSTEM - TANKER OPTION

	1982	1984	1986	1988	1990	TOTAL
AGRICULTURE	7786	68618	100054	99954	35667	312079
FORESTRY	555	6119	9469	9482	3412	29037
FISHING, HUNTING & TRAPPING	240	2161	3152	3149	1121	9823
METAL MINES	987	12557	20214	20269	7374	61401
MINERAL FUELS	1402	26923	45010	45190	16336	134861
NON-METAL MINES & QUARRIES	156	13238	23759	23915	8658	69726
SERVICES INCIDENTAL TO MINING	71	35863	65466	65923	23861	191184
FOOD & BEVERAGE INDUSTRIES	19537	169074	245071	244769	87249	765700
TOBACCO PRODUCTS INDUSTRIES	1037	8900	12868	12851	4549	40205
RUBBER & PLASTIC PRODUCTS INDUSTRIES	1445	23440	39500	39692	14338	118415
LEATHER INDUSTRIES	585	5495	8179	8177	2929	25365
TEXTILE INDUSTRIES	2297	21144	31383	31378	11236	97438
KNITTING MILLS	745	6730	9882	9875	3527	30759
CLOTHING INDUSTRIES	2613	23484	34399	34372	12274	107122
WOOD INDUSTRIES	1083	9559	14211	14214	5121	44192
FURNITURE & FIXTURE INDUSTRIES	1790	10949	15888	15871	5673	49671
PAPER & ALLIED INDUSTRIES	3697	41656	64803	64693	23252	197901
PRINTING & PUBLISHING	2708	29003	44522	44566	16015	136814
PRIMARY METAL INDUSTRIES	6069	117418	198263	199147	72399	593296
METAL FABRICATING INDUSTRIES	6691	57496	87355	87476	31913	270931
MACHINERY INDUSTRIES	15187	68063	84219	83541	31312	282322
TRANSPORTATION EQUIPMENT INDUSTRIES	16131	55968	62097	61685	23619	219500
ELECTRICAL PRODUCTS INDUSTRIES	10766	47850	57619	56980	21138	194353
NON-METALLIC MINERAL PROD. IND.	915	305922	557350	561269	203320	1628776
PETROLEUM & COAL PRODUCTS IND.	5691	72821	114948	115175	41385	350020
CHEMICAL & CHEMICAL PRODUCTS IND.	3929	40387	61812	61867	22272	190267
MISC. MANUFACTURING INDUSTRIES	1497	16257	25090	25117	9011	76972
CONSTRUCTION INDUSTRIES	3609	174868	308716	310541	112234	909968
TRANSPORTATION & STORAGE	10108	159586	261027	261726	94491	786938
COMMUNICATION	4542	47556	72692	72756	26141	223697
ELECTRICAL POWER, GAS, OTHER UTILITIES	3295	37442	58144	58231	20945	178057
WHOLESALE TRADE	13017	144993	226186	226887	82034	693417
RETAIL TRADE	17116	159967	237283	237216	84851	736433
OWNER OCCUPIED DWELLINGS	10035	88975	129843	129716	46274	404843
OTHER FINANCE, INSURANCE & REAL EST.	14823	182674	287440	288000	103599	876536
EDUCATION & HEALTH SERVICES	1365	13347	20053	20055	7191	62011
AMUSEMENT & RECREATION SERVICE	1286	13674	20980	20994	7523	64457
SERVICE TO BUSINESS MANAGEMENT	3805	230578	410641	413143	149546	1207813
ACCOMMODATION & FOOD SERVICES	6746	62889	93274	93244	33366	289519
OTHER PERSONAL & MISC. SERVICES	1651	16482	24871	24879	8921	76804
TRANSPORTATION MARGINS	4018	62185	101854	102214	36977	307248
OPERATING, OFFICE, LAB & FOOD	6687	107973	177410	178036	64351	534457
TRAVEL & ADVERTISING, PROMOTION	4971	55859	87032	87174	31440	266476
HOUSEHOLDS	154764	1371892	2003199	2001290	714195	6245340
TOTAL	376948	4228125	6557328	6566699	2363044	20092144

APPENDIX V.5

OCEAN INDUSTRY REGIONAL CLUSTERS AND PRODUCTS SPECIALIZATION

Regional Clusters	Product Specialization	Selected Manufacturers
Victoria	. Oceanographic Instruments . Meteorological Instruments	Aanderaa Instruments Ltd.
	. Slicklicker Oil Recovery Machine	R.B.H. Cybernetics (1970)
	. Undersea Wellhead Cellars . Pressure Hull . Winch Drum	Victoria Machinery Depot Co. Ltd.
Vancouver-Burnaby	. Containment Booms . Skimmers . Oil Spill Detection System	Bennett Pollution Controls Ltd.
	. Hydraulic Towing Winch . Double Drum Hydraulic Mooring Winch . Anchor Windlass	Burrard Iron Works
	. Marine Stoves And Heaters	Dickinson Marine Products Ltd.
	. Controllable Pitch Propeller System	General Propulsion Systems Ltd.
	. Oceanographic Submersibles	International Hydrodynamics Company Ltd. (HYCO)
	. Disc Brakes (for offshore oil pipe-laying barges) . Precision Control Equipment	J. Kobelt Manufacturing Co. Ltd.
	. Subsea Oil and Gas Well Completion and Production System . Submersible Capsule . Wellhead Cellular . Manifold Centre: Valves, Pipping and Controls	Lockheed Petroleum Services Ltd.

APPENDIX V.5 (Cont'd)

Regional Clusters	Product Specialization	Selected Manufacturers
Vancouver-Burnaby (Cont'd)	. Bow Thrusters . Proplulsion Units	Maritime Industries Ltd.
	. Acoustic Underwater Telephone . Diver Communication Package	Mesotech Systems Ltd.
	. Hydraulic Powered Submersible Pump	Techwest Enterprises Ltd.
	. Electrohydraulic Steering Gears . Hydraulic Steering System . Autopilot System . Control Value System	Wagner Engineering Ltd.
Calgary	. Pressure Control Switches . Rig Saver	Barber Industries
	. Drilling and Production Equipment	Olympic Ironworks Limited
	. Gas, Oil, and Steam Separators . Smokeless Gas and Hydrocarbon Burners	Porta-Test Systems Ltd.
	. Electromechanical and Electronic Instrumentation	ITT Barton Instruments
Edmonton	. Pressure Control Switches . Rig Saver	Barber Industries
	. Drilling Equipment Tools	Cougar Tools Co. Ltd.
	. Derricks . Masts . Triplex Pumps . Brakes	Dreco Ltd.
	. Hydraulic Casing Tongs . Hydraulic Tubing Tongs	Farr International Co. Ltd.

APPENDIX V.5 (Cont'd)

Regional Clusters	Product Specialization	Selected Manufacturers
Edmonton (Cont'd)	. Hydraulic Gate Valves . Multiple Orifice Valves (MOV)	Willis Oil Tool Canada Ltd.
Toronto-Hamilton	. Oceanographic Magnetometer	Barringer Research Ltd.
	. Generators . Control Equipment . Propulsion System	Canadian General Electric
	. Power and Control Cables	Canada Wire and Cable Limited
Toronto-Hamilton (Cont'd)	. Compressors . Pumps	Delaval Turbine Canada Ltd.
	. Naval Antenna Towing System . Sonar Domes	Fathom Oceanology Ltd.
	. Towing Mechanism Launches . Sonar Dome . Radar and Communication Reflector Type Antenna System	Fleet Industries
	. Oil Well Measuring Lines . Anchor Lines . Rotary Drilling Lines	Greening Donald Ltd.
	. Blowout Preventer . Oceanographic Winches . Marine Equipment	John T. Hepburn Ltd.
	. Hydrosonde Deep-Towed Seismic (DTS) System	Huntec ('70) Limited

APPENDIX V.5 (Cont'd)

Regional Clusters	Product Specialization	Selected Manufacturers
Toronto-Hamilton (Cont'd)	. Power Plants . Gas Turbines . Pumps . Compressors . Generators . Transformers	Westinghouse Canada Limited
Ottawa	. Gas Detectors . Gas Monitoring System	Armstrong Monitoring Corporation
	. Shipboard Radar Displays . Instrumentation and Electronic Equipment	D.G. Instruments Ltd.
	. Petroleum Leak Detection Monitor . Armoured and Unarmoured Sensor Cables . Movement Sensor Deflectors	Leak 'X' Detection Devices Ltd.
	. Marine Heating, Ventilation and Air Conditioning Equipment	Norris Warming Canada Ltd.
Ottawa (Cont'd)	. Data Communication Equipment . Voice Frequency and Monitoring System . Echo Sounder	Sperry Gyroscope
Montreal	. Marine Diesel Engines	Bombardier Inc.
	. Voice and Data Communication Equipment . Satellite Positioning System . Navigation System	Canadian Marconi Company
	. Propellers	Canadian Stone Marine Ltd.
	. Marine Diesel Engines	MLW Industries

APPENDIX V.5 (Cont'd)

Regional Clusters	Product Specialization	Selected Manufacturers
Montreal (Cont'd)	. Marine Engines . Propulsion Systems	Pratt and Whitney Aircraft of Canada Ltd.
	. Gas Turbine	United Aircraft of Canada Limited
	. Valves . Steam Traps	Velan Engineering Ltd.
	. Electro-Magnetic Cables	Wire Rope Industries
Halifax-Dartmouth	. Weaklink . Marine Riser Racks	Dartmouth Machine Co.
	. Underwater and Surface Survival Gear	Narwhal Marine Ltd.
	. Non-directional Beacons . High Power Transmitters . Radiator Antenna	Nautical Laboratories Limited
	. HF Data Links	Hermes Electronics Ltd.
	. Geophysical Equipment . Electrical Slipring Assemblies for Winches . Compact Rotary Gas Valve	Nova Scotia Research Foundation
Halifax-Dartmouth (Cont'd)	. Handling Systems . Traction and Umbilical Winches . Sliprings and Rotary Valves	Undersea Equipment Ltd.

APPENDIX VI.1

STANDARD INDUSTRIAL CLASSIFICATION-LIST OF SELECTED 1980 AND 1970 CLASSES

SELECTED 1980 CLASSES		SELECTED 1970 CLASSES	
DIGIT LEVEL	INDUSTRIAL CLASS	DIGIT LEVEL	INDUSTRIAL CLASS
301	Power Boiler and Heat Exchanger Industry	301	Boiler and Plate Works
3011	Power Boil and Heat Exchanger Industry		
302	Fabricated Structural Metal Products Industries	302	Fabricated Structural Metal Industry
3021	Metal Tanks (Heavy Gauge) Industry		
3022	Plate Work Industry		
3023	Pre-Engineered Metal Buildings Industry (Except Portable)		
3029	Other Fabricated Structural Metal Products Industries		
308	Machine Shop Industry	308	Machine Shops
3081	Machine Shop Industry		
309	Other Metal Fabricating Industries	309	Miscellaneous Metal Fabricating Industries

APPENDIX VI.1 (Cont'd)

SELECTED 1980 CLASSES		SELECTED 1970 CLASSES	
DIGIT LEVEL	INDUSTRIAL CLASS	DIGIT LEVEL	INDUSTRIAL CLASS
3091	Metal Plumbing Fixtures and Fittings Industry		
3092	Metal Valve Industry		
3099	Other Metal Fabricating Industries		
327	Shipbuilding and Repair Industry	327	Shipbuilding and Repair
3271	Shipbuilding and Repair Industry		
328	Boatbuilding and Repair Industry	328	Boatbuilding and Repair
3281	Boatbuilding and Repair Industry		
335	Communication and Other Electronic Equipment Industries	335	Communications Equipment Manufacturers
3351	Telecommunication Equipment Industry		
3352	Electronic Parts and Components Industry		

APPENDIX VI.1 (Cont'd)

SELECTED 1980 CLASSES		SELECTED 1970 CLASSES	
DIGIT LEVEL	INDUSTRIAL CLASS	DIGIT LEVEL	INDUSTRIAL CLASS
3359	Other Communication and Electronic Equipment Industries		
354	Concrete Products Industries	354	Concrete Products Manufacturers
3541	Concrete Pipe Industry	3541	Concrete Pipe Manufacturers
3542	Structural Concrete Products Industry	3542	Manufacturers of Structural
3549	Other Concrete Products Industries	3549	Concrete Products Manufacturers
355	Ready-Mix Concrete Industry	355	Ready-Mix Concrete Manufacturers
3551	Ready-Mix Concrete Industry		
391	Scientific and Professional Equipment Industries	391	Scientific and Professional Equipment Industries
3911	Indicating, Recording, and Controlling Insturments	3911	Instrument and Related Products Manufacturers
3912	Other Instruments and Related Products Industry		

SOURCE: Statistics Canada (1980 and 1970) Standard Industrial Classification Catalogue No. 12-501E, Ottawa: Supply and Services

APPENDIX VI.2

LIST OF CANADA BENEFITS DESIGNATED ITEMS AND RATIONALE

SOURCE: Canada Oil and Gas Lands Administration (COGLA)
Canada Benefits Branch
Unpublished 1982

APPENDIX VI.2 (Cont'd)

DESIGNATED ITEMS

GENERAL CLASSIFICATION	INCLUDES	RATIONALE
Drilling Rigs and/or Contracts	- Acquisition of new rigs. - Acquisition of drilling contractor services. - Upgrading, repair and maintenance of drilling rigs.	- Well developed Canadian capability experiencing difficulty supplying to major projects. - Several Canadian yards expressing interest in entering this field. - High value, politically sensitive equipment. - Several Canadian firms interested in developing offshore drilling expertise. - Market in Canada could expand substantially in the mid to long term. - New Canadian Standard likely to be introduced in the near future. - Use of this equipment has significant employment implications for CEIC.
Support Vessels and/or Contracts	- Supply boats, tugs, icebreakers, crew boats diving support and seismic vessels. - Acquisition of new vessels. - Acquisition of support vessel services.	- Well developed Canadian capability experiencing difficulty supplying to major projects. - Nascent Canadian operating capability developing. - Potential to encourage establishment of businesses in areas of high unemployment. - Market in Canada could expand substantially in the medium to long term. - Use of this equipment has significant employment implications for CEIC.

DESIGNATED ITEMS (Cont'd)

APPENDIX VI.2 (Cont'd)

GENERAL CLASSIFICATION	INCLUDES	RATIONALE
Dredging Equipment and Services	- Acquisition of new dredges. - Lease of existing dredges. - Acquisition of dredging services. - Presently applicable to Dome, Esso and Gulf Beaufort Operations only.	- Very low Canadian participation. - Canadian market large and possibly growing. - Interest shown in creating a joint venture with foreign dredging company. - Use of this equipment has significant employment implications for CEIC.
Drilling Equipment	- Drill Bits - Down Hole Tools - Fishing Tools - Hole Openers - Reamers	- Established Canadian capability experiencing difficulty supplying to projects. - Market expected to expand substantially in future. - Possibility to establish firms in area of high unemployment.
Deep Water Drilling	- Marine Riser R&D - Engineering or Technical Studies related to deep water drilling.	- Deep water drilling could be a major new area of technological development.
Wellhead Equipment	- Guide Base - Drilling Template - Conductor Pipe	- Nascent Canadian capability experiencing difficulty supplying to projects. - Market expected to expand substantially in future.

DESIGNATED ITEMS (Cont'd)

APPENDIX VI.2 (Cont'd)

GENERAL CLASSIFICATION	INCLUDES	RATIONALE
Casing (includes threading and welding of couplings)	- All size casing including smaller ranges referred to as tubing.	- Established Canadian capability experiencing difficulty competing with lower and perhaps unfairly priced foreign casing. - Possibility of expanding size ranges of casing produced in Canada. - Interest shown in establishing premium threading capability in Canada.
Mud Service Contracts	- Mud Services (including logging) - Purchase of Drilling Fluids and Chemicals	- Established Canadian capability experiencing difficulty supplying to projects. - Several potential mining developments under consideration to supply barite.
Diving Services	- Acquisition of Diving services including submersible diving equipment (manned and unmanned).	- Established and Nascent Canadian capability experiencing difficulty supplying to projects. - Market expected to expand substantially in future. - Possibility to establish firms in area of high unemployment.
Seismic Services	- Acquisition and interpretation services.	- Nascent Canadian capability experiencing difficulty supplying to projects.

DESIGNATED ITEMS (Cont'd)

APPENDIX VI.2 (Cont'd)

GENERAL CLASSIFICATION	INCLUDES	RATIONALE
Casing (includes threading and welding of couplings)	- All size casing including smaller ranges referred to as tubing.	- Established Canadian capability experiencing difficulty competing with lower and perhaps unfairly priced foreign casing. - Possibility of expanding size ranges of casing produced in Canada. - Interest shown in establishing premium threading capability in Canada.
Mud Service Contracts	- Mud Services (including logging) - Purchase of Drilling Fluids and Chemicals	- Established Canadian capability experiencing difficulty supplying to projects. - Several potential mining developments under consideration to supply barite.
Diving Services	- Acquisition of Diving services including submersible diving equipment (manned and unmanned).	- Established and Nascent Canadian capability experiencing difficulty supplying to projects. - Market expected to expand substantially in future. - Possibility to establish firms in area of high unemployment.
Seismic Services	- Acquisition and interpretation services.	- Nascent Canadian capability experiencing difficulty supplying to projects.

DESIGNATED ITEMS (Cont'd)

APPENDIX VI.2 (Cont'd)

GENERAL CLASSIFICATION	INCLUDES	RATIONALE
Engineering and Technical Studies relating to the EA	- Research and development, engineering and technical studies including those performed in support of current EA and the broad range of studies required in all phases of planning for development and production. Also includes studies to be contracted out to the foreign parent company.	- Possibility for development of firms in regions adjacent to the areas of exploration. - Canadian experience required for domestic firms to develop an internationally accepted track record.
Other (Specify)	- Any material, equipment or service peculiar to an individual EA which is deemed to offer significant potential for industrial development.	- Specific to the EA in question.

APPENDIX VI.2 (Cont'd)

DESIGNATED ITEMS

BY GEOGRAPHIC REGION

DESIGNATED ITEM	BEAUFORT SEA	EAST COAST
Drilling Rig and/or Contracts	X	X
Support Vessel and/or Contracts	X	X
Dredging Equipment and Services	X	
Drilling Equipment (specify)	X	X
Deep Water Drilling		X
Wellhead Equipment	X	X
Casing	X	X
Mud Service Contracts	X	X
Diving Services	X	X
Seismic Services	X	X
Engineering & Technical Studies	X	X
Other (specify)	X	X

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