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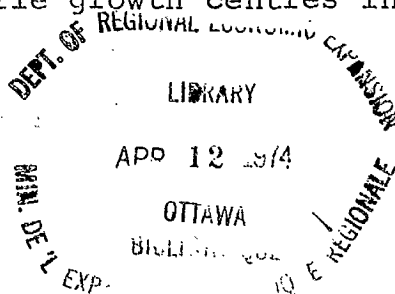
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NOTES ON THE APPLICATIONS OF NATIONAL
INDUSTRIAL COMPLEXES TO FORMULATIONS
OF REGIONAL INDUSTRIAL COMPLEXES -
SOME POLICY IMPLICATIONS

by B.K. LODGE

In a recent research report¹ by the Economic Development Analysis Division of DREE a number of industrial complexes² have been identified using the input-output industries (analogous to 3-digit SIC industries) of Canada, 1961 and 1966. The initial purpose of the study had been to obtain the national perspectives of the technologies of different industrial complexes with a view to evaluating possible applications to the development of regional or spatial complexes. Some important national industrial complexes are appended to this note for an easy grasp of the results we have obtained. However, this note is intended to throw some light on the policy implications of industrial complexes in the context of a regional development strategy by selecting an optimal bunch of industries in a region or sub-region. In evaluating the viability of regional complexes it is assumed that national

- 1 The report is technical and is entitled "Identification of Industrial Complexes from the Input-Output Tables of Canada and the U.S.A." Economic Development Analysis Division, DREE, February, 1974. It may be obtained on request.
- 2 Industrial Complex is defined as a bunch or cluster of industries which demonstrate some properties of maximal interdependence in terms of backward and forward linkages between any pair of industries. One hundred industrial complexes obtained for Canada showed a variety of industrial clusters of which steel mills, food and agriculture and construction stand out to be the dominant ones. An important upshot of industrial complex analysis is that only some industries have more affinity among each other in terms of supplies and demands than the rest of the industries of the economy (be it national or region). This being so it is not always possible to develop one particular industry without the support and/or development of other industries belonging to the complex, whether the development is induced or simulated, unless efficiency is at a premium. For the practical applications of the industrial complex analysis, see W. Isard, E. Schooler and T. Vietorisz "Industrial Complex Analysis and Regional Development", John Wiley & Sons, New York, 1959. Our work in this regard is largely inspired by this classic study as well as by DREE's concern over the development of industrial complexes associated with feasible growth centres in various regions.



industrial complexes reflect technologies much better than their regional counterparts. It is, nonetheless, admitted that while viability can be defined in a large number of contexts, namely technical, commercial, social and political, this note would be restricted to an evaluation of regional complexes in the light of technical and commercial considerations only. This may aid in expanding, to some degree, DREE's current approach to the exploration of economic opportunities in various regions or sub-regions.

The following approaches to an analysis on the viability of a regional industrial complex are now adopted that may capture some major policy implications for DREE:

- a) evaluation of grants/incentives to a particular industry in a region or sub-region where the industry is a part of an already existing industrial complex;
- b) procedure or frame-work of analysis to evaluate the feasibility and efficiency of a national industrial complex in a regional or sub-regional setting.

The illustrations for the above may be given by the Steel Mills Complex at the national level (complex number 1 at the end of the text) where there are five supplying industries and two receiving industries. In evaluating (a) let us now consider for the moment that such a complex already exists in a certain province, say New Brunswick, or to be more specific, in Moncton. Assume also that the Steel Mills industry (85) (or a firm belonging to that industry) gets a grant or incentive from DREE. Under what circumstances (ignoring the social and political considerations) would it be appropriate to consider that other industries in the complex, namely 82, 84, 87, 130 (on the supply side) and 86 (on the receiving side) should share in some of the benefits of grants/incentives given to Steel Mills (85). Evidently, whatever the performance rating of 85 before grants/incentives

from DREE its performance cannot be presumed to be independent¹ of the linkages which other industries (supplying and receiving industries) maintain with 85. Consequently, the question of eligibility of a particular industry for grants/incentives cannot be answered without knowing the position of other industries to which it is related in an industrial complex. However, a situation in which Steel Mills (85) is suffering from some of its own internal problems such as renovation of capital equipment, labour-management problems or rationalization in general, while other inter-connected industries are doing well in terms of their production deliveries, a case for grants/incentives to 85 alone can be made to support the whole complex satisfactorily. In general where such a situation does not arise, the case for grants/incentives to a particular industry which is part of an existing complex may be difficult to substantiate.

In developing (b), namely the appropriate framework for developing and evaluating regional industrial complexes, we may consider the same Steel Mills Complex in Moncton and ask ourselves: what criteria should one choose to say that a Steel Mills Complex may become efficient if it is localized in Moncton. The issues connected with such a problem can now be simplified by the following typology of cases requiring various investigation steps.

Case 1: Moncton produces, say, some outputs of receiving industries, say, Steel Mills (85) only but imports all other inputs except Sinter Plant and Blast Furnaces (84) from outside the province of New Brunswick. (Industry 84 is a capital item that cannot be imported).

1 It is well known that isolated development or evaluation of a part belonging to a whole is rationally impossible without the knowledge of other parts or components comprising the whole. Industrial complex is one of those many examples which illustrate such a phenomenon.

Investigation Steps for Case 1

1. Assuming that the existence of Steel Mills in Moncton has been a commercial proposition for domestic demand and/or for exports outside the province, why cannot Moncton produce also the inputs to support the Steel Mills instead of importing them?

2. In answer to investigation 1, one may come across the following possible explanations:

- (i) the scale of production of Steel Mills output may be so low that the inputs from 82, 87 and 130 cannot be obtained in large or 'bulky' amounts to take advantage of economies of scale in the use of those inputs. This may prompt imports of those inputs instead of local production.
- (ii) the further input requirements to turn out the essential production of inputs that go into Steel Mills cannot be produced in Moncton, i.e., the inputs from industries 82, 87, and 130 cannot be supplied because presumably even the essential requirements¹ to support or supply these industries cannot be domestically fulfilled.

Data requirements for the above investigations, particularly the amounts of imports of inputs and the current scale of production of Steel Mills, can be verified from the provincial Statistical Sources or from the Statistics Canada Manufacturing Division (CANSIM) subject to preserving confidentiality of data for those establishments who are concerned with Steel Mills. If the answers to (i) and (ii) are confirmed, given the minimum scale of production of Steel Mills (which should be obtained, if possible, from some engineering information - either through consultants in a

1 For Canada for each particular industry, say Breweries, we have identified what essential inputs from other industries are to be supplied to make that industry technically viable. These formulations are covered in what is called 'Island Industry Complex'. See the Technical Report, op cit.

feasibility study or from available knowledge), then technically speaking the development of the Steel Mills complex in Moncton by way of import substitution is not plausible. If, however, the explanation (ii) is not true, i.e. available inputs to support 82, 87 and 130 can be found while (i) is present, then some possibilities of a complex formation can be found since production of inputs supporting Steel Mills become feasible but is subject only to the question of scale of Steel Mills output. In that case demand considerations for Steel Mills output become the over-riding criterion - i.e., the demand for Steel Mills has to grow to an extent that can take advantage of scale economies. The latter can be verified partly from the past performance of the growth and level of Steel Mills output in Moncton. For a declining industry in a spatial context where all the necessary inputs to feed that industry are even domestically produced, a case for industrial complex surrounding the major industry may be a difficult task to fulfill.

Case 2: Moncton produces only one input, say, Ferro Alloy (87), which is exported outside the province of New Brunswick.

Investigation Steps for Case 2

1. According to the structure of Complex 1, Ferro Alloy (87) can only be used in the Steel Mills (85) but not in the Rolling Mills (86). In the absence of the other inputs produced locally, one can consider importing them for Steel Mills except for Sinter Plant & Blast Furnaces (85) which has to be present locally since plants and furnaces constitute capital items that cannot be imported.

2. Further inputs required to produce the necessary inputs, namely, 82, 85 and 130 to fulfill the Steel Mills can now be identified from the group of 'Island Complexes' we have for 82, 85 and 130.

3. The additional inputs can now be checked for availability in Moncton or New Brunswick. If the answer to 3 is affirmative and if Sinter Plant & Blast Furnaces can be built in Moncton, possibilities for Steel Mills complex then become clearer provided the minimum scale of production of Steel Mills could be known from engineering information as in Case 1.

4. In the event the answer to 3 is negative, it becomes necessary to evaluate the import cost of additional inputs (to support 82, 85 and 130) as against the local production costs of them. The viability of the complex can then be assured if the import costs are more than or equal to the local production costs.

Other types of cases can be derived from the two polar cases given above by combining various degrees of local or regional production capabilities on the input or the output side. In short the problem of development or installation of a specific national complex in a regional or subregional context can be handled by primarily analyzing import substitution vis-a-vis local production costs subject to demand considerations and the minimum of scale of the final output (in the examples it refers to Steel Mills output).

1. Island Complexes, as defined before, refer to groups of industries supporting any given industries. Thus, an 'Island Complex' associated with a given industry A is a group of industries, say, D, F, G and M which support A to be technically viable. The procedure for identifying Island Complexes and many examples showing its validity are outlined in 'The Technical Report', op cit.

SELECTED INDUSTRIAL COMPLEXES OF CANADA 1961 AND 1966
AND THEIR DISPOSITION

Name of the Complex	Supplying Industries	Inter-Industrial Linkages		Diagrammatic Presentation of the Complex
		Receiving Industries		
		Steel Mills (85)	Rolling Mills (86)	
1. Steel Mills	Iron & Steel Dummy Inc. (82)	yes	yes	
	Sinter Plant & Blast Furnaces (84)	yes	no	
	Steel Mills (85)	no	yes	
	Ferro Alloy Producers (87)	yes	no	
	Refractories Mfgrs. (130)	yes	yes	
		Residential Construction (158)	Non-Residential Construction (159)	
2. Construction, Residential & Non-Residential	Linoleum & Coated Fabrics Inc. (55)	yes	yes	
	Sash & Door & Planing Mills (64)	yes	yes	
	Asphalt Roofing Mfgrs. Mfgrs. (77)	yes	yes	
	Boiler & Plate Workers Workers (96)	yes	yes	

N.B., The bracketed numbers signify the input-output industry numbers of Statistics Canada's latest classification of input-output industries. 'yes' implies the existence of linkages and 'NO' implies the non-existence. The arrow signs in the diagram show the route from the supplying industry to the receiving industry.

Source: Technical Report on Industrial Complexes, Economic Development Analysis Division, DREE, February 1974.

Inter-Industrial Linkages

Name of the Complex	Supplying Industries	Receiving Industries			Diagrammatic Presentation of the Complex	
		Slaughtering & Meat Processors (16)	Poultry Processors (17)	Dairy Factories (18)		
3. Food & Beverage and Agriculture	Agriculture (1)	yes	yes	yes		
	Vegetable Oil Mills (29)	yes	yes	yes		
		Feed Mfgs. (22)	Flour Mills (23)	Vegetable Oil Mills (29)		
Food & Beverage and Agriculture	Agriculture (1) Vegetable Oil Mills (29)	yes yes	yes yes	yes no		
		Leaf Tobacco Processing (35)	Mfgs. of Soap & Cleaning Comp. (144)			
Food & Beverage and Agriculture	Agriculture (1) Vegetable Oil Mills (29)	yes yes	no yes			
		Wood Pulp (73)	Paper Producing (74)	Pulp & Paper Other Activities (76)		
4. Pulp & Paper	Forestry (2)	yes	no	no		
	Pulp & Paper Dummy Inc. (72)	yes	yes	yes		
	Wood Pulp (73)	no	yes	no		

Inter-Industrial Linkages

Receiving Industries

Name of the Complex	Supplying Industries	Receiving Industries					Diagrammatic Presentation of the Complex
		Sawmills (62)	Wood Pulp (73)	Paper Producing (74)	P&P Activities (76)	Other (76)	
5. Sawmills, Wood Pulp, Pulp and Paper	Forestry (2)	yes	yes	no	no		
	Pulp & Paper Dummy Inc. (72)	no	yes	yes	yes		
6. Clothing & Textiles & Fur Dressing	Cotton Yarn & Cloth Mills (44)	no	yes				
	Wool Cloth Mills (46)	yes	yes				
	Synthetic Textile Mills (47)	yes	yes				
	Thread Mills (49)	yes	yes				
	Narrow Fabric Mills (51)	yes	yes				
	Textile Dyeing & Finishing (54)	yes	yes				
	Fur Dressing & Dyeing Industry (154)	no	yes				

