THE IMPACT OF DREE GRANTS ON EMPLOYMENT IN THE ATLANTIC PROVINCES: AN INPUT-OUTPUT ANALYSIS*

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Introduction

The Department of Regional Economic Expansion (DREE), which was established in 1969, had the primary responsibility for reducing regional disparities in Canada. To achieve this objective DREE provided financial assistance to the slow growth areas through a variety of regional development programs. However, the one program which has received the most attention from academic economists is the Regional Development Incentives Act (RDIA) which came into effect in 1969 soon after the establishment of DREE. Under the provisions of this Act, DREE provided grants to manufacturing firms starting a new manufacturing or processing operation or expanding or modernizing an existing one. The primary goal of this program was to increase manufacturing job opportunities in the depressed regions by stimulating the growth of private investment.

The success which the RDIA program has had in achieving these objectives is, however, controversial. In an early study evaluating the efficacy of DREE incentives, Springate [9] finds that only 30 percent of DREE subsidized investment in large firms was incremental; i.e., would not have occurred in the absence of

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the subsidy.[1] Again, Usher [11] compares available empirical evidence on employment and investment growth with DREE's claims of incremental investment and job creation and concludes that there is little evidence to suggest that DREE subsidies have had a significant impact on employment and investment in the depressed regions. Other studies, however, conclude that the RDIA program has been moderately or highly successful in achieving its objectives. The Economic Council of Canada finds, for example, that the incrementality ratio for employment in DREE-supported manufacturing establishments in the Atlantic Provinces ranged between 39 and 68 percent [5: 162]. Similarly, the Atlantic Development Council finds that the RDIA grants were 60 percent incremental with respect to investment and 80 percent incremental with respect to jobs in the Atlantic Provinces [2], while DREE finds in its own analysis that the incrementality ratio for establishments was 78 percent and for employment, 70 percent [4].

The chief objection to these studies is that their results have not been obtained from a structural model which could be used to isolate the effects of DREE grants from all those other variables operating on investment and employment in the depressed regions.[2] In the hope of at least partly meeting this objection, this paper evaluates the success of the RDIA subsidies in creating employment in the Atlantic Provinces using Statistics Canada's 1974 Interprovincial Input-Output (IO) model. To make this evaluation, the payments made with respect to completed projects in manufacturing in the Atlantic Provinces for the period from 1974 to 1976 are impacted on the IO model and the model is used to compute the direct, indirect and induced employment increases in all of the provincial industries. The structure of this model is described in the next section and is followed by a description of the procedure that was used to impact the grant payments on the model. The estimation of the employment impact of the subsidies is then explained, following which the simulation results are presented and analysed. The final section summarizes the major conclusions of the study.

[1]Springate's study and the studies by the Atlantic Development Council and DREE referred to later in this introduction, are critically assessed in Gillespie and Kerr [6: 21-37].

[2]The only previous attempt to construct and estimate such a model using econometric methods is to be found in the work of Osborne and Miller [17].

The Interprovincial Input-Output Model[3]

Statistic Canada's interprovincial input-output model is a full-scale interprovincial model. A complete interindustry matrix is specified for each province and, in addition, interindustry flows between provinces are recorded in a set of interprovincial matrices for each pair of provinces. Thus, the complete 10-province intraprovincial model contains a table of 100 submatrices - 10 interprovincial submatrices on the diagonal and 90 intraprovincial matrices. This enables each industrial activity to be identified by industrial group and by location; i.e., by province.

The aggregate interindustry matrix has 1,910 rows and columns with each corresponding row and column representing a separate industry. Each province has a 191 x 191 matrix representing its own industrial structure and eighteen other 191 x 191 matrices illustrating the interindustry interprovincial trade relationships.

The interindustry interprovincial trade flows in the model were estimated using the provincial destination of manufacturing shipments data and transportations data for raw materials. To estimate interprovincial flows of services, service commodities were designated as local or national services. The former, including retail trade, personal and construction services, were assumed to be wholly supplied in the demanding province. The latter, comprising financial services and transportation communications, were assumed to follow the general pattern of interprovincial trade in manufactured goods excluding imports. These assumptions are somewhat arbitrary but were necessitated by the almost complete absence of data for interprovincial trade in services.

The interprovincial input-output model is a "closed" model in which households are included as an industry in the 191st row and column of the interindustry matrix of technical input coefficients for each province. In the "closed" model, households are viewed as industries which sell labour and other factor services to industry and receive in payment for these services wages and unincorporated income (the sum of these two payments is personal income). This income is then spent on goods and services produced by industries. By including rows and columns for the household sector, the "closed" model includes a Keynesian consumer expenditure multiplier.

[3]For readers unfamiliar with input-output accounting, a lucid introduction is provided in Armstrong and Taylor [1: 249-56]. A more advanced introduction can be found in Richardson [8]. For a full description of the structure of the interprovincial input-output model, the reader should consult Statistics Canada [10].

A Mathematical Statement of the Model

The interprovincial model can be expressed in matrix terms as follows:

$$X = A X + D \quad (1)$$

where X is a (1,910 x 1) column vector of industry outputs and personal income by province.
A is the (1,910 x 1,910) interprovincial interindustry table in coefficient form.
D is an exogenously specified (1,910 x 1) column vector of demands for industry outputs.

If I is an identity matrix the familiar input-output relationship is written:

$$(1 - A) X = D \quad (2)$$

from which it follows that

$$X = (1 - A)^{-1} D \quad (3)$$

By specifying any exogenous change in final demand for the output of any industry equation (3) can be solved to determine the effect of this change in final demand on the output of every industry (including the personal sector) in every province including the province of initial impact.

Impacting the Grant Payments on the Model

The grant payments with respect to completed projects in manufacturing in the Atlantic Provinces for the period from 1971 to 1976 are shown in Table 1. To estimate the impact of the payments on employment by industry it was decided to confine the analysis to the period 1974-1976,[4] a period which, as the figures in Table 1 show, accounted for 90 percent, or $36 million of the $40 million in total payments.

The decision to confine the analysis to the period 1974-1976 was made because of the very sharp increase in the price of crude oil announced by the OPEC countries in the fall of 1973. This increase would cause firms to substitute lower priced energy inputs for higher priced oil, thereby changing the pattern of

[4]Data for later years might also have been included but the danger is as one get farther away from the year for which the table was constructed (1974), the interindustry matrix will become a less adequate representation of production flows between industries, with the result that substantial errors would be introduced into the simulation results.

Table 1

REGIONAL DEVELOPMENT INCENTIVES PROGRAMME ACTUAL PAYMENTS MADE IN RESPECT OF COMPLETED PROJECTS IN THE ATLANTIC PROVINCES, 1969-1976 INCLUSIVE*

($000)

	1971	1972	1973	1974	1975	1976	Total
1. Food industries	490.1	184.6	172.1	88.0	5501.7	1512.4	7948.9
2. Fish processors	206.8	95.9	135.8	259.5	2287.1	3663.4	6648.5
3. Beverages			124.9	56.9	502.1	150.7	834.6
4. Tobacco		6.2		27.4		109.3	142.9
5. Rubber		122.5		273.3	63.4	126.7	585.9
6. Leather							
7. Textile				399.4	32.5	1463.7	1895.6
8. Knitting					100.9		100.9
9. Clothing					86.5	126.7	213.2
10. Wood		37.3	266.9	278.6	1407.2	3159.6	5149.6
11. Furniture				120.9	733.2	558.2	1412.3
12. Paper, allied ind.			413.8			272.3	686.1
13. Printing		7.9	97.6		56.2	177.2	338.9
14. Primary metals					4709.7		4709.7
15. Metal fabrication	25.8	20.1		96.2	457.0	323.7	922.8
16. Machinery		6.6			150.5	817.3	974.4
17. Transportation		40.4	6.7	2499.9	264.9	863.9	3675.8
18. Electrical				596.3	278.4	592.2	1466.9
19. Non-metallic				57.5	136.6	546.1	740.2
20. Petroleum							
21. Chemical	135.0			54.6		125.9	315.5
22. Misc. manufacturing	1239.9	148.6		478.5	6.7	19.4	1893.1
Total	2,097.6	670.1	1,217.8	5,287.0	16,774.6	14,608.7	40,655.8

* No projects attained completed status in 1969 or 1970.

input-output linkages between industries. Since such changes would have been incorporated into the interindustry matrix of the 1974 input-output table it was felt that this matrix would no longer provide an adequate representation of production flows between industries for years prior to 1974.

In order to impact the grant payments on the table it was necessary to estimate by how much the payments would have increased the final demand for the output of each of the 22 manufacturing industries shown in Table 1. To make these estimates the following procedure was adopted. First, the total payments made to each industry were broken down between capital and labour payments.[5] This breakdown was required because DREE does not publish data showing the proportion of its grant payments for completed projects that went to subsidize the capital and/or labour costs of each industry. Second, the capital and labour payments for each industry were divided by their corresponding capital and labour income-output ratios to obtain the industry outputs which constituted the final demand for the impact of the capital and labour grants.[6]

This procedure can be justified as follows. Capital and labour subsidies have both income and substitution effects on the purchase of capital and labour inputs. Assuming that the subsidies reduce the price of capital and labour proportionately, then there will be no change in the wage-rental ratio and hence there will be no change in the optimal ratio of capital and labour inputs used in production. If the elasticity of substitution between capital and labour is zero, then the purchase of these inputs is entirely explained by income or output effects. These effects occur because industries find their costs of production reduced by the subsidy payments. Consequently, they increase their output to maximize their profits.[7] To produce this output industries must purchase additional capital and labour inputs. These purchases will be equal to the increase in output multiplied by the industry's marginal labour and capital-output ratios respectively.

[5]The method used to make the breakdown is described in the appendix to this paper.

[6]The labour income-output ratios were calculated from the interprovincial input-output table. Preliminary and unpublished capital stock estimates have been made for each of the 22 2-digit manufacturing industries by the Construction Division of Statistics Canada. The capital-output ratios for each industry were calculated by dividing capital stock estimates by the value of gross output taken from the IO table.

[7]The amount by which output is increased is indeterminate unless we known the industry's demand curve. In the absence of this information it is assumed that the market demand will be sufficient to purchase the output produced. This assumption is not unreasonable since it is unlikely that DREE would give subsidies to industries which it believes were not financially viable..

It is assumed that the industry's additional purchases of capital and labour will equal the amount of capital and labour grants that it receives. This assumption seems reasonable since DREE provides grants to firms on the condition that they must be used to purchase capital and labour.

For the capital grants we can express these relations by the following identities:[8]

$$\Delta G \equiv \Delta K \tag{1}$$

$$\Delta K \equiv \beta \, \Delta Q \tag{2}$$

where ΔG is the change in the capital grants
ΔK is the change in capital purchased
ΔQ is the change in output
β is the marginal capital-output ratio

Dividing both sides of (2) by ΔG we obtain:

$$\frac{\Delta K}{\Delta Q} = \beta \tag{3}$$

Assuming that the firm's production function exhibits constant returns to scale the marginal and average - capital output ratios are equal as are their reciprocals the average and marginal products of capital. Therefore, the average product of capital can be expressed as $\frac{1}{\beta}$ where β is the average capital-output ratio.

Dividing both sides if (1) by ΔQ we can then write,

$$\frac{\Delta G}{\Delta Q} = \frac{\Delta K}{\Delta Q} = \beta \text{ [by (3)]}$$

from which it follows that

$$\Delta Q = \frac{\Delta G}{\beta} = \Delta G \times \frac{1}{\beta} \text{ (remembering that } \Delta G \equiv \Delta K).$$

Hence, the increase in output is equal to the capital grant multiplied by the average product of capital. And, by the same reasoning, the increase in output induced by the labour grant is equal to the amount of the labour grant multiplied by the average product of labour.

These assumptions, of course, may not hold in practice. For example, if industries have production functions which exhibit increasing returns to scale the marginal products of both capital and labour will exceed their average products so that multiplying the capital and labour grants by their corresponding average produc-

[8]Alternatively, we could have considered the labour grants because the analysis of these grants is exactly the same as it is for the capital grants.

tivities will understate the increase in output and, hence, the increase in employment induced by the grant payments.

Estimating the Employment Impact of the Grant Payments

Having estimated the increase in output for each manufacturing industry (i.e., the final demand increases) these outputs were multiplied by their corresponding 1974 provincial job-output ratios[9] calculated by the Input-Output Division of Statistics Canada and the results summed to estimate the direct employment increase in manufacturing in the Atlantic Provinces. The direct employment increase is the amount of labour that industries must hire in order to increase their employment in response to the grant payments.

There are, however, two other employment effects of the grant payments that must be considered. These are the indirect and the induced employment effects.

As the grant-receiving industries expand their output they purchase intermediate inputs from other industries. As these industries increase their output to meet this increase in demand they hire additional workers. This increase in employment represents the indirect employment created by the grant payments.

As employment is expanded in the grant receiving industries and in those industries which supply intermediate inputs to the subsidized manufacturing industries, workers receive increased wage incomes which they spend on the output of the consumer goods industries. To meet this increase in consumer demand the consumer goods industries must hire additional workers. This increase in employment is the induced employment created by the subsidies.

To estimate the indirect and induced employment created by the grants, several steps were required. First, the final demand increases were impacted on the IO model and the model was solved to compute the increase in total output in each of the provincial industries. Second, the increase in industry outputs was multiplied by their corresponding provincial job-output ratios to estimate the total employment increase in every industry. Third, the induced and indirect employment increase in manufacturing in the Atlantic Provinces was estimated by subtracting the direct employment increase from the total employment increase in

[9]The 1974 provincial job-output ratios were calculated by dividing the employment estimates for each industry by the industry output obtained from the intput-output table. The employment estimates by industry were derived from a variety of sources such as the Labour Force Survey, the employment surveys and the decennial census. In the case of manufacturing, the Annual Census of Manufacturing was the main source.

manufacturing. Finally, the indirect and induced employment increases in provincial industries outside of manufacturing were measured by their total employment increase, since the increase in direct employment occurs entirely in the manufacturing sector in the Atlantic region.

Simulation Results

Table 2 shows the impact of the capital and labour grants on total employment by major industrial group and by region for the period 1974-1976. In Canada the $36 million in grant payments created 7,228 new jobs, 70 percent of which occured in the Atlantic Provinces. Thirty percent of the total new jobs, therefore, were exported to other provinces, with Ontario and Quebec receiving most of the increase, reflecting the very heavy reliance of the Atlantic Provinces on imports from central Canada.

In the Atlantic Provinces the grants increased total employment in all industries by 5,093 additional workers, of which 3,303 (65%) occurred in the manufacturing sector. Of this number, 2,902 represents the direct employment increase in manufacturing.

DREE has claimed that its payments made for completed projects added 6,593 new direct jobs in manufacturing in the the Atlantic Provinces over the period 1974-1976 (Table 3). This figure exceeds the model's prediction of the direct employment increase in manufacturing by 3,501 jobs! Therefore, unless the model is substantially in error, only 44 percent of the jobs claimed by DREE were incremental (i.e., 2,902/6,593). The remainder were redundant, in the sense that they would have occurred in the absence of the subsidies.

It is possible, of course, that the difference between the model's prediction and DREE claims is simply a matter of the way in which DREE has defined employment. However, even if we define DREE's estimates to include both indirect and induced employment the incremental job ratio rises to only 50 percent (i.e., 3,303/6,593).

The success of DREE grants in creating employment in the Atlantic Provinces cannot be judged, however, by simply looking at their direct employment impact. One must also consider their indirect and induced employment effects.

Table 2 shows that the 2,902 additional workers employed in RDIA plants induced 2,191 additional jobs in firms supplying intermediate products to the subsidized firms and consumer goods to the employees of the subsidized firms.[10] Since every direct new

[10]The type II employment multiplier, therefore, which is defined as the ratio of the direct, indirect and induced employment increase to the direct employment is 1.75 (i.e., 5,093/2,902). For a discussion of employment multipliers see Richardson [8: 32-42].

Table 2

IMPACT OF LABOUR AND CAPITAL GRANTS ON TOTAL EMPLOYMENT (PAID EMPLOYEES) BY MAJOR INDUSTRIAL GROUP AND BY REGION, 1974-76*
(Closed Model)

Industrial Group	Atlantic Provinces	Quebec	Ontario	Prairie Provinces	BC, Yukon and NWT	Canada
Primary industries	609.4	39.6	35.8	17.9	3.5	706.2
Manufacturing	3303.4	360.0	408.3	26.9	15.9	4114.5
Construction	34.6	8.2	13.4	2.5	.5	59.2
Transportation storage and communication	200.4	116.9	148.8	16.0	6.7	488.8
Utilities	44.2	8.2	11.2	2.0	.4	66.0
Wholesale and retail trade	545.3	169.5	240.7	29.6	8.1	993.2
Service industries	355.8	160.2	243.8	29.8	10.8	800.4
Total	5093.1	862.6	1102.0	124.7	45.9	7228.3

* Based upon 1974 provincial job-output ratios.

Table 3

TOTAL DIRECT NEW JOBS CREATED IN COMPLETED PROJECTS IN THE ATLANTIC PROVINCES 1974-1976 INCLUSIVE*

	1974	1975	1976	Total
1. Food industries	151	559	275	985
2. Fish processors	155	400	828	1383
3. Beverages	3	50	8	61
4. Tobacco	9		9	18
5. Rubber	19	13	19	51
6. Leather				
7. Textile	65	4	173	242
8. Knitting		33		33
9. Clothing		72	10	82
10. Wood	123	460	441	1024
11. Furniture	29	143	107	279
12. Paper, allied ind.			25	25
13. Printing		21	41	62
14. Primary metals				
15. Metal fabrication	20	316	147	483
16. Machinery		27	169	196
17. Transportation	243	116	346	705
18. Electrical	392	60	275	727
19. Non-metallic	13	27	77	117
20. Petroleum				
21. Chemical	12		19	31
22. Misc. manufacturing	70		19	89
Totals	1304	2301	2988	6593

* These data are not published and were kindly supplied to the author by DREE.

job caused 0.75 additional jobs, it could be argued that the grants had considerable success in increasing employment in the Atlantic Provinces despite their smaller direct employment impact.

These results, however, should be accepted with a good deal of caution. Other input-output studies which have examined the effectiveness of incentive programs have found that the employment multiplier was much closer to 1. For example, Yeates and Lloyd [15] in their study of the employment impact of the Area Development Agency (ADA)[11] incentives in the Southern Georgian Bay region of Ontario found that the type II employment multiplier was only 1.083; that is, it took 12 new direct jobs to create 1 additional job.

If this result is accurate it would imply that the size of the employment multiplier found in this study seriously overesti-

[11]The ADA program, which was set up in 1963, offered a three-year holiday from income taxes and accelerated capital cost allowances to induce firms to locate in areas of chronic high unemployment.

mates the effectiveness of the RDIA program. One should avoid drawing this implication, however, for two reasons. First, the model used here differs considerably from the model employed by Yeates and Lloyd. Essentially what these authors do is to estimate the multiplier by estimating the numerator and the denominator of the expression for the employment multiplier given by

$$M = \frac{E_D + E_L + E_F}{E_D}$$

where M is total ADA induced employment; E_D is direct employment; E_L is indirect employment and E_F is induced employment. Unfortunately the authors were unable to obtain a satisfactory estimate of E_F. Consequently, it is possible that their estimate of the multiplier is seriously understated.

The failure to include a satisfactory measure of the induced employment effects of the ADA incentives would produce a serious downward bias in the estimate of the multiplier, as can be seen in the context of the present study by comparing the size of the employment multiplier obtained from the open and closed solutions of the interprovincial model.[12] In the open version of the model the estimate of the multiplier falls to 1.45, which is 21 percent below the closed model estimate. This lower estimate is explained by the fact that the open model fails to include the impact of changes in final consumer demand on employment in the consumer goods industries.

Secondly, the ADA program was a very different program from the RDIA. The ADA offered pure capital subsidies to induce new firms to locate in regions of chronic high unemployment. By contrast the RDIA attempted to achieve the same objective by offering firms subsidies based on *both* their capital and labour costs of production. One would expect that pure capital subsidies would have smaller multiplier effects on employment than combined capital and labour subsidies, since the former type of subsidy would have stronger substitution effects against the employment of labour than the latter.[13]

[12]In the open version of Statistics Canada's interprovincial input-output model households are included as an industry in the interindustry matrix but are excluded from the vector of final demands for industry outputs. In contrast to the closed version of the model, therefore, the open model does not contain an estimate of the Keynesian consumer expenditure multiplier.

[13]Assuming, in the absence of subsidies, that the firm operates with the optimal capital to labour input ratio, the effect of introducing a program of pure capital subsidies would be to raise the wage-rental ratio, causing the firm to substitute the cheaper priced input (capital) for labour. By contrast, the introduction of capital biased subsidies would reduce the price of capital proportionately more than the price of labour, causing a smaller rise in the wage-rental ratio and, hence, a smaller substitution effect against the use of labour than in the case of pure capital subsidies.

It is not surprising, therefore, that the estimate of the multiplier found in this study should be higher than the estimate obtained by Yeates and Lloyd, since different models using different data were used to analyse the effectiveness of two different programs. However, while the employment multiplier is not likely to be as low as 1.083 for the RDIA program neither is it likely to be as high as 1.75. There are reasons to believe that this latter multiplier overstates the effect of the RDIA program. First, since the RDIA subsidies, as Woodward [12; 13; 14] has shown, were strongly capital biased, the substitution effects of the subsidies would induce firms to substitute capital for labour. That such substitutions are likely to occur is made evident from Kotowitz's estimates of the elasticity of substitution between capital and labour for Canadian manufacturing which show that firms are sufficiently flexible in being able to choose the amount and quality of capital equipment used by each employee.[14] These substitution effects are ignored in the simulation results because of the usual assumption made in IO models that factor prices remain unchanged. Second, the model results ignore the possibility that subsidized firms may crowd out unsubsidized firms. This could happen, for example, if competition from subsidized firms for scarce types of labour, for favourable production sites, or for other scarce resources needed for production made it sufficiently more difficult for other firms to produce or survive in the area. Third, the model results will overestimate the impact of the grants in increasing employment if subsidized firms operate with excess plant capacity. If this occurs, then firms can expand their output with less than a proportionate increase in their factor inputs, including labour. This possibility is ruled out in the IO model, which assumes that all industries exhibit constant returns to scale; i.e., a doubling of output requires a doubling of inputs. Finally, the model results overestimate the increase in service employment in the Atlantic regions because the interprovincial trade flow estimates are constructed on the assumption that there are no import leakages associated with the purchase of local services such as construction, retail trade and personal services. This assumption is unrealistic, since it is clear that some portion of these services will be purchased outside the Atlantic Provinces.

[14]Kotowitz's estimate of the elasticity of substitution between capital and labour is .5; that is, each 10 percent change in the relative price of capital and labour would lead to approximately a 5 percent change in the ratio of capital to labour used in production. This estimate is cited in R. S. Woodward [14: 219].

Conclusions

Given the assumptions on which IO models are constructed, it is difficult to reach precise conclusions about the success which DREE subsidies had in increasing employment in the Atlantic region over the period from 1974 to 1976. Certainly in any evaluation of the success of DREE incentives it would be necessary to consider both their direct and indirect employment effects. Previous studies have tended to ignore these indirect or spillover effects and have concentrated their analysis on the success of the grants in providing new job opportunities in the manufacturing sector. The results of this study show that these indirect and induced employment effects were quite large. Indeed, the model results show that the indirect and induced employment effects amounted to 75 percent of their direct employment effects. In the absence of information on the substitution and crowding out effects of the grants and the precise nature of industry production functions, however, it cannot be stated with certainty that DREE grants have been successful in significantly increasing employment in the Atlantic Provinces.

Despite these difficulties there is, nevertheless, one important conclusion which can be drawn from the previously analysis, and that is the RDIA subsidies have had much less success in creating employment in the Atlantic Provinces than DREE has claimed. Even under the most optimistic assumptions (i.e., zero substitution and crowding out effects, constant returns to scale, etc.), the model results show that only 44 percent of the direct new jobs which DREE has claimed it created in subsidized manufacturing projects in the Atlantic Provinces were incremental. Moreover, this is clearly a substantial overestimate if for no other reason than that the substitution effects of capital biased subsidies would have induced firms to substitute capital for labour. It is very likely, therefore, that considerably more than 56 percent of the employment claimed by DREE would have occurred in the absence of the subsidies.

The results of this study thus do not support the rather optimistic conclusions of DREE and the Atlantic Development Council that the RDIA subsidies were 70 and 80 percent incremental with respect to jobs. Neither do they support the most recent estimates of the Economic Council of Canada that the incremental job ratio in DREE-subsidized establishments in the Atlantic Provinces could be as high as 68 percent.[15] Rather, they give more support to the opposite view that the grants have done more to

[15]The results here, however, are more in line with the Economic Council's lowest estimate that the incremental job ratio was 39 percent.

provide windfall profits to business firms than to achieve their primary goal of creating jobs in the Atlantic Provinces.

Appendix

Subdividing the Total Grant Payments Into Capital and Labour Payments

The total grant payments made to each of the 22 manufacturing industries shown in Table 1 were broken down into their respective capital and labour payments by an examination of the offer data which are published by DREE in its monthly reports to Parliament [3]. These data show the total dollar value of the offer made to each manufacturing firm in the Atlantic Provinces, as well as the proportion of the offer that went to subsidize the capital and/or labour costs of each firm. By classifying each firm to its appropriate 2-digit manufacturing industry, using the SIC manual prepared by Statistics Canada, it was then possible to compute the proportion of the total dollar value of the offers made to each industry which went to subsidize its capital and/or labour costs.[16]

These proportions, however, did not reflect the actual proportions in which final payments were made for capital and labour by DREE in any particular year. The reason for this was that DREE did not pay out the full amount of the grant in the year in which the firm accepted an offer. Under the DREE granting formula in the Atlantic Provinces in 1974, 80 percent of the grant was paid only after one half of the capital had been in continuous operation for thirty days. The remaining 20 percent was paid thirty months after the operation started if the grant was based on capital and forty-two months if the grant was based on capital and labour. Thus a firm which accepted a $100,000 offer from DREE on January 1, 1971, received $80,000 of the grant on February 1, 1971, and the remaining $20,000 on August 1, 1973, if the grant was based on capital and on August 1, 1974, if the grant was based on capital and labour. Therefore, final payments made in 1973 and 1974 reflected offers accepted in 1971. Consequently, to allow for this three year average lag between the acceptance of an offer and the making of final payments the capital and labour proportions calculated from the offer data were averaged over the three years 1971 to 1973, and the total payments made to each manu-

[16]These calculations support Woodward's conclusion that the RDIA subsidies were strongly capital biased. Thus 67, 73 and 83 percent of the total dollar value of offers made to manufacturing went to subsidize capital as opposed to labour costs in the years 1974, 1975 and 1976 respectively.

facturing industry in 1974 were multiplied by their respective average capital and labour proportions to obtain the breakdown between capital and labour payments. The same procedure was used to estimate capital and labour payments by industry for 1975 and 1976, except that the average capital and labour proportions used to make this breakdown were calculated for the periods 1972-74 and 1973-75 respectively.

References

1. Armstrong, Harvey and Jim Taylor. *Regional Economic Policy and Its Analysis.* Oxford: Phillip Allan Publishers, 1978.
2. Atlantic Development Council. *Regional Development Incentives Program: Atlantic Region.* St. John's: ADC, 1976.
3. Canada. Department of Regional Economic Expansion. *Report of the Regional Development Incentives.* Ottawa: Published monthly.
4. Canada. Department of Regional Economic Expansion. *Assessment of the Regional Development Incentives Program.* Ottawa: April 1973.
5. Economic Council of Canada. *Living Together: A Study of Regional Disparities.* Ottawa: Supply and Services Canada, 1977.
6. Gillespie, Irvin W. and Richard Kerr. *The Impact of Federal Regional Economic Expansion Policies on the Distribution of Income in Canada.* Discussion Paper No. 85. Ottawa: Economic Council of Canada, 1977.
7. Osborne, T. and F. C. Miller. *The Impact of DREE Grants on Manufacturing in the Atlantic Provinces.* Discussion Paper, University of Guelph, 1981.
8. Richardson, Harry W. *Input-Output and Regional Economics.* London: Weidenfeld and Nicolson, 1972.
9. Springate, David S. V. "Regional Development Incentive Grants and Private Investment in Canada: A Case Study of the Effect of Regional Development Incentives on the Investment Decisions of Manufacturing Firms." Ph.D. Thesis, Harvard University, Graduate School of Business Administration, 1972.
10. Statistics Canada, Structural Analysis Division. *User Guide to Structural Models.* Ottawa: 1974.
11. Usher, Dan. "Some Questions about the Regional Development Incentives Act", *Canadian Public Policy,* I:4 (1975), 557-75.
12. Woodward, R. S. "The Capital Bias of DREE Incentives", *Canadian Journal of Economics,* 7:2 (May 1974).
13. Woodward, R. S. "Effective Location Subsidies: An Evaluation of DREE Location Subsidies", *Canadian Journal of Economics,* 7:4 (October 1974).

14. Woodward, R.S. "The Effectiveness of DREE's New Location Subsidies", *Canadian Public Policy,* I:2 (1975), 217-31.
15. Yeates, M. and P. Lloyd. *Impact of Industrial Incentives: Southern Georgian Bay Region, Ontario,* Geographical Paper No. 44. Ottawa: Department of Energy, Mines and Resources, 1970.