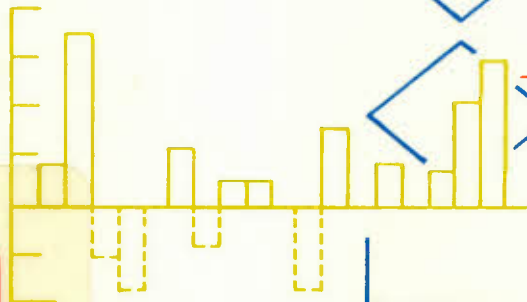
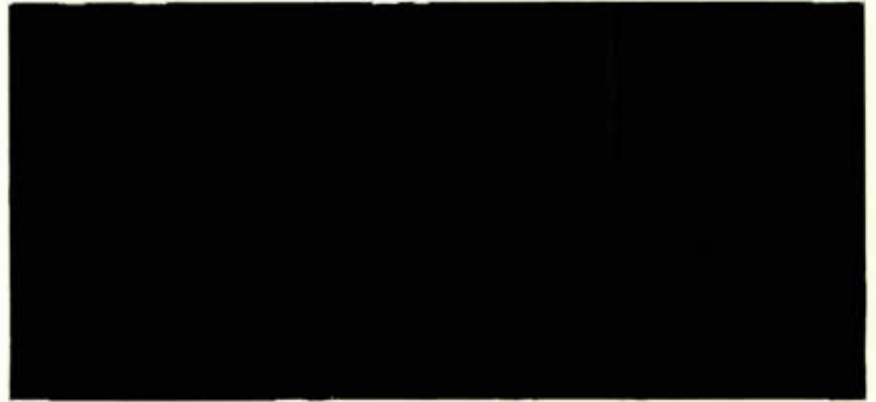




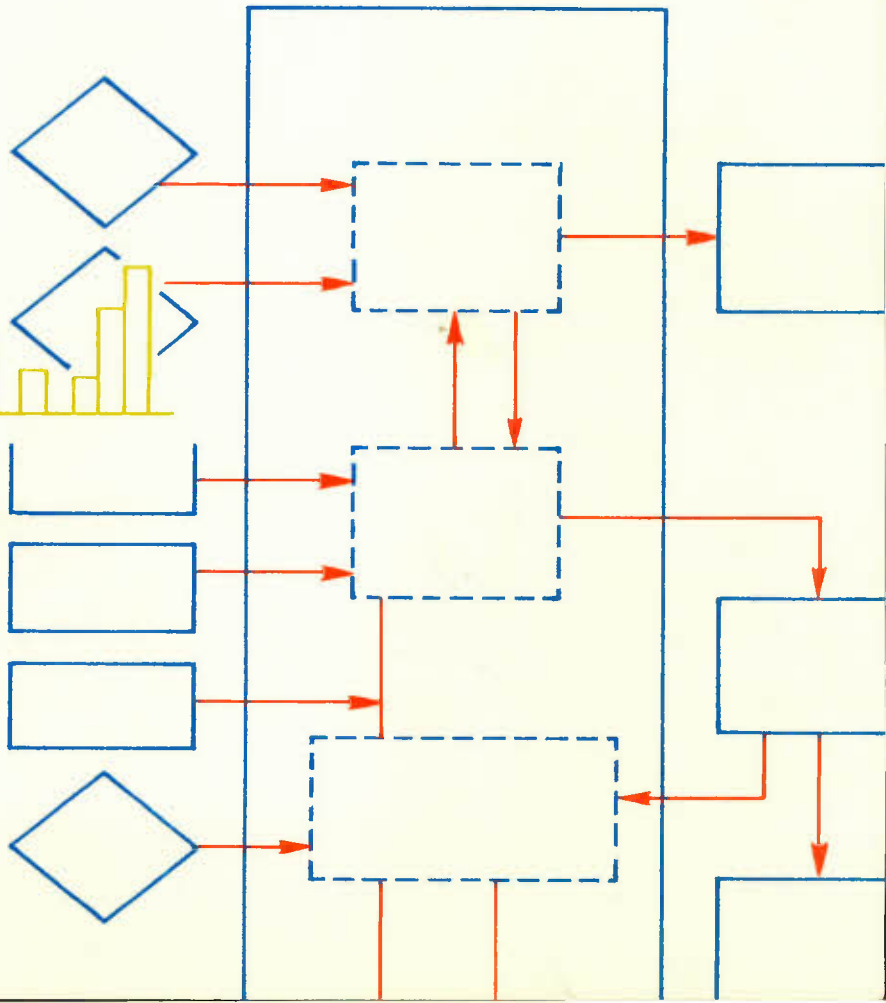
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DISCUSSION PAPER NO. 32

Estimates of the Aggregate Demand Effect  
of Income Maintenance Programs  
in the Maritime Provinces

by N. Swan  
and T. Glynn



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## SUMMARY

The theoretical section of the paper uses a two-country macroeconomic model to develop an expression for the multiplier associated with transfers of purchasing power into a region. The constants upon which the value of the multiplier depends are the marginal propensities to consume and to import in the two countries.

The empirical section begins by developing estimates of the marginal propensities for each of the Maritime Provinces, drawing heavily on data from a model of the Nova Scotia economy built by Czamanski, and deduces the value of the multipliers. It then describes how the value of net transfers associated with income maintenance programs may be calculated for each province. The first step in this involves finding the gross value of all transfers for income maintenance, which include payments by the federal government direct to individuals, such as unemployment insurance and old age pensions, conditional grants by the federal government to provincial or municipal governments for social assistance expenditures, and part of the unconditional grants of the federal government. The second step involves subtracting from the gross transfers an estimate of the taxes paid by Maritimers to the federal government as their share of the federal cost of the programs. The result is an estimate of the net transfer for each Maritime Province occurring as a consequence of income maintenance programs.

Applying the values of the multiplier to the values of the net transfers in the three provinces gives the aggregate



demand effects, with due allowance made for lags in the multiplier process. It appears that in Nova Scotia and New Brunswick the resulting stimulus amounts to about one per cent of Gross Regional Product, and that as a result employment is likely to be raised, and unemployment reduced, by about one percentage point in the long run. Results for Prince Edward Island are rather more uncertain.

## RÉSUMÉ

Dans la section théorique du document, les auteurs utilisent un modèle macroéconomique couvrant deux pays pour trouver une façon d'exprimer le multiplicateur relié aux transferts de pouvoir d'achat dans une région. Les constantes sur lesquelles repose la valeur du multiplicateur sont les propensions marginales à consommer et à importer des deux pays.

Le travail empirique débute par la mise au point d'estimations des propensions marginales pour chacune des provinces Maritimes, et s'appuie beaucoup sur des données tirées d'un modèle de l'économie de la Nouvelle-Écosse, construit par Czamanski, puis la valeur des multiplicateurs en est déduite. Les auteurs décrivent ensuite comment calculer, pour chaque province, la valeur des transferts nets associés aux programmes de soutien du revenu. Il faut d'abord trouver la valeur brute de tous les transferts au titre du soutien du revenu, qui comprennent des paiements faits directement par le gouvernement fédéral aux individus -- comme les prestations d'assurance-chômage et les pensions de vieillesse -- des subventions conditionnelles du gouvernement fédéral aux provinces ou aux municipalités pour les dépenses d'aide sociale, et une partie des subventions inconditionnelles du gouvernement fédéral. La deuxième étape consiste à soustraire des transferts bruts une estimation des impôts versés par les gens des Maritimes au gouvernement fédéral comme étant leur part du coût fédéral des programmes. On en arrive ainsi à une estimation du transfert net, pour chaque province Maritime, découlant des programmes de soutien du revenu.

L'application des valeurs du multiplicateur à celles des transferts nets, pour les trois provinces, permet de trouver les effets sur la demande globale, compte tenu des retards dans le processus de multiplication. Il semble qu'en Nouvelle-Écosse et au Nouveau-Brunswick, le stimulant qui en résulte représente environ 1 % du produit régional brut et que, par conséquent, l'emploi s'en trouvera probablement augmenté, et le chômage réduit, d'environ un point de pourcentage à long terme. Dans le cas de l'Île-du-Prince-Édouard, les résultats sont plus incertains.



## Introduction

Income maintenance programs in the Maritimes are not wholly paid for from tax revenue raised or bonds issued in the Maritimes. Since the difference constitutes a transfer from citizens in the rest of Canada to citizens in the Maritimes, macro-economic theory suggests that this transfer will have an employment-generating effect. In this Discussion Paper we attempt to estimate the size of this effect.

## Theory

The best estimating method would be to use simulation experiments with a large-scale, long-run econometric model of each province in the Maritimes. An econometric model exists for Nova Scotia,<sup>1/</sup> but resources could not be spared to undertake simulations on it, even assuming the model was suitable for the purpose without modification. No models exist, as far as we know, for New Brunswick and Prince Edward Island. In light of these problems we used a simpler and cruder method than simulation in all three provinces. We made approximate estimates of the long-run expenditure multiplier in each of the Maritime Provinces, and of the amount of the transfer to each province, namely total income maintenance expenditures minus the part paid for by Maritimers themselves. The product of the transfer<sup>2/</sup> and the multiplier was then our

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<sup>1/</sup>S. Czamanski, "An Econometric Model of Nova Scotia", prepared for the Nova Scotia Voluntary Planning Board (Halifax: Queen's Printer, November 1968).

<sup>2/</sup>The transfers in this case are permanent, i.e., long run, so that they are multiplied by a long-run multiplier.



estimate of the increment to GNP in each province due to the aggregate demand effect of income maintenance programs. From this one can infer the effect on employment and unemployment.

### Long-Run Expenditure Multipliers in the Maritimes

Each province may be considered as an open economy trading with the rest of Canada and the rest of the world. We assume that imports which come directly from outside Canada for use in the Maritimes are negligible compared with the total of imports from the rest of Canada, which of course have embodied in them import content from the rest of the world. This assumption permits us to operate with a two-country model, and probably does not do violence to reality.

We begin with the multipliers in the simplest possible Keynesian model, and then comment on what modifications would be necessary if we assumed, in the long run, that some of the assumptions of that model were too restrictive.

### The Two-Country Keynesian Model

We shall use symbols with bars on the top ( $\bar{q}$ , etc.) for variables relating to the rest of Canada, and without bars for a Maritime Province ( $q$ , etc.). Small case letters denote constant dollar or "real" values, large case letters current dollar or "money" values. The following variables may now be defined:

- $q$  : real output ( $\bar{q}$  for the rest of Canada)
- $P$  : price index of  $q$  ( $\bar{P}$  for the rest of Canada)
- $c$  : real consumption expenditure ( $\bar{c}$  for the rest of Canada)

- a : real investment plus real government expenditure on goods and services ( $\bar{a}$  for the rest of Canada). Includes exports to foreign countries, net of imports from them, in both cases.
- x : real exports to the rest of Canada ( $\bar{x}$  for the rest of Canada is exports to the Maritime Provinces only)
- z : real imports from the rest of Canada ( $\bar{z}$  imports by the rest of Canada from the Maritime Provinces only)
- W : wage index ( $\bar{W}$  for the rest of Canada)
- T : transfers of income to the Maritimes coming from the rest of Canada.

For the Maritime Provinces we have:

(1)  $Pq = P(c + a + x) - \bar{P}z$ . This equation says that the value of output is adjusted to match domestic demand in the Maritime Provinces.  $\bar{P}z$  is the value of imports from the rest of Canada.

(2)  $P = WS(q)$ , a standard aggregate supply curve, intentionally made homogeneous of degree one in wages and prices.

(3)  $Pc = \beta(Pq + T)$ . This says that the value of consumption expenditure is proportional to gross income, with  $\beta$  being the marginal propensity to consume gross income and gross income defined as the value of output plus the transfers. We could write, if we wished,  $\beta = \beta^*(1 - \tau)$ , where  $\tau$  is the marginal tax rate and  $\beta^*$  is the MPC as usually understood. The value of any constant in the consumption function may be assumed to be included in  $a$ , or to be zero in the long run; it does not matter which assumption is used.

(4)  $z = \gamma(q + T/P, \bar{P}/P)$ . Real imports depend on real gross income and their price relative to home goods. Notice that the exchange rate is unity, by definition of the monetary unit in both countries, unlike the normal two-country model.



For the rest of Canada, we have four equations based on similar reasoning to that used for the four above:

$$(5) \quad \bar{P}\bar{q} = \bar{P}(\bar{c} + \bar{a} + \bar{x}) - P\bar{z}$$

$$(6) \quad \bar{P} = \bar{W}\bar{S}(\bar{q})$$

$$(7) \quad \bar{P}\bar{c} = \bar{\beta}(\bar{P}\bar{q} - T)$$

$$(8) \quad \bar{z} = \bar{\gamma}(\bar{q} - T/\bar{P}, P/\bar{P})$$

As a matter of definition, we also have

$$(9) \quad \bar{x} = z$$

$$(10) \quad x = \bar{z}$$

These ten equations suffice to explain  $q$ ,  $P$ ,  $c$ ,  $z$ ,  $x$ , and their barred equivalents.

An especially simple version of this model arises if we take supply curves to be horizontal or nearly so in the relevant range.<sup>1/</sup> We may then define quantity units in such a way that  $P = \bar{P} = 1$ , and drop equations (2) and (6). Then, substituting (3) and (10) into (1), and (7) and (9) into (5) we obtain:

$$(1') \quad q = \beta(q + T) + a + \bar{z} - z$$

$$(5') \quad \bar{q} = \bar{\beta}(\bar{q} - T) + \bar{a} + z - \bar{z}$$

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<sup>1/</sup>This may be a reasonable assumption if there is substantial unemployment in both countries, as there usually is for the Maritimes and Canada.



Dropping the price arguments from the import function, since prices are assumed constant, we also have

$$\begin{array}{l} (4') \quad z = \gamma(q + T) \\ (8') \quad \bar{z} = \bar{\gamma}(\bar{q} - T) \end{array} \quad \left. \vphantom{\begin{array}{l} (4') \\ (8') \end{array}} \right) \quad \text{(the } \gamma\text{'s here are functions)}$$

Inserting (4') and (8') into (1') and (5') and totally differentiating we obtain

$$dq = \beta dq + \beta dT + \bar{\gamma}'(d\bar{q} - dT) - \gamma'(dq + dT)$$

$$d\bar{q} = \bar{\beta}d\bar{q} - \bar{\beta}dT + \gamma'(dq + dT) - \bar{\gamma}'(d\bar{q} - dT)$$

We note that  $\bar{\gamma}'$  and  $\gamma'$  are the marginal propensities of the rest of Canada and the Maritime Provinces to import from each other. The last two equations may be written as:

$$\begin{pmatrix} 1 - \beta + \gamma' & -\bar{\gamma}' \\ -\gamma' & 1 - \bar{\beta} + \bar{\gamma}' \end{pmatrix} \begin{pmatrix} dq \\ d\bar{q} \end{pmatrix} = \begin{pmatrix} \beta - \bar{\gamma}' - \gamma' \\ -\bar{\beta} + \gamma' + \bar{\gamma}' \end{pmatrix} dT$$

The multiplier we require is  $dq/dT$ . From the last equation

$$\frac{dq}{dT} = \frac{\begin{vmatrix} \beta - \bar{\gamma}' - \gamma' & -\bar{\gamma}' \\ -\bar{\beta} + \bar{\gamma}' + \gamma' & 1 - \bar{\beta} + \bar{\gamma}' \end{vmatrix}}{\begin{vmatrix} 1 - \beta + \gamma' & -\bar{\gamma}' \\ -\gamma' & 1 - \bar{\beta} + \bar{\gamma}' \end{vmatrix}}$$

### An Example

As an example of a rough calculation of the value of the multiplier, suppose the following assumptions held good:

$$\beta = \bar{\beta} = .65 \quad (\beta \text{ is, in the long run, approximately the fraction of GNP going to consumption})$$

$\gamma'$  = marginal propensity of a Maritime Province  
to import from the rest of Canada  
= .5

$\bar{\gamma}'$  = marginal propensity of rest of Canada  
to import from a Maritime Province  
= .025

Then we obtain

$$\frac{dq}{dT} = 0.15, \text{ i.e., every dollar of}$$

transfer income would generate 15 cents-worth of additional output in the Maritimes itself.

Some light may be cast upon the likely value of the multiplier by noting that  $\bar{\gamma}' \approx 0$ . If we assume  $\bar{\gamma}' = 0$ , we obtain

$$\frac{dq}{dT} \approx \frac{(\beta - \gamma')(1 - \bar{\beta})}{(1 - \beta + \gamma')(1 - \bar{\beta})} = \frac{\beta - \gamma'}{1 - \beta + \gamma'}$$

This will be positive if and only if  $\beta > \gamma'$ ,<sup>1/</sup> i.e., if the long-run marginal propensity to consume gross income in the Maritime Provinces exceeds the marginal propensity to import. We may take this a little further. The particular kind of expenditure increase caused by  $dT$  is an increase in consumption. Thus  $\gamma'$  is the marginal propensity to import the kind of final or intermediate products required for consumption goods (or services), and  $\beta - \gamma'$  is the marginal propensity to spend at home on the kind of final or intermediate goods used in consumption goods. It clearly must be positive. Thus, if  $\bar{\gamma}' \approx 0$ , the transfer expenditure multiplier must be positive. This conclusion appears to be robust under relaxation of the more

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<sup>1/</sup> Provided  $\beta < 1$ , as is normally assumed.

important of the assumptions made so far, and is an important one.

#### The Effect of Relaxing Certain Assumptions

(i) If aggregate supply curves were not flat, relative prices in Canada and the Maritimes would adjust so as to dampen the multiplier; if we were near full employment on average in the long run this would be an important reservation. Clearly we are not, and we have ignored this possibility.

(ii) The analysis has assumed no growth, but it seems likely that building in steady growth would leave the conclusions unaffected, because growth can be treated simply as a stretching of the units of quantity measurement.

(iii) It seems very likely that relative wages in the Maritimes will move upwards a little, however much unemployment there is in both the Maritimes and Canada to begin with, in response to a shift of demand from Canada to the Maritimes. This moves the whole supply curve upwards in the Maritimes relative to Canada, changes relative prices, and cancels some of the favourable shift in aggregate demand. This is true independently of whether (i) holds, and it lessens the multiplier effect in the Maritimes. Short of substantial econometric model building there seems no way of estimating the size of the effect. We have taken it as zero, and this is one of the more critical assumptions of the analysis.



Empirical Work for the Maritimes

In light of (i) to (iii) above we assume that the expression for  $dq/dT$  on page 5 is an adequate approximation to the multiplier.

Marginal Propensities to Consume and Import

To estimate  $dq/dT$  as given on page 5 we need a long-run value for the marginal propensity to consume out of GNI in each of the Maritime Provinces and in the rest of Canada. We also need for each Maritime Province a long-run marginal propensity to import from GNI, and for the rest of Canada a long-run marginal propensity, with respect to GNI, to import from each Maritime Province.

Much research indicates that the long-run marginal propensity to consume disposable income is equal to the average propensity.<sup>1/</sup> For disposable income, therefore, estimates of the average propensity would serve as well as estimates of the marginal. This will remain true for the average propensity to consume from GNI provided that disposable income in the future remains reasonably steady in the long run as a fraction of GNI. We shall tentatively assume that it will do so, despite data that show that over the postwar period this fraction has fallen, due essentially to a larger government share in GNP. This assumption is tantamount to asserting that the long-run secular increase in the government's share of GNI has about run its course.

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<sup>1/</sup> See, for example, M. Friedman, "A Theory of the Consumption Function", A Study by the National Bureau of Economic Research, New York, (Princeton University Press, 1957), and the literature cited therein.

The long-run APC for Canada is the easiest to obtain. For GNP in constant dollars the APC in the last twenty years has fallen within the range 0.58 to 0.65, with evidence of a slight downward trend. We therefore take the lower limit of this range, 0.58, as our estimate for the future.

Data on consumption and GNP for each of the Maritime Provinces are not available. We do have estimated values for Nova Scotia from Czamanski's econometric model, covering the period 1950-65. From that model we have calculated estimated GNP as, in Czamanski's notation:

$$C_1 + C_4 + C_5 + I + GI_G + GI_{ED} + GI_V + GS_A + GS_L \\ + GS_M + GS_H + GS_C + DF_S + e_A + e_C + e_{IS} + e_m + e_S - m$$

Values for these data were taken from Appendix II of Czamanski.

Annual values of the average propensity to consume can be estimated by dividing values of the estimated GNP values into consumption, which is the sum of  $C_1$ ,  $C_4$  and  $C_5$ . Over the 1953 to 1965 period, the nearest we have to the 1953-73 period examined for Canada, the APC varied between .64 and .69, with no evidence of a downward trend during the last six years. We therefore take the average APC of the last six years, 1959-65, as representative. It works out to 0.651. This seems quite reasonable in relation to the Canada-wide APC of 0.61 for the same period.

Czamanski's data also permit estimates of Nova Scotia's average propensity to import (API) from GNP over the 1950-65 period. It varied between 0.41 and 0.46, but there is



no evidence of any trend, so we take the average over the period as our estimate for the future. It was 0.434.

The Czamanski model also provides estimates of exports by Nova Scotia to the rest of the world, which are an upper bound to imports by the rest of Canada from Nova Scotia. Dividing exports by the difference between Canada's GNP and Nova Scotia's then gives an upper bound to the rest of Canada's propensity to import from Nova Scotia. Over the last ten years this upper bound has never exceeded 0.006. We assume, quite arbitrarily, that 80 per cent of Nova Scotia's exports go to the rest of Canada, and therefore set the APM for Canada from Nova Scotia at  $0.8 \times 0.006 = 0.005$ .

For New Brunswick and Prince Edward Island we have so far discovered no information akin to that for Nova Scotia which would allow estimates of the average propensities to consume and import, and of the average propensity of the rest of Canada to import from each of them. It seems fairly reasonable, however, to take values for the APC and APM equal to those of Nova Scotia. One might argue that for Prince Edward Island, being small even relative to Nova Scotia, this implies too low an estimate of the APM, but the greater incentive to self-sufficiency provided by being an island gives the opposite bias and makes the assumption of equality of APMs seem less implausible. Nevertheless, there is enough doubt here to mean that the final multiplier estimate for Prince Edward Island is less reliable than for the other two provinces. The average propensity of the rest of Canada to import from New



Brunswick and Prince Edward Island is likely to be slightly smaller than for Nova Scotia, because each of these provinces is smaller in both output and population. We assume that the APMs of the rest of Canada from New Brunswick and Prince Edward Island are smaller in the same proportion as their populations are smaller than Nova Scotia's. Thus we set values of 0.004 for New Brunswick and 0.001 for Prince Edward Island.

The values assumed for each of the three provinces are detailed in Table 1 below.

Table 1

VALUES ASSUMED FOR LONG-RUN MARGINAL PROPENSITIES

	Nova Scotia	New Brunswick	Prince Edward Island
Marginal propensity to consume from GNP ( $\beta$ )	0.651	0.651	0.651
Marginal propensity to import from GNP ( $\gamma'$ )	0.434	0.434	0.434
Marginal propensity of the rest of Canada to import from each province ( $\bar{\gamma}'$ )	0.005	0.004	0.001
Value assumed for MPC in rest of Canada ( $\bar{\beta}$ ):	0.610		

The formula developed above (page 5) for the multiplier associated with income maintenance expenditures was:

$$\frac{dg}{dT} = \frac{\begin{vmatrix} \beta - \bar{\gamma}' - \gamma' & -\bar{\gamma}' \\ -\bar{\beta} + \bar{\gamma}' + \gamma' & 1 - \bar{\beta} + \bar{\gamma}' \end{vmatrix}}{\begin{vmatrix} 1 - \beta + \gamma' & -\bar{\gamma}' \\ -\gamma' & 1 - \bar{\beta} + \bar{\gamma}' \end{vmatrix}}$$

The values of the multiplier turn out to be as follows:

	<u>Value of Income Maintenance Expenditure Multiplier</u>
Nova Scotia	0.270
New Brunswick	0.272
Prince Edward Island	0.276

Simply interpreted, this means that every net<sup>1/</sup> dollar of income maintenance expenditure transferred annually into a Maritime Province by the rest of Canada generates additional output valued annually at about 27 cents in Nova Scotia and New Brunswick and Prince Edward Island. Simultaneously, of course, there is a 27-cent reduction in output in the rest of Canada for any given level of aggregate demand in Canada as a whole. The interprovincial transfers implied by income maintenance expenditures thus shift aggregate demand interprovincially. We consider the actual size of the effect in recent years in the next section, and its implications in the section following that.

#### Estimating the Value of T

Each province receives revenue from the federal government. Individuals who receive transfer payments, such as old age pensioners, also pay taxes to the federal government. To estimate the value of T, we must subtract from gross federal transfers to Maritime governments and Maritime individuals

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<sup>1/</sup>"Net" means net of the amount paid by Maritimers in federal taxes towards the financing of such transfers, as is explained further in the following section.

that part which was paid for in the first place by federal taxes on Maritimers.

To this end, consider first the  $i^{\text{th}}$  expenditure program of a provincial government, with expenditure  $x_i$ . Let the rate of matching grants for this program, which may be zero, be  $a_i$ . For conditional grants we then have  $a_i x_i$  as the apparent federal grant under the  $i^{\text{th}}$  program.

Let  $CG_i$  be the total conditional money granted to all provinces by the federal government for the  $i^{\text{th}}$  program. The province's residents have paid for part of  $CG_i$  through federal taxes. Let  $r$  be federal taxes paid by provincial residents and  $R$  be federal taxes paid by all Canadians. Then an amount  $\frac{r}{R}CG_i$  has already been paid for. The net transfer in of conditional money for the  $i^{\text{th}}$  program becomes

$$a_i x_i - \frac{r}{R} CG_i$$

For unconditional transfers define  $ug$  as what is paid by the federal government to provincial government unconditionally. Let  $UG$  be what is paid by the federal government to all provinces combined unconditionally. Of  $UG$ , provincial residents have paid  $\frac{r}{R}UG$ . There is thus a net transfer to the provincial government of

$$ug - \frac{r}{R}UG$$

Excluding conditional grants, the provincial government spends  $x_i - a_i x_i$  on the  $i^{\text{th}}$  program. The total of such expenditures is  $\sum_i (x_i - a_i x_i)$ , which, with a balanced budget,



is also equivalent to revenue from own sources plus unconditional grants. The fraction of provincial government revenue, net of conditional grant money, going to the  $i^{\text{th}}$  program is

$$\frac{x_i - a_i x_i}{\sum_i (x_i - a_i x_i)}$$

It seems reasonable to allocate this fraction of the net transfer of unconditional money to the  $i^{\text{th}}$  program, giving a net transfer of

$$\frac{x_i - a_i x_i}{\sum_i (x_i - a_i x_i)} \left(ug - \frac{r}{R}UG\right)$$

Now let  $Z$  be total federal transfers made directly to persons in all Canada, e.g., old age security, UIC payments, etc. Provincial residents pay for  $\frac{r}{R}Z$  of these. If they actually receive  $z$ , there is a net transfer of

$$z - \frac{r}{R}Z$$

In sum, total transfers on account of income maintenance programs are

$$\left(a_i x_i - \frac{r}{R}CG_i\right) + \frac{x_i - a_i x_i}{\sum_i (x_i - a_i x_i)} \left(ug - \frac{r}{R}UG\right) + \left(z - \frac{r}{R}Z\right)$$

↓	↓	↓
Net federal conditional grants for provincial income maintenance expenditure	Net federal unconditional grants allocated to provincial income maintenance expenditure	Net federal income maintenance payments direct to persons

Complete data on these items of net transfer due to income maintenance in recent years in the Maritimes are

given in Table 2, and further details of sources of data and calculations are given in the two sections following.

Estimating r/R

Total federal taxes are available in the Statistics Canada annual publication "Federal Government Finance", Cat. No. 68-211. This total is broken down into income taxes -- personal and corporate -- general sales taxes, excise taxes, customs duties, estate taxes, unemployment insurance contributions, universal pension plan levies and other taxes. Since no provincial distribution was available it was necessary to distribute each of the individual tax categories among the provinces. Immediately following is an explanation by category of this distribution.

Income Taxes

Individuals - total (federal) taxes were distributed according to the total federal income and old age security tax payable by province as published in the Department of National Revenue, Taxation's "Taxation Statistics".

Corporations - total federal corporation taxes were distributed according to the provincial distribution of taxable corporate income as published in "Taxation Statistics".

General Sales Taxes - this total was distributed according to the provincial share of retail sales which was calculated using the Statistics Canada

monthly publication, "Retail Trade", Cat. No. 63-005.

Excise Taxes, - these taxes were also distributed among  
Customs Duties,  
Other Taxes the provinces on the basis of retail sales.

Estate Taxes - these taxes were distributed among the provinces according to the estate taxes assessed by province as published in "Taxation Statistics".

Unemployment - these contributions were distributed  
Insurance Con-  
tributions, Uni- among the provinces according to the  
versal Pension provincial distribution of wages and  
Levies salaries as published in the Canadian Statistical Review, Statistics Canada monthly publication, Cat. No. 11-003.

Once these formulae for distributing the various categories of federal taxes were decided upon it was simply a matter of calculating the federal taxes paid by residents of each Maritime Province under each category and then summing these categories to arrive at a total for each province. This total was then expressed as a fraction of total federal taxes paid by all provinces. Complete details are given in Table 2. In 1968-69, for example, out of a total of \$11,750 million for all of Canada Nova Scotians paid \$303.5 million so  $\frac{r}{R} = 0.0258$ . This procedure was carried out for all three Maritime Provinces for the fiscal years 1969-70, 1970-71 and 1971-72. The values obtained are shown in the last line of Table 2.



Table 2

FEDERAL TAXES PAID IN CANADA AND ESTIMATES OF  
FEDERAL TAXES PAID BY MARITIMERS

(In millions of dollars)

	1968-69	1969-70	1970-71	1971-72
<u>Income Tax -- Individuals</u>				
Nova Scotia	101.4	136.4	157.3	n.a. <sup>(1)</sup>
New Brunswick	71.1	92.2	111.9	n.a.
Prince Edward Island	8.2	11.7	14.1	n.a.
Canada	4,334.4	5,588.1	6,395.2	7,227.4
<u>Corporations</u>				
Nova Scotia	41.2	55.6	48.8	n.a.
New Brunswick	32.3	40.3	37.4	n.a.
Prince Edward Island	4.4	5.7	5.1	n.a.
Canada	2,213.1	2,839.1	2,426.4	2,395.6
<u>General Sales Taxes</u>				
Nova Scotia	70.3	76.9	75.7	n.a.
New Brunswick	51.6	60.6	62.1	n.a.
Prince Edward Island	9.0	11.0	10.5	n.a.
Canada	2,098.0	2,294.3	2,281.4	2,653.2
<u>Excise Taxes</u>				
Nova Scotia	29.6	30.0	31.9	n.a.
New Brunswick	21.8	23.6	26.1	n.a.
Prince Edward Island	3.8	4.3	4.4	n.a.
Canada	884.7	894.2	960.2	991.5
<u>Customs Duties</u>				
Nova Scotia	25.5	27.4	27.0	n.a.
New Brunswick	18.7	21.6	22.2	n.a.
Prince Edward Island	3.3	3.9	3.7	n.a.
Canada	761.7	818.3	814.5	988.6
<u>Estate Taxes</u>				
Nova Scotia	3.1	5.7	4.2	n.a.
New Brunswick	1.6	2.6	2.8	n.a.
Prince Edward Island	0.2	0.2	0.1	n.a.
Canada	112.4	100.6	119.8	132.0
<u>Unemployment Insurance Contributions</u>				
Nova Scotia	10.9	12.5	12.5	n.a.
New Brunswick	8.7	9.9	10.2	n.a.
Prince Edward Island	1.1	1.2	1.3	n.a.
Canada	433.0	492.0	495.2	570.6
<u>Universal Pension Levies</u>				
Nova Scotia	17.4	19.0	20.6	n.a.
New Brunswick	13.9	15.1	16.7	n.a.
Prince Edward Island	1.7	1.9	2.1	n.a.
Canada	689.0	746.0	813.1	826.2
<u>Other Taxes</u>				
Nova Scotia	4.1	5.1	5.4	n.a.
New Brunswick	3.2	3.7	4.2	n.a.
Prince Edward Island	0.4	0.5	0.6	n.a.
Canada	223.7	254.4	265.0	292.1
<u>Value of r/R</u>				
Nova Scotia	0.0258	0.0263	0.0263	0.0263 <sup>(2)</sup>
New Brunswick	0.0189	0.0192	0.0201	0.0201 <sup>(2)</sup>
Prince Edward Island	0.0027	0.0029	0.0029	0.0029 <sup>(2)</sup>

(1) Data for 1971-72 were not available at the time of writing.

(2) The value of r/R in 1970-71 was used for 1971-72 also.

Source: The data on total federal taxes paid for Canada were taken from "Federal Government Finance", Cat. No. 68-211.

### Estimating Net Transfers

Having thus arrived at the fraction of taxes paid for it was then possible to estimate the total net transfers due to income maintenance programs.

The total amounts of conditional grants for income maintenance transferred from the federal government to all the provinces combined are available in the Statistics Canada annual publication "Federal Government Finance", Cat. No. 68-211. In 1968-69, for example, this came to \$301.3 million so the part Nova Scotia could expect to obtain based on its share of taxes paid would be  $\$301.3 \text{ million} \times 0.0258$  or \$7.8 million. In fact Nova Scotia obtained \$13.8 million or a net transfer of \$6.0 million. This figure, and figures for other years and other provinces appear in the first column of Table 3.

In addition to the conditional grants the federal government also transfers unconditional grants to the provinces (also available in Cat. No. 68-211). These unconditional grants allow the provinces to increase their own expenditures on income maintenance programs in the province. Again using Nova Scotia as an example, out of a total of \$927.9 million transferred to the provinces in 1968-69 Nova Scotia could expect  $\$927.9 \text{ million} \times 0.0258$  or \$23.9 million, whereas it received \$95.1 million, so the net transfer was \$71.2 million. The fraction of this \$71.2 million spent on provincial income maintenance programs was estimated to be that fraction of the sum of total provincial revenue from own sources



and unconditional grants which was spent on provincial income maintenance programs. In 1968-69 the province of Nova Scotia spent \$6.0 million of its own funds on provincial income maintenance programs [data from "Welfare Services in Nova Scotia", Nova Scotia Department of Social Services] out of a total of \$162.5 million revenue from its own sources and the \$95.1 million in unconditional grants. Data on provincial government revenue comes from the Statistics Canada annual publication "Provincial Government Finance", Cat. No. 68-207.

Table 3

NET TRANSFERS DUE TO INCOME MAINTENANCE PROGRAMS

	Conditional Grants	Unconditional Grants	Transfers to Persons	Total
(Millions of dollars)				
<u>Nova Scotia</u>				
1968-69	6.0	1.7	53.0	60.7
1969-70	8.3	1.4	58.7	68.4
1970-71	7.0	1.3	61.5	69.8
1971-72	10.2	1.4	81.5	93.1
<u>New Brunswick</u>				
1968-69	6.5	2.8	45.9	55.2
1969-70	7.5	2.6	49.1	59.2
1970-71	8.4	3.0	52.2	63.6
1971-72	12.0	3.8	72.2	88.0
<u>Prince Edward Island</u>				
1968-69	2.2	1.2	14.5	17.9
1969-70	2.5	1.0	15.2	18.7
1970-71	2.6	1.5	16.5	20.6
1971-72	2.7	1.5	21.8	26.0

Source: Based on Table 2 and data in "Federal Government Finance", and "Provincial Government Finance", Statistics Canada, Cat. Nos. 68-211 and 62-207, and in "Welfare Services in Nova Scotia", Nova Scotia Department of Social Services, and "Annual Reports", New Brunswick Department of Social Services (see text for details of method of calculation).



From this we have  $\frac{6.0}{(162.5 + 95.1)} \times 71.2$  or \$1.7 million. This \$1.7 million is the amount of the net federal unconditional grants to Nova Scotia in 1968-69 which was spent on provincial income maintenance programs (see column 2 of Table 3 for this figure and similar data for other years and provinces).

Finally the federal government transfers income maintenance payments directly to persons under such programs as Unemployment Insurance and the Canada Pension Plan. For our purposes it was necessary to calculate the total from such programs being transferred to each Maritime Province in 1968-69 and estimate the net transfer. Data on unemployment insurance benefits by province are available in "Statistical Report on the Operation of the Unemployment Insurance Act" which is published monthly by Statistics Canada, Cat. No. 73-001. Data on Old Age Security payments, Canada and Quebec Pension Plan benefits, Family and Youth Allowances are available in the Annual Reports of the Department of National Health and Welfare. Totals for Local Initiatives Program, Opportunities for Youth and Manpower Training were supplied by the Department of Manpower and Immigration.

Illustrating once more with Nova Scotia, in 1968-69 Nova Scotians received \$125.9 million of a total of \$2824.3 million transferred to persons directly by the federal government under the above programs. According to its share of taxes Nova Scotia would receive \$72.9 million (.0258 times

\$2824.3 million) so a net transfer of \$53.0 million occurred (see Table 3). The working data underlying the results in Table 3 are presented in Table 4.

#### The Effect of Lags

We cannot straightforwardly estimate the aggregate demand effects as the product of the multipliers and of the net transfers in Table 3, because there will be a lag before the full aggregate demand effect of any transfers is felt. Suppose that from 1965 onwards one dollar per year were transferred (net) to Prince Edward Island through some income maintenance program. The full shift of 27.6 cents of aggregate demand to Prince Edward Island from the rest of Canada would not occur right away, but would take a length of time depending on the lags in the circular flow of expenditures. It might be two years before most of the effect was felt. Consequently, if we examined the level reached by net transfers in any particular year, and applied the multiplier to them, the resulting estimate of the increase in aggregate demand would be correct only if net transfers had been steady at that level for two or more years. If they were higher than they had been two years ago the true aggregate demand effect would be rather lower. The following section develops an estimating method that allows for this problem.



Table 4

DATA USED IN ESTIMATING NET TRANSFERS

(In millions of dollars)

	1968-69	1969-70	1970-71	1971-72
<u>Conditional Grants Under Income Maintenance Programs</u>				
Nova Scotia	13.8	16.5	17.8	22.6
New Brunswick	12.2	13.5	16.7	21.5
Prince Edward Island	3.0	3.4	3.8	4.1
Canada	301.3	310.7	408.8	472.9
<u>Unconditional Grants</u>				
Nova Scotia	95.1	95.5	101.5	102.9
New Brunswick	81.0	85.2	85.9	103.0
Prince Edward Island	15.9	18.2	23.2	24.2
Canada	927.9	1,000.5	1,318.9	1,490.3
<u>Provincial Expenditures from Own Revenue</u>				
Nova Scotia	6.0	6.5	7.2	8.3
New Brunswick	11.0	11.6	16.7	18.4
Prince Edward Island	3.9	3.3	4.7	4.7
<u>Total Revenue from Own Sources</u>				
Nova Scotia	162.5	228.4	270.4	279.9
New Brunswick	164.8	206.5	244.6	249.2
Prince Edward Island	26.0	30.2	37.7	37.9
<u>Federal Transfers to Persons</u>				
<u>Nova Scotia</u>				
Unemployment Insurance	20.5	24.3	29.8	46.3
Old Age Security	69.3	76.1	82.9	97.1
Canada Pension Plan	0.8	2.3	4.5	6.7
Family Allowances	21.3	21.1	21.0	20.9
Youth Allowances	2.8	3.0	3.2	3.3
Manpower Training	11.2	15.9	17.1	16.3
Local Initiatives Program	-	-	-	10.3
Opportunities for Youth	-	-	-	1.5
Total	125.9	142.7	158.5	204.4
<u>New Brunswick</u>				
Unemployment Insurance	20.5	22.8	27.6	41.6
Old Age Security	52.0	57.7	62.7	73.2
Canada Pension Plan	0.6	1.7	3.2	5.2
Family Allowances	18.4	18.1	17.8	17.7
Youth Allowances	2.5	2.6	2.7	2.7
Manpower Training	5.3	7.6	12.4	14.4
Local Initiatives Program	-	-	-	10.1
Opportunities for Youth	-	-	-	1.2
Total	99.3	110.5	126.4	166.1
<u>Prince Edward Island</u>				
Unemployment Insurance	3.9	3.9	4.5	7.1
Old Age Security	12.6	13.8	14.7	17.2
Canada Pension Plan	0.0	0.2	0.5	0.8
Family Allowances	3.2	3.1	3.1	3.1
Youth Allowances	0.4	0.4	0.4	0.4
Manpower Training	2.0	3.1	3.9	4.1
Local Initiatives Program	-	-	-	2.2
Opportunities for Youth	-	-	-	0.4
Total	22.1	24.5	27.2	35.3
<u>Canada</u>				
Unemployment Insurance	459.2	542.1	757.0	1,124.8
Old Age Security	1,541.3	1,730.5	1,907.2	2,205.4
Canada Pension Plan	21.1	62.9	119.5	192.0
Family Allowances	560.2	560.1	557.9	554.4
Youth Allowances	52.5	55.1	58.0	59.7
Manpower Training	190.0	245.0	289.6	328.4
Local Initiatives Program	-	-	-	175.9
Opportunities for Youth	-	-	-	31.0
Total	2,824.3	3,195.7	3,689.2	4,671.6

Source: Transfers of conditional and unconditional grants were obtained from "Federal Government Finance", Cat. No. 68-211.  
 Data on provincial expenditures from own revenues were obtained from "Welfare Services in Nova Scotia", Nova Scotia Department of Social Services, Annual Reports and Quarterly Statistical Bulletins of New Brunswick Department of Social Services and from "Provincial Government Finance", Cat. No. 68-207.  
 Total Revenue from own sources was obtained from "Provincial Government Finance" also.  
 The totals for Unemployment Insurance payments were calculated from Statistical Report on the Operation of the Unemployment Insurance Act, Cat. No. 73-001.  
 Totals for Old Age Security, Family Allowances, Youth Allowances and Canada Pension Plan came from the Annual Reports of the Department of National Health and Welfare as well as the Annual Reports of the Canada Pension Plan.  
 The Manpower Training and Local Initiatives and Opportunities for Youth totals came from the Annual Reports of the Department of Manpower and Immigration and from unpublished sources within the same departments.



Allowing for Lags in the Multiplier Process

Let the present time be  $\bar{t}$ . Let the multiplier be  $m$ , the multiplier time period  $t^*$ , and let the value of the incomplete multiplier from time  $\bar{t} - t$ , when  $\bar{t} - t < t^*$ , be the function  $m(\bar{t} - t)$ . Then

$$m = m(\bar{t} - t^*)$$

Let transfers be  $T(t)$ .

At time  $\bar{t}$  the total increment to aggregate demand from all transfers past is the sum of two amounts. One is the value of transfers at a time  $t^*$  units in the past times the full multiplier:

$$mT(\bar{t} - t^*)$$

For the other, consider time  $t$ , where  $\bar{t} - t^* < t < \bar{t}$ .

From time  $t$  to  $t + dt$  transfers rise by  $dT$ . To these extra transfers  $dT$  a partial multiplier applies, by time  $\bar{t}$ , of  $m(\bar{t} - t)$ . Thus the present increment to aggregate demand from  $dT$  at time  $t$  is  $dT \times m(\bar{t} - t)$ . Summing all such  $dTs$  from time  $\bar{t} - t^*$  to the present time  $\bar{t}$ , we get

$$\int_{t = \bar{t} - t^*}^{t = \bar{t}} m(\bar{t} - t) dT = \int_{\bar{t} - t^*}^{\bar{t}} m(\bar{t} - t) \frac{dT}{dt} dt$$

Thus the total aggregate demand effect is

$$mT(\bar{t} - t^*) + \int_{\bar{t} - t^*}^{\bar{t}} m(\bar{t} - t) \frac{dT}{dt} dt$$

Without loss of generality in this case we may put  $\bar{t} = t^*$ , i.e., we may choose the zero time point as being back in time by precisely the length of the full multiplier period. Then the multiplier is

$$M = mT(0) + \int_0^{t^*} m(t^* - t)T'(t)dt$$

We also obtain, then,  $m = m(0)$ .

Suppose, for example, that  $T(t) = T(0)(1 + bt)$ .

Then

$$\begin{aligned} M &= mT(0) + \int_0^{t^*} m(t^* - t) \frac{d}{dt} [T(0)(1 + bt)] dt \\ &= mT(0) + bT(0) \int_0^{t^*} m(t^* - t) dt \\ &= mT(0) + \frac{T(t^*) - T(0)}{t^*} \int_0^{t^*} m(t^* - t) dt \end{aligned}$$

A linear approximation to  $m(t^* - t)$  will serve, so we may write

$$m(t - t^*) = m \frac{t}{t^*}$$

Thus

$$\begin{aligned} M &= mT(0) + \frac{T(t^*) - T(0)}{t^*} \left[ \frac{mt^2}{2t^*} \right]_0^{t^*} \\ &= \frac{m}{2} \{T(0) + T(t^*)\} \end{aligned}$$

We may obtain  $T(0)$  and  $T(t^*)$  by fitting a straight line to a number of past observations; we chose the last three years'

observations. We also assumed that the multiplier time period was two years. It can then be shown<sup>1/</sup> that

$$1/2 \{T(0) + T(t^*)\} = 1/3 \{T(0) + T(1) + T(2)\}$$

Thus the multiplier may be applied to the average of the last three years' net transfers to get the current years' aggregate demand effect.

\* \* \*

The latest fiscal years for which complete data were available at the time of writing were 1968-69 through 1971-72. Given the method just developed for allowing for lags the aggregate demand effects can then be calculated for 1971-72 and were \$26.8 million in Nova Scotia, \$19.0 million in New Brunswick, and \$5.9 million in Prince Edward Island.

We may draw out the employment implications of these results by first considering Nova Scotia. GNP in Nova Scotia in 1971-72 has been estimated at \$2.6 billion (Table 5). Using this figure the increment to aggregate demand would be 0.8 per cent of GNP in the province. This increase in aggregate demand will increase employment, and we assume that in the long run the increase in jobs is proportional to the increase in GNP,<sup>2/</sup> so that

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<sup>1/</sup> Let the time trend be  $T(t) = \alpha + \beta t$ ,  $t = 0, 1, 2$ . Then  $T(0) + T(t^*) = T(0) + T(2) = 2\alpha + 2\beta = [(\alpha) + (\alpha + \beta t) + (\alpha + 2\beta t)] \times [2/3] = 2/3[T(0) + T(1) + T(2)]$ . Q.E.D.

<sup>2/</sup> Short-run multipliers fall well short of unity, but income maintenance programs are mostly permanent, so that the long run is relevant here. Capital and natural resources then cease to be constraints, and assuming constant returns, the long-run multiplier will be unity.



jobs will increase by 0.8 per cent. Based on employment in Nova Scotia in 1971-72 (see Table 5), this represents about 1,900 jobs. Abstracting from discouraged or additional worker effects this implies a reduction of about three-quarters of a percentage point in the Nova Scotia unemployment rate.

Table 5

ESTIMATES OF GROSS PROVINCIAL PRODUCT AND  
EMPLOYMENT BY PROVINCE, 1971-72

	Nova Scotia	New Brunswick	Prince Edward Island
Gross Provincial Product (Millions of dollars)	2,600	2,000	290
Employment (Thousands of persons)	240	200	36

The effects in New Brunswick and Prince Edward Island can be calculated similarly. In New Brunswick the unemployment rate is reduced by about one percentage point. In Prince Edward Island, the effect is apparently stronger -- a reduction in the unemployment rate of about two percentage points. For Prince Edward Island, however, there is more uncertainty about the size of the multiplier, which may well not be as large as 27 cents. Even so, the employment-creating effect is not likely to be any less than in New Brunswick and Nova Scotia.

Conclusion

The net transfer to the Maritimes occurring as a result of the complex of income maintenance programs has a substantial

and permanent aggregate demand effect. If the effect appears entirely in employment (and does not come out as high wages) it is sufficient to keep employment rates about one percentage point below what they would otherwise be.

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Glynn, Tony

Estimates of the  
aggregate demand

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