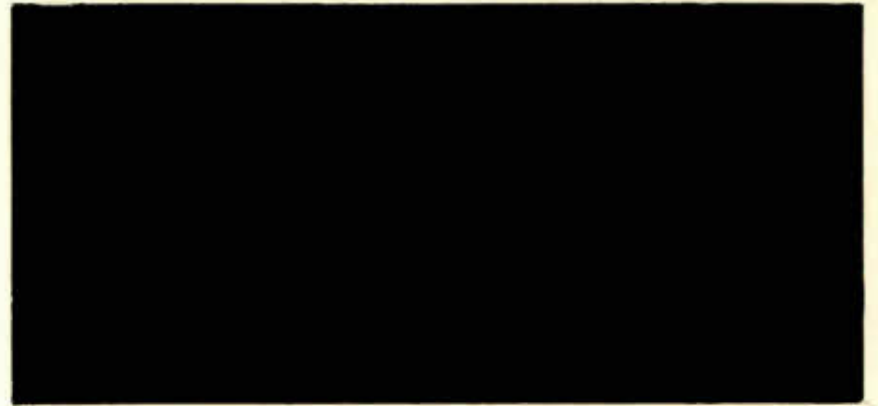
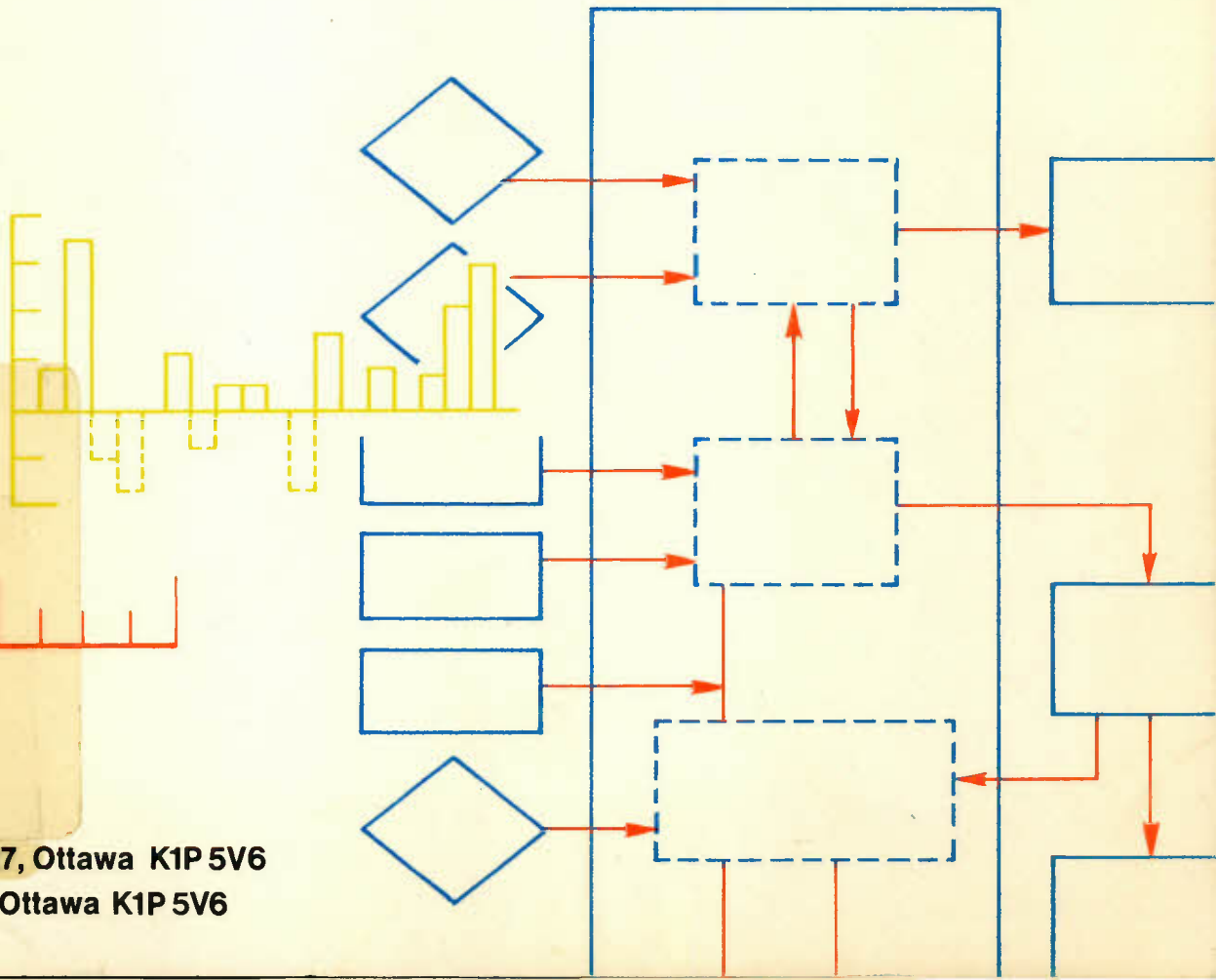




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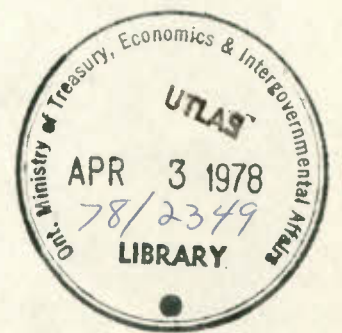
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DISCUSSION PAPER NO. 93

The Costs and Benefits of
Industrial Location Grants

by Neil Swan and A. Glynn



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Résumé

Le présent document traite de quelques problèmes soulevés par l'estimation des coûts et des avantages des subsides alloués aux entreprises par le Ministère de l'Expansion économique régionale. Il soutient qu'une évaluation rigoureuse de ces coûts et bénéfices exigerait l'existence d'une théorie universellement acceptable des vraies causes des disparités régionales. Plusieurs théories sont esquissées. L'une d'elles semble cependant plus adaptée aux données disponibles; cette dernière veut que la demande globale soit plus déficiente dans les régions à haut niveau de chômage que dans les régions où le chômage est faible; on explique ainsi en partie pourquoi les taux de chômage diffèrent d'une région à l'autre et comment la politique de stabilisation agit, même si de façon imparfaite, de façon à ce que l'économie fonctionne en moyenne à un niveau de capacité supérieur à ce qu'elle aurait connu sans elle. Si la théorie est exacte, il est alors possible de dériver une formule nous permettant de calculer le rapport avantages/coûts des subsides du MEER. L'un des paramètres de cette formule est déterminé par la sensibilité de l'émigration à la disponibilité des emplois pour une région donnée. On estime à zéro cette sensibilité au Québec, et on fait appel à une gamme plus généreuse pour les autres régions. L'application de la formule aux accords du MEER conclus pendant les années 1970-1972 implique que le rapport avantages-coûts de ces derniers n'a pas été au-dessous de 3. Néanmoins, d'autres théories des disparités régionales, pour lesquelles le rapport avantages-coûts serait bien au-dessous de l'unité, ne peuvent pas être rejetées définitivement.

SUMMARY

The paper discusses certain problems in calculating costs and benefits of grants under the Regional Development Incentives Act of the Department of Regional Economic Expansion. It argues that no rigorous evaluation of costs and benefits is possible in the absence of an agreed upon theory of the causes of regional unemployment disparities. Several possible theories are developed in outline form, and a case is made that one of them fits the presently known facts rather better than the others. That is the theory that aggregate demand is more deficient in high-unemployment regions of Canada than in low-unemployment ones, accounting for part of the unemployment differentials, and that stabilization policy works, not perfectly, but in the sense of being able to hold the economy, on average through time, closer to capacity output than would be the case in the absence of the policy. If the theory is indeed applicable, a formula can be developed for the benefit-cost ratio of RDIA subsidies. One parameter in the formula depends on the sensitivity of out-migration flows to job opportunities in a region. This sensitivity is taken as zero in Quebec, and as lying between rather broad limits outside Quebec. Application of the formula to RDIA agreements concluded over the 1970-72 period implies that their benefit-cost ratio was not less than three. Nevertheless, other theories of regional disparities, under which the benefit-cost ratio would be well under unity, cannot be categorically rejected.

For many years Canada has operated a program of grants to firms who will locate or expand in high-unemployment regions, first under the Area Development Incentives Act (ADIA), and then under the Regional Development Incentives Act (RDIA). The latter is administered by the Department of Regional Economic Expansion (DREE).

A recent publication of the Council¹ analysed the success of these programs. The methodology used has been criticized.² It is the purpose of this Discussion Paper to discuss further how RDIA, the present program of location assistance to firms, could be evaluated.

Two important questions need to be tackled in the evaluation of RDIA. One is whether jobs are created in the high-unemployment regions by RDIA grants, or whether a partial or

1 Economic Council of Canada, Living Together: A Study of Regional Disparities (Ottawa: Minister of Supply and Services Canada, 1977), cf. Chapter 8.

2 Ottawa Citizen, Saturday, April 23, p. 1, article by D. Seller, and Letters to the Editor, issues of Monday, April 25; Thursday, April 28; and Tuesday, May 3. A part of the criticism concerned methodology, another part, not at issue here, concerned the fact that one of the tables in "Living Together" (Table 8-8), contained an incorrect number for expenditures that, based on the methodology the Council used, gave very slightly more favourable results for RDIA than the correct number would have done. Specifically, in the third row, the number 248 should have been 264. In addition, the source of the table should read "Table 8-3, and annual reports of the Department of Regional Economic Expansion", and the title should read "Net Increment to National Output, in all Years After 1970, as a Result of RDIA Agreements Concluded in 1970-72, Under Various Assumptions About Incrementality". To match the changes in the table, in the paragraph immediately below, \$98 million should be changed to \$82 million and 18 per cent to 19 per cent.

complete "crowding-out" effect occurs. Evidence presented elsewhere¹ suggests that a crowding-out effect exists, but it is far from complete. This conclusion is broadly in line with much previous research.² The other, to be examined here, is how one

1 In Chapter 8 of "Living Together".

2 Previous direct estimates of the proportion of DREE subsidized investment that really creates jobs tend to focus not so much on crowding-out as on whether each particular firm would or would not have come without the grant it received, with less attention paid to the possibility that other, non-grant receiving firms, might fail to enter a region, or be forced to leave a region, as a result of assistance given to other firms. See, for example: Atlantic Provinces Economic Council, The Atlantic Economy, Fifth Annual Review (Halifax: APEC, October 1971); David J. V. Springate, "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; Atlantic Development Council, Regional Development Incentives Program: Atlantic Region (St. John's: ADC, 1976); and Department of Regional Economic Expansion, "Assessment of the Regional Development Incentives Program", a staff paper, April 1973. A number of other writers have tried indirect tests, which do allow for crowding-out, such as examining whether the level of manufacturing employment or investment shows unexpected deviations from trend (see, for example, D. Usher, "A Critique of the Canadian Program of Subsidizing Investment in the Less-Developed Regions", Discussion Paper No. 145, Queen's University). These tests have usually proved inconclusive, and it is in that sense that the incomplete crowding-out effect argued for in "Living Together" is in line with previous work. Mention should also be made of two important theoretical arguments. Woodward, Robert S., "The Capital Bias of DREE Incentives", Canadian Journal of Economics. Vol. VII, No. 2 (May 1974), argues that capital will crowd out labour; to the extent that there is crowding out of nongrant receiving firms an industry will use less labour for a given output, even though, if crowding out is not 100 per cent, total industry output will increase. This possibility was not allowed for in the research in "Living Together". For reasons outlined in Appendix B to this document, we are sceptical about Woodward's argument that the grants are capital biased. Usher argues, in "A Critique ..." that "Unless rent-earning factors of production can be identified, a program of subsidization at the margin [such as R.D.I.A.] serves only to generate windfall gains to recipient firms and windfall losses to other firms without increasing output at all". The findings of an incomplete crowding-out effect imply, therefore -- if one accepts them -- that rent-earning factors of production do exist. This would not be surprising in the Atlantic, where there are often less than half a dozen firms in a given (three-digit) industry, but Usher's theory might suggest that we cannot generalize findings for the Atlantic region to a larger region, like Quebec, where such rents are less likely to occur. It is assumed here, nevertheless, that such generalization is reasonably valid.

might assess the value of the jobs created in high-unemployment regions relative to the cost of creating them.

* * *

To facilitate discussion we shall use "H" as a shorthand expression for "high-unemployment areas" and "E" as a substitute expression for "the rest of the economy". In our shorthand terminology, the most important questions to be answered are whether creating jobs in H, via the RDIA grants, correspondingly destroys jobs in E, and whether creating jobs in H inhibits migration from H to E. The cost-benefit evaluation hinges heavily on the answers to these questions.

We begin by assuming no migration, and then introduce this possibility.

One may visualize the RDIA procedure as being essentially a payment to a company to put a plant where it would not otherwise do so. If the legislation works perfectly, the payment is just enough to leave profits unchanged, despite the higher costs. (In practice the payment will likely be a little higher than this, but this does not matter.)

Consider now a company that accepts the payment and locates in H, where it crowds out some other jobs that would have been there, but not enough to offset the job-creation effect.¹

¹ About 30 per cent to 60 per cent of the jobs created are lost through crowding-out, according to the estimates in "Living Together".

Obviously the jobs that it now provides in H no longer exist in E, but equally obvious is that some or all of these will be replaced by other companies and jobs that there is now room for in E in the absence of the company that has gone to H. This is the counterpart in E of the crowding-out effect in H. We might call it a "crowding-in" effect. If the crowding-in effect is 100 per cent, no jobs are lost in E; if it is zero, more jobs are lost in E than are gained in H; if it is equal to the crowding-out effect in H, no net jobs are created in the country as a whole.¹ Let us now consider closely the question of what happens to jobs in E. This depends on what model of the economic system one considers most appropriate. We look at several theoretical possibilities.

A. Classical World, Geographical Pockets of Structural Unemployment

In this kind of world, wage flexibility or other automatic mechanisms are adequate to ensure full employment in E, but structural factors, such as the decline of industries employing older employees who cannot retrain, are responsible for the unemployment in H. Notice that the unemployment in H is not due to frictional factors, by which we mean imperfections in the mechanisms for matching unemployed workers with vacant positions. Rather, there is a structural mismatch between the qualifications and characteristics of the unemployed and the requirements of naturally occurring vacancies.

¹ Suppose a hundred jobs in the company that moves, with a crowding-out effect of 40 per cent, so that sixty jobs net are created in H. If the crowding-in effect is 40 per cent in E, sixty jobs are lost there (100 less 40 crowding-in). The sixty-job gain in H is just offset by a sixty-job loss in E.

In this kind of world, to the extent that RDIA succeeds in creating jobs in H,¹ it is clear that no jobs are eliminated in E, for in the latter region the market mechanism is working and ensures that any temporary shortfall of jobs, such as that caused by a withdrawal of investment elsewhere due to DREE grants, is automatically compensated for by appropriate market adjustments.

B. Keynesian World, With Pockets of Structural Unemployment

In this world, we do not assume that market mechanisms automatically maintain full employment in E, but we do assume that demand-management policies can achieve the same end. Only in H, where there are structurally unemployed, does this interventionist mechanism for ensuring full employment fail.

If the world is of this kind, we have essentially the same situation as in case A. The mechanism for ensuring that jobs temporarily eliminated in E are fully replaced is different, but the end result is the same. To the extent that RDIA is successful in creating jobs in H, there is no offset in terms of jobs lost in E.

C. Classical World, With "Natural" Rates of Unemployment Varying Geographically

Here the "excess" unemployment in H is essentially frictional -- the mechanisms for matching unemployed workers

1 If the unemployment is structural, only certain types of plants will be able to employ the unemployed. With the wrong plants there would simply be a 100 per cent crowding-out effect. That there appears not to be may be one more piece of evidence that the unemployment is not in fact structural, or it may mean that the right types of plant do get built.

and vacancies are not perfect. In such a case, since unemployment is already at the minimum level in each region, RDIA programs will not work, and there can be no creation of jobs, or even diversion of jobs from one region of the country to another. There is no gain or loss in terms of the level of unemployment. There is a deadweight loss in terms of the administrative cost of the RDIA program, and there is a redistribution of income from E to H in the first instance, and probably from E to H on a complete general equilibrium analysis, after allowance has been made for factors such as the partial or complete ownership of companies in H by residents of E, etc.

In analysing the redistributive aspects of the RDIA program, or indeed of the DREE program as a whole, this is a convenient and acceptable model to use from a methodological point of view, in that it isolates the pure distributional effects. It is, if we understand it correctly, the model underlying a recent paper by I. Gillespie and R. Kerr.¹

D. Keynesian World, Demand More Deficient in H Than in E

The greater-than-average demand deficiency in H may occur only during recessions, or may occur both then and during normal times. A classicist might describe essentially the same state of the world by

1 W. Irwin Gillespie and Richard Kerr, "The Impact of Federal Regional Economic Expansion Policies on the Distribution of Income in Canada", Economic Council of Canada Discussion Paper No. 85, 1977.

arguing that wages were too high in H relative to E to clear the labour market, either during recessions or all the time.¹

In order to handle this case appropriately several possible variations of it must be distinguished.

Case (i): No national aggregate demand policy by government

In E and H demand fluctuates through the cycle, but as the peak of the cycle is approached serious capacity limitations and inflationary pressures appear first in E. The RDIA program transfers the locus of production of part of national demand from E to H. At the peak of the cycle this will reduce inflationary pressure in E with little elimination of jobs, and create extra jobs in H with little inflationary pressure. At the trough of the cycle, however, when inflationary pressure is low everywhere, the RDIA program is likely to shift jobs with no net creation of them.

Case (ii): Aggregate demand policy is in use

(a) Suppose first that the aggregate demand policy is perfect, in the sense that E can be held at precisely the level of capacity that is considered desirable as defined by the resulting

1 If institutional mechanisms set the real wage and set it at a level in H high enough, at all times, to generate the observed historical trend value of H's unemployment rate, e.g., if unions pick a value of u in H, and accept whatever wage results, then regional unemployment disparities will be imper-
vious to any policy or natural adjustment mechanism, whether based on classical or Keynesian theory. This possibility is testable (for example, it implies differently positioned regional Phillips curves, though it is not the only theory to do so), and we have rejected it, on the basis of testing for regional Phillips curves, in N. Swan and A. Glynn, "The Feasibility of Regionalized Stabilization Policy", paper presented at the June 1976 Meetings of the Canadian Economic Association.

unemployment and degree of inflationary pressure. Suppose, for example, that X per cent utilization of resources is the desirable level. The impact of RDIA would be, if no corrective action were taken, to lower the utilization rate in E from X to X' , say, while raising the level of utilization in H. However, if policy is perfect, it can and will restore the utilization of resources in E from X' back to X . Unless policy can be regionally differentiated, however, holding E at X per cent is insufficient to bring H to X per cent. The RDIA program helps to achieve this, in that it shifts production from E, where aggregate demand policy can ensure its restoration, to H, where aggregate demand policy cannot achieve a tight enough utilization of resources. The upshot is that the RDIA program creates jobs in H, with no loss of jobs in E.

(b) Next, suppose that policy is not perfect in the sense that demand cannot be manipulated to hold capacity utilization at exactly X per cent in E, but that it does achieve this on average, sometimes overshooting and sometimes undershooting. The institution of an RDIA program will then temporarily change the mean percentage of capacity at which E is operated, from say X per cent to some lower figure, X'' . Correspondingly, it will raise the average percentage degree of capacity operation in H closer to X , the desired level. That means there is a once-for-all deflationary impact on E whenever the RDIA program is successful. But even an imperfect stabilization policy in E can compensate for this change, in that the mean capacity level around which policy operates can be brought back from X'' to X , the desired percentage. It seems likely that the difficulty stabilization policy faces in E of

keeping the economy steadily at the chosen percentage of capacity results from a complex of factors tied to intertemporal variability in demand and lags in policy implementation. There is no reason to expect that these problems will be exacerbated by the RDIA program. Thus the failure to manage demand in E so as to keep it steadily at full employment in no way implies that the RDIA program must extinguish jobs there. Even an imperfect stabilization policy will, in the long run, be able to compensate for any secular change in demand levels in E, such as the one that the RDIA program is intended to bring about.

(c) Only if policy is imperfect in the sense of being so badly timed that it stimulates demand during periods that are naturally expansionary and contracts it in contractionary ones, so that the mean capacity utilization rate is the same with and without policy, will RDIA worsen matters in E. This is the same as case (i). A different possibility is that the planned policy fails, not because of timing, but because the Keynesian model is inappropriate. But if this is the case, E will be at its "natural" rate of unemployment, and the RDIA program will not eliminate jobs in E, for precisely the same reasons as those that cause aggregate demand policy to fail; we are back to case C.

* * *

It is clear that our view of the effectiveness of DREE, insofar as its objective is the creation of additional jobs rather than the geographical redistribution of a given stock of jobs, depends very much on what the current correct explanation of regional differences in unemployment is. That is not surprising.

In "Living Together" the Council argued that demand is substantially more deficient in the high-unemployment regions.¹ Moreover it took an optimistic view of the effectiveness of stabilization policy, in the sense of accepting that it works even though it may be far from perfect. This view is described by case D (ii) (b) -- the world is Keynesian, with policy that is capable of holding unemployment at a constant (but not necessarily optimal) average value in E, so that DREE policies are one way of supplementing national aggregate demand policy so as to get more employment in total. All this, provided migration is ruled out. What difference is made if we drop this assumption?

Allowing For Migration

It may be maintained that RDIA is pointless even if it does create jobs because in the absence of RDIA enough persons would have migrated from H to E to create as many or more new jobs in E as RDIA would have created in H.² It is necessary for this argument's validity (though not sufficient) that no problem exists in finding jobs for the in-migrants to E, either because E is classical or because stabilization policy is effective in E. We shall limit our discussion to two cases, D(ii)(b) already described, and a second one, not applicable in the absence of migration and therefore not earlier discussed: it would link steady state unemployment differences to steady state differences in migration rates.¹

1 In Chapter 6.

2 It does not have to be the unemployed who move, since each departure of an employed person will create a vacancy for an unemployed person.

We begin with a situation in which demand deficiency exists in H, but never in E, and in which there is no labour force growth or technical change. Suppose further that migration occurs from H to E in response only to the difference in unemployment rates. In the absence of RDIA, labour will flow from H to E, and the consequent reduction of labour supply in H will reduce unemployment there. In the presence of RDIA, the location of enough of E's production will be shifted to H to reduce unemployment that way instead. Thus, migration and RDIA are substitutes, with the difference being that RDIA's real resource cost is measured by the subsidies required to move the companies, plus the administrative costs, while the real resource cost of the migration is the cost of physically moving the people and their dependents.

The main difficulty with this model is its implicit assumption that aggregate demand is homogeneous of degree zero in total population. In a simple Keynesian model aggregate demand is the product of a multiplier and total autonomous spending. But autonomous spending will not in the long run be invariant to the size of the population in the geographic area within which that spending occurs. There is clearly more "autonomous" spending in the United States than there is in Canada. The reasons are

1 Two brief comments on other cases may be worth making. If the unemployment in H is structural, it will persist in E even if the unemployed migrate there, and will require an "E-based" DREE program or its equivalent. If the unemployment in H is at the natural rate, migration will lower national unemployment only to the extent that the weighted average of the E and H natural rates will gradually move to the E level as people move from E to H.

straightforward enough: more people means more need for the services of government (one type of "autonomous" spending), more need for capital equipment to supply private goods and services and, under normal assumptions about the role of relative domestic prices in determining the allocation of production between traded and nontraded goods, a greater absolute quantum of net exports. It seems more plausible, if an extreme assumption is to be made about the degree of homogeneity of demand with respect to population, that that homogeneity be taken as unity. Then migration would subtract about as much from demand as it did from the labour force, and would leave the rate of unemployment in H unaffected. We would not go this far, but do consider that most of the effect of migration in reducing labour supply will be offset, in the long run, by concomitant demand-reducing effects.

The second difficulty is that a migration flow may be occurring not in response to unemployment in H, but in response to income from employment being lower in H than in E, or in response to noneconomic factors. If so, RDIA will not interfere with the migration process, but will rather complement it.

These two difficulties go some way, in our view, to explain the empirical observation that high relative unemployment rates in the Atlantic have persisted for twenty-five years, despite very substantial out-migration during that period.

* * *

With continuous labour force growth and technical change, such as we observe in all Canadian regions, demand deficiency has to be defined relative to potential output at each point in time. A demand-deficiency explanation of high unemployment in H has to mean that, although the long-run percentage growth rate of demand for output is equal to the sum of labour force growth and technical change, as a fraction of potential output its level at each point in time is less than in E. If the growth rate of potential output is the same in H and E, and is equal to the growth rate of total demand for output in each place, the case is analytically essentially the same as the static one just considered; the only difference is that all variables must be measured in percentages of the growing output or labour supply and demand, including the RDIA spending and the migration that is a possible alternative to it. And the comments on that static model will apply similarly. The more interesting case, and this brings us to the second model we wish to consider, is one where, for some reason or another, demand for output is growing more slowly in H than the sum of natural increase and productivity growth, and faster than this sum in E.

Suppose first that the rates of growth of demand for output and so of demand for labour, in H and E, are independent of their respective rates of growth of labour supply. Then there will have to be a continuous out-migration from H, and in-migration to E sufficient to bring the rate of growth of labour supply in each region into equality with the rate of growth of labour demand. In the absence of this equality wages will fall in H relative to wages in E, and

unemployment in H will rise relative to unemployment in E, until the rate of out-migration from H is forced up to the point where the rate of labour supply growth is equal to the rate of labour demand in each region. There will be a moving equilibrium in which the rate of migration, relative wages and relative unemployment rates are all at stable levels. Such a scenario is an alternative explanation of long-run unemployment and income disparities in Canada; it amounts to saying that the global rates of employment growth that each region can sustain are not necessarily the same as the global rates of growth implied by natural increase in their population.

What will be the impact of (continuously growing) RDIA grants in this scenario? It is difficult to be sure, but it seems that all they can do is transfer part of total national growth from E to H, without much affecting the national average unemployment rate. The latter will change only to the extent that the equilibrium unemployment rate needed to generate a somewhat smaller flow of out-migrants will be lower, and the equilibrium income differential smaller, than in the absence of RDIA. But the change in the latter two variables could be very small; if so, the end result of the program is a more inefficient production of national output, with the inefficiency measured by the administrative cost plus the grant cost of the RDIA program.

Let us now ask how likely it is that this "moving equilibrium" view is the correct explanation of regional disparities. As a preliminary to this, consider the following "gedanken" experiment with the model, whose relevance will become clear shortly. Imagine that out-migration from H is banned. The consequence in H will be that the

steady state unemployment rate will rise, and the rate of growth of per capita income will fall, though it may well remain positive. Since the ratio of per capita income in H to that in E was previously constant (if it had not been, the migration rate would have increased to the point where it was), it will now decline steadily. Thus income "disparity" will widen steadily.

We can now describe certain difficulties with the "moving equilibrium" view of regional disparities in Canada that make it rather implausible. First, net out-migration from Quebec has been exceedingly small in the last twenty-five years. Yet relative incomes in Quebec have not fallen, as the "gedanken" experiment suggests they should have, but have been roughly steady. One can avoid this difficulty only by adopting some other theory for Quebec, thereby treating it as a special case. Second, Saskatchewan and Manitoba have very substantial net out-migration -- more than the Atlantic region -- but much lower-than-average unemployment rates. This might be explained by supposing that people are so sensitive to low incomes that out-migration keeps unemployment not only lower than it otherwise would be, but lower than in high income regions. But then people in the Atlantic have very low incomes, much lower than in Saskatchewan and Manitoba, and yet unemployment is much higher than average. One can reconcile the two observations by postulating a very different sensitivity to low income in the two regions, but this seems forced, as do other rationalizations of the difference. Third, although Ontario has substantial immigration with lower-than-average unemployment, British Columbia has very substantial immigration with higher-than-average unemployment.

This difference needs to be explained by the moving equilibrium theory and it can be done only with difficulty. Finally, the theory makes the assumption that the rate of growth of demand for labour is independent of the rate of growth of labour supply. That assumption is contradicted by the facts for Canada as a whole, where the unemployment rate in the last twenty-five years has shown a remarkable insensitivity to changes in the rate of growth of labour supply.

These problems as a group lead us to the view that the "moving equilibrium" theory of unemployment disparities is less plausible than an explanation that links the disparities partly to differing relative degrees of demand deficiency,¹ and partly to differences in frictional and seasonal unemployment.²

Calculation of Costs and Benefits

It should be obvious by now that no rigorous evaluation of costs and benefits is possible in the absence of an agreed-upon theory of the causes of regional disparities in both unemployment rates and income levels. Perhaps that is not surprising. But we shall nevertheless make a tentative evaluation on the basis of the foregoing analysis. In our view, model D(ii)(b) best fits the facts, and it can be plausibly maintained that the existence of

1 Following evidence presented in "Living Together", Chapter 6, as well as in N. Swan and A. Glynn, "The Feasibility", op. cit.

2 See especially the work of W. Thirsk, "Regional Dimensions of Inflation and Unemployment", Prices and Incomes Commission, Monograph, (Ottawa: Queen's Printer, 1973), and F. Lazar, "Regional Unemployment Rate Disparities in Canada: Some Possible Explanations", Canadian Journal of Economics, February 1977.

migration flows does not seriously limit its applicability. Certainly in Quebec the likelihood is vanishingly small that any job creation by RDIA is merely a substitute for out-migration. Outside of Quebec there is more room for debate, and we leave the migration question open at this stage by supposing that some unknown fraction, say θ , of any jobs created by RDIA are simply substitutes for migration that would otherwise have occurred. We would argue for θ close to zero, but others might wish to put it close to unity. It depends on one's evaluation of the true mechanism underlying regional disparities. We shall set it between 0.3 and 0.7.

Benefits and costs should be evaluated separately for Quebec and the rest of Canada, in view of the migration issue. Outside Quebec we have

Benefits: $(1-\theta)$ x number of (incremental) jobs created x value per job
 θ x number of jobs created x migration cost avoided per person employed in those jobs

Costs: administrative expense attributable to RDIA outside Quebec
subsidies paid per job actually created¹ x θ x the number of jobs created
value of leisure foregone per job created x $(1-\theta)$ x number of jobs created.

1 Subsidies paid on jobs that are not incremental and that do not prevent out-migration are in the nature of transfers rather than real resources foregone.

In Quebec we have

Benefits: the number of jobs created x the value per job

Costs: administrative expenses attributable to subsidy program
value of leisure foregone per job created.

Define the following symbols.

- J_A : jobs claimed outside Quebec
 J_Q : jobs claimed inside Quebec
 v : value per job created, net of foregone leisure
 i : incrementality ratio
 m : migration cost per person
 S_A : subsidies committed outside Quebec
 A : total applicable administrative costs

Then the benefit-cost ratio will be

$$R = \frac{v(J_Q + (1-\theta)J_A) i + \theta m J_A i}{A + \theta S_A i}$$

An approximate calculation of R , for RDIA agreements concluded over the 1970-72 period, is given in Appendix A. It certainly seems reasonable to maintain that R is not less than three, making the program apparently quite valuable, socially speaking.¹ There are four reservations to this conclusion.

First, the theory of disparities that one believes in determines the validity or invalidity of the benefit-cost calculation we have made. On some theories the benefits could be zero,

¹ The Appendix estimates put R between three and nineteen.

on others they could be limited to migration costs saved, and would then fall well short of costs. In our view such theories do not fit the facts well, but they cannot be ruled out.

Second, if the disparity theory that we consider acceptable is valid, then although the cost-benefit calculation is also valid, it should be noted that an alternative remedy would be available, whose benefit-cost ratio could exceed that for RDIA. The remedy would be to stimulate aggregate demand in the high-unemployment regions, by means such as tax cuts or government expenditure increases. On the other hand, until this alternative is actually tried, we should not dispense with a program that is presently in place, if we consider that it is working and has a benefit-cost ratio well in excess of unity. In addition, RDIA subsidies stimulate export demand (or import substitution) and present a less serious "leakage" problem. Because of this, they may well be complementary to other demand-stimulating measures, rather than substitutes for them.

Third, there may be alternative uses of government funds with benefit-cost ratios even higher than RDIA, ranging from other methods of fighting disparities through government expenditures for different purposes and possibly even to tax reductions.

Finally, the redistributive effects of DREE as a whole, should also be considered. Gillespie and Kerr, for example, show that some income is transferred, to a surprising degree, from the poor in rich regions to the rich in poor regions, as

well as in the more usual way -- from the rich to the poor wherever they live -- by the DREE program. Effects like this might give pause to any thought that the program should be markedly expanded on the basis of presently existing evaluations of it, including this one.

APPENDIX A

Our intention in this Appendix is to arrive at a reasonably acceptable range for the benefit-cost ratio of the RDIA program, based on the formula given at the end of the main text. The data we shall use relate to RDIA agreements signed within the 1970-72 period, and allegedly generating jobs both within the period and in later years, as projects agreed to during 1970-72 were gradually implemented. We choose this period partly in order to retain comparability with previous work presented in "Living Together", and partly to ensure minimal "overhang" of agreements signed but not completely implemented. The average lag in implementation probably lies somewhere between one and three years, and it seems likely, in view of the form of the legislation and scattered other evidence, such as submissions to the Regional Development Subcommittee of Parliament, that the great majority of agreements are either completed or lapse within four years of the initial signing.

The values of J_A and J_Q are available directly from RDIA monthly reports. They are corrected for withdrawals in later years, which occur frequently enough that roughly one-quarter of all agreements initially signed are not subsequently carried through to the job-creation stage. Subsidies outside Quebec, S_A are available from the same source, and were corrected in the same way for withdrawals.

The value per job created net of foregone leisure is more difficult to assess. A change in April 1974 in the regulations concerning the incentives available under RDIA tied the grant for a

new facility and a new product expansion to the expected average annual wage and salary bill for the second and third year of operation of the project. Consequently the Monthly Report on Regional Development Incentives for the June to December 1974 period provides some idea of the expected average annual wage payable to employees in RDIA assisted projects. This average turns out to be \$7,509.

Although this estimate is based only on those grants approved for new facilities and for new product expansions and generally applies only to the smaller projects, we could not detect by regression analysis, any systematic relationship between the average value per job and the total number of jobs in a given facility. In the few cases where we had data on the average wage for large projects (in terms of both capital costs and employment) these averages differed only by small amounts from the overall average. Thus we can reasonably conclude that the average wage of \$7,509 is representative of most of the expected employment associated with RDIA activity during this period of time.

If we assume a two-year lag in the setting up of commercial operations this average wage refers not to 1974 but to 1977 when each project is likely to be in the second year of commercial operation. Now the RDIA average wage of \$7,509 is 60.4 per cent of the average industrial wage for January 1977 (Statistics Canada, Cat. No. 72-002, February 1977) the latest available data at the time of writing:-

$$(1) \quad \frac{W_R^{77}}{W^{77}} = 0.604$$

and applying this ratio to the average industrial wage for 1970-72 gives an estimate of the RDIA average wage for that same period:-

$$(2) \quad W_R^{70/72} = (0.604)W^{70/72}$$

which gives a value of \$4,331.

This average RDIA wage of \$4,331 is a weighted average of both male and female wages such that

$$(3) \quad W_R^{70/72} = w_m W_M^{70/72} + w_f W_F^{70/72}$$

where w_m and w_f are assumed to be the same as the shares of males and females in the total labour force (available from Statistics Canada, Cat. No. 71-201, 1976). In addition we know for 1970 that on average women earned 30 per cent less than men having corrected for occupational and education differences.¹ Thus we have

$$(4) \quad W_F = \alpha W_M \quad \text{with } \alpha = 0.70, \text{ so that}$$

$$(5) \quad W_R^{70/72} = (w_m + \alpha w_f) W_M^{70/72} \quad \text{which gives us } W_M^{70/72},$$

since $w_m = 0.657$, $w_f = 0.343$, $\alpha = 0.70$ and $W_R^{70/72} = \$4,331$. Having calculated $W_M^{70/72}$ we then have $W_F^{70/72}$. These are \$4,828 and \$3,380 respectively.

Subtracting the value of foregone leisure from each,² assuming that leisure is worth one-quarter to one-half of the minimum

1 "Living Together", *op. cit.*, Chapter 5.

2 Since we assumed that the labour used would have otherwise been unemployed we need to subtract an amount from these wages to allow for foregone leisure thus arriving at "net" wages. We do not allow for unemployed capital on the grounds that in the very long run, the appropriate "run" here, any unemployed capital would have migrated out of the region. Nor do we allow for pure profits, since at least in principle the subsidies given are supposed to be insufficient to generate such profits.

wage for males and one-half to two-thirds for females,¹ we obtain

$$(6) \quad W_M^* = \$4,828 - (\$735 \text{ to } \$1,470), \text{ and}$$

$$(7) \quad W_F^* = \$3,380 - (\$1,470 \text{ to } \$1,960).$$

The weighted average of these net wages is then

$$(8) \quad W^* = w_m W_M^* + w_f W_F^* \quad \text{which gives a range of } \$2,693$$

to \$3,344 for W^* .

In principle, a DREE job lasts as long as the average lifetime of a firm -- an unknown number, which we assessed, very conservatively we think, at five years. We discounted at 5 and 15 per cent, following a suggestion of Treasury Board² to arrive at estimates for V (the value added) of \$9,681 to \$14,836.

The value of M was set at \pm 50 per cent of the cost of moving a family of four from Halifax to Toronto. This information was obtained in a telephone conversation with a local transportation company and the current year estimate was deflated by the transportation component of the consumer price index to reflect 1970-72 costs. The range was \$1,350 to \$4,050.

A lower bound on administrative costs was estimated as RDIA's share of the total administrative costs of DREE, and an upper bound as the lower bound plus 12 per cent of RDIA expenditures themselves. RDIA's share

1 The minimum wage rates were supplied by the Department of Labour.

2 See "Benefit-Cost Analysis Guide", Planning Branch, Treasury Board Secretariat, March 1976, p. 26

of total administrative costs was set at 14.2 per cent, the share of RDIA expenditures in total DREE spending, while the 12 per cent of RDIA spending represents the deadweight loss and welfare costs associated with the program, following a suggestion by Usher.¹ The larger figure implies that tax reduction, rather than some other program, is the alternative to RDIA. These administrative costs range from \$2.3 million to \$15.5 million.

The value of i was estimated in "Living Together" as between 0.39 and 0.68.

These data are summarized in Table A-1, and they lead to a value of R lying between 3.5 and 19.2.

Table A-1

Values Used in Calculating R

	Minimum Estimate for R	Maximum Estimate for R
J_A	25,460	25,460
J_Q	40,472	40,472
V	\$9,681	\$14,836
i	0.39	0.68
M	\$1,350	\$4,050
θ	0.70	0.30
A	\$15.5m	\$2.3m
Discount rate	15%	5%

1 See D. Usher, "A Critique", op. cit., p. 48.

APPENDIX B

ARE DREE GRANTS CAPITAL BIASED?

Woodward has made a strong argument that DREE grants are capital biased.¹ We nevertheless feel that the case is not proven.

In principle a firm gets a grant just sufficient to prevent it making losses in a designated region -- this requirement is built into the legislation. Theoretically, then, the grant should make a firm just indifferent between production in a designated region and production elsewhere. Presumably, though this is the letter of the law, it cannot be its spirit -- an extra payment beyond the covering of losses must surely be offered in order to tip the scales in favour of location in a designated region. Thus we have

$$(1) \quad \text{Grant} = \text{Loss} + \text{Extra payment}$$

Now the loss, by definition, is the difference between cost of production at market factor prices and the value of output, i.e., in a familiar notation

$$(2) \quad \text{Loss} = \text{TC}(Q) - Qp$$

Moreover the grant cannot legitimately exceed some maximum, which has been variously defined. Many of the regulations historically used could be expressed by the inequality below

$$(3) \quad \text{Grant} \leq \text{Min} \left\{ \frac{\theta_1 L}{\theta_2 K}, \theta_1, \theta_2 \right. \text{ constants with K as capital} \\ \left. \text{and L as labour} \right.$$

1 Op. cit.

From (1), (2) and (3) we derive

$$(4) \quad \text{Extra payment} \leq \text{Min} \left\{ \begin{matrix} \theta_1 L \\ \theta_2 K \end{matrix} \right\} + Qp - \text{TC}(Q)$$

The firm's problem is to choose Q , L and K so as to maximize the extra payment, subject to constraint (4), and a production function $Q = f(K, L)$.

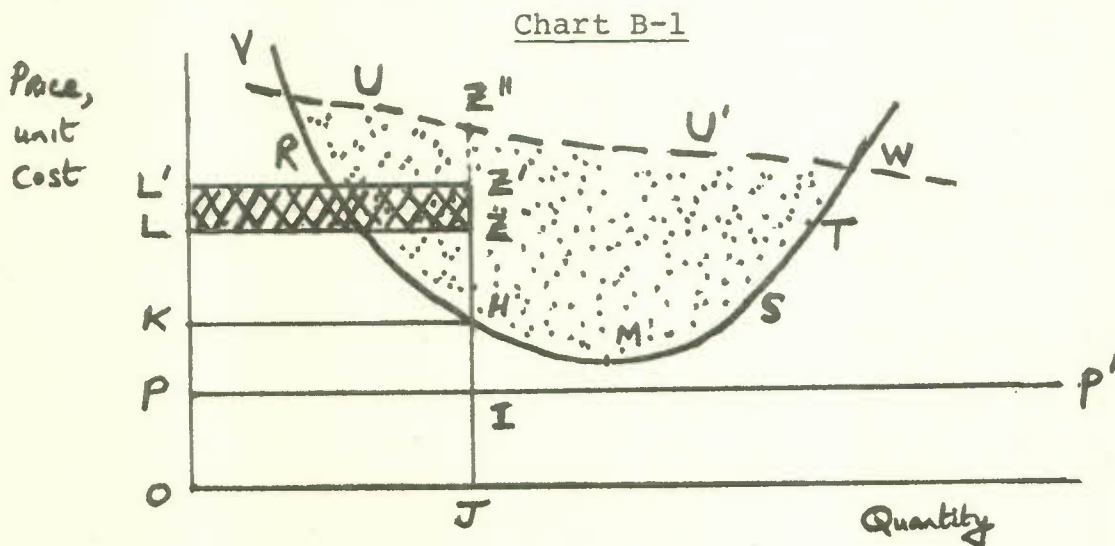
This problem cannot, however, be solved without knowing what variables the extra payment depends on. Suppose, as an extreme but informative example, that the extra payment is invariant to Q , K or L -- the variables the firm controls, so that

$$(5) \quad \text{Extra payment} = A, \text{ a constant}$$

Then as long as condition (4) holds, the firm gets the maximum extra payment of A . (4) then becomes

$$(6) \quad \text{TC}(Q) - Qp + A \leq \text{Min} \left\{ \begin{matrix} \theta_1 L \\ \theta_2 K \end{matrix} \right\}$$

Now consider the possibilities open to the firm, in terms of Chart B-1:



The curve of minimum unit cost at market factor prices is shown as RST, and the market price line for the product as PP'. A possible operating point is shown as Z. The losses, $TC(Q) - Qp$, are then rectangle P I Z L, and the extra payment, A, is shown as the cross-hatched area L Z Z' L'. Thus, the grant payable in total is P I Z' L'.

From (6) this area must be less than the minimum of $\theta_1 L$ and $\theta_2 K$. Now at output OJ the unit cost JZ could be reached either by choosing a more capital-intensive input mix than the optimal one (which gives unit cost JH) or by choosing a more labour-intensive input mix than the optimal one. Thus, the firm can choose points like Z, characterized by higher unit costs than the points on the minimum unit cost curve, by selecting either higher or lower capital-labour ratios than those on the curve. But there will be a limit on the extent to which unit costs for output OJ can be driven above the minimum level JH, imposed by the requirement that condition (6) not be violated. That limit may be a result of either the capital or the labour constraint in (6); which one does not matter for our purpose. The limit is shown as the height JZ" in the diagram. Similarly, for every other output there will be an upper limit on the unit cost that can be incurred consistent with satisfying condition (6). The locus of all such upper limits is shown as curve UU'.

Since the firm must also be above the minimum average cost curve, R H S T, it must operate somewhere inside the area V R H S T W U' U (shown dotted).

But the firm is absolutely indifferent among all points within this area. All give it an extra payment -- a "pure profit" -- of A. The government picks up all losses, including any inefficiency cost from not operating either on R H S T, or at the minimum point, M, of R H S T. There is absolutely no way of deciding whether the firm's choice within the dotted area will be more or less labour-intensive than point M, and so no way of concluding that grants are capital biased.

If the extra payment is not a constant, but a function of Q, L, or K or all of these, the analysis becomes more complex, but it remains clear that, without knowledge of the form of such a function, nothing can be said about the capital bias or otherwise of DREE incentive grants.

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