
THE ROLE OF EQUITY CONSIDERATIONS IN THE PROVISION AND PRICING OF PASSENGER TRANSPORTATION SERVICES

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I. INTRODUCTION: EQUITY AS AN OBJECTIVE OF GOVERNMENT POLICY

A precondition for discussing the role of equity in passenger transport services is a clear understanding of the role of equity in more generally defined economic policy. Not only does this provide a normative basis for considering equity in this special context, but it also makes clear how the various instruments for pursuing equity are interdependent. The most general form in which equity objectives can be addressed is by monetary transfers based on some index of well-being or need. The traditional tax-transfer mechanism appropriately designed to take household and personal circumstances into account can be used for this purpose. The use of other narrower instruments, such as in-kind transfers, subsidies on particular goods or services, or regulations to target specific groups (each of which may be relevant for the case of passenger transport services), presumes that general taxes and transfers are in themselves inadequate. It is helpful to know precisely if and why this inadequacy exists.

We approach this general question in two steps. First, we consider the role of equity as an objective of government policy. This involves outlining the role of government in a market economy and seeing what this implies for

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equity as an objective among other objectives of government, especially efficiency. Second, we consider the instruments that might be used to achieve equity objectives most effectively. Subsequently, we apply these principles to the particular case of passenger transport services, and draw some tentative policy conclusions.

The reader is forewarned that some of the discussion in the early sections is a bit abstract, though not difficult. This is not intended to obscure the issues, which ultimately require us to make rather practical judgments. Instead, the purpose of the discussion is to put the judgments into a broader context to avoid the temptation of making simplistic decisions whose broader implications are not fully understood.

It is important to stress at the outset that any policy conclusions can only be tentative because in the realm of equity, value judgments are unavoidable. Depending on the value judgments one is prepared to accept, the policy implications can differ dramatically. This will become especially clear in the first two sections of this paper. Indeed, this will be true of economic policy evaluation more generally. Except in rather special circumstances, the role of equity objectives cannot be ignored, and not all persons are likely to agree with the judgment made in any particular case. This is also likely a relevant consideration in the passenger transportation case as well.

1. THE OBJECTIVES OF GOVERNMENT ECONOMIC POLICY

The evaluation of economic policy involves comparing the allocation of resources under alternative policies and ranking them according to some criterion. Ideally, we would like to use a criterion which is as objective or scientific as possible. However, it turns out to be impossible to avoid making value judgments a part of the criterion. In what follows, we summarize how value judgments enter into economic policy evaluation according to modern welfare economics.

We begin with the bare minimum value judgments that are taken as being "maintained hypotheses" in much of the literature. These are the assumption of *individualism* and the *Pareto principle*.

Individualism means that what ultimately counts in evaluating policy is its effect on the well-being of individuals in society. This is opposed to some



organic view of society in which what counts are the effects of the policy on, say, institutions or on abstract principles which have a value in their own right (for example, freedom of speech, non-discrimination, etc.). The notion of individualism typically carries with it the assumption that individuals are the best judge of their own well-being, referred to as the property of *non-paternalism*. There are circumstances in which the principles of individualism and non-paternalism are difficult to sustain. For example: Should children and people with mental disabilities be treated non-paternalistically? Should households be treated differently than individuals? Fortunately, the answers to such questions are probably of secondary importance to us for transportation issues.

The Pareto principle holds that, if a policy change makes at least one person better off and no one worse off, it represents a social improvement. It seems to be a reasonable requirement, although there are circumstances in which it may be said to conflict with other widely held principles.¹

If policies could be ranked according to these two criteria alone, policy evaluation would be a relatively simple matter. Unfortunately, that will not be the case. Most policies violate the Pareto principle; that is, they make some persons better off and others worse off. Thus, something more than these two principles will be needed to rank policy alternatives. Economists who are not prepared to make further value judgments have attempted to avoid the issue in one of two ways. In some instances, they have attempted to extend the Pareto criterion to circumstances in which, although some persons are made better off and others are made worse off, the former could hypothetically compensate the latter and still be better off. Alternatively, they have simply ignored redistributive considerations and treated a dollar as being worth the same no matter to whom it accrues. Consider each in turn briefly.

According to the first criterion, if the gain to one person measured in monetary terms exceeds the loss to another, it seems reasonable to suppose that the gainer could compensate the loser and still be better off. If so, the *hypothetical compensation test* is said to be satisfied and a Pareto improvement should be potentially possible. This notion of a *potential Pareto improvement* has been taken by some to be synonymous with an efficiency gain. If we can come up with monetary measures of changes in individual well-being, it might seem that, by simply summing up the gains

and losses thus measured, we could say whether a policy change improves efficiency of the economy. (We return below to a discussion of how we can measure gains and losses in monetary terms.) However, this is not a satisfactory way to deal with the matter for several reasons:²

i. The criterion of a potential Pareto improvement is itself ambiguous.

Whether the hypothetical compensation test is satisfied or not depends upon the form which the compensation is imagined to take. In the literature, there are various assumptions about the nature of the compensation. The early literature based on Kaldor (1939) assumed that the compensation simply reallocated an existing bundle of goods without any change in production. Later analyses assumed that lump-sum income transfers were used and that the compensation therefore caused production changes to take place. Finally, the compensation might only be possible using distorting taxes and transfers, in which case different production responses could occur. For a given policy change being evaluated, whether or not a hypothetical compensation test is satisfied could depend upon which form of compensation is hypothesized. For example, if the gainers could make lump-sum transfers of income to the losers, the test might be satisfied, whereas if the compensation involved redistributing the given bundle of goods, or if transfers could only be made using distorting taxes, it might not.³

ii. For any given form of compensation, the ranking of alternatives by the hypothetical compensation test is bound to be incomplete, and may well be contradictory depending upon the starting point. That is, in comparing the pre-policy and post-policy outcomes for any given policy change, the compensation test may not be satisfied in going from either one to the other, so the ranking is incomplete. Or, it may be satisfied for both.⁴

iii. The compensation test is virtually impossible to implement from market data. For example, it is well known that aggregating welfare measures such as consumer surpluses over persons will not indicate whether or not the compensation test is satisfied.

iv. Perhaps most important, if the compensation is not actually paid, a policy change will in fact make some persons better off and others worse off. The fact that compensation could have been paid will not constitute to many observers an unambiguous gain in social welfare. To evaluate it as a gain in social welfare requires trading off the gains to the gainers with

the loss to the losers. In other words, it involves an interpersonal comparison of welfare, something which the compensation test was designed to avoid.

Despite the unsatisfactory nature of the compensation criterion, many economists have nonetheless advocated, either explicitly or implicitly in their practice, the simple summing up of gains and losses in monetary terms to various persons without regard to whom they accrue.⁵ Various justifications may be made for this. One is an appeal to the separability of redistributive from efficiency concerns. As we discuss below, there are certain circumstances in which this is a perfectly defensible position. Indeed, part of our later discussion details when that is the case for passenger transport services. Basically, this position segregates all additional value judgments into a particular set of redistributive instruments, rather than avoiding value judgments entirely. Another justification for treating the dollar gains as having the same weight for all is that pure ignorance or lack of information may prevent one from desegregating the aggregate gains to persons of varying circumstances. Finally, some persons have argued that, over the long run, the chances of being a gainer and being a loser will roughly cancel out, so it is pointless to try to treat them differently. For many of the issues we address below, these latter two arguments clearly do not apply.

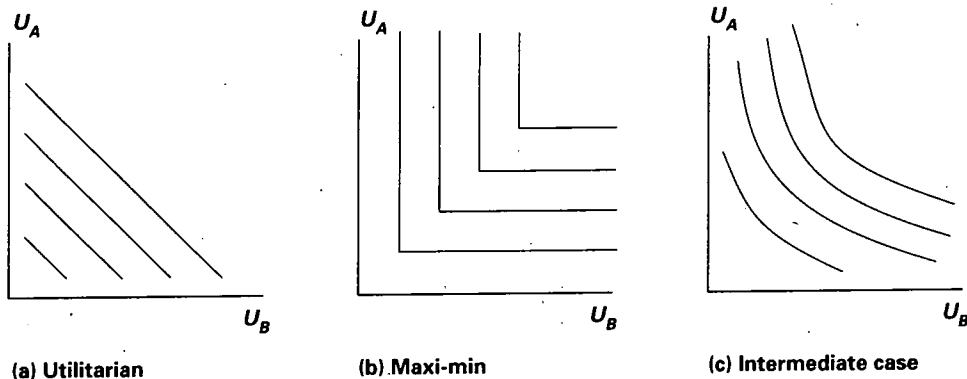
One is left with a fairly convincing case for going beyond the two maintained hypotheses of individualism and the Pareto principle for evaluating policies. The question then becomes what additional judgments need be made. There is bountiful and highly technical literature on *social welfare functions* which addresses precisely this issue. Much of it stems from the highly influential, but distressingly agnostic, work of Kenneth Arrow (1951). Arrow formulated the famous Arrow Possibility Theorem which, roughly speaking, says the following. Suppose we want to compare alternative allocations of resources and the only information we have available is the rankings of those alternatives by the persons in the economy. Suppose further that we place no restrictions on the form of the individual rankings, we require the Pareto principle to be satisfied, and we impose a technical requirement known as the *independence of irrelevant alternatives*. The latter basically says that the ranking of any two alternatives is independent of the availability of any other. Then, the only procedure which can be guaranteed to give a rational ranking of the alternatives is a ranking in accordance with the preferences of only one person, that is, what is referred to as a "dictatorship."

The Arrow Possibility Theorem has spawned a great deal of research, much of it attempting to relax its requirements so as to avoid the dictatorship outcome. A brief survey of some of the consequences of this literature is presented in the Appendix. For our purposes, we will simply avoid the conceptual issues involved in taking collective decisions by following the conventional procedure of assuming that society's ethical norms can be represented by a *social welfare function*. A social welfare function is simply a function which aggregates the utilities of the members of the society.⁶ In making a social welfare function operational for policy evaluation purposes, two main challenges emerge. The first is to obtain a measure of individual utility. Economists have devised a way of representing individual utility levels in monetary terms and this is referred to as a monetary measure of *real income*. The principles of representing utility by monetary measures of real income is also discussed briefly in the Appendix.

Given a monetary measure for utility levels, the next challenge is to devise a way to trade off or weight utility or real income levels obtained by different persons in order to aggregate them into a measure of social welfare. As is pointed out in the Appendix, when aggregating real incomes using a social welfare function, a key ethical property of the social welfare function is the degree of inequality aversion. Depending on the degree of inequality aversion, quite different degrees of redistribution can be called for. The three panels of Figure 1 depict indifference maps for three different social welfare functions with differing degrees of inequality aversion. All satisfy the properties listed above. In panel (a), the so-called *utilitarian* social welfare function is shown. According to this function, all that counts is total utility, not its distribution between the households.⁷ It is said to have no aversion to inequality. Panel (b) shows the opposite extreme of complete aversion to inequality. It is referred to as the *maxi-min* social welfare function.⁸ Panel (c) shows an intermediate case in which there is some aversion to inequality. These social welfare indifference curves can be used to rank alternative possible outcomes.

To illustrate the consequences of these differing attitudes towards unequal utility levels, consider the following example drawn from Sen (1973). Suppose there is a fixed amount of income to be redistributed between two persons, and suppose that the redistribution can be done in a costless way. That is, there is no inefficiency associated with the redistribution. Suppose that the two persons differ systematically in their utility functions. In

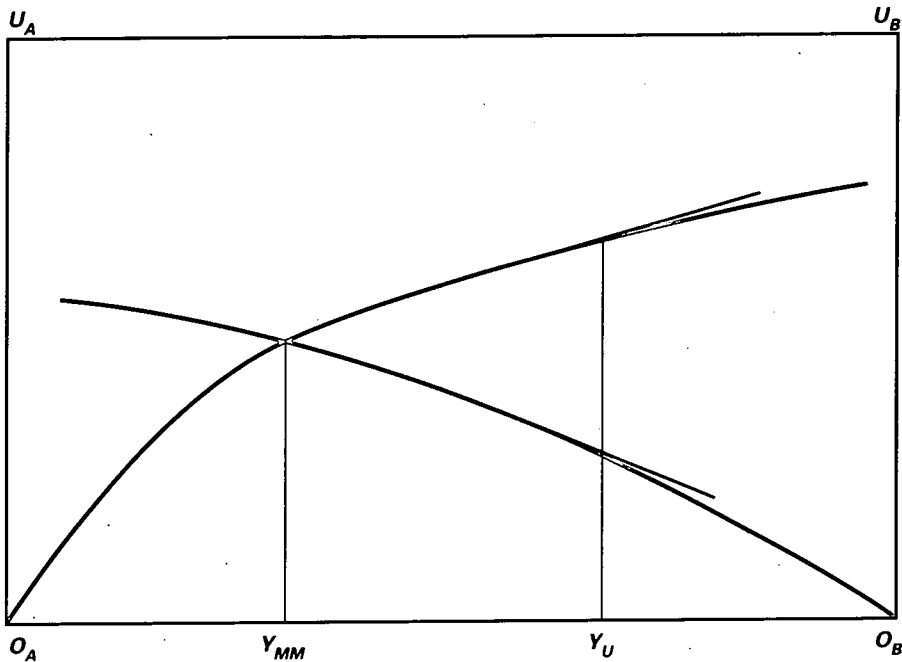
Figure 1



particular, person *A* obtains more utility from a given amount of income than does person *B*. We will say person *A* is the more efficient utility generator. It may be that *B* is disabled or less healthy. Consider now how the given amount of total income should be allocated between the two individuals under the various social welfare functions. Figure 2 can be used to do so.

Figure 2 depicts the utility levels associated with differing levels of income for the two persons, with *A*'s utility drawn from the origin labelled O_A and *B*'s drawn from that labelled O_B . Under the maxi-min social welfare function, the utility levels of the two persons would be equalized. The distribution of income Y_{MM} would achieve this. Notice that, given the differences in the ability to convert income to utility, this would require income to be distributed in favour of the less-efficient utility generator, *B*. This may be contrasted with the utilitarian case. Here, income is distributed between the two such that the marginal utilities are equal. This is shown as the distribution Y_U where the slopes of the utility functions are equal. Note that, in this case, the income distribution is opposite to the maxi-min case. Person *A* gets more than person *B*; also, person *A* ends up with a higher level of utility. The sum of utilities is maximized independent of its distribution. The intermediate case is not shown on the diagram, but obviously it will have a distribution of incomes between Y_{MM} and Y_U . More generally, the greater the aversion to inequality, the more income will be allocated to person *B* relative to person *A*. It should be obvious from this that value judgments play an important role in redistributive policy.

Figure 2



This example relied on differences in utility functions to generate ambiguities about the optimal redistributive policy. In those examples, if the two persons had identical utility functions, full equality would have been the prescription.⁹ However, it is easy to devise circumstances in which, even with identical utility functions, redistributive policy depends critically on the form of the social welfare function. This is discussed with reference to two further cases in the Appendix. There it is shown that simply making income variable by, say, allowing persons to decide their labour supplies, makes the extent of redistribution heavily dependent on the degree of inequality aversion in the social welfare function. This will be the case even when non-distorting (lump-sum) redistributive transfers are allowed.

When the tax-transfer system itself imposes efficiency costs on the economy, the amount of progressivity in the tax is reduced for any social welfare function. The examples in the Appendix clearly show that the extent of redistribution through the tax-transfer system is potentially quite limited when efficiency considerations are taken into account. I do not draw from that the conclusion that redistribution is necessarily limited; only that redistribution through the tax-transfer mechanism might be. As discussed below,

there are many other instruments that governments use for redistributive purposes. By their nature, many of them do not have the same efficiency costs involved. Instead, the extent of their use is determined by pure equity considerations.

A key issue that arises in evaluating and implementing economic policy is the extent to which the objectives of equity and efficiency can be separated. In an important general sense, the two cannot be separated. All policy decisions affecting resource allocation can, in principle, affect both, and, if government were a single monolithic agency, that agency would want to evaluate its decisions from a social welfare point of view incorporating both equity and efficiency considerations. However, the public sector itself is a highly decentralized organization in which resource allocation decisions are taken more or less independently in many different areas. In such a setting, it is more natural to ask whether each of these individual decisions should be taken with equity as well as efficiency objectives in mind.

Although the literature on this is not extensive, a good case can be made for continuing to follow the advice of Musgrave (1959) and think of the allocation and distribution branches of government as being essentially separate branches. Distribution decisions by their nature tend to be of somewhat broader applicability than allocation decisions. The latter are taken in the first instance at a more decentralized level. Most economists would agree that decentralized decision making on public sector resource allocation, including cost-benefit analysis, should basically be done with efficiency in mind. Equity objectives should be pursued by a central agency with a broader mandate. This agency could be responsible for setting tax-transfer policies and the regulatory framework, and these would act as constraints on those taking resource allocation decisions. Our discussion of equity considerations that follow are made from that perspective.

2. THE ROLE OF GOVERNMENT IN A MARKET ECONOMY

The above discussion focussed on the criteria that might be used to rank alternative allocations of resources, particularly those in which the distribution of utilities among households differed. We showed that very different rankings could occur depending on the value judgments one chose to make, in particular, depending on the degree of aversion to inequality in the social welfare function. Ultimately, we will consider the way in which

the government can achieve whatever redistributive objectives it wishes. However, before so doing, it is useful to review the prior question of the role of government in a market economy.

The conventional argument for government activity in allocating resources is a rather negative one, based on the notion of market failure. It is well known that, under certain circumstances, the decentralized decision making of the market has certain attractive properties in achieving efficiency in the allocation of resources. In particular, in idealized circumstances, the market, if operating competitively, will yield a Pareto efficient outcome. The role for government rests on two things — first, that those idealized circumstances may not hold (the market-failure argument), and, second, that the market outcome, no matter how efficient it is, may not be equitable. The ability of the government to intervene successfully depends upon how benevolent one views the government to be as well as how efficient it is (that is, how much *government failure* there is). Economists vary widely in their judgments of these issues, and therefore of how interventionist they think the government should be. This is over and above the differences that may exist in value judgments different persons hold about the ideal amount of equity versus efficiency. We leave that as an open question and simply recount the sources of market failure, thinking of them as necessary, though not necessarily sufficient, conditions for government intervention.

The sources of market failure and inequitable outcomes are fully documented in the public finance literature so we need do little more than list them here. They include the following:

Public Goods

Markets cannot be relied on to provide efficient amounts of goods which are simultaneously consumed by all. This is certainly true when the public goods exhibit the property of "non-excludability," that is, when non-paying users cannot be excluded from use. However, it is generally also true when excludability is possible. Even if persons could be excluded from using a public good, efficiency suggests that they should not be since the property of publicness implies that additional users can be added at no cost to society. This is the traditional argument for government provision of goods and services.

Externalities

Related to the above is the case where activities of some firms or households cause beneficial or detrimental effects which do not get priced for one reason or another. Governments may respond by assuming responsibility for their provision, or for using corrective mechanisms such as taxes/subsidies or regulations.

Economies of Scale

The cost efficient scale of output of a good or service may be large relative to the market it is serving, in which case competition will not prevail. Again, government may undertake to provide the item itself, or it may regulate private behaviour. (Alternatively, it may do nothing as some economists would advocate.)

Unemployed Resources

There may be problems of coordination on some markets which imply that some resources go unused. Examples of this include labour, housing and capital. There have been some theories to suggest that there are systematic sources of inefficiency on these markets which government intervention can, in principle, address (for example, search externalities on labour and housing markets).

Absence of Full Markets in Uncertainty

A fully efficient allocation of resources requires that risks be fully traded and diversified away to the extent possible. This may not occur for a variety of reasons. For one, markets may be simply too thin for some types of risks, given the transaction costs involved. For another, a great deal of risk may be induced by uncertainty of government behaviour itself. Presumably this is not fully diversifiable. Finally, risk markets may not function perfectly because of informational problems as discussed in the next category.

Asymmetric Information

It is now widely acknowledged that many markets are characterized by what is referred to as asymmetric information problems, meaning that one side of the market is better informed than the other. This implies that resources will not be allocated in their most efficient way. The two most common

versions of this are *moral hazard* and *adverse selection*, and they have been analyzed most extensively in insurance markets. However, they apply to many sorts of markets, such as the markets for labour and capital. Basically, moral hazard refers to a situation in which one side of the market can take actions which affect the outcome, but which cannot be observed by the other side. Market outcomes may well involve non-optimal amounts of such actions. Adverse selection occurs when participants on one side of the market differ from each other in some characteristic that is not observable to the other side. Such markets are known to result in inefficient outcomes, and perhaps not even to have equilibrium outcomes. There is a considerable literature on market failure resulting from adverse selection and moral hazard. What has not been established in the literature is whether this sort of market failure can be averted by public sector intervention. For example, the public sector is likely to face exactly the same sorts of difficulties in becoming informed as the private sector. Thus, it may not be possible for the government to improve upon the market solution for such things as health and unemployment insurance, at least on efficiency grounds. We have to look elsewhere for a rationale for government intervention in these areas. The most likely reasons have to do with equity arguments which the final two items address.

Unequal Incomes

Even if the market were allocating resources in a perfectly efficient way, the outcome may not be regarded as being optimal, if it results in allocations which are unequal. Governments may therefore wish to interfere in order to redistribute resources on equity grounds. These last two categories look at equity in two related ways. One indicator of inequality is simply differences in observed incomes among households generated by the market. These differences may come from several sources including the following: abilities, inheritances, human capital accumulated, work effort and pure market luck. Virtually all governments engage in tax-transfer policies which redistribute income from the better-off to the worse-off households. However, there is a limit in the extent to which redistribution on the basis of income can be effective in achieving equity. There are two basic reasons for this, both of which have been referred to already. The first is that income may be a very imperfect indicator of well-being, especially since it does not reflect differences in, say, leisure. The second is that, for any given household, income is an endogenous concept. Persons can change their income by altering

their behaviour thereby causing inefficiency. The public finance literature has argued quite convincingly that the extent of redistribution that one can achieve by income-based instruments alone is likely to be quite limited.¹⁰

Social Insurance

There are, however, other arguments for redistribution which are related to the above but which recognize the possible usefulness of other sorts of instruments. The literature on redistributive income taxation tends to emphasize differences in the ability to earn income as a source of inequality. There are many other characteristics which also can result in utility differences and which can be (and, in practice, are) used as a basis for redistribution. They include such things as health and physical characteristics, employment status, location of residence and date of birth. Redistribution based on these features is sometimes referred to as social insurance for the following reason. The endowment each person brings with him or her at birth is largely a matter of luck. If individuals could insure themselves against being unlucky in these characteristics, they surely would. However, they obviously cannot do so on ordinary insurance markets. Insurance can only be purchased before the event being insured against is revealed and, in this case, that occurs at birth. Thus, they can only be "insured" against being unlucky at birth after the fact by the public sector. The conceptual device of putting oneself behind the "veil of ignorance," that is, imagining not knowing what one's characteristics are going to be, and asking what kind of insurance one would be willing to purchase, is often used as a normative justification for compensating persons for being unlucky at birth. This might be used as the justification for public health insurance, unemployment insurance, assistance to persons with disabilities, intergenerational transfers in favour of unlucky cohorts, etc. In each of these cases, the object of redistribution is somewhat different than income. Depending upon how sharply the government can observe the underlying characteristics, the possible induced inefficiencies in behaviour may be greater or less.

We take these roles for government in a market economy as given. The primary issues we wish to address concern how government achieves the equity objectives in practice, and how this may apply to the special case of passenger transportation services. The following two sections address those in turn.

II. INSTRUMENTS FOR ACHIEVING EQUITY IN THE ALLOCATION OF RESOURCES

Virtually everything governments do has a redistributive effect. What is perhaps less widely recognized is the extent to which redistribution is the main motivation behind various government programs. Public finance theory, which has tended to focus on efficiency analysis, has largely ignored this, at least until quite recently. We are used to thinking of the tax-transfer mechanism as the means of achieving distributive equity, with most other functions of government aimed at efficiency or stabilization issues. This way of looking at the role of government is typified by the public finance textbook device of separating government functions conceptually into allocation, distribution and stabilization branches. Government expenditures on goods and services are then thought of as fulfilling an allocative function, while distributive goals are met using taxes and transfers. However, closer inspection reveals that many important programs on the expenditure side of the budget are at least partly redistributive devices. This section simply summarizes all the instruments that fall into that category.

1. TAXES

Many of the taxes used by governments are structured to take distributional objectives into account. The main exceptions might be specific excises, the corporation income tax, and, to some extent, customs duties. Specific excises and customs duties are levied for particular purposes, such as correcting for externalities, industrial policy and user-fees. The corporate tax is best thought of as a withholding tax on behalf of the personal tax and, as such, its redistributive effects are addressed through the personal tax system by the method of integration (for example, the dividend tax credit). It also serves as a device for extracting revenues from foreign-owned firms by exploiting the international tax crediting system.¹¹ At the provincial and local levels, there are other tax types such as property taxes, licences and user-fees. These are also directed to non-distributive goals.

The two main taxes that are of relevance for redistribution are the individual income tax and general sales taxes (both federal and provincial). Each of these has provisions that are specifically redistributive in intent. Consider each in turn.

Individual Income Tax

There are three main ways in which the personal income tax is designed to take equity into account. The first is in measures which adjust the base for personal circumstances, such as number of dependents, disability and age.¹² The rationale for many of these measures is to make taxable income a better measure of welfare or discretionary income and thereby improve the horizontal equity of the tax system. As discussed earlier, this is justified by the notion that different persons require differing amounts of expenditures to achieve the same level of utility. As the Carter Royal Commission Report put it, different persons have differing levels of non-discretionary expenditures.

The second consists of deductions based on expenditures which are deemed not to be utility augmenting. These include the costs of employment, the cost of moving, educational expenses, day care expenses, charitable donations and medical expenses. These again are intended to address the horizontal equity issue by adjusting the base. The case of medical expenses, which includes those involved with disability, is an interesting one. It could be argued that persons who incur medical expenses and who receive the disability tax credit actually have different utility functions than others. Depending on the degree of inequality aversion one subscribes to, one might want to do more than simply make expenses for these persons tax-deductible. Doing the latter merely saves them the tax costs of the medical expenses they incur and does nothing to correct for the underlying disutility they live with as compared with healthy persons. If the degree of inequality aversion is high, one might want to transfer sizeable sums to persons with disabilities, especially since that is a characteristic which is relatively easily observable and not influenced by the behaviour of those involved.

The third component of the direct tax which addresses equity is the rate structure itself. Its degree of progressivity is a combination of the basic personal exemption and the structure of marginal tax rates on persons. In practice, it has been observed that the tax system, as a whole has only limited progressivity in it.¹³ On theoretical grounds, there are good reasons for this. As mentioned earlier, the vast literature on the optimal progressivity of the income tax, emanating from the seminal paper by Mirrlees (1971), has tended to support the view that, given the equity-efficiency trade-offs involved, the amount of redistribution that should be accomplished through the income tax system is more limited than one might believe. The fact that leisure

and household production are sources of untaxed real income apparently restricts the optimal degree of progressivity considerably. Much of this literature is based on simulation procedures, and it would be beyond the scope of this paper to survey it fully. However, the results consistently tell the same message. We need not take from this the message that redistribution itself is of limited interest as a policy objective. As we point out below, there are many ways other than taxes that governments can redistribute, and some of them can be very effective.

Indirect Taxes

A high proportion of taxes are levied from indirect taxes of a general sort. These include the new *Goods and Services Tax* at the federal level and the provincial retail sales taxes, all of which have as their intended bases some measure of the consumption of households. The first thing to note about general sales taxes is that their bases could be designed to be virtually identical to direct tax bases, if the government so desired. That is, if the government levied a reasonably comprehensive income tax on individuals, it could design the sales tax to be equivalent to an income base. This would involve including all consumer goods and services as well as net capital goods purchases.¹⁴ Alternatively, if it taxed consumption at the personal level (which is not far from the truth under the current income tax system), the equivalent sales tax base could be purchases of goods and services used for consumption. In practice, of course, governments are somewhat inconsistent in their choice of direct and indirect tax bases, since they seem to prefer income for the former and consumption for the latter. However, the point is that they could, if they so desired, achieve the same base under either system.

This leads us to ask the fundamental question of the tax system. Why do we need both indirect and direct taxes in the system, if both can be levied on the same base? Why not just use one and save the separate cost of collection involved in having both? There are two answers to this — a theoretical one and a more practical one. The theoretical approach recognizes that there is a type of progressivity which can be achieved under a sales tax system which cannot be replicated under an income tax system. It arises because of the ability to implement a differential rate structure by commodities, such as charging lower tax rates (perhaps zero) on necessities and higher ones on luxuries. The main result of the theoretical literature is that,

if the utility function of households is characterized by *separability* of goods from leisure, nothing is gained by having differential commodity taxes alongside an income tax.¹⁵ To put it differently, the sales tax rate would be the same for all commodities and would be equivalent to a proportional income tax; thus, commodity taxation would be redundant with an income tax. Furthermore, even if separability did not apply, the government is unlikely to have the information to know the appropriate rate structure to use for the indirect tax system. Thus, the case for using an indirect tax alongside a direct tax on these grounds is weak.

The practical reason for having a direct-indirect tax mix lies elsewhere. The accepted reason is that evasion and avoidance of the income tax is possible, and the incentive to evade increases with the tax rate. Having a direct and an indirect tax in the same system thus fulfills two functions. First, it brings into the tax net on the expenditure side some persons who otherwise would have escaped taxation altogether because of evasion. Second, by providing a source of revenues to the government, it allows the tax rate on income to be lower, thereby reducing the incentive for evasion.

If we accept this as the practical reason for having a mix of direct and indirect taxes in the same system, then the case for introducing some progressivity into the system through the use of differential commodity tax rates can be made. Tax rates could justifiably be lower on goods with lower income elasticities of demand, if the possibility of evasion and avoidance is higher for high income persons. For example, the exemption for food and other necessities could be given theoretical justification. We return to this when we apply our discussion to passenger transportation.

2. TRANSFERS

Roughly one third of federal government program expenditures go to transfers to individuals. The most important of these are unemployment insurance, pensions and family allowances. At the provincial level, the major transfer program is for welfare. Welfare payments and family allowances are explicitly designed for redistributive purposes and complement the income tax system. Indeed, many have argued that they should be formally integrated with the income tax system in the form of a comprehensive negative income tax. This would rationalize the welfare system, treating it symmetrically with the income tax and avoid some of the existing system's adverse incentives on work effort.

The cases of unemployment insurance (UI) and public pensions are sometimes thought of as fulfilling other, non-redistributive, objectives. For example, the term "insurance" implies that UI is primarily a device for efficiency in labour markets. The term insurance applies to the notion of trading risk on the market. A purchaser of insurance is selling risk to an insurer who presumably is willing to take on the risk because of an ability to pool it among several purchasers. It is thus like a purchase of a commodity which both sides are willing to do voluntarily because it leads to a gain from trade, that is, to an efficiency gain. As long as there are no market failures, the private sector ought to be able to provide insurance efficiently. It is difficult, if not impossible, to make a convincing case based on efficiency or market failure grounds for public sector intervention in insurance markets. It is true that such markets may be plagued by such phenomena as adverse selection and moral hazard which prevent them from operating perfectly. However, the same informational problems which prevent the private sector from providing insurance efficiently apply equally to the public sector. This is as true for labour markets as for other markets. On theoretical grounds, it has been shown that private insurers could provide unemployment insurance almost as efficiently as the public sector.¹⁶ It is more reasonable to view unemployment insurance as being implemented at least partly for redistributive reasons, and that partly accounts for it being a compulsory scheme. There has been a limited literature on the use of unemployment insurance as a redistributive instrument, and it is likely to be an area for research in the coming years.

Similar issues arise in the case of public pensions. There is no particular reason to think that public pensions are justified as corrective measures for inefficient private pensions. Other arguments for their existence must be made. Three are found in the literature. The first is simply the *positive economics* argument that unfunded public pensions are transfers from the young to the old. The median voter obtains a positive net present value from such programs because, being somewhere around mid-life, the expected future benefits are well in excess of the contributions for the rest of his or her working life. Thus, the median voter will continue to vote for unfunded public pensions despite the fact that they reduce long-run levels of welfare for future generations.¹⁷

The second is that unfunded public pensions, being vehicles for redistributing income across age cohorts, can be used to smooth out fluctuations in "luck" among different cohorts. This is referred to as *intergenerational*

risk sharing and is sometimes used as a typical example of the principle of social insurance.¹⁸ As mentioned above, social insurance is the phenomenon of insuring *ex post* against the various circumstances of one's birth. It is distinguished from ordinary insurance which is intended to insure against future contingencies.

The third is a rather more recent argument. It views public pensions as a form of compulsory saving, or, in other words, a form of provision of future consumption greater than that which the person would have acquired individually. This can be viewed as a kind of *in-kind* transfer, much like the provision of food and housing. The recent theoretical literature on optimal income taxation focussed on the desirability of using in-kind transfers alongside income taxation as redistributive devices. The argument is that, given the optimal income tax, social welfare can be improved by forcing additional consumption of commodities that are relatively more important to low-income earners. The forced consumption, or in-kind transfer, will only be effective to the extent that the good in question cannot be retraded. It has been used in the literature to date mainly in the context of pensions, education and health services.¹⁹ This argument for pensions is really more applicable to compulsory funded pensions.

3. SOCIAL PROGRAMS

Governments in Canada also provide a number of social programs, many of which involve the provision of goods and services. Major examples of this include health care and services to the poor, those with disabilities and the elderly. We would argue that education at all levels can also be viewed as a sort of social program. One feature of these programs is that they support expenditures on what are essentially private goods and services. In the literature, they are referred to as *quasi-private* goods, since they are private but are provided in amounts fixed by the public sector. Being private, they could have been provided by the private sector. Indeed, in some countries, some of them are private, at least to some extent (for example, health care in the United States).

If one investigates why these quasi-private goods are provided publicly rather than being left to the private sector, the answer largely turns on their redistributive properties. There may be some efficiency arguments for public intervention revolving around externalities of various sorts, but they are

hardly enough to warrant the massive public intervention that we see in most industrial countries. It seems more appropriate to view public provision of health, education and welfare services as being instruments for redistribution. Indeed, from this point of view, they may accomplish at least as much as the tax-transfer system itself. Whereas the tax-transfer system tends to be restricted to redistributing according to income, these other programs, like UI and Old Age Security (and the Guaranteed Income Supplement), redistribute according to some other characteristic, such as health status or need. They can be viewed as types of social insurance which compensate persons for some characteristic which they have acquired independent of their economic activity. Many of these programs can be implemented effectively with adverse behavioural incentives that are not as severe as with the tax-transfer system based on income. This implies that the arsenal of redistributive instruments in the public sector budget includes taxes and transfers, UI, pensions, health care, education and welfare services. These span a major proportion of government fiscal activity.

4. FEDERAL-PROVINCIAL ISSUES

In Canada, a number of these activities are among the "exclusive" legislative responsibilities of the provincial governments. These include almost all health, education and welfare services, the exceptions being UI and pensions which are federal responsibilities by explicit constitutional amendment. This means that significant sources of redistributive power are in the hands of the provinces rather than the federal government. If left to their own devices, the provinces could, if they wished, pursue their own redistributive objectives. Two important issues arise here. The first is the extent to which the responsibility for equity ought to be at the federal rather than the provincial level of government. The second is, given that at least some responsibility lies with the federal government, how can it be exercised effectively, if so many of the instruments are in the hands of the provinces? Full treatment of these subjects is beyond the scope of this paper.²⁰ However, it is useful for background purposes to dwell briefly on these two points.

Regarding the assignment of equity responsibility to the two levels of government, the literature on fiscal federalism tends to support the notion that the federal government ought to be primarily responsible for equity. The main argument is the view that principles of horizontal and vertical equity ought to apply nationwide. In other words, identical persons ought to be

treated the same no matter where they reside. Conceptually, the social welfare function should apply nationwide. Against this grand principle must be set the counterargument that different provinces may have different "tastes" for redistribution. That is, some provinces may prefer to treat their poor more generously than others. The balance between these two arguments will determine where the ultimate responsibility for equity lies.

In Canada, the federal government assumes significant responsibility for equity and this is reflected in recent constitutional provisions. Specifically, section 36 of Schedule B of the *Constitution Act, 1982* reads:

- (1) Without altering the legislative authority of Parliament or of the provincial legislatures, or the rights of any of them with respect to the exercise of their legislative authority, Parliament and the legislatures, together with the government of Canada and the provincial governments, are committed to
 - (a) promoting equal opportunities for the well-being of Canadians;
 - (b) furthering economic development to reduce disparity in opportunities; and,
 - (c) providing essential public services of reasonable quality to all Canadians.
- (2) Parliament and the government of Canada are committed to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation.

The first part of this seems to suggest that minimum national standards of equity should apply, and the federal and provincial governments have joint responsibilities for achieving them. The second part obliges the federal government to make equalizing transfers to the provinces. The *Canadian Charter of Rights and Freedoms*, which was also part of the *Constitution Act, 1982*, may also impose certain equity obligations or constraints upon the government, including non-discrimination, language and mobility rights. Thus, it would seem that the federal government has significant responsibilities in the area of equity, even though it does not control all the instruments for achieving it.

There are several components of federal-provincial fiscal arrangements that are designed to allow the federal government to play a major part in setting national standards of equity. One is the ability to maintain a common base and rate structure for the individual income tax. The vehicle for this is the Tax Collection Agreement negotiated with each province except Quebec. An agreement allows the federal government to administer the income tax of the province, provided the province abides by the base and rate structure of the federal government. The efficacy of the Tax Collection Agreement mechanism depends upon the federal government maintaining a dominant position in the income tax field. This has eroded significantly over the past few years as the provincial expenditure responsibilities have grown and the federal government has turned over to the provinces more responsibilities for financing them. The recent restrictions in Established Programs Financing (EPF) transfers and the advent of the *Goods and Services Tax* will accelerate that trend to the point where the harmonized income tax system is in jeopardy.²¹

Another vehicle for federal achievement of national equity standards is the system of equalizing transfers to the provinces. The main component of this is Equalization itself. However, the other two main programs, EPF and the Canada Assistance Plan (CAP), also have equalizing aspects to them. The ultimate aim of these programs is as stated in part 2 of Section 36, which is to provide provinces with the ability to provide comparable public services at comparable tax rates. The theoretical justification for this on equity grounds relies on the notion of horizontal equity. It is fully spelled out in Economic Council of Canada (1982). Note that the equalization provision provides for provinces having the capacity to deliver comparable public services at comparable tax rates. It does not oblige them to provide identical services. That is, some provincial responsibility for equity is maintained.

Finally, the use of the federal "spending power" via conditional grants can be seen, and justified, as a means of fulfilling the federal responsibility for equity. The sorts of conditions imposed by the *Canada Health Act* can be viewed largely as equity-motivated. The same might be said of the conditions of the Canada Assistance Plan. Historically, the use of the spending power has been a matter of contention from a purely legal point of view. The provisions of the *Constitution Act, 1982* would seem to have solidified the federal government's case for using the spending power as a necessary instrument (and the only one it has) for pursuing equity in areas of provincial legislative responsibility.

5. IN-KIND TRANSFERS

Governments may also provide transfers of goods to persons in need rather than delivering them through the income-transfer system. These are referred to as *in-kind* transfers. Examples include food (in the United States), housing, education, health care; welfare services and transport services to those with disabilities. There are two main reasons that are used to justify in-kind transfers as opposed to cash transfers. One argument views transfers to the poor as being at least partly motivated by the collective altruism of the better off. If the rich get utility from the well-being of the poor, they will willingly agree to make transfers to them. The efficient amount of such transfers may not come about through private charity because of a free-rider problem. That is, if all the rich simultaneously benefit from donations to the poor, it will not be in the interest of them individually to donate the optimal amount; there is no incentive for each one of them to take account of the benefit generated to others from a transfer. Thus, there is a role for public provision purely on efficiency grounds. If so, the ideal form of the transfer depends upon the preferences of the rich. If the rich cared only about the level of welfare of the poor, *as judged by the poor themselves*, cash transfers would be preferable to in-kind ones. However, if the rich would prefer the poor to adopt a different expenditure pattern, that is, if they were paternalistic, the transfers might be directed to certain goods. The one difficulty that arises here is that, if the goods can be resold (as in the case of food), the two types of transfers are essentially equivalent. Of course, it is also possible to have the transfer built into the general tax-transfer system through the system of deductions and exemptions. For example, owner-occupied housing is treated preferentially in the income tax system, while food is favoured under the sales tax.

In-kind transfers may also be justified on equity grounds as part of a more general system of redistributive policy towards the poor. The argument, due initially to Nichols and Zeckhauser (1982) and recounted in Blackorby (1990), is fairly technical, but the essential point can be summarized as follows. Cash transfers are typically related to the income level of households. Yet, income levels are very imperfect indicators of individual welfare because they do not capture other characteristics, such as health, employment, leisure, etc. Thus, a given income level can include persons of differing levels of welfare, and persons of high ability can behave like those of low ability so as to be eligible for transfers. In these circumstances, if

transfers could be targeted better, they could be directed toward those who truly need assistance at the expense of those who do not (but who can pose as if they do by varying their labour supply, etc.). One way of achieving this is to provide in-kind transfers in goods which are specifically related to non-income characteristics which affect utility levels. Others may include making transfers dependent upon the characteristic, and subsidizing the provision of the service in question. Different methods of targeting may be more efficient in different circumstances. Many of the above-mentioned services may be of this sort. More important for our purposes, transportation services for persons with disabilities and other disadvantaged groups would be of this sort. This will be discussed further in the next section.

It might also be noted that services provided for one group of persons may have spillover benefits for others. For example, passenger transport services to those with disabilities may benefit the able population by reducing delays which would otherwise occur from the disabled using the service. Thus, even if the main objective of providing the service is equity, efficiency considerations may support it as well.

6. REGULATION

Finally, governments may pursue equity objectives through the regulatory process thereby avoiding the budgetary process altogether. Examples of this include minimum wage legislation, pay and employment equity rules, and health and safety regulation both of products and the work place. The use of regulatory devices as an alternative to expenditure or tax measures will also be discussed further in the next section on equity in passenger transportation.

There is a general issue involved in regulating and providing in-kind services, and that is who ought to bear the cost. In principle, the answer to that is straightforward. The costs of any program instituted for equity purposes should be borne out of general revenues. There is no particular reason for the provider of the service to bear the cost. In practice, this may be difficult to enforce. It is not always clear precisely what the net cost of a regulation is to the sector being regulated. If the firm itself is in a regulated sector or is a public firm, it is even more difficult. Nonetheless, the principle is clear. To impose the cost on the firm is equivalent to taxing the users of the firm's services to pay for a policy whose objective is equity and which should be paid for by society at large.

III. APPLICATION TO PASSENGER TRANSPORT SERVICES

1. GENERAL PRINCIPLES

The above discussion evaluated the issue of equity in general and how it might be accomplished by policymakers. It was a rather lengthy discussion concentrating on rather abstract principles. This section is intended to apply those principles to the case of passenger transportation. In fact, the application is fairly straightforward and should take relatively little space. It should, of course, be remembered that the discussion can only lay out general qualitative arguments. The exact way in which they are applied in practice must necessarily involve a value judgment.

It is useful to begin this section with a summary review of some of the principles obtained in the earlier sections. Economists naturally think of the tax-transfer process operating on the basis of income as the main fiscal instrument for redistribution. There are many instances in the literature in which supplementary instruments can improve social welfare over and above what is possible by redistributive income taxation alone. The following summarizes the types of arguments involved.

- i. If the tax-transfer process is used to its optimal extent for redistributive purposes, and if persons differ in their ability to earn income, the only argument for using pricing policies, such as differential excise taxes or subsidies, for redistributive purposes is if the household utility function is not separable. In particular, goods which are relatively substitutable for leisure should be subsidized, and those which are complementary should be taxed.
- ii. If there are restrictions on the use of the income tax system for redistribution, a stronger case can be made for pursuing equity through pricing policies as a "second best" equity policy. Relevant restrictions might include the following:
 - a) The possibilities of tax evasion and avoidance induce virtually all countries to use a tax mix of indirect and direct taxes so as to reduce the benefits from evading and to indirectly tax those who do. If higher income persons are better able to evade, the structure of indirect taxation should be progressive.

- b) If the income tax system does not treat persons with negative taxable income symmetrically to those with positive taxable income, supplementary instruments which assist low income persons can be welfare improving.
 - c) The government may simply lack the information to be able to implement the optimal direct tax system. On the other hand, it may have good information about the sorts of commodities that are consumed by less well-off persons and treat them favourably.
- iii. If there are decreasing returns to scale industries, and if optimal taxes can be imposed, marginal cost pricing should apply (subject to the discussion of item ii above) and the losses should be recovered from general revenues.
- iv. Much of the literature on redistribution treats persons as differing only in income-earning ability. However, there may be other characteristics which cause utility differentials across households. If so, redistributive instruments which are based on these other characteristics can complement the tax-transfer mechanism in the government's arsenal of redistributive devices. Furthermore, the efficiency-equity trade-off might be much different here than in the income case. If the characteristics can be observed directly, the efficiency cost of redistribution along this dimension would be limited to the cost of raising the revenues required to finance it.
- v. In fact, governments use the expenditure side of the budget for purposes which have important distributional implications. Indeed, in many cases this may be their main justification. Uniform public provision of quasi-private goods through the public sector can be social-welfare improving if they have relatively greater benefits to those in the economy who are less well off. To the extent that these benefits can be earmarked to the less well off, they would be even more efficient redistributive devices. This is true even if the full potential of redistributive income taxes has been used.

The remainder of this section considers the application of these general principles to the case of passenger transportation.

2. ALTERNATIVE WAYS OF ADDRESSING EQUITY ISSUES IN PASSENGER TRANSPORTATION

It is useful at the outset to present a general catalogue of ways in which equity issues might be pursued in the provision of passenger transport services. This can be done via the tax system, by the use of subsidies or by regulation. A list of possible ways might include the following:

- i. Preferential sales tax rates may apply on passenger transportation services. They may be restricted to certain types of transport, for example, those which are used by those less well off. A case in point is the exemption of municipal transit from the federal *Goods and Services Tax*.
- ii. Related to this is the use of pricing policies on publicly owned transport, such as rail. Any price above marginal cost is essentially equivalent to an excise tax. There may be equity reasons for having differences between price and marginal cost, and there may be second best reasons as well.
- iii. Passenger transport services tend to have considerable infrastructure associated with them (roads, airports, rail lines, etc.) which gives rise to overhead costs which must be covered. This makes them essentially decreasing-cost industries perhaps over sizable levels of output, since the overhead costs must be spread. The public sector may provide or finance the infrastructure. From a welfare economics point of view, this actually makes some sense as a way of enabling the industry to set prices closer to marginal rather than average costs.
- iv. Special transport services might be provided on below-cost terms to the ill, the disabled and the elderly. These might include ambulances, wheelchair facilities and the like. They could be provided as part of publicly-supplied transport services, or their provision for private sector services could be subsidized or regulated.
- v. Transportation facilities serving remote and disadvantaged areas could be subsidized in the sense that they could be provided despite the fact that their provision would be rejected by a conventional cost-benefit analysis using consumer and producer surpluses.
- vi. Finally, there may be preferential prices given to identifiable types of persons such as the elderly, those with disabilities, etc. These could be

over and above the preferential prices that might be used as a method of ordinary price discrimination. Ideally, these should be financed out of general revenues.

This may only be a partial list in the sense that there may be other ways in which public policies could serve to interfere with pure market considerations in the provision of passenger transport facilities. However, these are illustrative enough of the types of policies that are used to serve our general purposes.

Some of the above involve the provision of certain services at less than cost, and an issue naturally arises as to how such services should be financed. As a matter of general principle, the ideal would be to finance (out of general revenues) any special costs arising from fulfilment of an equity objective. This might take the form of a subsidy or of public provision itself. However, that is not always entirely feasible. It may not always be possible to identify the separate costs of special facilities for such things as disability that may have been regulated by the public sector. There are certainly many examples of cases in which regulation of standards in other contexts is not accompanied by financial compensation, such as health and safety standards, building standards and zoning regulations. An alternative which might prove feasible in some instances is to allow a generous tax deduction or credit for additional expenditures incurred to satisfy transportation regulations which were designed to satisfy an equity objective. This will help pass some of the costs onto general revenues instead of relying on cross subsidization from other users.

3. SUBSIDIZING PASSENGER TRANSPORT AS AN INSTRUMENT OF INCOME REDISTRIBUTION

Suppose we think of passenger transport services simply as a good purchased by households along with several other goods. The amount purchased by households depends upon their income and preferences, and the government is able to observe income for redistributive purposes. Can we make a *prima facie* case for giving passenger transport services preferential tax treatment as part of a general policy of income redistribution? As mentioned above, there are two possible reasons why one might want to supplement redistributive direct taxation with preferential treatment by commodity. The first is as follows. Redistributive taxes only the

real income earned from market activities; that obtained from non-market activities (that is, leisure and household production) go untaxed. If different commodities have different degrees of substitutability or complementarity for non-market activities (that is, if the utility function is not separable), a case can be made for differential commodity taxation. Unfortunately, the structure of that differential taxation is not straightforward, and involves both equity and efficiency effects. The equity effects would tend to favour lower taxes (higher subsidies) for necessities and higher taxes for luxuries.²² The efficiency effects would tend to impose lower taxes on commodities with the non-market activities, and vice versa. Thus, for example, a necessity which is also substitutable for non-market activities would seem unambiguously to call for a subsidy. However, conflicting cases could also arise.

The demand characteristics of passenger transport services presumably vary according to mode. One might think that bus transportation has a lower income elasticity of demand than rail, followed by automobile and air. The income elasticity for the bus might also be low relative to all commodities. If so, equity arguments might favour subsidizing the bus mode. If the transport services tend to be used to commute to work rather than for leisure activities, they will also be complementary with working, in which case the efficiency effects also tend to favour subsidizing them. If these sorts of empirical arguments are held with any degree of confidence, a theoretical case could be made that, even in a world in which progressive income taxes can be employed without constraint, it might still be justifiable to subsidize forms of transport relied upon by low income persons. On the other hand, other modes of transport such as intercity transport may tend to be more substitutable for working (that is, complementary with leisure) in which case one could propose a tax on efficiency grounds. Of course, there is the further problem that the government may not have enough information to design the optimal income tax. If the government nonetheless feels confident in knowing which types of goods are necessities, it can knowingly achieve some redistribution via subsidization of particular goods.

This general argument for subsidizing some sorts of transport services might be further supported by some other subsidiary arguments. One might be the well-known second best argument, which really has to do more with efficiency than with equity. The second best argument suggests that, if a commodity is priced below its marginal cost, other commodities which are substitutable for it should be as well. In the case of passenger

transport services, automobile travel is said to be priced below its social marginal cost because such things as the costs of congestion, road use and pollution are not fully included in its price.²³ Similarly, air travel may be priced below its marginal cost, if the full marginal-user cost of airports is not charged to the airlines. Since public surface transport may be to some extent substitutable for these modes, second best principles could be used to justify pricing below marginal cost.

The second argument relies on the notion that redistribution toward the poor may be partly justified by altruistic preferences of the well-to-do. If the altruism is paternalistic, it may support subsidizing particular types of goods. If transport services fell into this category, some support could be found for subsidizing them. It is not clear that the weight of this argument is particularly strong, compared with the previous two.

The above arguments considered the case for subsidizing some forms of passenger transport as a supplement to income-based tax-transfer mechanisms which could be used without restriction. If there are restrictions on the use of taxes and transfers, further support can be obtained for the subsidization of goods and services which are relatively more important to low-income persons. As mentioned above, perhaps the most important justification of having a mix of indirect and direct taxes is to counteract the massive evasion and avoidance that might arise if sole reliance were placed on direct taxes. That being so, the redistributive potential of direct taxes is not being exploited to its fullest. Under these circumstances, preferential tax treatment of necessities can be given theoretical justification. As well as food, shelter and clothing, transportation services used by lower-income persons could be given favourable treatment.

The direct tax system may, for some reason, not treat persons with negative tax liabilities symmetrically with those with positive tax liabilities. The former requires refundability of the liabilities and this may be difficult to implement fully. Also, some of the transfer mechanism is essentially in the hands of the provinces and they may not be fully coordinated with the federally-controlled income tax structure. Again, the preferential tax treatment of necessities may be a practical way of compensating for this absence of effective transfers to low-income persons.

4. SUBSIDIZING PASSENGER TRANSPORT AS A DECREASING COST INDUSTRY

Some types of passenger transport services may be characterized by decreasing returns to scale as a result of large fixed costs. In a perfect world, the fixed costs would be covered from general revenues in a non-distorting fashion, and the marginal cost would be imposed as a price for using the service. Capital decisions would have to be based on net surplus calculations rather than financial profitability. Any price charged above marginal cost should be regarded as equivalent to an indirect tax. The extent to which price diverges from marginal cost should be treated as equivalent to an indirect tax, and the above discussion applies. Thus, if it is desired for equity reasons to give preferential treatment to, say, passenger rail service, this service would have to be operated at a loss. In the case of buses, the recouping of fixed costs through taxes and fees of various sorts is apparently close to complete, as discussed in the Interim Report of this Royal Commission. Thus, in the absence of further indirect taxes, the practice is not far from average cost pricing, that is, above marginal cost pricing.

5. PASSENGER TRANSPORT SERVICES AS ASSISTANCE TO PERSONS WITH CHARACTERISTICS OTHER THAN INCOME

The above discussion concerns the incorporation of equity principles into the general tax and pricing treatment of passenger transport services. The emphasis was on redistributing among households according to income-earning ability and the possible shortcomings of the direct tax-transfer system. Now, we turn to the fact that there are other dimensions along which one may want to redistribute as well as the income dimension. It is obvious that, in practice, governments engage in many such measures. Recalling our earlier discussion, much redistribution takes place in ways other than the tax-transfer system and is based on criteria other than income. The health care system is a redistributive device based on health status; the pension system depends on age cohort; unemployment insurance depends upon employment status (and, to some extent, industry and regional location), etc. The question is whether there are certain aspects of passenger transport provision which can be viewed as contributing to equity according to non-income characteristics.

Incorporating equity considerations based on non-income factors is, in a sense, more ambiguous than those based on income. In the case of the latter, the equity concerns can be integrated into the income tax-transfer system, and the determination of the degree of progressivity can be left to those responsible for general income redistributive policy. With redistribution based on other factors, a somewhat independent judgment must be made on the extent of redistribution that is equitable. We saw earlier in our discussion of social welfare functions that, depending on the sort of judgment one makes about the degree of aversion to inequality, one can obtain very different optimal income distributions when persons differ in their utility functions. With very little aversion to utility inequality (for example, utilitarianism), income would be distributed in favour of persons who are more "efficient" at generating utility, and vice versa. For example, if persons with disabilities are assumed not to be able to convert income into utility easily, utilitarians would give them relatively few resources, that is, they would not compensate them for their disability. On the other hand, for social welfare functions with a great deal of aversion to utility inequality (for example, maxi-min), enough resources would be transferred to those with disabilities to compensate them for the difficulty of converting income into utility. This could involve substantial redistribution, especially if the efficiency costs of such transfers were low. What determines the outcome in this case is fundamentally a matter of value judgment, captured in what we have referred to as the degree of aversion to utility inequality. This makes it very difficult to state explicit policy implications since virtually any redistributive outcome can occur depending on the value judgment one makes. Even the direction of transfer of resources to persons with particular characteristics is a matter of judgment.

Furthermore, in evaluating this issue, it is not enough to know whether certain types of passenger transport services are associated with persons of certain characteristics who, for equity reasons, deserve special attention. It is also important to know if delivering the services through passenger transport is the most efficient way of doing so. If the characteristics can be identified and observed, it might be preferable to provide cash grants directly to the individuals rather than providing in-kind services. That, however, is essentially a matter of efficiency.

Potentially, there are a variety of characteristics affecting utility that might be associated with passenger transport services. In fact, a number of

them have been mentioned in the Research Program for the current Royal Commission. Let us treat each in turn.

Persons with Disabilities

Clearly one of the main disadvantages persons with disabilities face is a lack of mobility, so one would think that special provision of transport services might have a role to play here. To justify special treatment of persons with disabilities in general, it is necessary to assume that society has aversion to utility inequality. Suppose that to be the case. The assistance could take the form of cash transfers or in-kind services, or some combination of the two. There is now in place a system of cash assistance delivered to those with disabilities through the income tax. This includes a tax credit based on disability as well as the deductibility of additional medical expenses associated with the disability. One would suspect that, by any reasonable standards, the amounts involved in these two mechanisms fall far short of that which would be needed to compensate the disabled for the loss in utility due to their disability. Indeed, the implicit amount of inequality aversion contained in these measures is also probably a good deal less than that which is implicit in the system of redistribution based on differences in income-earning ability, unemployment status and illness. The tax credit as well does not distinguish among varying degrees of disability, as would presumably be required for redistribution truly based on differences in utility levels. One of the reasons for this is undoubtedly a difficulty in certifying with any degree of accuracy the relative degrees of disability of various sorts. In fact, there is apparently a good deal of uncertainty surrounding the exact criteria for eligibility for the Disability Tax Credit. Furthermore, the affording of deductibility for additional medical expenses represents only a limited attempt to compensate for the loss in utility due to disability. At the least, one might have expected full compensation to have been given for this, rather than the partial compensation implied by the tax savings from deductibility. At most, deductibility reflects the additional cost of earning income implied by the medical expenses.

In addition to the above forms of cash assistance, those with disabilities also obtain some services in kind. To the extent that their medical costs are insurable, these are provided free of charge.²⁴ Again, this compensates for many of the necessary medical expenses that are incurred as a result of being disabled, but does not attempt to compensate for the utility-reducing

effects of the disability itself (for example, pain and suffering, etc.). That is presumably the role of cash transfers. There are certain welfare services that provinces supply to the disabled that are analogous to full health insurance. Like health insurance, they represent transfers which are directly related to the extent of the disability. Persons who are more disabled, in the sense of requiring more medical and welfare services, receive correspondingly more assistance. This would seem to be an efficient way of differentiating among persons with differing degrees of disability.

The provision of transportation services to the disabled, including such things as wheelchair buses, special services at rail, air and bus terminals, specially designed seats, washroom facilities, etc., are directly analogous to in-kind medical and welfare services. They are a form of social insurance whose benefits are related to the degree of particular forms of disability. On equity grounds, it would seem to me to be arguable that these services should be freely provided to users for two reasons. First, that would put them on an equal footing with medical insurance, which itself must reflect an equity judgment. Second, from a value judgment point of view, it would seem to me to reflect a minimum level of aversion to utility inequality comparable to what seems to be accepted in the income tax-transfer system. As mentioned, there is an issue as to how these should be paid for. We have suggested that, in principle, the cost should be borne out of general revenues. This could take the form of a subsidy to the provider, in the case in which the provider is a private operator, though that may be cumbersome to administer. Perhaps the more sensible procedure would be to use a tax credit system for at least part of the costs involved in making the services available.

The Poor

The case for providing transportation services to the poor is quite different from that of the disabled, if by poor we mean those with low income. Of course, poor persons may be poor because of disabilities or, as discussed below, because of lack of employment opportunities in the province of residence. If so, the disability should be thought of as the cause. However, in general, we can think of poverty *per se* as reflecting differences in the ability to earn income rather than differences in the ability to transform income into utility. That being the case, transport services are merely one of the many types of goods that the poor consume along with a variety of others

such as food, housing, clothing, etc. Thus, as discussed above, policies for equitable treatment of these persons is primarily addressed through the tax-transfer system.

The case for providing in-kind transfers rests largely on an argument that passenger transport services are substitutable for non-market activities. It is not clear to me that such an argument can be sustained. Of course, if we have in place a large indirect tax system as well as a direct one, an argument can be made for incorporating equity norms into the tax structure. In this case, it can be held that services used relatively more heavily by low income persons should be given preferential tax treatment. This was discussed in more detail above so need not be repeated here.

Residents of Remote Areas

Residents of remote areas obviously seem to have greater need for transport services than other persons to obtain the same level of utility. Relatively large amounts of their budgets would be devoted to this as compared with other persons. Thus, it seems natural, at first sight, to think of providing such services at reduced cost. In judging this issue, a couple of considerations seem to be relevant. First, it is important to know whether the fact of residency in a remote area should be treated as an exogenously given characteristic of a person, or one which can be acquired at low cost. To say the same thing in other terms, one wants to know the extent to which the costs of moving from remote areas, *including* psychic costs, are high or low. If they are high, say because of cultural attachment to place of birth, then residency in a remote area might be treated as a non-income characteristic which directly affects utility. It then becomes a matter of comparing utility levels of persons who are resident in remote areas with other persons who are resident in populated areas.²⁵ If it is judged that residency in a remote area itself is a characteristic which causes utility to be lower, then a case could be made for compensating for that difference, assuming that one is averse to inequality differences. However, that compensation might well take the form of cash transfers, say, delivered as tax credits, rather than transfers in kind. In this case, the cash transfer need only be related to the fact of residency in remote areas and not other characteristics.

On the other hand, transfers in kind might be justified, if the degree of utility loss from living in remote areas was related to the level of consumption of particular services by persons. For example, the disutility of living in remote

areas might be related to the quantity of transport services consumed. Those with the greatest disutility might travel to and from the area most often, thereby incurring greater costs than others. It would not likely be feasible to make cash transfers to households based on their demand for travel services, since it would be difficult to measure the latter for any given individual. In these circumstances, targeting assistance to persons through subsidized transport services might be an efficient way of pursuing redistributive equity goals.

It might be noted that, if costs of migration to remote areas were not prohibitive, complications would arise. Residents of remote regions would contain a mix of persons who were there by birth, and who preferred to be there, and those who were born elsewhere and migrated there. The latter presumably require some financial compensation to overcome the psychic cost of moving to the remote region. In this case, the real income they obtain will differ systematically from their observed income, and this ought to be taken into account in the income tax-transfer system. In particular, the tax-transfer system based on observed income would systematically discriminate against moving to the remote region, since the differential income compensating for the psychic cost would be taxed. Thus, an inefficiently low amount of migration to the remote area would occur. The remedy for this would seem to be to provide preferential treatment through the income tax system rather than through in-kind services.

On the other hand, if mobility costs were low so that persons were free to move to and from remote regions, they would do so until they were in the region offering the greatest income. In this case, there would seem to be no apparent reason to differentiate through the income tax system between persons residing in different areas. In this case, whether in-kind services should be given special treatment would rely on the same general arguments as stated earlier about supplementing the income tax system with differentiated sales taxes. If transport services for persons in remote areas were substitutable for non-market activities, a case could be made for providing them at preferential cost. Also, in the indirect tax component of the tax system, if transport services were necessity goods to persons in remote areas, a case could be made for giving them preferential tax treatment in the sales tax system.

Residents of Have-Not Provinces

The case of residents in have-not provinces is somewhat similar to the case of persons in remote areas, though with some exceptions. The exception concerns the fact that the one important thing which differentiates persons in different provinces is the behaviour of their respective provincial governments. It has been well established that, in a decentralized federation where the provinces have significant taxing and spending responsibilities, there is an economic argument that can be made on both equity and efficiency grounds for a system of equalizing transfers.²⁶ The objective of such equalization is captured in the wording of subsection 36(2) of the *Constitution Act, 1982* which obliges the federal government to make equalizing transfers to the have-not provinces such that all provinces can provide comparable public services at comparable rates of taxation. This objective is realized in Canada by a variety of instruments including Equalization, Established Programs Financing and the Canada Assistance Plan. Equalization in principle works to compensate for differences in tax capacity among provinces.

The relevance of this provision for passenger transport depends upon, first, the extent to which passenger transport services are regarded as public services, and, second, on the extent to which they are regarded as the responsibility of the provinces. If they are regarded as public services, it will presumably be because of the sorts of equity reasons discussed above. To the extent that the provinces are responsible for their provision (for example, municipal transit, buses, roads, etc.), the federal government may, nonetheless, have an interest in setting equity standards, since by subsection 36(1) it bears joint responsibility for equity. In that case, the federal government can only exercise its influence over passenger transport by less direct means. For example, it may provide incentives through the tax system, or it may provide conditional transfers to the provinces to maintain some sorts of national standards. It cannot legislate directly in areas of provincial responsibility, and presumably this implies that it is unable to regulate standards. A full consideration of federal-provincial fiscal arrangements as they apply to passenger transport is beyond our scope. However, the ultimate equity objectives that the federal government might want to impose are the same as those we have already discussed.

The Elderly

Finally, let us consider one further category of persons not explicitly mentioned as disadvantaged, but nevertheless one that could be treated as such, and that is the elderly. This may be relevant since the elderly may have special reasons to rely on certain types of transport services. The case of the elderly is essentially the same as that of the disabled in terms of the principle involved.²⁷ Being elderly is a characteristic which is observable and which affects one's utility over and above that due to income level. One might want, therefore, to make cash transfers contingent on age for equity reasons. Also, to the extent that utility varies with need for transport services, provision of such services can be justified on equity grounds.

IV. SUMMARY REMARKS

The purpose of this paper has been to survey the arguments for using equity as a criterion for public policy; to discuss the ways in which equity considerations are incorporated into policy, including through direct and indirect taxes and transfers, social insurance, government expenditures, transfers in kind and regulation; and to consider what implications this might have for passenger transportation services. Some of the key results we have discussed are as follows:

- Public policy choices necessarily involve making value judgments. It is convenient to think conceptually of these judgments as being incorporated in a social welfare function, which is an aggregate of individual utilities. A key value judgment involved in this aggregation is the degree of aversion to inequality in utilities. Depending on one's aversion to inequality, very different redistributive policies can be obtained, from the progressive to the regressive.
- Individual utilities depend upon a number of factors, including ability to earn income, effort, and other characteristics such as health status and disability, age, employment and location of residence, to name a few. Redistributive policies can be directed at any of these dimensions.
- The conventional income-based tax-transfer system addresses mainly inequalities aimed at differences in ability to earn income. There is a limit to its redistributive potential, both because there are other sources

of utility than ability-to-earn-income differentials, and because income derives not only from ability to earn, but also from effort. In other words, there is an efficiency-equity trade-off. Studies have indicated that there are strict limits to the redistributive potential of income-based taxes and transfers.

- Governments engage in a number of other redistributive policies besides those based on income, and some of them are delivered through the income tax system. In fact, a significant proportion of program spending is actually motivated mainly by redistributive considerations, including such large programs as UI, pensions, medical care, welfare, and even public education. Many of them tend to be directed to characteristics other than income. In other cases, public provision of quasi-private goods can serve an income redistributive goal, if they are of relatively greater benefit to low-income persons.
- On the tax side, governments rely both on direct and indirect taxes to raise the bulk of their revenues even though, in principle, it might be better to rely on direct taxes only. Indirect taxes become necessary to reduce the ability and incentive to evade direct taxes. A case can be made for incorporating some progressivity into the indirect tax system.
- Applying these principles to the case of passenger transport, introducing equity considerations into the provision of passenger transport can be viewed as supplementing the income-based tax-transfer system, or as addressing utility differences arising from characteristics other than ability to earn income.
- As an instrument for income redistribution, subsidizing some forms of passenger transportation can be justified to incorporate equity into the indirect tax system. This would presumably apply to forms of transport which are used mainly by low-income persons. There are a variety of reasons discussed in the text as to why equity considerations ought to be incorporated into the indirect tax system.
- Subsidizing passenger transport could also be justified on grounds of efficiency. For one, these may be decreasing cost industries which would be operated at a loss under optimal pricing policies. For another, the second best argument states that, if some forms of transport are available below marginal social cost (for example, road transport), then others should be as well.

- Subsidizing of particular forms of passenger transport services can also be justified to provide assistance to persons on the basis of utility characteristics other than ability to earn income. This is particularly true of the elderly, the disabled and the ill of health, and it may apply to a certain extent to those in remote areas.

In summary, there are good theoretical reasons for taking equity considerations into account in the provision of passenger transportation. However, to do so requires that value judgments be made. It also requires some confidence in the relationship of various forms of passenger transport to individual characteristics which affect utility.

APPENDIX

The purpose of this Appendix is to discuss certain aspects of the literature on social choice and social welfare functions which have a bearing on the meaning and use of equity in evaluating public policy. The starting point is the Arrow Possibility Theorem which was mentioned in the text. Recall that it states that, if the only information we have available is the rankings of alternatives by the persons in the economy, if there are no restrictions on the form of those rankings, and, if both the Pareto principle and the independence of irrelevant alternatives must be satisfied, then majority voting procedures cannot be guaranteed to give a rational ranking of the alternatives.

In response to this Arrow Possibility Theorem, two branches of literature developed. One branch, known as *positive social choice*, is concerned with relaxing some of the technical requirements, such as the independence of irrelevant alternatives or the unlimited nature of household rankings, so as to avoid the dictatorial outcome. This literature is preoccupied with the mechanism of obtaining social rankings rather than the normative properties of the rankings, so is of little interest to us. The more interesting branch for our purposes is known as *normative social choice* analysis and looks at the consequences of using more information on household preferences. We restrict attention to that.

Under the Arrow Possibility Theorem, only household rankings or orderings of alternative allocations are allowed. Normative social choice theory considers adding, to that, information concerning the measurability and comparability of individual utilities. Naturally, this involves making value

judgments over and above those of individualism and the Pareto principle. The literature on normative social choice is much too long and complex for us to begin to survey. However, there is one notion that has come out of it that is very appealing for our purposes, and that is the following. Suppose we accept some notion of measurability and interpersonal comparability of household utilities. Sen (1977) has shown that, under very weak requirements, the social ranking of alternative social states depends only upon household utility levels achieved in those states, and not upon any extraneous information. The requirements are unrestricted domain, the Pareto indifference principle, and the independence of irrelevant alternatives. In the literature, this is referred to as the principle of *welfarism*. In other words, the abstract construct of a Bergson-Samuelson social welfare function can be used as a conceptual device for ranking social alternatives.

We take this notion of a social welfare function which depends only upon individual utilities as our starting point. Making it operational involves two further steps. One is devising ways of measuring individual utilities in, say, dollar terms. The other involves weighting these utility measures in the social welfare function. The latter naturally involves a value judgment. Let us discuss these very briefly in turn.

The conventional means for measuring the utility of a household is by the use of a so-called "money metric" indicator of utility. Technically speaking, a money metric associated with a given level of utility is the amount of money that would be required to achieve that utility level at a given set of reference prices for all goods (including leisure). This is what economists refer to as the *expenditure function*. Differences in the value of the expenditure function between two different allocations can be interpreted as the compensating variation or the equivalent variation depending on what set of reference prices is used. The conventional consumer surplus notion is simply an approximate measure of the compensating or equivalent variation. The fact that the value of the money metric depends upon the set of reference prices used is simply a reflection of the fact that utility cannot be unambiguously measured. It is useful to refer to this money metric indicator as the *real income* of households. If all persons had a common utility function, and if the same set of reference prices were used by all, the social welfare function could be rewritten as a function of these measures of real income rather than of utility levels. We return below to the form that the social welfare function might take.

Real income as measured above is a sensible money metric measure for utility if persons have the same utility function; that is, if they have the same ability to convert real income into utility. However, there are some obvious circumstances in which that will not be possible. Two that have been considered in the literature are as follows:

Differences in Household Size and Characteristics

When households consist of differing numbers of persons of different ages, they are likely also to differ in the utility they generate from a given level of per person real income. For example, some consumption goods are consumed in common among members of the household so that economies of scale can be achieved in consumption. Furthermore, some economies in household production of non-market services can be obtained. Economists have attempted to deal with these differences by adjusting real incomes by means of *household equivalence scales*. The household equivalence scale is constructed in the following manner. First, a reference household is chosen, for example, a single person with no children. Then, the equivalence scale for a person in a household of type x is calculated to be the ratio of the real income of that person to the real income that would be required by a person in the reference household to obtain the same level of utility. In other words, the equivalence scale can be interpreted as the number of persons in households of type x that are equivalent to one person in the reference household in terms of the ability to generate utility from real income. Equivalent real income is simply observed real income deflated by this equivalence scale. The concept of equivalence scales is widely used in empirical work for dealing with families of different size and composition. It could also be used to adjust real incomes to account for a variety of other circumstances, such as differences in the cost of earning income, medical expenditures, moving expenses, and the extra costs of living in remote areas.

It should be also noted that the concept of household equivalence scales bears a close resemblance to the principle of *horizontal equity* in tax theory. The latter says that persons at the same level of utility ought to be treated the same by the tax system (that is, ought to pay the same taxes). This idea is captured by the saying that "equals should be treated equally." The implementation of horizontal equity should, in principle, be accomplished through the tax base. That is, the tax base should be adjusted by a system of deductions so that persons with equal utilities have the same tax base,

even though they have very different pre-tax incomes. The tax-rate structure can then be applied to the adjusted base. This procedure is generally used by economists as an argument for deductions rather than credits to account for such things as family size, medical expenditures, educational expenditures and the cost of earning income.

Differences in Utility Functions

A related problem is that of the case in which different persons with the same income receive different levels of utility from that income. For example, persons with disabilities or ill health may require more income to generate the same amount of utility. This is a more difficult one to deal with since there are obvious identification and measurement problems in correcting for these differences in utility functions. To correct for it fully in the tax system would presumably involve more than a set of deductions. Whether one actually wants to correct for it fully is discussed further below.

There are other ways in which utility functions may differ among individuals as well. For example, persons may have different preferences for particular types of goods. Thus, some persons may have a relative preference for leisure, others for fast cars, others for taking risks, etc. These differences would also be very difficult to take full account of because of obvious measurement problems. On the other hand, from the point of view of redistributive equity, it is not obvious that they are essential problems.

Suppose we have solved these problems of how to measure utility using some notion of real income suitably corrected for differences in household circumstances and utility functions. The next step in principle is devising a weighting system for aggregating these utility measures, or, in other words, devising a social welfare function. This is where the crucial value judgments arise. Depending upon the type of social welfare function chosen, very different redistributive policies can emerge as is shown in the text. If we are prepared to make further value judgments, a simple general form of social welfare function emerges which allows us to isolate a key determinant of redistributive equity.

To begin with, let us postulate some reasonable properties that a social welfare function might be required to satisfy. It will be assumed to satisfy the Pareto principle and to be welfaristic (that is, to depend only on utility

levels of households, and to be increasing in individual utility levels). Following much of the literature, the social welfare function will be assumed to satisfy the following further reasonable technical properties: anonymity, separability and quasi-concavity. Anonymity means that it does not matter which households get which utility levels; only the utility levels themselves count. Separability means that, in ranking two allocations, only those households which have strict preferences over the two should count, not those which are indifferent. (This was due to Fleming (1952) who used it as a basis for arguing in favour of a utilitarian social welfare function.) Quasi-concavity is a technical term which is equivalent to saying that social indifference curves in utility space cannot be concave to the origin. These requirements leave a large family of social welfare functions. However, they differ from one another in what may be termed their *aversion to inequality*. The notion of aversion to inequality is illustrated in the text for the simple two-person case. Here we may simply note the general algebraic form that the social welfare function may take:

$$W = \sum_{h=1}^H \frac{(u_h)^{1-\rho}}{1-\rho}$$

- where u_h is the real income of household h , H is the number of households, and ρ is the aversion to inequality, sometimes also referred to as the equity parameter. Note that for $\rho=0$, we have the classical utilitarian case considered in the text. Similarly, as ρ approaches infinity, the social welfare function approaches the maxi-min form, also discussed in the text. More generally, the higher the value of ρ , the greater the aversion to inequality in utilities among households, and the stronger the equity-efficiency trade-off.

The consequences of differences in the degree of inequality aversion for redistributive policy are illustrated in the text with reference to lump-sum redistributive transfers when total incomes are fixed. However, there are other circumstances in which the parameter becomes important as well. Two further cases will illustrate this. The first case is that in which we allow labour to be variable, but retain the assumption that income can be redistributed in a non-distorting way. The second occurs when we allow for the efficiency costs of redistributive policy.

Suppose we continue the above two-person example, but assume that the persons have the same utility function. Furthermore, assume that they have different wage rates because of some underlying differences in ability, and that they can vary their income by changing their supplies of labour. Thus, utility is assumed to depend upon consumption (after-tax income) and leisure. *A* is assumed to be the high-wage person and *B* the low-wage person. For this case, the government is assumed to be able to redistribute income in a lump-sum way, and we ask how redistributive the tax system should be. Consider the two extremes of utilitarianism and maxi-min.

In the utilitarian case, the government redistributes income until the marginal utility of consumption is the same for both persons. As Stiglitz (1987) has shown, equalizing the marginal utility of income entails a highly redistributive policy which actually makes the high-wage person worse off than the low-wage person. In the special case in which the utility function is the sum of the utility of consumption and the utility of leisure, full equality of income is achieved, but high-wage persons work more because of their higher wage rate.

The maxi-min case has been considered by Sadka (1976). Here, utility levels are equalized by the tax. Since the high-income persons will be supplying more labour, they will have to be left with high levels of income to keep them at the same utility level as the low-wage persons. Consequently, the tax system will be less progressive than under utilitarianism. In fact, there is no presumption that it will be progressive at all. Depending on the shape of utility functions (that is, the substitutability of leisure for consumption), the tax could be regressive or progressive.

Thus, even without bringing efficiency considerations into the picture, there is considerable ambiguity about how redistributive the tax system should be. It depends upon whether or not utility functions differ; whether leisure is variable and, if so, how substitutable it is for consumption; and how much inequality aversion there is in the social welfare function.

Once efficiency considerations are added, the analysis becomes more complicated, but the ambiguities remain. The complications arise because of the fact that redistributive taxation is no longer lump-sum, but is based on income. That being the case, the tax imposes a distortion on labour supply, and the distortion increases with the extent of redistribution. There is thus

a trade-off between equity and efficiency. Unfortunately, the analysis of this problem is very complicated, and most authors have had to resort to simulation techniques. There is an enormous literature on the so-called "optimal income tax" which calculates the form of the income tax schedule under a variety of supposedly realistic assumptions about individual preferences and social welfare functions. Basically, the message of that literature is that the optimal amount of progressivity of the income tax is surprisingly limited.²⁸ It is not clear from the literature how much of that is due to the efficiency-equity trade-off and how much is due to the variability of leisure *per se*.

ENDNOTES

1. See, for example, Sen, 1970.
2. A more technical and detailed review of these arguments can be found in Blackorby and Donaldson, 1990.
3. A full discussion of this issue may be found in Boadway and Bruce, 1984.
4. The former arises because some changes may involve redistribution with no change in efficiency. The hypothetical compensation test will be satisfied only if all persons could be made potentially better off by a change. If a policy has mainly redistributive effects, that will not be possible. For example, to use the technical jargon of welfare economics, a policy change which involved a move along the society's *utility possibility frontier*, making one group of persons better off and another worse off without distorting the economy, could not be ranked by a hypothetical compensation test. The test would not be satisfied either for the policy change or for the change in the opposite direction. The possibility that the compensation test is contradictory in the sense that it could be satisfied in both directions is well known and is referred to as the Scitovsky Paradox after Scitovsky, 1941. It is discussed fully in Boadway and Bruce, 1984.
5. One of the main advocates of this has been Harberger, 1971.
6. This is sometimes referred to as a Bergson-Samuelson social welfare function after Bergson, 1938 and Samuelson, 1947.
7. This social welfare function goes back to Mill, 1921 and is sometimes referred to as classical or additive utilitarianism.
8. This is sometimes referred to as the *Rawlsian* social welfare function after Rawls, 1971.
9. This is the classic case of Edgeworth, 1881.
10. See Mirrlees, 1971, Roberts, 1984 and Tuomala, 1990. Taking occupational choice into account, it is even more limited. In fact, rather perverse redistributive results can be achieved in this case, as has been shown in Boadway, Marchand and Pestieau, 1990.
11. For a detailed discussion of the role of the corporate tax, see Boadway, Bruce and Mintz, 1987. There are, of course, those who see the corporate tax as a vehicle for taxing the rich and would like to see more revenues extracted from the corporate sector. They would do

this through the corporate tax itself as well as through such things as minimum taxes levied on corporations. It is not clear that thinking of the corporate tax as a redistributive tax makes much sense. For one thing, it would be a very blunt instrument for the purpose. For another, it has become widely accepted that, given the degree of openness of international capital markets and the ease with which corporate capital can be reallocated among countries, much of the incidence of the corporate tax falls back on non-capital factors of production, especially labour.

12. In fact, many of these are now delivered through credits rather than deductions, though credits can be structured to have similar effects to deductions when combined with rate structure changes. We would argue that, where it is appropriate to make adjustments in the tax through the base, this should be done by deductions (exemptions) rather than credits.
13. Most incidence studies have shown that the tax structure as a whole is not too different from proportionality. See the recent survey of the literature in Whalley, 1984.
14. The choice of a destination or an origin basis would be irrelevant for this equivalence.
15. Technically, a separable utility function may be written

$$U = U [f(X_1, X_2, \dots, X_n), L]$$

where X_i is the consumption of good i and L is leisure. The implication of this function is that relative demand for the goods is independent of the amount of leisure taken.

16. On theoretical grounds, the only source of market failure that has been identified as a potential argument for government intervention is the existence of search externalities (Diamond, 1981). This could hardly form a justification for the structure of UI as we see it today.
17. See Browning, 1975.
18. See Gordon and Varian, 1988.
19. The result seems first to have been discovered by Nichols and Zeckhauser, 1982. A cursory summary of this literature is found in Blackorby, 1990. The application to health services is in Blackorby and Donaldson, 1988; and that to education and pensions is in Boadway and Marchand, 1990. Guesnerie and Roberts, 1987 had applied a similar analysis to the case of minimum wages as a way of inducing more leisure. The analysis has been extended to unemployment insurance by Marceau and Boadway, 1991.
20. I have tried to deal more fully with these issues in Boadway, 1991.
21. This argument is developed in Boadway, 1989.
22. By necessities, we mean commodities which comprise a lower proportion of expenditures of a person's income as income rises. Conversely, luxuries are a higher proportion of expenditures as income rises.
23. This may be only partly true since the cost of fuel may be above its marginal cost due to taxes.
24. That is, they are free of charge at the margin. Medical plans may require premiums to be paid, but these do not vary with treatment.

25. It is also the case that persons in remote areas are better off than if they had to move to populated areas. However, that is not the issue here.
26. See Economic Council of Canada, 1982.
27. That is not altogether true. Being elderly is a part of the life cycle that everyone has a possibility of encountering. Some persons fare better than others in terms of well-being when elderly.
28. A good survey of the literature may be found in Tuomala, 1990.

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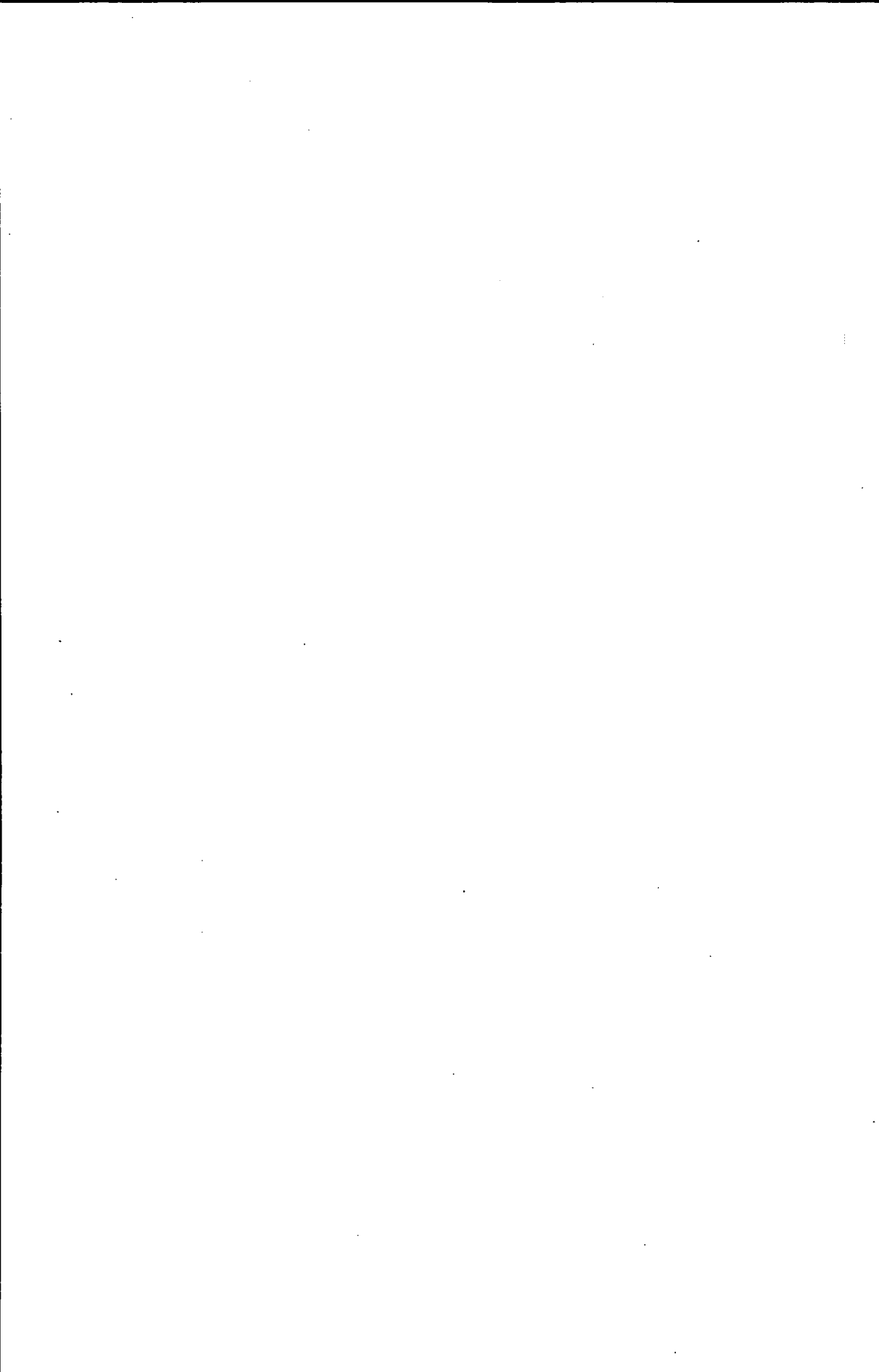
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TRANSPORTATION AND ECONOMIC DEVELOPMENT: A SURVEY OF THE LITERATURE

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OVERVIEW

This paper is both a survey of the literature on transportation and economic development, and an essay that addresses many of the questions that are of interest to the Royal Commission on National Passenger Transportation. This paper is referred to in the text as "the survey," and it deals with the following:

- transportation and economic development in general, and as it concerns passenger transportation in particular;
- transportation and regional economic development in general, and as it concerns passenger transportation in particular; and
- transportation and tourism.

After introductory and methodology comments, these areas are developed in Parts A, B and C. An extensive bibliography is included, and is referred to throughout the paper.

THE CHALLENGE

Economic development is defined both narrowly and broadly. Narrowly, the concern is with the growth of real Gross Domestic Product (GDP), real GDP per capita, and real GDP per worker. Broadly, the following indicators are considered: GDP and some distributive measures; GDP and non-market economic activities; GDP adjusted for changes in resource stocks, indicators of social well-being and environmental quality.

The overarching set of questions are:

Has transportation caused economic development? Have identifiable transportation elements, individually or in concert with other elements, caused identifiable changes in Canadian measures of economic development? More specifically, have passenger transportation changes caused economic development?

As Maddison (1989) has shown, Canada, along with other Western industrialized economies, has gone through four phases of economic growth during the 20th century. These are:

- fairly rapid economic development before World War I;
- slow growth, stagnation and depression from the end of World War I through 1950 (for Canada and the United States, the results of the Great Depression were reversed, and considerable increases in economic activity took place during World War II);
- a so-called "Golden Era" of exceptionally rapid economic development from 1950 through the early 1970s (with considerable convergence of national productivities toward the leader, the United States); and
- slow growth and higher inflation between the mid-1970s and the end of the 1980s.

Was transportation a contributing cause of these phases of economic development? Is there anything in a recent argument that the slowdown in investment in infrastructure (particularly in transportation) since the early 1970s has been a significant factor in the recent general economic slowdown?

Also, is there anything in the contention that deficiencies in infrastructure, including transportation facilities, are a major drag on the growth prospects of the 1990s? (Munnell (ed.), 1990.)

These questions may be asked on a less macro basis. For example, have broad *sub-groups* of transportation investment, operation and regulation caused identifiable outcomes for important *segments or regions* of economic development? Do these sub-groups of changes add up to important changes in both the size and structure of the Canadian economy? Some illustrative questions follow:

- Has the construction and operation of the Interstate Highway System in the United States and the equivalent system in Canada since 1950 been a major contributor to national productivity in these countries?
- Historians (Bothwell et al., 1989) have recorded that the widespread use of privately owned and operated cars in Canada occurred after World War II. Was this a factor in Canada's post-war Golden Era of economic development? (*Historical Atlas of Canada*, Vol. III, Plate 53)
- Have containers and piggy-back services substantially improved medium- to long-distance transportation of medium-weight, medium-value goods over long distances, and thus contributed to growth of markets, division of labour and productivity of important economic sectors?
- Has the development of efficient medium- to long-distance jet passenger aircraft revolutionized middle- to long-distance passenger travel? Have these changes greatly improved business travel and thus made possible the efficient management of larger national and international businesses, and thus improved productivity in many sectors of the economy? (*Historical Atlas of Canada*, Vol. III, Plates 53, 54 and 55)
- Have the United States and Canada achieved efficient highway pricing and investment as well as efficient airport pricing and investment? If not, what have been the costs of the inefficiencies? What can be done about them?
- Have the regulation and deregulation of rail and trucking services reduced the inefficiencies in these services, and thus greatly improved the productivity in some sectors of the Canadian economy?

- What are the alternatives in financing mixed private-public goods such as transportation, and in particular passenger transportation? What has been used in Canada? Are the approaches efficient and equitable?

The analysis can also be carried on at a much more micro level. Have particular projects in transportation been clear successes or failures? What are the criteria for decision making and evaluation? Are they appropriate or inappropriate? Are there major gaps in the available information, so that decision making and evaluation of transportation projects are clouded with uncertainties? What are the precise linkages of transportation projects or decisions and specific economic outcomes? How has the transportation system, its use and regulation adapted to changes in technology, demands for services, and other economic circumstances?

THE LITERATURE THAT PROVIDES EVIDENCE ON TRANSPORTATION AND ECONOMIC DEVELOPMENT

A wide variety of materials should be considered, some of them cursorily. They include:

- theories of international and inter-regional trade, and of location of firms and industries;
- theories of economic development, particularly regarding capital, knowledge and the extent of markets;
- theories of public goods and public choice, and impressionistic application to transportation; issues of externalities;
- comparative economic history:
 - general literary economic history; metropolis literature;
 - quantitative economic history, particularly that which treats economic development, transportation, trade and movements of people;
 - history and analyses of shifting structures and location of economic activities; and
 - transportation history;
- economic geography, particularly that which deals with changing location and interrelationships of economic activities and people;

- empirical analyses of general macroeconomic development;
- empirical analyses of models of transportation and economic development: macro, segments, regions, also demand for and cost of analyses of transportation services, particularly of passenger services;
- decision making on capital projects, particularly on infrastructure, and, within this category, especially on transportation;
- policy literature on economic development: general, regional, and regional disparities;
- policy literature on transportation; and
- regulation, deregulation, nationalization, privatization, subsidization and taxation of transportation.

THEMES IN THE LITERATURE

One central theme is that investing in transportation has contributed to economic development. The improvements to railroads and ships after 1870, trucking in the 20th century, and the Interstate Highway System after World War II illustrate this theme.

Transportation elements are one set out of many sets of contributors to economic development. Others include saving and the accumulation of capital; improvements in knowledge and innovations; increases in the size of the labour force and improvement in its skills; and changes in trading environments.

The contributions of transportation to economic development are difficult to identify, for several reasons. To be precise about the causality, and the strength and efficiency of the contributions, is a demanding task, fraught with uncertainty.

When many factors are causes of economic development, individually and in concert, untangling the contributors is difficult. This is so whether the elements be the size and skills of the labour force, the size and structure of the stock of capital, the state of knowledge, or the trading environment, to name a few.

Transportation decisions are often made on a case-by-case basis, yet their effects often accrue on a network basis. Thus, the consequences of transportation decisions may be quite different (sometimes better and sometimes worse) than were envisioned in the initial decision.

Transportation elements are sometimes causes of economic developments, and sometimes consequences of them. The developments of cars, highways and air services have caused changes in passenger transportation. However, the increases in wealth and income of people, from whatever sources, have caused increased travel. Analyses that can cope with and measure two-way causality are notoriously difficult.

The measurement of costs and benefits of activities carried out through market economies can be made within tolerable margins of error. But the measurement of costs and benefits of government activities is more complex and subjective. Even more treacherous is the measurement of costs and benefits of saving time, reducing noise, increasing safety, restructuring logistical arrangements, and protecting the environment.

Despite the difficulties of identifying and measuring the costs and benefits of transportation elements for economic development, the effort must be made. The attempt can be carried out at a highly macro level (all transportation investment and the national output of goods and services), at intermediate macro levels (blocks of transportation and segments and regions of a nation), and at micro levels (the evaluation of particular transportation projects). Indeed, the literature to be surveyed covers all these approaches.

GEOGRAPHIC DISTRIBUTION AND MOVEMENT OF PEOPLE

Economic development generates geographical distributions of activities and people that are uneven and specialized. Geographical distribution is partly a reflection of transportation services, but is largely determined by other factors. Except for resource industries, strong tendencies have emerged throughout the world in this century for activities to be concentrated in metropolitan areas. (See Careless, 1979; Kerr, Holdsworth and Matthews, 1990; *Historical Atlas of Canada*, Vol. III; McCann, 1987.) As cities tend to differ in the types of services and commodities they produce, inter-regional movement of goods and people is necessary in a developed economy.

Transportation of people is an integral part of the growth and operation of developed economies. Much of the movement is intra- rather than inter-regional: going to and from work, shopping, attending school, obtaining health care, enjoying day-to-day recreation. Private cars and small trucks, taxis and public urban transportation are the main sources of local transportation.

Inter-regional movements of people are the main focus of the Royal Commission. As shown in its Interim Report, private recreational and vacation travel are the largest portion. Private cars are the dominant mode for short-to-medium distances, and air services for medium and longer distances. Buses and trains are now the minority modes for such travel. Inter-regional business travel, typically by air, is also substantial.

For movements of people, cars, trucks and buses are joint users of the road systems. Joint use of airports for goods and people movement is also important.

Developments in *passenger transportation* have been factors contributing to economic development. These include, for example, the increase in ownership and use of passenger automobiles in the 20th century, and post-World War II development of large, jet-engined passenger aircraft. However, just as for goods, and for the same reasons, the precise links between passenger transport and economic development are more difficult to determine. Transportation causing economic development — and the obverse, economic development causing transportation — are important characteristics of movements of people.

CONTENTIOUS ANALYTICAL AND POLICY VIEWS

Inevitably, there are considerable imprecisions about policy regarding transportation, reflecting:

- difficulties in determining cause-and-effect relationships between elements of transportation and economic development;
- differences of view about transportation services as public goods;
- difficulties in measuring costs and benefits, as noted already;
- the domain being considered — country, state or province, region, or municipality;

- different views about the feasibility of imposing and collecting charges for use of public facilities;
- differences of market conditions;
- differences in values or objectives of economic and social policy; and
- differences of view about the efficiency of government.

From even a preliminary review of the literature, some contentious analytical and policy views emerge:

- the United States and Canada have some transportation facilities and services that fall short of current technology, demands, and cost opportunities;
- even when facilities are appropriate, they are used inefficiently;
- counting of the benefits and costs of transportation is inappropriate;
- the nation has too much, or too little infrastructure, particularly transportation infrastructure;
- decision-making models for transportation are grossly wrong;
- efficient transportation services are impeded by massive monopoly practices, "feather-bedding," subsidization, regulation, and bureaucratization; and
- efficiency considerations in transportation are overwhelmed by considerations of entrenched special interests, distributional pressures and political values (see the debates between Winston, 1990 and Altshuler, 1990 in Munnell (ed.), 1990).

THE SURVEY

PART A — TRANSPORTATION AND ECONOMIC DEVELOPMENT

THE STATISTICAL RECORD OF ECONOMIC DEVELOPMENT

Maddison provides the most thorough and up-to-date analysis in his study, *The World Economy in the 20th Century* (1989). What follows are a few extracts from that book.

Table 1 is a summary of the aggregate of the 16 Organisation for Economic Co-operation and Development (OECD) countries and some components, 1900-87. It shows that per capita real incomes among the OECD countries were over five times as large late in the 20th century as at its beginning. It also shows that about two thirds of the increase in real product was from increases in output per capita.

Table 1

SUMMARY OF THE AGGREGATE OF THE 16 OECD COUNTRIES AND SOME COMPONENTS — 1900-1987

(a) GDP in billion "international" dollars at 1980 prices	1900	603.1
	1987	7,759.3
(b) Population (million persons at mid-year)	1900	310.0
	1987	700.7
(c) Per capita GDP in "international" dollars at 1980 prices	1900	1,946.0
	1987	11,073.0
(d) Rate of growth of GDP (annual average compound rate) 1900-87		3.0
(e) Rate of growth of population (annual average compound rate)		
1900-50		1.3
1950-87		0.5
1900-87		0.9
(f) Rate of growth of per capita GDP (annual average compound rate)		
1900-50		1.1
1950-87		3.3
1900-87		2.0

Table 2 is an extract from Maddison. It shows that trends in Canadian GDP growth were well above the OECD average in the 20th century, and more so in the first half than in the second half. A major factor in this growth has been the more rapid growth in Canada's population than the average of OECD countries, both in the first half and in the second half of the century. Canadian productivity growth has not been outstanding, being a little above the average of the OECD countries during the first half of the century, and a bit below during the period from 1950 to 1987.

Table 2

INDIVIDUAL COUNTRY GROWTH PERFORMANCE, 1900-1987
 (ANNUAL AVERAGE COMPOUND GROWTH RATES)

	GDP			GDP			GDP		
	Popu- lation	per capita		Popu- lation	per capita		Popu- lation	per capita	
	1900-87			1900-50			1950-87		
Australia	3.1	1.7	1.4	2.4	1.6	0.8	4.0	1.9	2.1
Austria	2.2	0.3	1.9	0.8	0.3	0.5	4.2	0.2	3.9
Belgium	2.1	0.4	1.6	1.3	0.5	0.8	3.2	0.4	2.8
Canada	4.1	1.8	2.3	3.9	1.9	2.0	4.4	1.7	2.0
Denmark	2.8	0.8	2.0	2.7	1.0	1.6	3.1	0.5	2.6
Finland	3.3	0.7	2.6	2.7	0.8	1.9	4.1	0.6	3.6
France	2.4	0.4	2.1	1.3	0.1	1.2	4.0	0.8	3.2
Germany	2.8	0.7	2.2	1.7	0.8	1.0	4.4	0.5	3.8
Italy	2.8	0.6	2.2	1.8	0.7	1.1	4.3	0.5	3.7
Japan	4.3	1.2	3.1	2.3	1.3	1.0	7.1	1.0	6.0
Netherlands	2.9	1.2	1.7	2.4	1.4	1.0	3.6	1.0	2.6
Norway	3.4	0.7	2.6	2.9	0.8	2.1	4.0	0.7	3.4
Sweden	2.8	0.6	2.3	2.6	0.6	2.0	3.1	0.5	2.7
Switzerland	2.8	0.8	2.0	2.6	0.7	1.9	3.2	0.9	2.2
United Kingdom	1.8	0.4	1.4	1.3	0.5	0.8	2.5	0.3	2.2
United States	3.2	1.3	1.8	3.1	1.4	1.7	3.2	1.3	1.9
OECD average	2.9	0.9	2.1	2.2	0.9	1.3	3.9	0.8	3.0

Source: Maddison (1989), Table 1.2.

Table 3 is an extract from Maddison. For the OECD countries, it shows the enormous shift in the structure of employment and output. These data remind us of the enormous exodus from employment in agriculture to both industry and services, and more recently from industry to services. The recent shift of output from industry to services has been less than that of employment, reflecting the higher growth of productivity in industry than in services.

Table 4 is a reproduction from Maddison. It shows the exceptional rate of productivity growth among the OECD countries in what Maddison calls the "Golden Era," between 1950 and 1973. Average growth rates of productivity since then have been a little above those during the first half of the century. The data also show that Canadian growth of productivity was well above the OECD average during the first half of the century, and has been below the average since 1950.



Table 3

**LONG TERM CHANGES IN STRUCTURE OF EMPLOYMENT AND OUTPUT
(OECD AVERAGE)**

	Employment			Value added		
	Agriculture	Industry	Services	Agriculture	Industry	Services
1900	38	31	31	28	31	41
1950	25	36	39	15	41	44
1980	7	34	59	4	37	59
1987	6	30	64	4	36	60

Source: Maddison (1989), Table 1.4.

Table 4

**OECD PRODUCTIVITY GROWTH (GDP PER MAN HOUR), 1900-86, FOR THE 16 OECD COUNTRIES,
INCLUDING CANADA**

	1900-13	1913-50	1950-73	1973-86
Australia	1.1	1.6	2.7	1.8
Austria	1.5	0.9	5.9	2.8
Belgium	0.9	1.4	4.4	1.7
Canada	3.5	2.4	2.9	1.5
Denmark	2.2	1.6	4.1	1.5
Finland	2.1	2.3	5.2	2.5
France	1.6	2.2	5.0	3.4
Germany	1.5	1.0	6.0	3.0
Italy	2.4	1.7	5.5	2.1
Japan	2.3	1.7	7.6	3.1
Netherlands	1.1	1.7	4.3	1.8
Norway	2.1	2.5	4.3	3.3
Sweden	1.6	2.8	4.4	1.6
Switzerland	1.6	2.7	3.3	1.6
United Kingdom	0.9	1.6	3.2	2.5
United States	1.7	2.4	2.4	1.2
OECD average	1.8	1.9	4.5	2.2
USSR			3.6	1.2

Source: Maddison (1989), Table 7.2

Table 5 is an extract from Maddison. These data show the general trend of convergence of levels of national productivity toward the leader, the United States. There are explainable exceptions, such as the relative decline of Australia and the United Kingdom during the first half of the century, and

the setbacks for many European countries and Japan due to World War II. These data also show that the level of Canadian productivity has been second only to that of the United States throughout most of the 20th century.

Table 5

COMPARATIVE LEVELS OF OECD PRODUCTIVITY (GDP PER MAN HOUR) 1900-86
(U.S. GDP PER MAN HOUR = 100)

	1900	1913	1950	1973	1986
Australia	94	87	64	68	73
Austria	47	46	26	57	70
Belgium	63	58	40	62	90
Canada	61	76	76	85	89
Denmark	52	56	42	61	63
Finland	30	31	30	55	65
France	41	41	38	67	89
Germany	49	48	29	64	79
Italy	39	43	33	66	74
Japan	16	17	13	40	51
Netherlands	72	67	51	78	84
Norway	39	41	42	64	84
Sweden	41	41	46	72	76
Switzerland	53	53	58	70	73
United Kingdom	82	74	54	64	75
United States	100	100	100	100	100
15 country average (excluding United States)	52	52	43	65	76
USSR			28	36	36

Source: Maddison (1989), Table 7.3.

THEORIES OF ECONOMIC DEVELOPMENT

This paper is concerned with developed economies. Much interest existed in the 1950s and 1960s in explaining the variations in economic development of particular countries over time, and differences in economic development among nations. While there were differences in both the fundamentals and the nuances of these explanations, some common ground is found, particularly regarding the *proximate determinants* of economic development. Many of the examinations proximately explained *levels* of potential (sometimes actual) economic development by treating GDP as a function of the quantities

of land, labour, capital, quality of labour, and productivity (more recently, total factor productivity). (See Abramovitz, 1952; Hirschman, 1958; Kindleberger, 1965; Lewis, 1955; Hood and Scott, 1957; and Solow, 1962.)

Derived from this starting point, the *growth* in output was taken proximately to be determined by the *growth* of land in use, the *growth* of the quantities of labour and capital, the *improvement* in the quality of labour, and the *increase* in (total factor) productivity. Attempts to explain changes over time in economic development of a nation or group of nations and comparisons of development among countries were made using these proximate determinants.

For example, for the 16 OECD countries, Maddison bases his proximate explanation of the slower growth between 1973 and 1984, compared with 1950 to 1973, largely on the slowdown in the growth of total factor productivity, and secondarily on the slowdown in capital formation. (See Table 6.)

Table 6

COMPARATIVE OUTPUT, INPUTS AND PRODUCTIVITY PERFORMANCE, OECD COUNTRIES
(ANNUAL AVERAGE COMPOUND GROWTH RATES)

Period	GDP	Cropped land area	Quantity of labour input	Labour quality improvement due to education	Capital stock	Total factor productivity
1950-73	5.40	-0.40	0.54	0.40	4.72	3.35
1973-84	2.26	-0.11	-0.39	0.48	3.22	1.65

Note: Labour is in hours; the figure for labour quality improvement due to education assumes a 0.5 percent proportionate gain in labour quality from a 1 percent increase in educational attainment of the population of working age. Weights used for OECD countries to combine inputs to determine total factor productivity were labour 0.67; capital 0.30; and land 0.03. Weights are proportionate to average shares of factors in total income.

These figures have to be interpreted with care because of annual differences in utilization of inputs. The slower rates of growth and the reduced inputs used after 1973 are partly due to the greater average degrees of economic slack that followed during the years after 1973.

In the literature on economic development, these proximate determinants raise many questions. What, for example, accounts for and affects "total factor productivity," which rather mysteriously dominates the explanations of growth? How does growth in knowledge generate increased productivity? How much of the transformation is through the embodiment of new knowledge in the stock of capital? What accounts for the continued, though variable, efforts of saving and investment? To what extent is the availability of extensive supplies of labour for small increases in real wages a factor in the differences in economic development? To what degree has the extension of markets been a major factor in explaining variations in economic development?

Many years ago, Kindleberger appraised the situation in words that still apply:

We have suggested that there is no agreement on how economic development proceeds and have implied that this is because the process is not simple. There are many variables involved, and there is a wide range of substitutability among ingredients — land, capital, the quality and quantity of labor, and technology can substitute for one another, above certain minima, although there are at the same time certain complementary relationships among them. The will to economize and organization are probably the only indispensable ingredients. For the rest, none are necessary, and none sufficient.

The writers who place greater emphasis on one ingredient or another . . . all of them have useful insights. Even the rather rigid stage theories can illuminate the development process, just as in human growth one can propound a wide variety of sets of stages. . . . But the search for a single theory of growth, or a dominant variable, or the key to development is surely too simplistic. It may be less courageous to be eclectic, but it is also more reasonable. In a complex process with many variables and wide ranges of substitution, it is foolhardy to be a true believer in one causal pattern.

Transformation of resources among sectors is a requirement of growth and development in an economy of more than one output. It is called for by the fact that consumption of any one good encounters diminishing returns after a time. As income increases, old wants take smaller percentages of income, and new wants arise. In consequence, resources must be transferred to new occupations.

The major transformation is from agriculture to manufacturing and services. Productivity is likely to differ between sectors, at any level of income, and to change at different rates. Redundant labor with no (or even negative) marginal productivity is thought to exist as disguised unemployment in overpopulated, underdeveloped countries. If demand increases in the industrial sector, the transfer of this labor into industry can hold down wages, maintain profits, stimulate industrial investment, in a particular model of development "with unlimited supplies of labor." *This model also has historical support and relevance to the recent growth of countries in Western Europe.*¹

One question that has intrigued economists and others in recent years has been the cause of the slowdown in economic growth throughout the Western industrialized countries since 1973. Even allowing for the *sui generis* growth experience of the "Golden Era" between 1950 and 1973, the subsequent decade and a half or so of growth and inflation has been disappointing. The most obvious explanation has been the decrease in investment and saving efforts.

The proportion of output saved and invested was certainly smaller after 1973 than it was before, in many OECD countries (Boltho, 1988; Dean et al., 1989; and Maddison, 1989). The consensus of respected analysts, however, is that declines in investment and saving efforts are not sufficient explanations of the overall slowdowns in the observed economic growth trends (Slater et al., 1991 paper for Investment Canada). It is noteworthy that the principal cause among OECD countries of the decline in savings efforts was not private saving, but decreased public or governmental saving in many countries.

THEORY OF INTERNATIONAL AND INTER-REGIONAL TRADE, INDUSTRIAL POLICY AND TRANSPORTATION

Neo-classical Explanations of Trade and Development

Harris's (1985) study for the Macdonald Commission is a useful basis for the limited consideration that must be given to these topics in this survey.

Harris reviews the neo-classical theory of comparative advantage and its basis on relative factor proportions. His central proposition is that countries (regions) would have comparative advantages in those goods and services

that made relatively intense use of their relatively plentiful factors of production. Countries (regions) would and should export those goods and services in which they had comparative advantages. Thus Canada would be expected to be an exporter of wheat, forest products and minerals, and to be an importer of tropical foodstuffs. Transportation costs have often been major factors in determining the degree of specialization. Thus transportation facilities and costs are a significant determinant of trade and development for primary products.

In reviewing neo-classical explanations of trade and development, Harris also acknowledges that some nations (regions) have technological advantages over others for extended periods of time, and that export specialization may reflect these advantages too.

For most of the post World War II period, the United States has been considered the overall technological leader, with the other developed countries engaging in a game of catch-up. This notion has been central to the economic development analyses of Maddison (1989) and Boltho (1988), which emphasize convergence of productivity rates of various nations toward that of the United States. One expression of the technology spread is in the product-cycle literature following Vernon (1966 and 1969).

The main theme of Harris, however, is that although the neo-classical theory of international and inter-regional trade is satisfactory for specialization in primary products, it requires major modification or additions for trade in manufactures. Harris recalls that many trade studies during the last few decades have shown that the neo-classical theory does not explain world trends in trade in manufactures.

Harris's New Paradigm

For this, according to Harris, a new paradigm is required. It should explicitly incorporate technology, highly skilled labour, and market structures that are oligopolistic and monopolistic. It should also incorporate economies of various modes of developing, controlling and exchanging information. The focus is on firms. The prize for a firm is innovation. Being first in an activity, and being well along the learning curve, offers advantages of markets and higher income. Comparative advantages can be *engineered*, that is, they

can be created by investment in research and development, skills and communications. Nations or regions with such leading activities will climb in the international league of exports, jobs and real income.

As to the location of firms that fit the new paradigm, Harris treats transportation as a relatively insignificant consideration. For most manufacturing industries, transportation is regarded as a minor cost element in production and distribution. Other factors are more important: technology, research and development, professional and managerial people, comparative labour costs and the agglomeration economies of cities.

For a country to successfully pursue Harris's new paradigm, firms have to be *plugged-in* to the international networks of research and development, applications of new technology, engineering, integration of markets, and sources of supply. Transportation and communications for these purposes may not be a large part of the costs of firms, but they are essential. *Transportation of people in the processes of production and distribution of goods and services appears to have become more important than it was in the past.*

Harris notes that:

the old perspective of looking at transport costs and distance to market as a significant determinant of location of new industry or relocation of old industry is for the most part irrelevant; given that transport costs represent a low share of total cost of most goods. Transport costs are rarely the most significant determinant of location (p. 61).²

Harris's main concern is to develop and apply this new paradigm to Canadian industrial output and trade in manufacturing. While he only examines trade in services in a cursory way, the Institute for Research on Public Policy studies of the service industries (Dobell and English, 1988) and the Fraser Institute studies of services (Grubel and Walker, 1989) suggest that the new paradigm is applicable to them also.

Harris does not differ with the leader-follower interpretation of post-World War II economic development of the Western industrialized nations (with the United States as leader), as expounded in Maddison and Boltho. Application of his paradigm, however, suggests two important qualifications. The

first is that explanations of variations among nations in their climb in the ranks of productivity performance requires careful analysis of the industrial development of the individual countries. Secondly, the position of "leader" is likely to be shared more widely in the future.

THEORIES OF PUBLIC GOODS AND PUBLIC CHOICE, AND IMPRESSIONS REGARDING APPLICATION TO TRANSPORTATION: ISSUES OF EXTERNALITIES

For decades now, most developed countries have regarded elements of transportation as public goods on one or more grounds. (See Pigou, 1918; Knight, 1924; Musgrave, 1959; Coase, 1960; Boadway, 1985; Grubel and Walker, 1989; Watson, 1988.) Grubel and Walker, for example, have noted that:

. . . social benefits of consumption exceed the amount of revenue which the producers can recover through private market sales and which are needed to cover the costs of production (for example, light-houses, roads, education, defence, police, administration of justice, fire protection, and public transportation).

Costs of collecting fees from users may be so high that incentives for private construction and maintenance of these facilities and services are inadequate to assure an efficient supply. This is often called the *free rider* problem; efficient ways do not exist to exclude non-payers from using a service, such as a highway.

There may be negative externalities, such as noise, pollution and accidents, as well as positive externalities, such as improved access, saving of time, and so on. Yet, there may not be efficient ways to collect appropriate fees from those creating the negative externalities. The public may not even recognize their individual contributions to positive or negative externalities. With respect to traffic congestion, for example, individuals may believe that their additional use of a road adds an imperceptibly small increment to the congestion; thus they may not take it into account in their decisions.

There may also be merit rather than, or as well as, pure economic value to supplying a good or service, as is the case with the contribution of education to an informed citizenry in a democracy.

Markets may also be subject to significant inherent imperfections, such as the markets for health protection insurance and unemployment. In these markets, costs of marketing and administration are high relative to the value of the insurance protection; control of moral hazard behaviour is difficult; and self-selection of risks is likely in a market arrangement.

The good or service may be a natural monopoly; without public intervention of some sort, too little of the good or service may be produced, and too high a price may be imposed. In the past, these considerations prompted public interest in postal services, railroad services, city light services, city electricity and gas services, telephone services, radio and television transmission, and airport services.

A resource may be inherently a common property, such as a fishery, an oil or gas pool, or a common ground owned and used freely by all members of a village. Unless public policy devises means of common exploitation of such common properties, the property may be degraded by individual use, to the detriment of the relevant groups of people.

It has been widely understood for a long time that, for most situations in which there is a public interest, there are many different ways in which that public interest can be exercised. Activities can be privately produced and distributed, subject to taxes and subsidies to users or producers, to regulation of service and price, and to control of supply and use. Activities can be produced by governmental agencies; and the goods or services can be distributed freely, or sold, or subjected to direct or indirect user-charges. Property rights to fish, to search for oil and gas, or to pollute can be created by governments and private groups, and they can be sold in various ways, including public auctions.

Bird (1976) provides a particularly good survey of the theory and practice of user-charges and earmarked taxes in Canada. The Gramlich paper in Munnell (ed.) (1990), "How Should Public Infrastructure Be Financed?" and the Gomez-Ibanez paper in the same volume, "What Are the Prospects for Privatizing Infrastructure? Lessons from U.S. Roads and Solid Waste," reflect U.S. experience and changing views on dealing with public and mixed public-private goods.

The interesting questions for this literature survey are:

- how common are externalities and public goods — particularly in transportation?;
- what is the basis for externalities and public goods?;
- have externalities and public goods changed in any way, particularly with respect to passenger transportation?; and
- have the feasible and efficient ways of dealing with these externalities and public goods changed?

It is not for us to provide expert answers to these questions. Specialized knowledge is needed for that work. Rather, we point to some important suggestions found in the literature.

Changing Externalities

Massive changes have taken place in the externalities and public goods aspects of transportation. The post office, the railroads, and urban transport are either no longer natural monopolies, or, if still technically natural monopolies, are subject to much more competition. The degree of monopoly power, where some still exists, is much less. Courier services, fax machines, trucking, air freight, and the private car have lessened the power of these former monopolies. The natural monopolies in communications are less secure against competition than they were formerly.³

It appears that microelectronic technology is making it possible to impose user-charges efficiently in situations where they could not be imposed in the past (such as the application of electronic surveillance and charging for urban vehicle congestion).

Successful developments in property rights, and conditions for their use, have taken place in a number of other areas: oil and gas exploration and exploitation, *stinting* rights in the east coast offshore fishery, and landing rights and terminal use at airports. Coase (1960) challenges a number of the classic cases for public goods — lighthouses, bees and pollination — with evidence of efficient development of property rights and markets. Coase shows that efficient markets develop over time but only when the market involves a relatively small number of participants.

While the literature indicates that some traditional views of externalities and public goods have become (or are becoming) less persuasive, it also suggests that some externalities and public goods are becoming more important. These include transportation.

The most prominent negative externality is the atmospheric pollution produced from the burning of hydrocarbons by cars and trucks. Noise and accidents are also of increasing concern.

Positive externalities receiving increasing attention in the literature include improvements in the time taken to produce and distribute goods, and increases in the reliability of truck transportation. Just-in-time inventory and production arrangements have received a good deal of attention in recent years, according to Hickling (1990). So have improved distribution arrangements says Quarmby (1989).

Externalities and Government Intervention

The economic case for government intervention in transportation is still compelling. Nonetheless, it has been challenged a good deal in the last three decades by concerns over the possible inefficiencies of governments. The challenge has been systematized in the theory of public choice (notably by Buchanan and Tullock, 1962. See also Watson, 1988 and Grubel and Walker, 1989).

Since transportation, historically, has been one of the major activities subject to public interest and alleged externalities, it has accumulated an enormous body of government interventions. Common observation reveals an enormous buildup of groups with vested interests in the continuation of these interventions, including businesses, politicians, bureaucrats, labour organizations, local communities and lobbyists. These groups are clearly visible whenever changes are proposed. Thus, the concern of public choice analysts with the inefficiency of government also applies, in some measure, to transportation.

With respect to infrastructure, including transportation, the battles between proponents of economic efficiency and other values and considerations have intensified recently. A particularly clear and intense example is found in the papers and comments by Winston and Altshuler in Munnell (ed.) (1990).

Winston is a well-known and respected analyst and advocate of economic efficiency in the investment and pricing of highways and airports. But, in this paper, he detects an increased concern for economic efficiency among decision makers for transportation.

Altshuler, a political scientist and experienced public official, and now Professor of Urban Policy and Planning at Harvard, challenges this view. His doubts are reminiscent of the arguments in the 1930s about the compatibility of democratic governments and effective economic organization and acceptable sharing of income. After setting out his pessimistic view of democracy in the United States, Altshuler notes:

American infrastructure policy has been far more responsive to group pressures and broad popular attitudes than to efficiency arguments, and . . . it is likely to remain so. . . . road congestion charges remain a political loser. . . . a shift in the basis of truck taxation from gross weight to axle weight . . . is plausible. . . . The more difficult question is whether trucking taxes will increase sufficiently under this scheme to bring about a major reduction in the implicit subsidy that heavy trucks have long received. Here I have severe doubts, since the general nature of the subsidy has been well understood for decades. . . .

I believe that pricing strategies to alleviate airport congestion are forthcoming. Air traffic delays are of interest to large numbers of voters as well as to commercial airlines. It seems unlikely that runway and terminal expansion, or air traffic control improvement, will be sufficient to alleviate airport congestion in the face of rapid traffic growth in the decades ahead. The great question is whether the problem will become so severe that politicians are willing to challenge the general aviation lobby. (pp. 210-11)

Similar political economy questions arise from related papers. In the public finance literature, user-charges and earmarked taxes have had much support. Gramlich's paper in Munnell (ed.) (1990) is a recent illustration. Yet user-charges and earmarked taxes are not often utilized. When they are, these systems tend to be poorly designed. Privatization of pure public goods has been recommended by many economists, but little privatization has taken place. Why? Altshuler's arguments about the values, special

interests and inertias of U.S. democracy are too extreme. Nevertheless, the limited success of economic efficiency arguments suggests that Altshuler's approach should be given careful consideration in the formulation of public policy, particularly with respect to transportation.

MACRO VIEWS ON TRANSPORTATION AND ECONOMIC DEVELOPMENT

In the literature on economic development, Kindleberger has also made some wise observations on transportation and communication. He considers increasing the size of the market important not only to the exploitation of comparative advantages of regions, but also to the pursuit of economies of scale in a world that is far from purely competitive. The linkage of markets by improvement in transportation, or by an improvement in a product that makes it lighter and more readily transported, becomes part of a development process.

"It is not surprising," says Kindleberger, "that economic development is correlated positively with transport facilities." This is illustrated by international comparisons of the density of railroad lines of nations compared with income per capita, and density of roads, compared with income per capita. Kindleberger also cites illustrations of post-1870 expansion of trade and transport, and the growth in per capita income.

Kindleberger *links contributions of communications and transportation.*

Too little attention is generally paid in these accounts . . . [of economic development] to the spread of communication needed to link markets. . . . Along with transport, or rather some distance in advance of capacity to transport, there must be a network of communication, which is vital to market operation.⁴

History of Transportation as a Contributor to Economic Development

It is not necessary to deal at any length or in detail with the general economic history in which transportation is given much credit as a contributor to economic development. A few reminders of that history will suffice:

- The faster growth of trade than of output throughout the developed world is well known, and it could not have taken place without improvements in transportation and communication.

- The historical economic geography of Canada in the 20th century as presented so beautifully in Volume III of the *Historical Atlas of Canada*, shows the connections between transportation and economic development in this country.
- The travel sections and advertisements in the weekend newspapers are visual evidence of the enormous growth of the tourism trade, an industry in which transportation is an essential ingredient.

DISAGGREGATED MACRO MODELS OF INFRASTRUCTURE, TRANSPORTATION AND NATIONAL ECONOMIC DEVELOPMENT

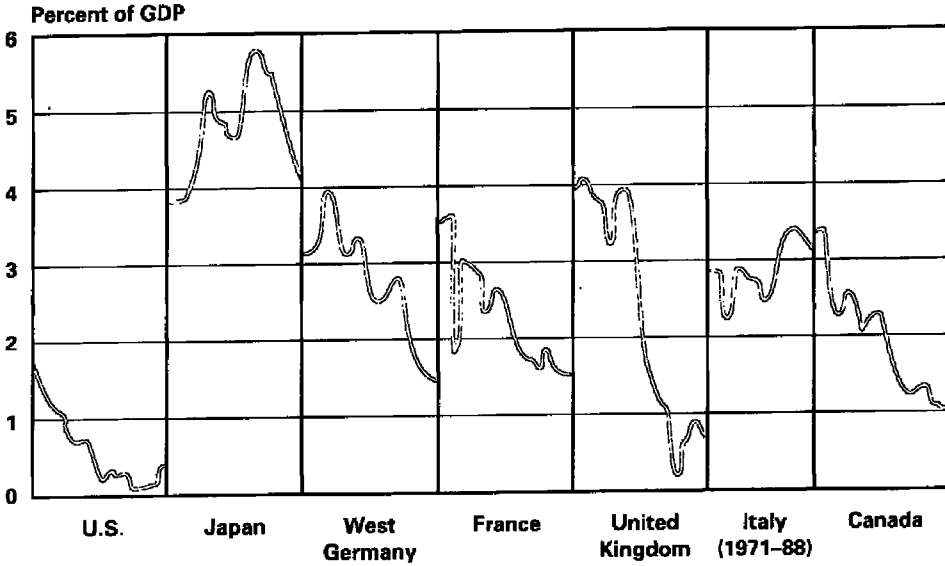
Ordinary observation⁵ has linked the deterioration of infrastructure, increased congestion, decreased investment in infrastructure and slower economic growth during the last 15 years in the United States and Canada. Infrastructure deterioration has often been attributed to decreased investments in transportation systems. This is one important cause of slower growth and smaller increases in productivity. (See Choate, 1984; Governors' Task Force, (1989; U.S. National Research Council, 1988; U.S. Congress, Joint Economic Committee, 1989; Munnell, 1990c; and Munnell (ed.), 1990a, particularly papers and comments by Aschauer, Aaron, Musgrave, Munnell, Hulten, Friedlaender, Peterson, Blinder, and Tarr.)

At the most general level of observation, public investment declined as a share of gross domestic investment in the Big Seven of the OECD members between 1967 and 1985. Chart 1 is reproduced from Aschauer (1989c). As is known from Dean (1989), gross investment as a share of GDP declined during the same period, and public investment as a share of GDP markedly decreased.

The Canadian National Income and Expenditure accounts show the decrease in government gross fixed capital formation in recent years. Table 7 summarizes the post-World War II record.

Chart 1

PUBLIC INVESTMENT AS A SHARE OF GROSS DOMESTIC INVESTMENT: 1967-1985



Source: National Accounts (OECD). Reprinted from Aschauer (1989c).

Table 7

CANADA --- SUMMARY OF GROSS FIXED CAPITAL FORMATION AS A PERCENTAGE OF GNP AND GDP

Period	Government Gross Capital Formation	Business and Housing Capital Formation
As a percentage of GNP		
1950-54	3.09	18.18
1955-59	3.82	20.50
1960-64	4.21	17.20
1965-69	4.22	18.60
1970-74	3.72	18.63
1975-79	3.29	19.81
As a percentage of GDP		
1975-79	3.32	22.00
1980-84	2.88	20.04
1985-89	2.42	18.63

Note: Investment and GNP figures are calculated from Department of Finance, *Economic Review*, 1980. Investment and GDP figures are calculated from Statistics Canada, National Income and Expenditure Accounts, March 1991 (latest number).

INVENTORIES OF DEFICIENCIES OF INFRASTRUCTURE

Inventories of the amount and quality of infrastructure deficiencies have been compiled in Canada and the U.S. by central governments, states and provinces, cities, and highway authorities. (See Choate, 1984; Congressional Budget Office, 1983; U.S. Governors' Task Force Report, 1989; Joint Economic Committee, U.S. Congress, July 1989; and Federation of Canadian Municipalities, 1985.)

These inventories of deficiencies usually involve a comparison of what exists with some specified desirable standards, such as road conditions, levels of congestion and environmental standards. Most of these standards are derived from engineering criteria rather than from economic ones. They do not usually deal with the issues of specific links between infrastructure and economic development. (See Batchelder, 1979; Hickling, December 1999; David Lewis et al., 1988; National Council on Public Works Improvement, 1988.)

Recently, however, a number of macroeconomic studies exploring the quantitative linkages of infrastructure in general, and transportation in particular, to economic development have appeared. In order to consider the relationships of particular factors to potential and actual economic growth, it is necessary to disaggregate the general models of economic growth. This is equally so for education, training and retraining programs, research and development, transportation development, and so on.

The best known of these quantitative studies are by Aschauer (six articles between 1988 and 1991 are listed in the bibliography). Other prominent studies are those by Deno (1988), Eberts (1991), Fox — a detailed evaluation of a large body of empirical work of this type — (1990), and Munnell (1990b).

The Aschauer studies focus on treating private capital and public capital (or types of public capital) as separate determinants in a production function linking outputs, such as GDP, to inputs, such as quantity and quality of labour and technological change. Various formulations of the production function are used in the articles. Surprisingly large increases in productivity are attributed directly or indirectly to public capital (for example, through the stimulus of public capital to the productivity of private capital). The studies make comparisons over time, across countries, among regions, and among

sub-sectors of economies such as manufacturing. Qualitatively similar results have been generated from these studies, such as large contributions to economic growth from infrastructure, though with substantial differences in the quantitative results.

These results have met with profound scepticism from some analysts, notably by Schultze (1990), Aaron (1990) in Munnell (ed.), Musgrave (same volume) and Winston (1991).

Notes Schultze:

According to Aschauer's regression, (March 1989) a 1 percent increase in the stock of public infrastructure raised the level of output — everything else held constant — by 0.39 percent during the period from 1949 to 1985. By virtually all estimates, that increase was larger than the gain in output from a 1 percent increase in the stock of private business capital. Yet the stock of business capital (in 1987) was 3.3 times the size of the stock of public capital. (p. 63)

Says Schultze:

Those same results also imply that a one-time increase of \$10 billion in the net stock of public infrastructure would yield a permanent increase of \$7 billion in the annual level of GNP. While not a free lunch, this would be a very cheap banquet. (p. 63)

Aaron (1990) in Munnell (ed.), notes that:

David Aschauer has made one of the more fascinating and important contributions to this debate [concerning the growth slowdown]. He has called attention to the rather extraordinary disregard by economists and others of the possible role of public investment in explaining the slowdown. He has produced a series of papers in support of his contention that a sharp deceleration of public investment, especially investment in what he calls "core infrastructure," is very nearly sufficient to explain why growth slowed in the United States. . . . The paper presented at this conference continues his efforts to marshal support for this thesis. . . . Aschauer has had a valuable insight but has greatly exaggerated its quantitative importance; this paper does little to advance the thesis he propounded elsewhere. (pp. 51–52)

According to Winston (1991):

Some readers may be familiar with the work of Aschauer (1989), who estimates time series regressions that attempt to explain the impact of the nonmilitary public capital stock on the nation's productivity, and finds very powerful effects. In fact, the effects he finds are too powerful.

Consider a one-time lump-sum \$60 billion increase in infrastructure spending. An increase of this magnitude in 1985 would enable public works capital spending to regain its 1960 share of GNP. This lump-sum investment represents a 6 percent increase in the value of the infrastructure stock. Using Aschauer's elasticity estimate of .24 for the change in productivity with respect to the change in the infrastructure capital stock leads to a 1.4 percent increase in current output from the investment or a \$70 billion gain in the first year. With conservative parameters, the present value of the gain in future years would exceed \$600 billion, for a benefit-cost ratio of 10:1.

This return is implausible. Charles Schultze (1990) argues [that] Aschauer's findings simply demonstrate that the time pattern of productivity and public investment growth are similar (both rising in the 1950s and 1960s, and both falling in the 1970s and 1980s), and that this correlation generates grossly inflated estimates of the return to public infrastructure investment. (p. 126)

Munnell (1990a and b), in careful work, has produced some more modest quantitative estimates than Aschauer; she continues to attribute importance to his general theme.

While not accepting entirely the arguments of Aschauer and company, Hickling gives some weight to the notion that the record of infrastructure investment has been a factor in productivity experience. This view appears to be based in part on other indicators of accumulated under-investment in infrastructure in general, and in transportation in particular.

The Fox Paper⁶

A brief review of the Fox Paper is warranted because it is the most comprehensive and sensible evaluation of a large body of recent theoretical and empirical work.

Despite all the limitations and difficulties of the recent macro and sub-macro investigations of infrastructure and economic output, Fox concludes that some cautious conclusions may be drawn:

- Public capital investments can increase production.
- The mechanisms through which public capital affects output include:
 - complementarity between the public capital stock and private capital;
 - public capital operating as an input directly in the production process;
 - Keynesian demand effects from construction.
- Public capital investments are subject to diminishing and potentially negative returns.
- Investments in core infrastructure, and particularly transportation and roads, appear to offer the greatest productivity gains. Water and sewer and communications are also productive.
- The relative effects of marginal public investment at a particular site depend on the structure of industry where the investments are made, characteristics of other inputs available in the region, current infrastructure levels, and demand for output that would be produced in the region. . . .
- Public capital investments may crowd out private investment, but the net effect of new infrastructure still can be greater private investment and production if the complementary relationship between public and private capital in production offsets contemporaneous crowding out. (pp. 47–48)

Fox notes that:

. . . the major limitation of the research is it has little, if any, direct policy application, though it has been useful in expanding economists understanding of infrastructure's role in the economy. . . . With continued research we can continue to expect development of sound guidelines for answering these questions and targeting investments to those

locations where they are likely to be most effective. *However, the guidelines will only assist in making the best decisions and need for careful benefit/cost analysis to consider the specific merits of individual products will remain as important as ever.* One guideline already apparent is that infrastructure needs vary widely by region and country. [emphasis mine] (pp. 48 and 51)

Fox's Approach

For those interested in technical analysis, a brief review of Fox's approach will be of interest. He begins by setting out a framework that can be used for evaluating the variety of theoretical and empirical macro literature.

One part of the framework is a generalized form of an aggregate supply function which, among other things, treats private and public capital as separate inputs. Another part is an aggregate demand function that is a mixture of full-employment growth and Keynesian elements, but with explicit distinct treatment of private and public investment demand. A third part is a function generating public capital stock and investment. Along with some other secondary functions, but not with a complete simultaneous equations specification, Fox uses the interaction of the aggregate supply and aggregate demand functions as the determinant of the infrastructure-output relationships.

Fox examines a large number of empirical studies of various aspects of these relationships, which are based on time-series and cross-section data; nationally, internationally and regionally. After a careful critique of these studies, he comes to the conclusions set out above.

THE LITERATURE ON TRANSPORTATION AND ECONOMIC DEVELOPMENT

A considerable amount of literature now exists under this heading. It comprises books and articles that examine theoretical, empirical and policy considerations. Much of the literature recognizes the economic benefits of transportation, as well as the military, social and political benefits. As to economic benefits, some are conventionally counted in national income. However, many economic benefits that are important are not so measured, including time saved outside working hours; congestion reduced; safety improved; and emissions reduced.

The literature on transportation and economic development is generally about *the comparison of economic costs and benefits* of the construction and operation of various kinds of infrastructure. A project is considered to be a net contributor to economic development if its benefits, comprehensively measured and properly discounted, exceed its costs, also comprehensively measured and properly discounted. The literature considers the value of economic development of projects in such diverse fields as waterways, ports, irrigation, soil conservation, railroads, highways, and urban transportation. Much of the literature since the end of World War II has been concerned with developing countries. The World Bank has been an important centre of such studies. But the concepts and principles of measurement of infrastructure contributions to economic development (including transportation) are essentially the same for developed countries as they are for developing countries.

While the application of the cost-benefit approach to infrastructure may be more difficult, because of the absence of markets in many of the benefits, and the conditions of use, the consensus appears to be that the same concepts and principles apply, whether one is considering the contribution to economic development of a steel mill, a shopping centre or a new office building.

A consensus among economists on the appropriate concepts and measurements had appeared by the early 1960s in such works as Eckstein (1958); Krutilla and Eckstein (1958); Fromm (ed.) (1965); Mohring and Harwitz (1962); and Owen (1957). These concepts and measurements differed significantly from those generated in the engineering literature which dominated the planning and decision making of infrastructure at that time. The economic concepts considered to be relevant today (see Hickling, 1990) are essentially updated versions of the earlier economic work. While these economic criteria appear to be given more weight now than they were earlier, the literature suggests that engineering criteria still dominate planning, decision making and evaluation. Also, when the economic criteria are introduced, major errors of application occur. The alleged results are major economic inefficiencies (see Hickling, 1990).

Adler's article, "Economic Evaluation of Transport Projects," in a volume edited by Fromm (1965), is a clear and persuasive presentation of the economic principles and their applications.⁷ The tone of his presentation is established at the outset:

There is . . . no causal relation between the backwardness of the economics of transport evaluation and the fact that until a few years ago it was virtually the exclusive domain of engineers. On the contrary, this condition is to a considerable extent due to the failure of economists to interest themselves in this area even though it is one in which close cooperation between economists and engineers is especially important. As a result, some of the most common mistakes in project evaluation result from the failure to apply economic criteria correctly or at all; a few of these, such as the failure to distinguish between private and public costs and benefits and between average and marginal costs, are discussed below. . . . (p. 171)

The basic purpose of the economic evaluation of a project is to measure its economic costs and benefits in order to determine whether its net benefits are at least as great as those obtainable from other marginal investment opportunities in the particular country. There are, of course, many costs and benefits other than economic ones, such as the cultural opportunities from greater travel and the military and administrative advantages, and sometimes disadvantages, from greater mobility. These are not considered here . . . [for various reasons. . . .] (p. 173)

It is sometimes stated that the value of a project should be measured by its contribution to the growth of national income as conventionally measured. This is not inconsistent with the above formulation, but it is not a practical approach. For one, it would exclude certain benefits altogether, such as greater comfort from an improved highway, or the time saving used for more leisure, which would not be reflected in national income. More important, the national income approach is too complicated and indirect. . . . However, the national income approach is useful in focussing on costs and benefits from the point of view of the economy as a whole and not merely of the parties directly involved. In this way it helps in selecting the benefits to be included and those to be omitted and in avoiding counting the same benefit twice in different forms, such as when an improved highway reduces transport costs and increases land values. (pp. 173-74)

In order to measure economic benefits and costs and to compare them with other investment opportunities, they must be expressed

in monetary terms, which is the only practical common denominator. This presents a problem since market prices do not reflect real costs to the extent that workable competition does not prevail in major sectors of the economy. . . . [T]here are two special problems. . . . The first one arises from the fact that some transportation services by their very nature are oligopolistic or even monopolistic so that the prices charged for these services frequently have no direct relation to costs. . . . A second related problem arises from the direct and indirect subsidization of many transportation services by governments. . . . [G]asoline taxes and other charges on the beneficiaries do not cover the costs of highways (including maintenance, depreciation, interest, and administration); even where they may cover overall costs, there is usually no direct relation between specific user charges and the differing costs of the various transport services, such as those of trucks, buses and passenger cars. (pp. 174-75)

Measuring Economic Costs

Adler then turns to measuring economic costs, which he notes is substantially simpler than measuring economic benefits and can usually be limited to making adjustments in expenses. Sales and indirect taxes, licence fees and import duties should not be included in the costs, as they are not social costs. Wages ought to be measured on a social opportunity cost basis. The economic cost of capital should be on the social opportunity cost, which Adler suggests was in 1965 for developing countries at least 8 percent real and frequently more than 10 percent. The equivalent for capital-exporting developed countries would be lower at that time. Adler writes:

The problem of the appropriate interest rate can be minimized somewhat in the evaluation of many projects by expressing the results in terms of an internal rate of return on the investment, rather than in terms of [a] benefit-cost ratio. (p. 176) [The profession now considers the comparison of discounted benefits and costs to be a more satisfactory approach. Even when internal rates of return are used, they have to be ranked and compared with hurdle rates of costs of capital. Thus the internal rate of return does not permit escape from the difficulties of selecting a cost of capital.]

Adler notes that the costs of developing projects often occur sooner than the benefits. Accordingly, it is necessary to put both on a present-value basis at the same time, and the best reference point is the date when the project began.

Adler also notes that ancillary works necessary to the functioning of the main new transportation project should be included in the overall evaluation.

Measuring Economic Benefits

Adler then turns to measuring economic benefits. He indicates that this is usually much more difficult than measuring economic costs because:

- some benefits . . . such as the increased comfort and convenience . . . are difficult to express in monetary terms since there are usually no market prices for such benefits. . . .
 - monetary benefits, such as reduced transport costs, benefit a great number of people over a long period of time, requiring difficult long-range forecasts. . . .
 - many benefits are indirect, such as the stimulation to the economy from improved transportation; and for these benefits to materialize, investments in fields other than transport are frequently necessary.
- (p. 179)

He notes that the most important benefits from transport projects include:

- reduced operating expenses initially to the users of the new facility and also usually to those who continue to use the existing facilities;
- lower maintenance costs;
- fewer accidents;
- savings in time for both passengers and freight;
- increased comfort and convenience; and
- stimulation of economic development. (p. 179)

Adler emphasizes, like Mohring and Harwitz, the distinction between size of benefits and their distribution. It is likely that the benefits of transportation

developments will be widely dispersed in ways that depend on the nature of markets, government regulations and so on. This results in double-counting when measuring the size of benefits. It also gives rise to difficult substantive issues because the size of the benefits depends on their distribution. If, for example, a transportation project stimulates a large increase in use, the size of the benefits may be quite different than if usage is changed little.

The most direct benefit from a new or improved transport facility, and frequently the most important one, is the reduction of transport costs. In measuring this, Adler insists that *the proper method is a with-and-without test, rather than a before-and-after test*. Bearing in mind the dynamics of growth of usage and other factors, what would have been the profile of costs over time without the project? What will be the profile of costs over time with the project? The before-and-after test is commonly used to measure the benefits, usually resulting in gross over-estimates of the economic benefit.

The reduction in transportation costs counted should be the marginal cost of the movement rather than differences in average costs between the with-and-without situation. If, for example, a highway development diverts traffic from railroads to highways, which have lower costs, the benefit or saving is the marginal cost of saving railroad transport costs, not the difference between the average cost of movement on the highway and the railroad. Use of average costs to measure benefits may exaggerate considerably the benefits of the highway project.

Total distribution costs, not just costs of shipment, are the primary concern. If a project reduces costs of loading and unloading, storage, insurance, breakage, and so on, as well as shipping costs, these other benefits have to be factored into the evaluation of the transportation project being considered.

Also, in evaluating a transportation project, account must be taken of the new traffic that is created. Benefits in accident reduction and time savings are often crucial. Though difficult, they have to be translated into monetary terms to make a proper evaluation. Saving in inventories can be a particularly important result of a transportation project.

Adler is noncommittal about the economic development benefits of transportation. He notes that:

It is frequently assumed that all transport improvements stimulate economic development. The sad truth is that some do, some do not, and that even some of those that do may not be economically justified in the sense that there may be better investment opportunities. Each project must therefore be investigated individually and no helpful generalizations appear possible until more research may show that certain definite correlations do exist.

Before any transport improvement can be said to have stimulated economic development at all, a number of conditions must be met. The most important is showing that the economic development would not have taken place in any case even without the transport improvement. A second is that the resources used in the new development would otherwise have remained unused or used less productively. Finally, it is essential that the economic activity stimulated does not replace activity which otherwise would have taken place.

These conditions may be obvious, but it is surprising how often they are forgotten in practice. . . .

Where a transport facility does lead to increased output and the above conditions are met, the net value of this additional output is the proper measure of the economic benefit. In many situations, however, the transport facility is not the only new investment needed to achieve the increased production. This raises the problem of allocating the benefit . . . among the transport and the other investments. For this there exists no correct theoretical answer but there are at least three practical approaches. One would be not to make an allocation at all and relate the total benefits to the total investments. A second would be to annualize the other investment costs and deduct them from the benefits. A third would be to allocate the benefits in the same ratio as the transport investment has to the other needed investments. (pp. 189-90)

Comparing Costs and Benefits

Adler notes that:

Once costs and benefits have been measured in monetary terms to the full extent meaningful, the results can be put into at least three different forms:

- the rate of return on the investment;
- the benefit-cost ratio; or
- the pay-back period. . . .

While the basic ingredients — the value of the costs and benefits — are the same regardless of the final form in which they are expressed, the usefulness of the various forms is different, depending on the purpose. A short pay-back period is important where the future is unusually uncertain, where better investment opportunities are likely to arise soon, or where funds are not available on a long-term basis. . . .

Discounting benefits and costs by the opportunity cost of capital is theoretically the best way of comparing different projects. The most important disadvantage of this approach is that a particular interest rate must be chosen for discounting. . . .

This disadvantage can be minimized somewhat by expressing benefits and costs in terms of the internal rate of return on the investment, i.e. the rate which equalizes discounted costs and benefits. In this case, the opportunity cost of capital becomes important only in the marginal cases where the internal rate of return is not clearly above or below the area within which the opportunity cost of capital may be estimated to be. . . .

[T]he rate of return formula has the practical advantage that economists, financial experts and many businessmen have some concept of what an interest rate is, so that a rate of return is probably more meaningful to many audiences than a benefit-cost ratio. On balance, therefore, the internal rate of return on the investment is usually, but not invariably, the most satisfactory form in which to express benefits and costs of transportation projects in the less developed countries.
(pp. 192-94)

As noted above, the economic and financial profession now prefers cost-benefit ratio calculations over internal rates of return because they demand the ranking of possible projects. Also, the same judgement is required for the social cost of capital to decide on investment programs.

CAN GENERALIZATIONS BE MADE ABOUT OVER- AND UNDER-INVESTMENT IN TRANSPORTATION AFTER EXAMINING THE PROJECT EVALUATION LITERATURE?

Adler does not provide a general answer to this question. Individual projects, however they are decided upon, may be put through the benefit and cost evaluation. From the enumeration of the difficulties and possible mistakes, it appears that Adler believes that errors of both kinds arise. Some projects are undertaken or mooted, though a proper benefit and cost calculation would indicate that they are far from worthwhile in terms of economic value. Some projects are not undertaken, though a benefit-cost screening suggests that they would be worthwhile. It is not clear in Adler where he considers the balance of errors to lie.

Mohring and Harwitz (1962) are more daring. They write:

A limited investigation of the subject suggests that the methods presently used to measure these "benefits on existing highway use" on balance understate their values substantially. [A footnote suggests that too small a rate of interest discount is generally applied]. Those who have undertaken such studies have typically used very conservative values to estimate those user benefits which are difficult to quantify. Two groups of benefits in this category are particularly worth mentioning: (1) benefits to users of substitute facilities; and (2) the value of time saved. (pp. 18-19)

Mohring and Harwitz (1962) are also concerned with what measure of benefits would be comprehensive but not subject to *double-counting*. They write:

Presuming that all of these measurement problems had been surmounted and that a close estimate of the reduction in the time and dollar transportation costs afforded by a highway improvement had been obtained, would this estimate in fact cover *all* of its "benefits on existing highway use"? An unqualified "yes" answer seems in order . . . most of these presumed additional benefits actually involve income or substitution effects . . . or benefit transfers. Both true and internal transfers of these benefits undoubtedly take place. . . . *However, it must be remembered that a transfer represents the passing-on of a benefit and not the generation of an entirely new benefit* [emphasis mine].

Much of the same argument applies to the first of the substitution benefits enumerated above — that of a highway for other forms of transportation. The only net benefit is the associated saving in transportation costs, a benefit which is, to repeat, typically underestimated. (p. 22)

As indicated at the outset, Hickling's *Primer* (1990) appears to me as an up-to-date tackling of the decision-making and benefit-cost literature of the late 1950s and early 1960s. It deserves a more careful review in this survey, which is done below. Meanwhile, it is worth mentioning that Hickling's concepts, and its judgement about under-estimation of the benefits from transportation projects, are consistent with those of Mohring and Harwitz. Incidentally, Hickling favours benefit-cost ratios over internal rate-of-return measurements.

Though the regional material will be developed in a separate section of the survey, this is an appropriate place for a brief discussion of regional literature.

REGIONAL INFRASTRUCTURE (PARTICULARLY TRANSPORTATION) AND ECONOMIC DEVELOPMENT

The literature includes many books and articles on these subjects, applying both the macro and sub-macro methods of analysis, and cost-benefit analyses.

Providing that the regional definitions and measurements of output and inputs are correct, in principle, similar conclusions can be drawn about regional infrastructure and economic development as are made about national infrastructure and economic development. Indeed, many of the studies reviewed by Fox (1990) attempt just such analyses.

Similarly, in principle, cost-benefit analyses are fully applicable to regional infrastructure (and, in particular, transportation projects). In fact, since the outcomes depend on regional or local conditions and the application of other factors, regional or local venues are the preferred cases for cost-benefit analysis.

As Mohring and Harwitz (1962) argue, the fact that many of the benefits of transportation projects in one region are shared with other regions is not, in principle, a deterrent to the evaluation of the projects. Size of benefits is

one thing; distribution of them is another. Both authors recognize, however, that size of benefits may depend on distribution, and this has to be taken into account.

While, in principle, the measurements and evaluations of regional projects are achievable, in practice there appears to be a good deal of double-counting and window-dressing in the analysis of regional infrastructure and economic development.

Systematic review of the regional economic development literature and transportation is presented in Part B of this review. Among those reviewed are: Courchene (1981); Eberts (1991); regional aspects of Fox (1990); Friedlaender (1990); Freidman and Alonso (1964); Kraft, Meyer and Valette (1971); Munnell (1990a); Savoie (1986); and Sullivan et al. (1989).

Hickling: *A Primer on Transportation and Economic Development*

For the purposes of the Royal Commission, Hickling's *Primer* is the most useful piece of literature available.

- Hickling judiciously blends the macro and micro evaluation and decision-making approaches (which the *Primer* calls the indicative planning methodologies and the investment choice methodologies).
- While putting primary emphasis on goals of economic growth, economic welfare and improvements in living standards, it provides for incorporating regional and distributional objectives.
- It provides a sound basis for evaluating benefits, costs, and benefit-cost comparisons; and for dealing with discounting of costs and benefits.
- It points toward the dynamics and efficiency considerations that are appropriate to establishing the *base cases* against which new projects should be compared.
- The *Primer* provides a convincing comparison of engineering and economic criteria for evaluation and decision making for transportation projects. It also provides an impressive survey of current practices and common errors, without being "smart-alecky" or "preachy."
- It incorporates logistical and environmental implications of transportation projects.

- The *Primer* points toward sensible answers to the questions of over- and under-investment in transportation projects.
- It recognizes that we live in a world of risk and uncertainty, and have to decide upon and evaluate transportation projects accordingly.
- It is written in non-technical language.
- And finally, the *Primer* is educational rather than critical in tone.

Here are a few highlights from the *Primer*:

- "Growth for growth's sake has never been the center-piece of American public policy. Nevertheless, the fact stands that growth, through acceptable means and at acceptable costs — sustainable development — is the only means available to recover and sustain ground in American living standards, and most of the increased growth can be achieved only through increased levels of productivity." (p. 1)
- "There is wide-spread agreement that higher rates of capital investment are key to the future growth of productivity and living standards." (p. 3)
- "In the public sector, where market forces are weak, special efforts must be made to ensure that infrastructure investment matches and enhances productivity gains in the private sector." (p. 3)
- "In the case of transportation infrastructure . . . [u]nless these investments yield economic gains, including productivity gains, that exceed the costs of achieving them, they will make no contribution to the nation's overall rate of economic expansion. Interregional competition, like competition generally, is a healthy thing. But when a region grows at the expense of others without generating a net contribution to the sum of all economic activity, living standards for all will stagnate and decline over the long-term." (p. 5)
- "At a minimum, decision makers need to assure themselves that policies and programs will make a net contribution to economic growth. . . . [They] do not have to settle for only the most highly stimulative projects; a poorer locality might warrant project funding even though its proposal offers less potential for productivity growth than the proposal of a wealthier region. *But any project should offer at least a minimum net contribution to economic growth to stay in the running* [emphasis mine]." (p. 14)

- As a primary objective, Hickling recommends *growth in total economic welfare*, that is, "increased economic benefits that exceed the increased economic costs of achieving them. 'Welfare' is distinguished from 'output' in that welfare includes factors, such as time and safety, that have economic value but are not included in the normal accounting definitions of economic output and gross product." (p. 15)
- "While productivity gains alone can often justify transportation investment, this is rarely the case with employment, income and other targets of regional redistribution." (p. 20)
- Regarding negative environmental impacts: "The critical issue therefore is not whether such transportation investments are environmentally sustainable, but rather how to devise policies that make a portion of the benefits available to finance the mitigation of negative environmental impacts." (p. 24)
- "How can a "minimum-required contribution" to economic growth be defined in practical terms? The operational approach . . . is through use of the rate-of-return concept commonly applied in investment planning generally." (p. 26)
- "Two errors are quite common in recent practice. The first is a marked confusion between distributional aims and aims relating to economic growth. It is not unusual, for example, for the projected employment and related economic ripple effects of an investment to be regarded as evidence of economic growth and singled out for measurement as key program objectives A second common error is failure to conduct the kind of analysis needed to measure the prospective growth implications of policy and program options." (p. 29)
- *Indicative Planning Methodologies*, which attempt to determine how much infrastructure spending is enough. Hickling reports on, and evaluates as a useful tool, the methods based on the infrastructure-productivity statistical analysis of Aschauer et al. (The Hickling paper is more impressed by the measurements of Aschauer et al. than I am.) *Hickling is cautious about the practical applications of such analysis*: "While the application of indicative planning methodologies can help executives identify gross under- and over-investment levels from a budgetary perspective, only the application of forward-looking [investment choice] methodologies can identify the most promising investments and distinguish strong from weak transportation program and project choices." (pp. 34-37)



- *Investment Choice Methodologies* are the heart of the *Primer*. "Whether growth is defined in terms of productivity, gross output or economic welfare and living standards, it can only occur if more of value is put into the economy than is taken out (spent) in order to achieve it. Only by gauging transportation policies and investments in terms of their rate-of-return and net present value can decision makers discern their implications for productivity and economic growth. . . . [T]he state or local transportation analyst needs to ask whether the economy as a whole will be made better off by undertaking the project rather than not undertaking it, or by undertaking an alternative project instead." Hickling then compares the key measures of productivity and economic growth. (pp. 37–49)
- For a number of cases, Hickling compares commonly used engineering decision-rules with economic rules based on net-present-values. *They show that the economic measure of benefit commonly exceeds that arising from engineering decision rules.* Other things being equal, this evidence points to a bias toward under-investment in highway and airport projects in the United States. (pp. 43–44)
- "Sound economic decisions in investment planning necessitate that major new policies, programs and investments be approved only if they can be justified after accounting for the impact of developments and actions that lead to the most efficient use of existing facilities. Rarely is it the case that "nothing happens" to improve current systems in the absence of major investment. The 'nothing happens' and 'do-nothing' baselines of comparison for prospective new policies assume that the transportation system and related patterns of economic activity will reflect the status quo in the absence of investment. This assumption fails on three counts:
 - First, it fails to adjust demand for a program or a project's services to the no-investment case. . . .
 - The second problem inherent in the status quo baseline is that it ignores steps available to state and local transportation authorities to improve the productivity of transportation systems in lieu of major expansion [for example, by the use of congestion pricing].
 - The third intrinsic problem in a base case defined by status quo conditions is that it can inhibit a broad search for innovative policies and programs of solving problems. . . ." (pp. 63–65)

The remainder of the Hickling study is a thorough, and by now fairly orthodox primer on identifying benefits and costs and applying benefit-cost analysis. It is worth noting that the Hickling study considers that the time-saving and reliability of transportation have had (and can have much more) major beneficial effects in the organization of production and distribution, and in savings in inventories.

ECONOMIC DEVELOPMENT AND INTERCITY PASSENGER TRANSPORT

The literature on economic development and intercity passenger transportation is much scarcer than that on economic development, and on transportation in general. The Royal Commission has contracted for a study of the income and price elasticities of the demand for passenger transportation, one of the main concerns under this heading. Accordingly, the elasticities will be reported on here rather cursorily.

It is clear that there are two-way causations between economic development and intercity passenger transportation. Such developments as jet passenger aircraft and paved roads have caused developments in intercity passenger transportation. Looking at the relationships the other way, increased real household incomes have been a cause of the enormous increases in the ownership and use of private cars, in both intra-city and intercity passenger transportation.

Recent literature that addresses the subject includes Gillen and Oum (1981); Grubel and Walker (1989); *Mathematica* (ed.) (1966 and 1967); McRae, (January 1989); Morrison and Winston (1989); Oum and Tretheway (1988); Oum, Waters and Yong (1990); Palmer (1988); Salvas-Bronsard and Bastien (1984); Scarfe and Krantz (1988); Transport Canada (1982, 1988a, 1988b and 1989); VIA Rail (1989); and Watson (1988). The classic literature on consumer demand and the analysis of family budgets will be left to the Royal Commission's study of elasticities (such as the works of Houthakker and Taylor, and of Prais and Houthakker).

In the Royal Commission's Interim Report, the distinction is made between business and personal intercity passenger transportation.

Intercity Business Travel

Consider business travel first. Among the important points made in the *Interim Report* and other literature on this subject are the following:

- For business travel, a useful distinction is the one between travel that involves providing business services, and travel that involves other aspects of the production and distribution of goods and services.
- As Grubel and Walker (1989) show, business services account for about half of overall service economies. Also, these services have been a major factor in the rapid growth of the service economy in North America. These services make intense uses of the transportation of people and communications.
- Business travel places a premium on speed and reliability. For short-distance intercity business travel, the car is clearly the preferred mode. For medium-distance as well as long-distance business travel, air service is clearly the preferred mode. The ability to work while travelling is important, thus the rapid growth of working facilities on aircraft and phone service in cars is understandable. The saving of time is also important. Thus, for business travel, congestion is highly undesirable, particularly when getting to and using air services (Winston, 1991).
- Though price is a consideration for business travel, it is by no means the dominant consideration. The ability to obtain and adjust service quickly, and the considerations just noted, appear to be dominant. Thus, airlines have found it attractive to charge higher prices for business than for personal air service, as well as to provide better facilities.
- For business travel, complements to air service, such as airport hotels, hospitality services and airport car rentals have developed rapidly during the post-World War II period.
- During the post-World War II period, the big loser as a mode for business travel was rail passenger service.
- With improvements in service and reductions in costs, business communications are becoming a substitute for some business travel. Nonetheless, there are still some strong complementary relations between communications and business travel.

Personal Intercity Travel

The Royal Commission's preliminary work and a quick scan of the literature reveals the following points:

- Personal intercity travel is dominated by the use of personal cars for short- and medium-distance voyages. The personal use of air services is growing rapidly, particularly for long-distance voyages. Long-distance personal voyages are also growing rapidly. Train and bus services appear to be losing shares in passenger transportation.
- The spread of personal ownership and use of cars, first in America, then in Europe and Japan, has brought about one of the greatest social changes of modern times. Intercity personal travel is no longer the preserve of the rich. People of almost any age and economic standing can go almost anywhere they want, with privacy, comfort, convenience and economy. People will not readily give up their personal ownership and use of a car for a bus or train (or, in cities, for urban rapid transit). This applies more in North America, with its vast distances and low population densities, than it does in Europe or Japan. But the car, even in Europe and Japan, has a remarkably large share of the intercity transportation market.
- Car and air services are commonly labelled "superior goods," in the economists' sense of that term. The contention is that, other things being equal, increases in demand for these services will outpace increases in income. Bus service has been labelled an "inferior good" (Palmer, 1988) meaning increases in demand for bus services will not keep up with increases in income. Evidently, intercity common carrier buses are now used mainly by the young, the poor and the elderly. Palmer argues that rail passenger service in Canada is still a superior good.
- These income elasticities are important distinctions, for they provide some indication of the relative growth in the demand for various intercity passenger services as the incomes of Canadians change. The evidence, however, has to be analyzed carefully. Firstly, the demand for passenger service per household could decline or increase slowly in comparison with the increase in household income; yet the overall demand for the service could increase much more rapidly because of the increase in the numbers of households. Secondly, other factors affecting demand change over time. Quality of services may be altered by supply factors. The relative prices of the services may be changed (for example, the energy price

cycles of the last two decades affected modes of passenger transportation differently). Policies may change regarding the structure and system for imposing charges for the use of public facilities. The distribution of income and wealth may alter; personal transportation preferences may differ among income classes. Thirdly, one set of observations may arise from depressed economic conditions and another from boom economic conditions.

Industry analysts predict that intercity passenger transportation in North America will remain dominated by the private car and the aircraft during the next two decades (Johnson in U.S. Department of Transportation, 1989; U.S. Congress, Joint Economic Committee, 1989). With the application of new materials, such as composites and ceramics, and changes in design of engines (perhaps with the use of alternative fuels), the supply capabilities (quantity, quality and cost) of both cars and aircraft are expected to continue to improve. These expectations reinforce the conventional wisdom that cars and aircraft will dominate the next two decades of intercity passenger transportation.

However, these "status quo forecasts," as Fuller calls them, may be challenged by radical changes in environmental regulations, fuel prices, and other considerations.

One key question is whether high-speed intercity rail services could become economical substitutes for car and air services. Others will have to answer that question for Canada. In my view, Hickling's *Primer* should be applied to such issues, just as it should to highways and airports. The Hurley and Jones Discussion Paper (1990) indicates that substantial capital subsidies would be required to support high-speed intercity rail service in the Montreal-Ottawa-Toronto corridor, to say nothing of the Quebec-Montreal and the Toronto-Windsor links. Press reports of the Ontario-Quebec Task Force and of the Bombardier and Asea Brown Boveri proposals appear to call for substantial subsidies. Whether such subsidies would be justified to bring the social benefits into line with the social costs of such services, I cannot answer, for lack of data.

For conventional rail passenger service, Cubukgil and Soberman (1986) argue that subsidies would not be needed in the Quebec-Windsor corridor. They maintain that VIA Rail could operate in this corridor without them if

three conditions were met: (1) excessive charges by the railroads for their services could be eliminated; (2) feather-bedding practices of VIA Rail's workers could be cut way back; and (3) VIA Rail's excessive administrative overhead could be reduced.

EFFICIENT TRANSPORTATION INFRASTRUCTURE INVESTMENT AND PRICING POLICY

The main ideas of the theory of efficient transportation infrastructure policy were first worked out more than 70 years ago (See Pigou, 1918; Knight, 1924; and Mohring and Harwitz, 1962.) These ideas, however, remained more or less just academic musings for many years, even among economists. Recently, a tremendous amount of interest in the subject has arisen. One reason for this is that newer technology, particularly the application of microelectronics, appears to make efficient user-charge systems practical. Another has been new evidence (both data and quantitative analysis) that shows the inefficiencies of certain systems, particularly highways and airports. A third reason for the current interest in transportation infrastructure policy is the enormous estimate of the costs to maintain, restore and add to the infrastructure. This has given a renewed sense of urgency toward improving the efficiency of the system.

The literature, in addition to the classics noted above, includes: Bos (1985); Downs (1962); Bird (1976); Brander et al. (1988); Gillen et al. (1988); Hickling (1990); Oum et al. (1990); U.S. Department of Transportation (1989); Morrison and Winston (May 1990); Schultze (1990); Small et al. (1989); and Winston (1985 and 1991). The best survey of the literature is in Winston (1985), and the most compact recent application to highways and airports is in Winston (1991). As already noted, the most severe critique of the practicality of the economic efficiency advocates is by Altshuler, in Munnell (ed.) (1990).

Altshuler's central idea is to invest more efficiently in infrastructure (highways and airports appear to have received the most attention), and to then charge appropriate prices for its use.

Consider highways, for example. Two sets of problems arise, one concerning trucks and the other concerning cars and their equivalents. Trucks are the primary cause of the deterioration, and need for highway repair, resurfacing and reconstruction. The deterioration is primarily a function of the thickness

and quality of the pavement (road surface), and the axle-loading of the trucks. According to Small et al. and Winston (1991), current engineering standards do not demand thick enough and strong enough pavements. A program for upgrading pavements and charging trucks for their use (based on axle-loadings) could lead to substantial improvements in the long-run efficiency of the highway system.

Cars and their equivalents, not trucks or buses, are the main cause of highway congestion. To alleviate this, congestion pricing could be introduced as part of the regulations governing the use and financing of highways. This now appears to be technically feasible, and practical. Small et al. (1989) and Winston (1991) report on a number of successful experiments in congestion pricing.

Winston (1985) surveys the work on time and price elasticities in transportation, and indicates their importance in determining appropriate congestion pricing. These user- and congestion-charges would be in addition to gasoline and other fuel taxes, with overall revenue to cover the costs of building and maintaining the highway system. As a transition measure, some use of general revenue or borrowed funds would be required.

Highways

Winston (1991) sums up the highway case as follows:

Efficient highway infrastructure policy is designed to make the best use of scarce durability and capacity. Scarce durability arises because roads can only withstand a finite number of standard loadings before they need resurfacing. Efficient road wear pricing attempts to reduce loadings by forcing shifts to trucks with fewer loadings; efficient investment recommends road design that allows roads efficiently to withstand a greater number of loadings. Each policy extends road life and saves society maintenance expenses; together they reduce maintenance expenses even more and, most importantly, they minimize redistribution and thus political problems. Scarce capacity is effectively rationed by congestion pricing; such capacity only can be used by those motorists willing to pay an efficient premium for it. With efficient highway infrastructure policy in place, authorities are able to make efficient decisions about whether building new roads can be economically justified. (p. 122)

Winston's argument is set out more fully in Small et al. (1989), and congestion-pricing arguments are supported in varying levels of detail in Downs (1962); Hickling (1990); Johnson, in U.S. Department of Transportation (1989); Schultze (1990); and Small, Winston and Evans (1989). Though the economic efficiency arguments regarding highways are logically sound and supported by evidence, Altshuler regards congestion pricing in the United States as unacceptable for political reasons.

Airports

Similar efficiency arguments are being applied to airports, where the problem is mainly congestion. Winston (1991) writes:

Optimal airport pricing and investment policy could generate roughly \$11 billion (1988 dollars) in annual benefits. Travellers [would] reap \$8 billion in reduced delay and also would pay lower fares because the expansion in runway capacity called for under optimal investment combined with congestion pricing would reduce congestion to such an extent that, on average, landing fees would fall. The annualized cost of the additional runway investment is only about \$1.5 billion. Carriers benefit from the lower operating costs from reduced delay. Airports' net revenue would fall slightly, but, as we argue below, they would become financially self-sufficient. . . . Combining efficient pricing and investment would postpone the need to build expensive new airports. . . . Continued growth in air travel will eventually necessitate constructing new airports, but these decisions will be made more efficiently if we make better use of our current airport capacity.
(pp. 123-24)

Gillen (1988) has published an elegant and technically persuasive paper on the application of airport pricing principles to Canadian airports. In particular, the paper presents the case for peak and off-peak pricing, for differentiation among types of user, and for combinations of marginal-cost pricing and demand elements in efficient pricing systems. Hickling (1990); Morrison (1983); Morrison and Winston (1989); and Morrison and Winston (1990) also present strong cases for efficient investment and pricing of airport use.

Altshuler (1990) is more optimistic about the applicability of economic efficiency principles to airport congestion than to highway congestion. Even

so, he believes that public concerns over noise and environmental considerations will outweigh much of the economic efficiency argument regarding investment in airports.

Bird (1976) presents a good case for more widespread application of user-charges on public facilities in Canada. Gramlich (1990) presents the current public finance view of the application of user-charges for public goods in the United States. Much of what he suggests would be suitable in Canada.

The efficiency literature also provides evidence as to whether there is over- or under-investment in such infrastructure as roads and airports. *It strongly supports the view that the investment has been excessive*, in the sense that if the capital stock were efficient, it could provide additional and more efficient services. Paradoxically, additional investment would be required in the short-run to improve the durability of roads, install congestion pricing systems, build more airport runways, and improve traffic control facilities. But, argue the advocates, less investment would be required over the long-run, and self-sustaining financial arrangements could be operated for roads and airports.

TRENDS AND PROSPECTS FOR TRANSPORTATION NEEDS

In this literature review, no attempt is made to canvas the forecasts thoroughly. The Royal Commission has other work under way on trends and prospects. Some incidental literature on these matters was encountered, however, and is reported on here.

Since many Canadian trends follow those in the United States, we begin with a review of those trends. We then make a few Canada-U.S. comparisons, and speculate a little on Canadian trends and prospects for transportation needs.

The U.S. literature upon which comments are made includes: U.S. Department of Transport (1989); U.S. Congress, Joint Economic Committee (1989); U.S. National Research Council, Transportation Research Board, *A Look Ahead, Year 2020*, and particularly an article by Lewis, Hara and Revis: "The Role of Public Infrastructure in the 21st Century"; Eno Foundation, *Transportation in America* (May 1990); and comments by Gail D. Fosler, in Munnell (ed.) (1990).

Demographic Trends

A good starting point is the section of the overview paper by Fuller, in *Moving America*, that deals with Johnson's paper, "Transportation for the Next Century." Fuller's paper concentrates on demographic trends as they will affect transportation, but on a more detailed basis than the Royal Commission did in its Interim Report. Fuller writes: "The cumulative impact of demographic change suggests the following conditions for the United States in the future:

- slower economic growth and relatively less total demand for new transport investment;
- a service-oriented economy with relatively less demand for freight movement;
- a premium on service in which transport speed, safety, and reliability all feature;
- problems in finding an adequate labour force for transportation;
- more demand for leisure travel;
- major highway transport demand in suburban areas of the West and South;
- more flexibility in work schedules; and
- a greater consumer premium on time and convenience in transport, making America an 'impatient society'." (p. 7)

Growth in transportation demands in the U.S. is expected to be slower in the future than in the last few decades, largely because of demographic factors. Some continued growth in demand is expected. The population is still increasing overall, and growth in the Southern and Western regions is rapid. Increases in income are expected to continue, and to eventually overtake increases in expenditures on transportation. Car and air travel are forecasted to be the preferred modes in transportation growth. The combination of that growth, the demands for better service and the economic burden of improved transportation services has increased the pressure for improved operating efficiency.

Based on Johnson's paper, Fuller contends that improvements in the operating efficiency of the transportation system are not only important, but feasible. He is more optimistic than Altshuler (1990). Fuller writes:

Operating efficiency means higher speed and improved service quality, particularly involving transport nodes, or hubs. Johnson suggests that four developments are needed to achieve efficiencies: (1) understandable service goals and measures of goal achievement, (2) *market-oriented strategies and pricing for solving transport problems* [emphasis mine], (3) new funding methods, and (4) information tools to enhance transport performance. There is special promise in applying computers to existing transportation systems; the opportunities for applying bold new technologies, however, are very limited. (p. 7)

Disagreements about the extent to which market-oriented approaches to transportation services should be adopted have been encountered already in this survey. In *Look Ahead, Year 2020*, Lewis et al. make strong arguments for increased use of user-fees for transportation services, but not exclusively user-fees. Fosler (1990) accepts the contention that rate-of-return and efficiency considerations, and privatization, may point toward increased efficiency in infrastructure investment and operations. In her judgement, however, "... infrastructure spending ... will have to rise substantially; and it will have to rise in areas in which neither the economics nor the political process will favour private solutions." (p. 182)

Any long-run economic forecasts risk paying too much attention to some forces and not enough to others; or of not foreseeing changes that may become important. Fuller queries Johnson's orthodox forecasts. Will environmental and energy difficulties alter transportation demands or the way in which they have to be met? Will the application of computers to transportation be extensive and efficient? Some queries from other literature include: Will the Southern and Western United States be able to cope with water shortages that could limit their growth? Will the suburbanization and diffusion of the location of economic activities continue? Will society cope effectively with the transportation needs of the elderly and persons with disabilities? Will high-speed, guided ground transport in major intercity corridors be intensively developed in North America, and, if so, will this succeed in displacing much of car and air travel?

When comparisons are made of the current situation and recent trends in passenger transportation in Canada and the United States, several similarities and differences stand out (see *Transportation in America*,

May 1990; *Getting There: Interim Report of the Royal Commission on National Passenger Transportation*, 1991; Bothwell, Drummond and English, *Canada Since 1945*, revised edition, 1989.)

The post-World War II growth and age-structure of the two populations are similar, except that the rate of growth, relative levels of immigration and size and duration of the Baby Boom were larger in Canada.

The aging of the populations is similar, except that changes in Canada lag behind those in the United States. The enormous increase in female participation in the labour force has been similar too, though to a slightly greater degree in the United States. In both countries, use of private cars and air travel have become the preferred modes of intercity travel since 1945. Levels of car ownership are now high in both countries, but more so in the United States than in Canada. Similarly, use of air travel is greater in the United States. Due to the aging of the populations, growth of intercity travel is expected to slow in both countries; but income, demand, and technological changes suggest that some growth in intercity passenger transportation is likely in both. There is likely more potential for such growth in Canada than in the United States.

Canada does not have a sunbelt comparable with the one in the United States. It acts as a catalyst for population growth, and people travelling in this area rely on cars, small trucks and aircraft for transportation. Urban and suburban trends in Canada are largely based on car transportation, and it is difficult to envisage this changing during the next two to three decades. Trends toward a service-oriented economy, a premium on speed, safety and reliability in transportation, two- and three-worker households in which each person depends on his or her car, increases in leisure travel, and a predicted scarcity of young people — all these are qualitatively similar in Canada and the United States. The transformation of air service to hub-and-spoke patterns is also common to both countries.

Among the differences, proportionately more people and activities in Canada are located in areas with cold, harsh winters. Highway deterioration from weather is thus a bigger problem in Canada. Canadian tourist travel to the United States is proportionately larger than that of Americans to Canada (and absolutely larger, too).

SOME TENTATIVE CONCLUSIONS ON TRANSPORTATION AND ECONOMIC DEVELOPMENT, WITH SPECIAL EMPHASIS ON PASSENGER TRANSPORTATION

The conclusions to this survey are presented in two parts. The first is an overview of the evidence on transportation (in general, and passenger in particular) and economic development. The second is a recall of the more startling and outrageous recommendations for policy changes in transportation and economic development.

Overview of Evidence on Transportation and Economic Development

Both for transportation in general and for passenger transportation in particular, a vast and varied literature supports the contention that transportation has been a major contributor to economic development. Common observation provides a worthwhile body of supporting evidence, but there is much more. Historical and econometric analyses point to these conclusions. Much systematic evidence has been developed at macroeconomic levels, and for regions and sectors. Rigorous methods and useful standards have been applied to thousands of individual projects and proposals. Some reconciliation of engineering and economic methodologies has taken place. Despite the criticisms and calls for reform in policy regarding transportation and economic development, the conclusion set out above appears to be warranted.

The evidence suggests that transportation investment and maintenance will be worthwhile contributors to economic growth in developed countries in the future. However, those contributions do not seem likely to be of overwhelming importance on the scale of the railroad and steamship in the 19th century, or of the car, truck, highway and airplane in the 20th century.

The issue of *improved economic efficiency* in the investment and operation of transportation is raised in much of the literature, and many suggestions are made on how to reach that objective. These include congestion pricing or taxation; increased use and redesign of user-charge systems; and substitution of privatized for public services. More rigorous and careful application of economic benefit-cost measures are suggested, along with integration of the economic and engineering criteria for decisions on transportation. Still, the economists' zeal for *economic efficiency* continues to be ignored by many, and vigorously challenged by others.

The so-called "public good" arguments for government involvement in transportation (as owners, operators, financiers, subsidizers and regulators) appear to be less applicable and more selective than they were in the past. Natural monopoly elements, where they continue to exist, are subject to more competition. Changes in technology have made externalities that could not be charged to users in the past, now chargeable and collectible. The inefficiencies of governments weigh more heavily in public choice than before. Public concerns still arise in transportation services, and some have become more important (for example, environmental protection).

Speed and reliability of service are of increasing concern in transportation, but they appear to be largely determined by private decisions.

Contentious Analytical and Policy Views in the Literature

Early on in this survey, a number of contentious analytical and policy views were flagged. What follows is a summary of some of the evidence for these views.

First, many writers suggest that the United States and Canada have mixes of transportation facilities and services that are inappropriate because they are out of keeping with current technology, demands, and cost opportunities. As an example of this, see Friedlaender's and Walters' judgements (in Munnell (ed.), 1990) concerning the gross over-building of roads in many rural U.S. areas, as well as the over-building of rapid-transit systems to and from city centres.

Hickling shows that too little attention is paid to net economic benefits in decisions about the amount and kinds of transportation projects. Hickling also notes that misleading technical, local and regional criteria are widely used in decision-making models, particularly by state and local governments. Projects have been built that have little value. Projects with net economic value have not been undertaken because their measurement was not done correctly.

Small et al. and Winston provide convincing evidence that the design of highways (particularly the thickness and durability of pavements) is inadequate, and that the number of runways at airports is also inadequate.

Downs and Schultze argue convincingly that if transportation facilities are provided to the public at a zero or near-zero private marginal user-charge, then projects aimed at reducing congestion will inevitably cause more usage and more congestion.

A second startling contention in the literature is that facilities, even when they are appropriate, are used inefficiently. Schultze, Winston and Small et al. show convincingly that, for highways, there are inappropriate user-charges for trucks, and an absence of appropriate congestion charges for all types of users. Recently, other literature has supported instituting user-charges. For example, both Tobin and Blinder, in their testimony to the U.S. Congress Joint Economic Committee (1989), urged much greater application of user-charges to infrastructure. Hickling's discussion of the base case against which new projects should be compared is notable in this connection. Similar arguments were developed by Adler, in Fromm (ed.) (1965).

In the literature, a third startling and repeated contention is that the counting of benefits and costs of transportation is frequently inappropriate. Hickling argues that too little attention has been given to benefits such as time-saving, reliability, user-costs, vehicle damage, and safety, so that benefits are frequently under-estimated. Small et al. and Winston argue the same point.

Hickling argues that too little weight is given to the benefits arising from improved efficiency in the production and distribution of goods (such as just-in-time logistics of production and enormous economizing on inventories at all levels of production and distribution). This point is strongly reinforced by Quarmby (1989). Pollution Probe, Suzuki and others argue another case, that gross under-estimates have been made of the costs of environmental degradation caused by transportation practices. Fourthly, it was noted earlier in this survey that there were strong views in the literature that the United States and Canada have too little infrastructure, particularly transportation infrastructure. There were equally strong views that the bias was toward too much investment in infrastructure.

Evidence for there being *too little investment in infrastructure, and transportation in particular*, includes the following:

- the Aschauer et al. macroeconomic studies of the high productivity of infrastructure, a productivity that is alleged to be much above the returns

on other investment, and by implication above the social opportunity cost of capital;

- the widely held view, among both engineers and economists, that investment in infrastructure during the last two decades has been reduced, and that it has not been sufficient to maintain the real stock of that capital;
- the carefully measured judgement of such transportation economics experts as Mohring and Harwitz about the strong tendency to underestimate the benefits of highway projects;
- Hickling's illustrations of possible projects for which the benefits appear to clearly exceed the costs;
- Hickling's evidence on widespread under-estimation of benefits, particularly of highway and airport projects; and
- Hickling's contention that too high a hurdle rate (social opportunity cost of capital) is used to evaluate transportation projects.

Evidence for there being a bias toward *over-investment in infrastructure* includes:

- the convincing evidence of Small et al. and Winston that large inefficiencies in transportation infrastructure could be overcome by an initial investment to upgrade the systems, together with user-charges;
- the widespread tendency, noted by Adler and Hickling, to count as benefits things that are not benefits (such as employment), and to double-count benefits (transportation savings plus increments to land values); and
- the extensive window-dressing of benefits that is found in the decisions and evaluations of most state and local infrastructure projects.

My inclination, after reviewing this evidence, is to refute the extremes of criticism as well as the promises of benefits from reforms. Undoubtedly, there have been major mistakes in transportation planning and undertakings. The over-building of railway lines in Western Canada early in this century, and of Mirabel airport in the second half of this century, are examples that come to mind. But every line of public and private venture contains successes and failures. The question is whether the mistakes in transportation are the exception rather than the rule. Canada and the United States could not have had as successful a half-century of economic

growth as they have had since the end of World War II if their transportation investments and operations were failures, or, at least, gross errors.

I am inclined to accept the arguments about the benefits of increased application of user-charges and earmarked taxes in transportation. New opportunities have arisen from new technologies. While not as pessimistic as Altshuler about their acceptability, I believe that there will be a good deal of inertia in extending user-charges in transportation. Furthermore, the efficiency improvements are not likely to be as large as Winston, Schultze and Small maintain.

I am more inclined to accept the Aaron, Schultze, Winston, and Musgrave judgement on the size of the economic returns to infrastructure investment than I am to accept the Aschauer judgement. But the line of analysis opened up by Aschauer, and explored by many others, has added to the evidence on the role of infrastructure on the economy as a whole, and on regions and sectors.

I acknowledge that a good deal of fakery, puffery, and wrongheadedness exists in the analysis and decision making on investment and management of infrastructure, including transportation. But a good deal of weight should be given to the other side of this argument. Much more careful and reliable benefit-cost analysis is done in these areas than was carried out 20 or 40 years ago. Computer-based analysis and information bases have enormously improved these aids to decision making. A highly trained and experienced profession of planners and evaluators has developed as a result.

PART B

TRANSPORTATION AND REGIONAL ECONOMIC DEVELOPMENT (WITH SPECIAL EMPHASIS ON PASSENGER TRANSPORTATION)

QUESTIONS AND CONCEPTS

In this part of the survey, the main issues are:

- Has transportation shaped the *regional pattern* of Canadian economic development?

- Has passenger transportation shaped the *regional pattern* of Canadian economic development? In what ways? Have the transportation activities been beneficial? Where they have not been fully effective, why not?
- Are transportation (particularly passenger transportation) projects and policies effective ways for improving the overall and regional features of Canadian economic development?
- What are the interactions between transportation and other factors affecting the regional features of Canadian economic development?
- While the interests in this survey are ultimately Canadian, much of the literature is based on U.S. experience. Because of similarities in economic history and geography, however, that literature provides lessons for Canada.

A pragmatic approach to the concept of "regions" seems best for this survey. The regions that are considered to be affected or affectable by transportation developments are: metropolises and their satellites; secondary cities; "heartlands" and "hinterlands," as geographers call them; provinces; and regions within provinces and states, singly or in groupings. The main concern of this survey is inter-regional, but the structure of modern economies requires consideration of intra- as well as inter-regional developments and the relationships between them.

TRENDS OF REGIONAL ECONOMIC DEVELOPMENT IN CANADA AND THE UNITED STATES

What have been the main regional patterns of Canadian and American economic development during the last half-century? Superficially, how have changes in transportation affected them? How have the patterns of economic development affected transportation?

CONSIDER CANADA FIRST

While the production and distribution of resource-based export staple commodities have become smaller shares of Canadian GDP than they were five and ten decades ago, they are still important activities. For the agricultural,

fishing, forestry and mineral products industries (oil, gas and derivatives), transportation continues to be a major factor. It is required mainly for the movement of commodities, although passengers who service these staple industries also require transportation. Location of extraction and processing activities continues to be mainly at the resource base, and these bases are spread across the country. Thus, Canada's resource industries and its transportation shape many of the country's regions. The decline of the share of the work force involved in agriculture has been particularly dramatic.

Secondary manufacturing increased and then fell back as a share of Canadian GDP, but continues to be a major group of activities. To a surprising degree, these industries are centred in the major metropolitan areas — particularly in and around Toronto and Montreal. Within these urban areas, manufacturing has moved from the city centres to the suburbs and satellite cities. (See the *Historical Atlas of Canada*, Volume III, Plates 7, 12, 13, 14, 51, 54, and 55.) While transportation costs do not appear to be as critical for the location or productivity of secondary manufacturing as they used to be, they are still important. Moreover, speed and reliability of transportation services have become more important for many secondary manufacturing industries.

Service Industries

The largest recent change in the structure of the Canadian economy, aside from the decrease in the agricultural work force, has been the growth of service industries. Aside from rural recreational activities, the bulk of service activities have located in and around metropolises. This is not surprising in view of the Grubel and Walker (1989) evidence that about half of service activities are business services of one kind or another. Transportation of people and interpersonal communications are major causes of the development of these parts of the service economy.

Health care and education have grown more rapidly than the GDP and the work force; these too are predominately located in and around metropolises. School consolidation and busing have increased the urban concentration of elementary and high school education.

The enormous increase in the participation of women in the labour force has affected the structure of the economy and has interacted with transportation. It has:

- intensified growth in ownership and use of private cars;
- intensified the substitution of household equipment for household labour; and
- been a catalyst for the rapid growth of fast-food outlets and commercial consumer services.

Regions

Cities outside the Canadian heartland have become ambitious to diversify their activities and outgrow regional servicing functions.

Despite a huge increase in productivity for the Canadian economy as a whole, poor and low-productivity regions persist. Newfoundland, much of the Maritime provinces, and parts of rural Quebec appear to not have improved their comparatively low productivity, slow growth, high unemployment and under-employment in relation to the Quebec-Ontario heartland, Alberta and British Columbia.

Regions in which Aboriginal peoples live continue to have notoriously poor economic performance, with a few exceptions. Even within prosperous provinces, pockets of poverty, some of which have a regional dimension, persist. Examples of these are areas in which declining manufacturing industries predominate, and areas in which the primary resource is declining.

The United States is witnessing many of these trends as well, and is seeing some significantly different trends, including:

- a movement of people to the sunbelt;
- a decline in numbers of unionized workers;
- industrial decline in the Great Lakes and midwestern regions; and
- a large and persistent illegal immigrant problem.

HAVE TRANSPORTATION ELEMENTS BEEN MAJOR FORCES SHAPING THE REGIONAL AND INTER-REGIONAL STRUCTURE OF THE CANADIAN AND UNITED STATES ECONOMIES?

Conflicting Opinions

Transportation gets mixed reviews in both countries with respect to regional economic development. Some writers attribute the economic development of a region to favourable transportation developments. Canadian examples of this include:

- the post-World War II highway links between central Canada and the U.S. interstate highway system that are largely responsible for the continental integration of the Canadian and U.S. manufacturing economies;
- the development of oil and gas pipeline networks and the post-World War II development of Alberta and Saskatchewan oil and gas resources; and
- the Quebec North Shore and Labrador Railway and the post-World War II development of the Labrador Trough.

Many writers attribute unsatisfactory regional economic development, in part, to inadequacies or mistakes in transportation developments and policies (for example the reduction in subsidization of Maritimes freight rates).

Some writers contend that transportation developments or policies could be the main force to improve the economic welfare of less-well-off regions. These regional transportation proposals are sometimes thought to be consistent with increased national GDP. Sometimes they are acknowledged to be mainly diversionary, but are advocated nevertheless. It is frequently contended that most regional transportation projects merely shift activity from one region to another, thereby *reducing* real national output. This view is given much weight by Adler, in Fromm (ed.) (1965); and by Hirschman (1958). Much of Hickling's *Primer* aims to prevent such outcomes.

It is important to recognize, nevertheless, that many transportation developments that improve national economic development necessarily have favourable effects on many regions. If investment in better pavements for highways greatly improves the efficiency of their use, it is likely that these same improvements will benefit most regions; trucking, after all, is

ubiquitous throughout Canada. If improved air traffic control technology would improve the national efficiency of air service, it is likely to do so in most regions, though not necessarily to the same degree. If real incomes produced or received increase in most regions, even though relative gaps are changed little, the demand for some kinds of transportation services will increase in most regions, though again, not necessarily to the same degree.

Thus, the issues of transportation and regional development have to be appropriately formulated. For example:

- Are national trends in transportation causing national economic development to be applied appropriately in various regions?
- Are some trends in transportation more effective for some regions than for others, and do the projects and policies reflect this?
- Do some problems in transportation, such as congestion, occur everywhere, although more severely in some regions than in others?
- Is transportation a more suitable agent of economic development in some regions than in others?

LITERATURE TO BE SURVEYED

The literature to be surveyed includes:

On regional development theory and policy: Adler, in Fromm (ed.) (1965); Eberts (1991); Fox (1990); Green (1971); Isard (1975); Kraft et al. (1971); McCann (1987); Norrie and Percy (1988); Savoie (1981 and 1986); Sitwell and Seifried (1984); Studnicki-Gizbert (1990); Sullivan et al. (1989); Vernon (1969); and Munnell (1990b).

On empirical regional and transportation literature: Deno (1988); Eberts (1991); Fox (1990); Friedlaender (1990); and Munnell (1990a).

THEMES IN THE LITERATURE

Among the literature on transportation and regional development, several themes appear repeatedly. The same concepts and measurements apply regionally as they do nationally for deciding on and evaluating

transportation and economic development. Transportation projects are rarely the main determinant of location or productivity of activities in a region. Except for resource industries, they are generally one element interacting with many other elements in determining regional economic development. If many other elements are not favourable to economic development in a region, a major transportation investment is not likely to be worth the cost.

The integration of transportation projects and policies and other regional economic development policies has seldom been done effectively. Indeed, in recent books on regional economics, it is surprising how little attention is given to transportation. In Savoie (1986), for example, there are three minor comments on transportation.

SOME DETAILS FOR VARIOUS KINDS OF REGIONS

Any consideration of transportation and economic development should deal with such diverse regions and inter-regional relationships as were noted above. They should deal both with regions with high employment, productivity and growth, and with those with low employment, productivity and growth. Consideration of regionalism and economic development should not be confined to the so-called "have-not" regions and the "poverty pockets."

During the 1950s and 1960s, the literature on economic development paid considerable attention to public investment and social overhead capital. Hirschman (1958) notes the political and social pressures in both developing and developed countries to scatter public investment over all regions in a country. Often the national economic development results were poor. Fox (1990) remarks on the limited empirical evidence that exists on the regional effects of infrastructure developments and policy, despite Hirschman's early interest in the subject.

Fox writes:

Application of research results to improve policy requires understanding how the productivity of infrastructure varies at different locations, and why. Presumably, a given marginal infrastructure investment shifts the production frontier out by different amounts across regions. Further, actual production may not respond to a shift in the frontier,

particularly if the economy was already operating inside the previous frontier. However, little empirical evidence exists on how productivity effects vary by region, despite longstanding conceptual arguments that considerable difference should be expected (for example, see Hirschman, 1958) and it is difficult to generalize the findings of what research exists. The lack of good guidelines on infrastructure's productivity in different geographic and economic environments is perhaps the most troublesome limitation imposed by the current base of empirical knowledge. (p. 32)

In reviewing transportation and regional development, this paper examines:

- large, mature, well-off regions;
- hinterlands, between-hinterlands and export markets;
- hinterland cities seeking diversification;
- passenger movements in diverse regions;
- have-not and have-less regions; and
- Canadian programs and regional inequalities.

In large, mature, well-off regions, transportation is one element of integrated development processes. Such regions generally have a well-developed transportation system with a high density of roads, railroads, and airport facilities. Kraft et al. (1971) make note of this when they remark that:

- On the whole, transport will not greatly influence the shape of future regional development in the United States, although under certain circumstances it may help a region to capture a fair share of decentralizing industry. In this respect, service considerations more than costs may determine the attractiveness of a particular transportation network.
- The diminishing role of transportation in influencing location choices should not be too surprising in a country where the network is very extensive already. (p. 35)

Similar conclusions apply to Canada now, although the Trans-Canada Highway network is less developed than the Interstate Highway System in

the United States. Transportation will have to adapt to changing demands, growth and technology.

As discussed in the general treatment of transportation and economic development, Western industrialized countries have, for decades, concentrated their economic activity in and around cities. These concentrations, however, differ in their degree of specialization. Porter (1990) emphasizes the clustering of related firms in certain cities.

Axiomatically, better-off regions have the wealth and income to maintain and improve transportation. However, judging by the pleas of U.S. governors for federal funds and for tax-exempt status for transportation bonds, the willingness of even the better-off states to be self-sustaining in infrastructure investment and maintenance is limited. (See U.S. Governors' Task Force Report, 1989; and Gramlich in Munnell (ed.), 1990.)

Economic development can be largely a self-sustaining process, although in the past it has depended on certain public goods, such as education, transportation and communications, and research and development.

Whether public policies on transportation and economic development should focus on increasing infrastructure, or improving its efficiency of design and use, or some mixture, is a moot point. The governors (1989) and many economists (Galbraith, 1991; Joint Economic Committee hearings, 1990) emphasize increased investment. As shown in Part A of this survey, the Congressional Budget Office, Schultze, Small and Winston emphasize improving the efficiency of investment and use. These arguments are being fought for in every better-off region in the United States. The situation in Canada is unclear, although highway authorities and municipal governments in well-off regions are pleading for more provincial and national financing of infrastructure investment.

It appears that the movement of people within and among the more highly developed regions in North America will continue to grow more rapidly than the real output of goods and services of the regions. This inference is drawn from Winston's 1985 survey. Even if much improvement in efficiency in investment and use takes place, eventually some increase in the stock of infrastructure capital (particularly in transportation) will be worthwhile. As Fosler commented in Munnell (ed.) (1990), economic and social pressures will support such increased investment sooner rather than later.

The major transportation problems in the well-off regions of Canada are likely to be congestion and maintenance of the infrastructure.

TRANSPORTATION AND ECONOMIC DEVELOPMENT IN THE HINTERLAND AND BETWEEN THE HINTERLAND AND EXPORT MARKETS

Transportation is central to staple product production and distribution of hinterland. If a new resource project is proposed in an area not served by transportation, then the development and cost of transportation is an integral part of the decision for the project. Examples of this include the Quebec, North Shore and Labrador Railroad; Pine Point Mine; North-East B.C. Coal; Alberta Pulp and Paper; and Beaufort Sea and Mackenzie Valley oil and gas. If the new resource project is already served by transportation, then the prospects for the project are improved.

Transportation has often led economic development and shaped its regional distribution (see Eberts, 1991; Fogel, 1964; Fox, 1990; Kraft et al., 1971; McCann, 1987; and Sitwell and Seifried, 1984). Canals, waterways, ports, railroads and roads are well-known examples of how this happens in the United States and Canada. More often than not, these transportation developments involved public investment.

The consensus in the literature is that transportation is a necessary but not sufficient condition for the economic development of areas that have not shared fully in the economic development of well-to-do countries. However, even if transportation is necessary, it is usually considered to be an unimportant element in regional development programs. Eberts (1991) writes:

... public infrastructure is more a necessary condition than a sufficient condition for economic development. While public infrastructure construction can provide local jobs, unless the project is of considerable size and ongoing, sufficient demand to sustain local economic development must come from other sources. Still, the question needs to [be] raised, "Would the investment have occurred without the transportation investment?" (p. 7) [He later asks] Does transportation induce economic development? The answer, gleaned from the current body of empirical research is a qualified yes. . . . Furthermore, the positive effects of transportation are seen at both the local and national level. [This remark appears to refer to the literature generated by Aschauer

et al.] If the effects were observed at only the local level, one would be inclined to ask whether transportation investment, and other infrastructure investment, is simply rearranging a fixed pool of resources, benefiting those regions that have attractive infrastructure investment at the direct expense of other regions. However, the observed national positive effects allays these concerns to some extent. The ability to stimulate economic growth depends on the economic state or development of a region. (pp. 21-22); see also Sullivan (1989.)

Hinterland Cities

Hinterland cities seek diversification of their economies; they want to be something more than service centres for their hinterlands. Poor or expensive transportation services are alleged by some writers to be a major limitation on such diversification (Studnicki-Gizbert, 1990; and McCann, 1987).

Governments have tried diversifying in ways that avoid transportation becoming a decisive impediment, such as concentrating on high-tech, high-value goods and services, and on intellectual capital. These have been the purpose of the Alberta diversification programs and the federal government's Western Diversification Program.

Residents and governments of the Maritimes and the Prairies have made repeated complaints about transportation impediments to their diversification and their opportunities to penetrate markets in central Canada and the United States.

Moving People

While much of the attention on transportation and regional economic development has been on the movement of goods, satisfactory services for the movement of people are also essential.

Movements of people arise from migrations, seasonal labour flows, trade, information exchange, management practices, and educational activities.

Land that is unsuitable for agriculture is sometimes the most attractive for cottages, camping and tourism. Familiar examples of this include the Canadian Shield north of Toronto; the Laurentians; the Rockies; and the Manitoba-Ontario-United States border country. Effective transportation services (such as Highway 400 north of Toronto) are essential in these areas.

One of the clearest examples of the impact that transportation has on economic development and movement of people is the highway development in Newfoundland. Newfoundlanders used to rely on boat connections among the outports and between the main centres and the outports; today they rely on cars and trucks. The Trans-Canada Highway in Newfoundland has brought about profound changes in the province's social and economic life.

The "Have-nots" and the "Have-less" Regions

One of the main concerns of regional development in Canada has been improving the lot of the "have not" and the "have-less" regions.

Even if policies and programs contribute little to or even decrease national product, most highly developed Western nations do not take a *laissez-faire* approach to the people and institutions in their "have-less" regions. Regional aspects of economic development have been of concern in less-developed countries too, and involve economic, political, social and equity considerations (see Bothwell et al., 1989; Courchene, 1981; Economic Council of Canada, 1977 and 1980; Friedman and Alonso, 1964; Green, 1971; Hickling, 1990; Hirschman, 1958; Kraft et al., 1971; Lithwick, 1978; Savoie, 1981 and 1986; Scott, 1978; and Simeon and Robinson, 1990).

It is usually best to first consider equalization transfers to people and governments, and then to consider regional development *per se*, such as projects and policies. This survey is concerned with regional development projects and policies.

Regional Transportation Policies

Transportation often has important regional development effects, even when it is not integrated into policies and programs that are more commonly called "regional." In Canada, transportation programs and policies of major regional importance have included:

- building railways and roads to serve less-well-off regions, with considerable public investment and subsidy;
- subsidies for transportation services, such as Crow rate, feed grain movements, and Maritime freight rates; and

- development of proposals for region-serving transportation, such as the gas pipeline to Vancouver Island, and the proposed Maritime extension of the gas pipeline from Eastern Canada.

Studnicki-Gizbert (1990) examines the different approaches to subsidies in Canada; he is highly critical of several of the methods used, and points to inappropriate incentives and inefficiencies.

Regional considerations also arise in transportation regulation and deregulation, such as:

- trucking deregulation, in assurance of reliable, economical common-carrier service for remote areas;
- airline deregulation, in proposals for assurance of reliable and economical service for remote areas; and
- branch line closings, in consideration of the adequacy of remaining transportation services.

Substantial national and provincial regional development programs have been implemented since the latter 1950s, many of which are now summarized in the Fall 1990 Canadian Labour Market and Productivity Centre (CLMPC) *Quarterly Labour Market and Productivity Review*. The best reviews are in the books by Donald Savoie, and are listed in the CLMPC article.

These programs, while they had an infrastructure component, did not contain much transportation activity. It may be worthwhile for the Royal Commission to examine some of the Federal programs under Department of Regional Economic Expansion (DREE), Department of Regional and Industrial Expansion (DRIE), and successors, and federal-provincial agreements under these programs, to determine the transportation components, both for goods and for people.

The programs were laden with subsidies to private investment, either to draw in activities from outside the region or to support local initiatives. In recent years, the latter strategy has come into more favour. These Canadian programs have been plagued by local "pork barrelism," and nearly every politician usually promotes, or at least acquiesces to, such activities. Every

town in the Maritimes seeks its share of development funds. Sub-regions within well-to-do provinces seek their share too. Growth-pole ideas were badly abused in Canada.

Reducing Regional Disparities

The conventional wisdom among analysts of Canada's regional policies is that disparities in productivity and produced income have *not* been reduced by such policies. It is agreed, however, that disparities in *received* income have been substantially reduced, mainly due to federal-provincial transfers to provinces and to people, including equalization, Established Programs Financing (EPF), sharing of Canada Assistance Plan (CAP), and the transfers to people through Old Age Security/Guaranteed Income Supplement (OAS/GIS), Unemployment Insurance Commission (UIC), and Canada Pension Plan/Quebec Pension Plan (CPP/QPP). Not all of these programs are regional *per se*; indeed few of them have specific regional considerations built in. However, they have been the main forces in reducing the regional disparities in Canada, with respect to income received by persons and household.

Movement of People

The improved relative *income-received* position of persons in the have-less regions has been accompanied by increased movement of people in all categories, and therefore has called on improved transportation services. An excellent illustration of this is the greatly increased movement of people within the 100-mile radius around Halifax as compared with one or two decades ago.

CONCLUSIONS REGARDING TRANSPORTATION AND ECONOMIC DEVELOPMENT

Many transportation and passenger transportation elements that have contributed to national and international economic development have been shared among the regions, though not always equally:

- good, paved highway systems have been developed in centres where there is significant population density, and for connections between these centres;



- private ownership of cars and light trucks has become considerable in all regions;
- reliable rapid air passenger service, and air traffic control is available throughout the country, including remote areas; and
- oil and gas pipelines serve most regions that have significant population density.

On the negative side, all regions have experienced a deterioration in railway passenger services and little improvement in intercity bus services. The one exception is the improvement in commuter train services for Toronto and environs.

Transportation's Role in Regional Development

Participation in these transportation-economic development changes has led to investment in transportation in many regions. The literature contends that overbuilding of highways in rural areas occurs more often in the U.S. than it does in Canada.

Some region-specific economic developments are dependent on transportation facilities. Other economic developments have been important contributors in the development of multi-purpose transportation facilities. For example, many resource-sector economic developments have been dependent on road, railroad, and air services. As another example, tourism has often been a deciding factor in the decision to turn a local or regional road into a major highway.

In mature, better-off regions, the main transportation problems are congestion and maintenance. Such regions are capable of self-financed transportation developments, with some allowance for spillover.

When it comes to boosting the economic development of less-well-off regions, transportation and general economic development policies have not been well integrated. Transportation projects appear to be decided by authorities that are distinct from and often out of touch with development authorities and *vice versa*. Admittedly, there are some infrastructure components in general programs concerning regional disparities, but the lack of integration is the rule rather than the exception.

Transportation is often thought to be a minor element in general regional development policies. Paradoxically, advocates of transportation developments often, at the same time, allege regional development benefits in support of their projects.

A couple of decades ago, airports were widely touted as being growth poles (for example, Mirabel and Pickering). These expectations have been severely discounted since then.

On balance, the consensus among transportation economists is that there is a bias toward exaggeration in alleging that transportation projects produce regional economic development benefits.

PART C

TRANSPORTATION AND TOURISM

INTRODUCTION

Intercity movements of people can usually be divided into those for business and those for non-business purposes. (There is some overlap, such as travel to conventions.) Non-business purposes are the aggregation of travel for visiting friends and relatives, for pleasure and for personal reasons.

The principal concern in this part of the survey is travel for non-business purposes, which will be called "tourism." The Royal Commission's Interim Report shows that, in 1988, tourism comprised 83 percent of domestic intercity trips. The report also shows that:

- Canadians travel primarily within their own provinces;
- most trips are for short and medium distances;
- international travel is increasing;
- the transportation mode that travellers choose depends on the length of trip. For short trips, cars are used 95% of the time, air almost never, bus about 3% of the time, and rail about 1%. Use of cars falls to 81% for trips between 320 and 800 kilometres in one-way distance, while air jumps into

second place with 12% for such trips. Bus and rail increase their shares to 4% and 3%, respectively. As trip lengths increase further, air's share increases and the shares of the other three modes decrease;

- Canadians travel primarily by car;
- use of a personal vehicle consumes approximately 91 cents of every consumer transportation dollar; and
- air travel is the most popular mode of public transportation. For long trips, Canadians tend to choose air travel. In 1988, 29% of business trips and 3% of pleasure trips were taken by air.

This section of the survey is concerned with the causal links between transportation and an aspect of economic development, tourism.

Here are the critical questions:

- Is there convincing evidence that transportation projects, policies and operations have shaped tourist activities? How? Why? Have the results been relatively efficient?
- Does that evidence indicate important forces of future development of tourism? Which of these forces arise from transportation? Does the evidence point to policy options for current or future decisions?
- Is there convincing evidence of causal links from tourism to transportation projects, problems, policies and decisions?

Transportation developments clearly cause tourism developments, and *vice versa*. The development of large, fast, economical jet passenger aircraft has led to long-distance tourism. Tourism in the Canadian Shield has led to demands for and provision of better access roads. *Precise analysis of these relationships, and in particular of their changes over time, is difficult.*

Particularly important issues for transportation policy are the response of travel (both personal and business) to changes in the elapsed time and cost of trips, and the incomes and characteristics of travellers. (Economists call these measurements "elasticities of demand.")

The literature examined in this survey includes: Bothwell et al. (1989); Gillen and Oum (1981); Grubel and Walker (1989); *Mathematica* (1966 and 1967); McCann (1987); Oum and Gillen (1983); Oum, Waters and Yong (1990); Palmer (1988); Scarfe and Krantz (1988); Watson (1988); and Winston (1985).

TRANSPORTATION SUPPLY

A number of transportation developments have increased tourism in North America in general, and in Canada in particular. These have included:

- the enormous increase in private car ownership and operation. (Bothwell et al., 1989 show that mass ownership of private cars in Canada occurred *after* World War II);
- the development of a highway system of paved roads. (Even more than the mass ownership of private cars in Canada, this is a post-World War II phenomenon in Canada [Bothwell]. In the United States the most visible indicator of this is the near-completion of the Interstate Highway System by the early 1970s. Canada has its Highway 401 and Trans-Canada Highway from St. John's to Victoria);
- the development across Canada of a network of civilian airports, with navigation and air traffic control services for dense movement of aircraft, by day and night, in all weather. (The nucleus of the system was given impetus from the wartime Commonwealth Air Training Program, as mentioned in the Bothwell and Kilbourn biography of Howe);
- the availability of reliable, fast, large, economical passenger aircraft;
- the availability of cheap motor fuels; and
- the proximity to Canada's main metropolises of the recreational potential of the Canadian Shield. Land that was virtually useless for agriculture is now the home of vast supplies of rivers and lakes, cottages, campsites, ski hills and so on.

IMPORTANCE OF TOURISM

Though the available data is incomplete, it contains many indicators of the important place that tourism plays in the lives of Canadians. Watson (1988), for example, shows the growing household ownership of recreation

equipment, such as vacation homes, camping equipment, boats, snowmobiles, skis, cycles, motorbikes, and adult-sized bicycles (Table 33). Watson also:

- provides summary data on family expenditures on various forms of recreation or recreational equipment . . . [and notes that] consumers' spending on entertainment and recreation increased from 4.0 percent of GNP and 6.3 percent of total personal expenditure in 1961 to 6.0 percent of GNP and 10.1 percent of personal expenditure in 1983. It is not at all surprising, therefore, that most of the items tracked in Table 34 have also increased more rapidly than total personal expenditure, which rose by just over three and a half times (in current dollars) between 1969 and 1984. For instance, spending on vacation homes rose more than fourfold; spending on holiday lodging more than four and a half times; purchases of recreational vehicles more than five times; purchases of bicycles almost five times. . . . (pp. 78-80)

Watson also comments on the growth in the use of national parks, campground activities, national historic parks and provincial parks — another set of indicators of growth in tourism more than in proportion to population and income (Table 36).

The tourism into and out of Canada is large, though still much smaller than the domestic aspect.

MODES OF TOURING

Modes of transportation for tourism have already been summarized from the Royal Commission's Interim Report: the mode for short and medium trips is personal car, with air travel being of increasing importance for medium- to long-distance trips.

Palmer (1988) provides useful data on passenger trips by bus and rail. Between 1975 and 1985, the trend has been for an absolute decline in intercity common carrier bus trips, but not much decline in comparable rail trips. Palmer argues that, "Regardless of some qualms about these data, it appears that passenger rail service may be a normal good, whereas passenger bus service is more than likely an inferior good [p. 46]."⁸

ELASTICITIES OF DEMAND

Trends in trips, expenditures and income suggest that the income elasticities of demand for tourism activities as a group are more than one. For example, a 10 percent increase in income will lead to more than a 10 percent increase in expenditure on tourism. (The income elasticity of demand of individuals, or, for that matter, for groups of individuals for particular elements of tourist activity, may be well below unity without contradicting the conclusion about aggregates.)

However, analyzing demand and family expenditure is difficult, and full of complexities. The classic literature on elasticity analysis is not reviewed here. Note is taken, however, of the review article by Winston (1985). For demand, Winston reports favourably on models that examine the responses both to elapsed time of trip and cost (price) for various modes and trips. Estimates of price and service-time elasticities are reported.

Winston notes:

These coefficients can be used to calculate estimates of price and service time elasticities of demand and decisionmakers' value of travel time. . . . In contrast to elasticity estimates for urban passenger transportation, service-time elasticity estimates for intercity bus and rail transportation tend to be larger than the price elasticity estimates. Furthermore, their large magnitude . . . indicates that reductions in service times could be significantly effective in increasing rail and bus-market share. Generally, the cost and service-time elasticities for air and auto are inelastic. This is not too surprising in view of the fact that these modes already possess a relatively large share of the United States' intercity travel market. (pp. 73-75)

TRANSPORTATION RESPONSES TO TOURIST DEMAND AND SUPPLY

Some transportation developments take place in response to tourist use and demands. They may follow some developments and then induce further tourist development. Particularly good examples of this in Canada are Highway 400, north of Toronto; the Laurentian Autoroute, north of

Montreal; the Calgary–Banff–Lake Louise–Jasper–Edmonton highway and rail service; the early development of a good paved highway from Winnipeg to Kenora; and the Cabot Trail on Cape Breton Island.

Ancillary developments are also important to the transportation-tourism mix, and include; airport hotels; highway service centres; multi-purpose resort complexes; ski hills and lifts; marinas; and parks and camp grounds.

A particularly important activity for long-distance and foreign travel has been the development of reservation systems, tour packagers and wholesalers, and an industry of travel agencies. These serve both tourist and business travel.

ENDNOTES

1. Kindleberger (1965), pp. 189–90. [Emphasis mine.] In more recent literature, the slowdown in economic development is sometimes attributed to the reduction in the redundancy of labour, with the consequent increase in real wages and reduction in real profits. See Cornwall (1977) and Boltho (1988).
2. On infrastructure and location of industry, however, see Munnell (1990) in the volume she edited for the Federal Reserve Bank of Boston.
3. Some of these activities may still be *natural monopolies* in the technical sense. Their activities may still be operating in regions where declining average costs are large relative to the total (narrowly defined) market. Even in these cases, however, there is generally more competition for the activity from close substitutes.
4. Kindleberger (1965) pp. 157–58.
5. These observations have often focussed on transportation, with the same alleged cause-effect relationships.
6. Fox (1990): "The Contribution of Infrastructure Investments to Growth: A Review of the Literature."
7. Essentially the same ideas are found in Mohring and Harwitz (1962), but are developed by them in a more technical way.
8. For a normal good, the income elasticity of demand is positive, though it could be large or small. For an inferior good, the income elasticity of demand is negative; that is, an increase in income, other things being equal, induces a decrease in the quantity demanded.

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