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AMENITIES FOR REGIONAL DEVELOPMENT:

THE CASE FOR BRITISH COLUMBIA

by

Hans Georg Steiner

B.A., Simon Fraser University, 1974

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

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SIMON FRASER UNIVERSITY

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AMENITIES FOR REGIONAL DEVELOPMENT:
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ABSTRACT

Amenities for Regional Development:

The Case for British Columbia

Numerous attempts have been undertaken by various levels of government to alleviate regional imbalances in economic welfare. Development policies have been initiated to improve the economic as well as the social well-being of those living in areas with low income or high unemployment. Many of these policies are based upon the traditional economic belief that regional disparities are a result of market disequilibria. Consequently, such measures as subsidies, incentives and grants to attract industries to lagging areas have been considered to be the most effective policy tools to lessen the impact of regional disparities. However, the limited success of many regional development programs has brought these views under close scrutiny.

At the same time it has been suggested that non-economic factors, such as amenities, are important determinants of the location of economic activity. Amenities are generally described as locational qualities which are pleasant or agreeable to an individual, such as climate, recreation opportunities, etc. The emergence of amenities as determinants of location may have been aided by advancements in technology which have, for some industries, rescinded the

traditional ties to either sources of material input or markets. Also, changes in consumer behaviour brought about by higher income and increases in leisure time have encouraged amenity-oriented location decisions.

The purpose of this thesis is to (1) investigate whether or not amenities do influence location decisions and related population change, and (2) isolate possible amenity factors which lend themselves as complements to regional development policies. The study of amenities as an impediment to population growth does not lend itself to rigorous analysis. This is partly caused by the fact that interpretation of amenities are diverse and that many of the amenity factors are difficult to quantify.

The thesis studies population changes and amenity variables for 31 British Columbia population centres between 1961 and 1971. Using multiple regression analysis, models explaining population growth in terms of the initial level and change in the quality of various amenities are tested.

The results of the analysis lead to the conclusion that, during the period of observation, amenity-related population change took place. Furthermore, some amenity factors were identified that could be suitable for use as complements to other regional development tools to reduce regional imbalances in economic welfare.

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CHAPTER I

INTRODUCTION

The emergence of countries, states, federal unions or even economic associations has provided the basis for economic interaction between and within such geographic areas but has not, in many instances, alleviated the problem of economic disparities. Consequently, in regional (or national) economies these issues have attracted attention in the ranks of academia, governments and, to some extent, in the industrial sector. Concern is expressed with, for instance, the level of poverty, human suffering and, at times, political unrest, which is often caused by national or regional disparities in the level of economic well-being. To mitigate these economic disorders, recourse was sought from economic theories to explain the forces underlying regional economic activity, culminating with the development of regional location theory.

The development of a specific field of regional science is itself a recent phenomenon. Although regional studies were at the heart of geography at the beginning of the twentieth century, it is only since the late 1950's that other social scientists have begun to focus their attention on the problems of regional analysis.[1]

Even though these theories attempt to integrate location theory more thoroughly into existing micro-economic theory, they have been largely ineffective to deal with issues of regional disparities.

To lessen the gap between developed and developing regions, development policies and tools have been initiated and introduced to improve the economic as well as social well-being of those living in the less advantaged areas. For instance, within the Canadian context a great deal of effort is centred around the need to improve 'regional balance'.[2] However, this is always discussed in the context of how to improve the income and employment opportunities in poorer regions; in other words an optimal resource-allocation solution is usually sought to deal with the problem. This preoccupation with applying purely economic principles and criteria to a regional (or national) problem has unfortunately ignored the existence of other locational determinants, notably the attraction exercised by amenities, such as climate, recreational opportunities, etc.

The limited success of past as well as present regional development programs has recently come under close scrutiny.[3] At the same time, earlier suggestions stressing the importance of amenity effects as factors of regional growth are analyzed,[4] encouraged by results obtained from industry location surveys which supported the stipulated influence of amenities as a locational determinant.[5]

The overall agreed-upon interpretation of amenities links the location decision of individuals as well as industries to some unique non-economic features present in an area or region; these features are in the form of natural or man-made (urbanization) amenities, or a combination thereof. Though the existence of amenity (or non-economic) factors has been noted in the literature, very little progress has been made in including these factors in the theoretical models of regional economics. This may be due to the fact that the effects of these locational determinants are difficult to quantify and thus do not lend themselves to be incorporated readily in mathematical or statistical regional models.

The recent, albeit sparse, recognition of amenities as determinants of location may have been aided by several developments. First, the emergence of "footloose industries" in some sectors has rendered the traditional location theories obsolete. These industries carry the distinction that, because of technological advancements in some sectors such as electronics, location decisions are not influenced by transport costs. Second, the overall increase in leisure time coupled with the resultant increase in leisure activities tend to favour areas which are able to supply such opportunities to an individual. Third, the lure of pleasant living conditions expressed either in form of climate, social activities, easy access to urbanization amenities, etc., has

probably influenced the location decision of a wide segment of today's society.[6]

The presence of amenity-related location factors, although rarely tested empirically, forces some wide-ranging issues upon the person or group responsible for establishing comprehensive regional development policies. The challenge at hand is, first, to determine whether or not the amenity influence can be observed as well as tested and, second, to identify those unique locational features which could be utilized as components of an overall regional development policy.

Within this context, the purpose of this thesis is to investigate in more detail the concept of amenities and amenity-related location. It specifically explores the hypothesis that amenity factors do indeed exert a considerable influence with respect to an individual's locational prefernece. It also presumes that the amenity influence can be observed. To examine the possible amenity effect, 10-year population changes in 31 British Columbia population centres are studied.

Having defined the issue, the conceptual framework and development of this thesis can be outlined as follows: Chapter II provides a brief discussion of the leading theories of regional growth as well as an overview of location theory. The chapter concludes with the discussion of Canadian regional development programs, their purposes and

policies; reference is also made to investigations about the effectiveness of these assistance programs.

Chapter III is developed in three distinct sections, all of which are important to the main hypothesis of this thesis. The first section investigates the mobility of 'factors of production' (capital and labour); the second section provides a review of the amenity literature; and the third section introduces a theoretical amenity model.

Chapter IV is the foundation of this investigation. In this chapter the hypothesis and methodology are developed for a regional amenity model. Locational amenity variables identified are climate, recreation, agglomeration, distances and health amenities.

Chapter V focusses upon the quantitative inquiry of this thesis. Using multiple regression analysis, models explaining population growth in terms of the initial level and change in the quality of various amenities are tested. The results of the analysis and their interpretations lead to the conclusion that, during the period of observation, amenity-related population change took place.

Chapter VI, the conclusion, summarizes the various aspects and outcome of this investigation in relation to amenity-oriented location. Areas of additional research are suggested and policy recommendations are made, stressing the utilization of those amenity factors which could be used as complements to other regional development tools.

Footnotes

[1]Krumme (1970), pp. 3-5.

[2]Economic Council of Canada, *Fifth Annual Review* (1968), p. 7.

[3]Springate (1972); DREE (1973); Woodward (1975); for a broader discussion see Munro (1978).

[4]Ullman (1954); Klaassen (1968); Cebula (1969); Wheat (1973); Liu (1975); Svart (1976).

[5]Wallace and Ruttan (1961); Cameron and Reid (1966); Pinfield, Hoyt et al. (1974).

[6]Witness the growth of Vancouver, Victoria or Kelowna in British Columbia or the overall population gain of the 'sunbelt' in the U.S.A. ("Americans on the Move," *Time*, March 15, 1976.) It must be noted, however, that for an amenity-related growth to take place, a certain threshold level of amenities must be present.

CHAPTER II

TRADITIONAL THEORIES OF REGIONAL GROWTH AND DEVELOPMENT

Regional social scientists are constantly discussing the concepts of economic growth and the level of development resulting from growth. Different researchers and policy makers, however, have different definitions for economic growth. Nevertheless, if levels of economic growth are discussed, a tantamount reference to increases in productivity, social welfare, per capita income, population and leisure time is implied.

Whatever measure is taken to define economic growth, economic activity is never diffused evenly across a spatial unit such as a province, region or nation. Even though economic activities--the exchange of goods and services--take place whenever and wherever people associate with each other, these activities may not improve their standard of living. Under-developed or depressed regions are not only found in the Third World; they also exist in most of the highly industrialized countries.

To gain a better understanding of the forces that either enhance or hinder economic growth, one must first look at the conditions required for economic growth to take place. Once these conditions have been identified, we can isolate reasons

why the transmission of economic activities is not uniform. The latter is of vital importance to the policy maker, who may then establish goals and implement ways of alleviating the problem.

The task undertaken in this chapter is to identify the components of regional growth, to review some of the current policies used for revitalizing depressed areas, and to report on the effectiveness of these policies.

Regional Growth Theories

There are three leading theories of regional growth: economic base, neo-classical and cumulative causation theory. Each will be discussed in turn.

Economic Base Theory

The transmission of growth from one region to another is often explained within the framework of trade theory. During the early stages of regional growth, inter-regional trade may be possible if the less-developed region has a comparative advantage over another region in the production of one or more goods. This will result in a certain degree of specialization in the under-developed region, which may be accompanied by economies of scale which should result in higher productivity.[1] Increases in exports of goods and services, the level of which is determined exogenously, will lead to higher per capita income, higher savings and will encourage an increase in the level of investment. The higher savings and

investment ratios will in turn expand the "non-basic" sector through the regional multiplier effect.

Economic base theory thus is comprised of (a) the export activities which represent the "economic base" or "basic activities" and (b) the economic complement of the base--namely, the service industries--the "non-basic activities."

Neo-Classical Growth Models

The application of neo-classical growth models is an adaptation of aggregate growth theory to regional economics. The widely-used application of neo-classical growth models may be linked to three advantages it has over economic base theory.

First, the model contains a theory of factor mobility as well as a theory of growth. Second, it is very easy to adapt aggregate growth theory to regional economics. Finally, the application of neo-classical models yields precise results due to the assumptions made. These assumptions are: full employment, a homogeneous commodity, zero transport costs, identical production functions in all regions, and a fixed supply of labour. Provided these assumptions are met, labour movement will be from low-wage regions to high-wage regions and capital will flow in the opposite direction.[2] There are, however, problems associated with the application of neo-classical models to regional economics. As Richardson (1973) points out: "... for instance the full employment assumption

is not usually relevant to regional economics, since to an extent regional problems emerge because of substantial inter-regional differences in the degree of resource (and particularly labour) utilization."[3] Similarly, perfect competition cannot be assumed in regional economies since space itself and the existence of transport costs limit competition.

Cumulative Causation Models

This theory is usually attributed to Myrdal (1957). The basic notion of this theory is that market forces tend to increase, rather than decrease, the inequalities between regions. Regardless of the initial location advantage in terms of natural resources or transport facilities, the interplay of these market forces leads to a clustering of economic activities. This build-up becomes self-sustaining because of increasing internal and external economies at the centre of agglomeration.[4] The rate of growth of the lagging region is finally influenced by the rate of growth in the developed region. This induced effect may be either in the form of a favourable 'spread' effect or in the form of an unfavourable 'backwash' effect. While the spread effect provides markets for the products of the lagging region, the backwash effect, unfortuantely, offsets any gains from trade. Disequilibrating flows of labour, capital, consumer goods and services from the under-developed region distort the pattern of production and industrialization of the lesser developed region.

A similar treatment is found in Hirschman's (1958) 'trickling-down' and 'polarization' effects. The favourable trickling-down effects occur when the developed region buys goods from the lagging region and also invests in the poor region.

Kaldor (1970) provides a different interpretation of cumulative causation theories. He argues that the principle of cumulative causation is nothing more than the existence of increasing returns to scale. Increasing returns favour the rich regions and inhibit development in the less developed area. The scale effects enable the rich region to gain a virtual monopoly of industrial production. Relative efficiency wages determine whether the region's share in the overall market is rising or falling. The lower the efficiency wages the higher the growth rate in output.[5]

The combination of these three theories and the many analytical tools derived from them provide some insight as to the economic growth of a region and also to the location of economic activity. The export base theory--i.e., the demand side of regional growth--focusses on location in resource/export areas. The neo-classical theory--the supply side--pays attention to the optimal location where profits (with respect to labour and capital employed) will be maximized. Trade between regions will further the regional growth pattern, specialization and economies of scale in production will be attained because of exchange.

The development (or growth) of a region involves not only the insights provided by growth theory, but is also influenced by factors which are incorporated in location theory, such as transport costs and consumer as well as producer behaviour.

Location Theory

The theory of economic activities within a spatial arrangement has undergone many changes since its early inception. The classical theory of location of industry, which originated in Germany during the nineteenth century, assumes economic rationality, complete information and, furthermore, a static market situation.[6] Later work, in particular by Cristaller (1933), Losch (1939) in Germany and Hoover (1948), Isard (1949, 1956), and Greenhut (1956) in the United States, refined the classical theory by including consideration of market areas and central places. Losch formulated a network of markets around producers located in the centre. The size of these market areas is a function of demand and the cost of production as well as transportation costs. Greenhut attempted to determine simultaneously supply, demand and location by integrating the leading theories of location: 'least-cost' theory (as formulated by Weber in 1909 [1929]) and 'market-area' theory. Earlier, Hoover and Isard had introduced the concept of substitutability into regional analysis. Hoover proposed a substitution of materials, whereas Isard investi-

gated the possibility of substitution in the transport sector. The consideration of transport inputs permits the explanation of the increase in productivity resulting from:

(1) Exploiting the unequal distribution of natural resources, and
(2) Postponing and mitigating diseconomies from excessive agglomeration and forces of diminishing returns.[7]

It should be clear by now that the classification of theories into regional growth theory or location theory is of limited importance. For a general theory of regional development one must combine the theory of location (location decisions of the individual firm and household)[8] and the inter-regional macro-economic growth theory. The resulting general theory ought to be a dynamic theory rather than a static one so it can explain the impact of changes in production, transport, income, etc., on locational patterns of consumption and production. Such a theory is, unfortunately, difficult to formulate due to the nature of the assumptions postulated by the two leading theories. The neglect of growth theory to consider the spatial arrangement, or, for that matter, the inability of location theory to deal with patterns of regional growth has directed attention to the study of urban systems. Within a spatial array of activities, it is thought that the theory of urban systems will provide a satisfactory explanation of location and growth theory combined.[9]

Regional Development: Purpose and Policy

The uneven spatial distribution of economic activity, brought about by such forces of the market economy as higher returns to factor inputs at different locations, has been of primary concern to decision makers of almost every country. For instance, in Canada a great deal of attention is focussed upon the need to improve regional balance.[10] Regional programs and policies have been initiated to lessen the impact of disparities and to encourage the development of viable regional activities. If we address ourselves to the question of regional development we are faced with many issues. Among these, we are primarily interested in the question: why has a particular region succeeded or failed to attract a viable economic activity? Furthermore, we encounter the various arguments for or against government policies to influence the location of economic activity.[11] At the present time, the general consensus is one of favouring government directives and we can employ Bird's (1966) definition of regional development to capture this sentiment:

> Regional development concerns the attainment of increased real per capita income by residents of a region, including increased accessibility to public services and facilities, with the help of regional economic and social policies and programmes. ... Among the choices of expected major significance are those with respect to:
> - ways of increasing productivity potential through improved health and education ... social assimilation;
> - for given level of consumer income, ways of spending this income on such goods and services as health, food, education, housing, clothing and leisure activities.[12]

Early attempts to attain these objectives focussed on labour mobility. Out-migration of the unemployed was believed to bring the local labour supply into equilibrium with local employment opportunities. This policy has, however, come under heavy criticism.[13] It has been noted that out-migration usually results in a 'brain drain' associated with the loss of young productive workers. Even though the labour market may reach an equilibrium position, a further decline in community welfare is inevitable. Unemployed workers, leaving the region, take with them the unemployment benefits, reducing regional revenues even further.[14] In addition, the per capita cost of maintaining the existing local infrastructure increases. Out-migration also often offsets the power base of elected officials, creating a situation which may be against the political interest of this group. The opponents of the mobility policy also argue that regional balance can be attained best by injecting sufficient capital into a lagging region. Capital subsidies or grants will attract industries, create employment and consequently an optimal social welfare position will be reached.[15]

Assistance to depressed areas in Canada has undergone considerable change during the past decade. Until the establishment of the Department of Regional Economic Expansion (DREE) in 1969, which combined most policies and programs under one department, the existence of the previous development plans can best be explained as "... one of

programmes without policies."[16] Present-day regional development programs, as administered by DREE, in addition to various provincial government development, have, however, well defined goals and objectives. To reduce regional disparaties the DREE policy goals have been set to (1) enhance industrial development, (2) provide infrastructure assistance in selected areas, (3) encourage social adjustments and rural development, and (4) facilitate the access of people to new employment opportunities as well as improve their income.[17]

Recently, numerous efforts have been undertaken to investigate the effectiveness of the assistance programs (Springate, 1972; Woodward, 1974; DREE, 1973; Usher, 1975), with the tenable conclusion that the goals set have not been met. Springate mentions the possibility of 'free riders'; firms locating in specific regions regardless of financial assistance offered by DREE to these firms. It appears that this is a universal problem, since government officials have no insight into the planning decisions of individual firms.[18]

A more critical and useful analysis is presented by Woodward, and also by Usher. Woodward observed the ratio of subsidy to total employment created and concludes his study with the observation that the DREE programs, as established, bias firms' production technology decisions towards capital-intensive techniques despite DREE's mandate to develop employment opportunities.

Usher, on the other hand, provides a more general critique.[19] The effects of the Regional Development Incentives Act of 1969 upon investment, employment, innovation, the distribution of income, and equity in dealing between government and business in the less developed areas of Canada are investigated. In Usher's opinion, there exists reasonable doubt that the objectives, as outlined in the Act, have not been achieved: "In view of all the uncertainties inherent in the subsidization of firms--the absence of solid evidence that investment in the designated regions is really increased, the even greater doubt about employment...."[20]

Conclusion

The objectives of regional development and the tools designed to entice economic activity to locate in lagging regions must take account of the foundations of regional growth and the factors influencing the location of these activities. The limited success of regional development incentives, as shown by the prevalence of regional disparities, lead one to suspect that the development potentials of a region have not been identified properly and consequently have been treated as separate features.

The development potential of an area can be described as either the maximum possible amount of goods and services available for production, or the potential income value of these resources. The availability of these resources, then,

can be evaluated by four different criteria:

(1) from the quantitative and qualitative point of view: the available quantities and qualities of the factors of production:
   (a) land (area, topography, climate ...);
   (b) the resident population according to sex and age as the basis fo the skilled and unskilled labour pool;
   (c) the available amounts and qualities of private capital and public infrastructure capital.

(2) from a structural point of view: the relation of these resources to one another--i.e., employment structure, economic structure ...;

(3) from a spatial point of view: the economic-geographical location of a region; agglomeration of population and economic activity ...;

(4) from an overall organizational point of discussion: the framework of government organization (the co-ordination of federal, provincial and regional governments).[21]

Given this set of criteria, it should be possible to establish a realistic set of direct economic development goals based upon labour, land, infrastructure, locational, agglomeration and structural potentials. The pattern of change for new products, innovations and new markets, however, may reduce the importance of the traditional factors of regional growth. It has been noted that 'hidden potentials'

such as climate, sunshine, external benefits from places of higher learning may represent one of the more important, but so far least recognized, sources of regional prosperity.[22] The remaining chapters of this thesis will attempt to identify these hidden potentials to study the applicability of these non-economic factors within the context of regional development programs.

Footnotes

[1]Presently there are two important theories of comparative advantage as a basis for inter-regional trade. The first is the classical doctrine of comparative costs, which stems from Mill and Ricardo. The second is the so-called Heckscher-Ohlin theorem, which stipulates that comparative advantage depends upon: (a) different productive factor endowments among regions (countries), and (b) different factor intensities of production processes for different goods. See for instance: Caves (1960); Chenery (1961); Ohlin (1933); Johnson (1957); North (1955); Tiebout (1956).

[2]See for example: Borts (1960); Borts and Stein (1964).

[3]Richardson (1973), p. 22.

[4]Ibid., pp. 29-30.

[5]Kaldor (1970), pp. 337-47. 'Efficiency wage' is determined by the change in maoney wage relative to the change in productivity.

[6]The names of J.H. von Thunen, A. Weber, C.F. Friedrich, and T. Parlander are frequently mentioned as the originators of location theory.

A good review of location theory can be obtained from Alonso (1975); Lösch (1938) reprinted in Friedman and Alonso, eds. (1975); and Greenhut (1952).

[7]Isard (1949).

[8]The location decision-making process of firms and/or individuals (families, groups) can, *ceterus paribus*, be linked to certain maximization / minimization criteria within a given preference function. The location decision may further be influenced by "external locational factors," such as transport and labour costs, and also by "internal location factors" such as spatial preference patterns, organization or investment structures. In this context, individuals, as well as firms, have a more or less distinct notion about their future in terms of status, income, profits, size of operation, etc. (For a more detailed discussion, see Krumme [1970].)

[9]See for instance: Richardson (1973); and von Boventer (1974). The notion of growth poles can also be detected in the writings of Christaller (1933); Lösch (1938) reprinted in

Friedman and Alonso, eds. (1975); Hirschman and Myrdal (1958). To ensure dynamic conditions, Perroux's (1955) system requires one firm or industry within the pole to adopt some leadership or dominance. For a further discussion of growth pole theory see: Hansen (1970, 1975); Hermansen (1970); Kongstad (1974); Monsted (1974), and Darwent (1969) reprinted in Friedman and Alonso (1975).

[10]See for instance the *Fifth Annual Review* by the Economic Council of Canada (1968).

[11]For a discussion of this topic and the opposing view of the planned adjustment, see Cameron (1968).

[12]Bird (1966) in a letter to Fox; reprinted in Fox (1966), Chapter II, pp. 2-3.

[13]For instance, the 1954 Newfoundland "Centralization" program and the 1965 federal-provincial "Resettlement" program attempted to achieve two objectives. First, assist people from the outports to move to jobs elsewhere in Newfoundland. Second, move people to better services such as health, education, etc., to upgrade the qualifications of the unemployed fishermen. As Copes (1972) points out, the resettlement program was only partly successful. It succeeded only in its second task, but failed to attain the primary objective--provide jobs. The movement of people from the outports into the central cities of Newfoundland created bottlenecks, thus as Copes reasons, the program should have been extended to assist people to move to the mainland of Canada where more employment opportunities may have existed.

[14]Vanderkamp (1970).

[15]See for instance: Moes (1962); Morss (1966); Cumberland (1971); Robock (1966). The objective is not only to entice capital (thus industries) to move to target areas, but also to entice local capital to be invested locally rather than in areas where the rates of return to capital are higher (Hansen, 1974, p. 24). For a discussion of required population shifts to reduce disparities, see Munro (1974).

[16]Graham (1965), p. 10. A review of the federal-provinical assistance programs can be found in: Brewis (1969); Brewis and Paquet (1968); Munro (1977).

[17]Munro (1978).

[18]See for instance: EFTA (1968).

[19]Usher (1975), p. 575.

[20]Langkau-Herman and Tank (1973), pp. 12-23.

[21]Zimmermann (1970), p. 232.

[22]Brewis and Paquet (1968); Klaassen (1965); Ullman (1954); Allison (1965).

CHAPTER III

THE CONCEPT OF AMENITIES AND THEIR RELATIVE IMPORTANCE FOR REGIONAL DEVELOPMENT

The previous discussion introduced two important concepts of regional development. First, industry location is influenced by two principles--least cost and market area orientation and second, various government programs are designed to influence the location behaviour to reduce regional imbalances while at the same time providing for maximization behaviour for industries. In addition, the emergence of "footloose" industries and individuals, caused by innovations and improvements in technology, as well as higher education linked with professional specialization, may aid the welfare maximization criteria inherent in development plans. For many industrial sectors the traditional dependence on either sources of inputs or markets is now obsolete; instead, amenity orientation of location has evolved.[1] For instance, research industries such as electronics have low transport costs but need specialized scientists and technicians. In general, it is believed that this highly trained group of professionals is short in supply and thus can be choosy with respect to the location of work and residence.[2] Here the main objective of regional planning is to render the region in question as attractive as possible to the mobile

factors of production (labour, capital and entrepreneurship) compared to rival regions. A region which is not attractive to these factors will in most instances fail in its attempt to improve its economic welfare.[3]

This chapter will investigate the factors involved in the movement of firms and individuals to specific locations. Detailed attention will be given to the amenity factors and their influence on location decisions. Finally, a theoretical amenity model of location will be introduced.

Mobility of the Factors of Production

Even though a basic notion of resource mobility for capital and labour has been presented already in Chapter II (Growth Theories), an extension of this subject is required at this point.

Mobility of capital resources. There appears to be a general consensus that the movement of capital resources is purely economic in character. Capital, being almost perfectly mobile, with near zero transport costs and perfect information about capital markets, will in most instances seek the location with the highest rate of return.

Mobility of labour resources. The determinants of individual migration are, unfortunately, not as clearly defined as is the case with capital movements. Traditional migration studies focussed upon the employment opportunity criteria. Migration was from low wage regions to high wage regions and

also to better employment opportunities. An extension of this line of thinking is seen in basic spatial gravity models. In this model, a distance variable is included to serve as an indicator of 'barrier' to migration.[4] The shortcoming of these models is seen in the premise that the existence of employment opportunities is the sole determinant of migration flows.

A modification of the traditional migration models was brought about with the introduction of capital theory to migration studies. The resulting 'human capital theory' of migration attempts to account for many non-economic factors ignored in the traditional migration model.[5] Moves are undertaken to increase pecuniary as well as non-pecuniary (psychic) income which in turn increases individual utility. The decision to move is finalized after a careful evaluation of factors such as personal taste, past and expected employment opportunities, past migration experience, the monetary costs of moving, the loss of friends and family, etc. The decision maker, under conditions of uncertainty, chooses moves which will maximize his lifetime expected value on income. We can thus postulate an objective function (Z) for a move from region i to region j:

$$\text{Max } Z_{ij} = PV_j - PV_i - T_{ij} \qquad (1)$$

where: PV_j = the expected discounted income obtained in destination j;

PV_i = the expected discounted income at origin i; and

T_{ij} = a measure of all discounted moving costs incurred in the move.

Another refinement of the basic migration model is the 'capture-cross-section component' model. This model postulates that the individual attraction of a given region depends not only upon the intrinsic attributes of a destination region j as perceived from region i, but also the competing factors from all other possible destinations k. The probability of a migrant from region i selecting a destination j from a competing set of areas k can be expressed as follows:[6]

$$U_{ij} = \frac{q_j P_j f_{(c_{ij})}}{\sum_k q_k P_k f_{(c_{ik})}} \qquad (2)$$

where: U_{ij} = the differential attraction of origin i and destination j;

q_j = some undetermined attractiveness of city j;

P_j = population of destination j;

$f_{(c_{ij})}$ = a weight measuring the intrinsic attraction (c) in relation to its size and distance from the origin i;

k = attractiveness of all competing regions k.

Although all migration models contain the three main controlling components--distance, differential attractiveness of areas, and availability of information--the results obtained from migration analysis are not consistent. The

widespread use of these so-called 'deterministic' models is primarily based on ease of application and uniform generalization of migration determinants. The difference in explanatory power of the various models employed suggests that the previously neglected non-economic determinants--amenities--may in actual life exert a considerable influence.

The Review of the Amenity Literature

Increased dissatisfaction with traditional equilibrium models has resulted in a search for non-economic factors to explain the location decisions of individuals. These 'other' location determinants are often categorized as amenity factors. The recognition of the existence of these factors can be separated into three groups: (1) qualitative statements; (2) survey articles, and (3) analytical studies. The following discussion will briefly review these contributions and will also point out the different interpretations and definitions of amenities.

An early attempt to identify the components of amenities was undertaken by Ullman (1954). His article "Amenities as a Factor in Regional Growth" is still regarded as the leading reference in discussions about amenities. Ullman interprets amenities very broadly: climate and amenities are synonymous. The main argument of Ullman's paper stipulates that an increasingly "footloose labour" force and industrial sector would respond to the lure of a mild climate. The favourable

climate conditions in Florida, California and Arizona are held responsible for the rapid population growth in these three states: "the new frontier of America is thus a frontier of comfort, in contrast with the original frontier of hardship."[7]

A more detailed interpretation of amenities is presented by Stevens and Brackett (1967), who discuss natural and urbanization amenities. Natural amenities are characteristics such as climate, mountains and forests, water bodies ...; urbanization amenities include supply in the arts, shopping facilities, a variety of public services and a host of other benefits usually "associated with city life."[8] It is conceivable that these factors are stimuli which lead to feelings of comfort, pleasure or joy. The reaction of the human response system can then be observed by the willingness to pay a higher price for a particular amenity package such as waterfront property.[9]

Perloff and Wingo (1961) introduce the concept of the 'amenity-resource' effect. This effect exerts an influence upon the job-seeking migrant as well as the non-job migrant--the retired individual. Both groups will seek out more intangible services such as climate and coastal areas: "The natural resources, then, need not enter directly in the process of production but only influence directly the location of markets as well as production."[10]

The actual observed influence of amenity factors upon the development pattern of a spatial unit is presented by Perloff and Dodds (1963). The authors draw attention to the development pattern of Florida, which to some extent is contrary to the traditional theories presented in Chapter II: "... where manufacturing and certain agricultural opportunities have followed the establishment of a recreation-oriented, permanent service sector base."[11]

The relevance of amenities for regional planning is expounded by Klaassen (1968). He contends that "... a certain level of amentities or social infrastructure is necessary before an area can attract the industries likely to be sound for it."[12] In addition, the level of amenities supplied is as important as capital and labour in the quest for economic development: "... the area in question is not only evaluated in terms of purely economic factors, but also from its endowment of such general offerings as housing, education, shopping, and entertainment."[13]

The statements made about the influence of amenities are in part supported by industry surveys. Attempts to isolate the factors involved in area/site selection show amenity factors to be important in the final location decisions. Wallace and Ruttan (1961) report:

> ... first, the relative importance of ranking amenities rose as the number of managerial personnel transferred from other locations rose, second, comments from company officials, ... [that] if the minimum level of community facilities was not met, there was a tendency to ... omit the community from further considerations, even though locational incentives have been offered.[14]

A similar influence of management upon a firm's location decision has been observed by Cameron and Reid (1966). The major factors involved in the final selection of non-Scottish plant sites was found to be in the opposition of the management:

> The strongest views against locating on social grounds were expressed by companies transferring their production facilities. ... The management concerned was not convinced that existing social and family ties could be maintained.[15]

While the presence of economic incentives such as income and employment may be of importance to an individual to move to certain areas, the level of amenities provided or available will in most instances determine the level of satisfaction with the new residence. Pinfield, Hoyt et al. (1974) investigated the causes of labour turnover at an industrial complex in northern British Columbia--a community with high wages and jobs--and discovered that among the "quits" and "non-quits" general dissatisfaction was expressed with: (1) opportunity for entertainment and recreation; (2) climate; (3) isolation; (4) public transportation; and (5) shopping facilities. These factors were especially important among the respondents who quit after the first six to nine months of employment.[16]

A sociological analysis of single-industry communities in Canada, undertaken by Lucas (1971), states that the residents of such communities ranked services and facilities that should be available in a typical resource community as: (1) entertainment and recreation; (2) incomes in relation to

the cost of living; (3) housing; and (4) good access to cities in the south.[17]

The respondents also felt that:

> ... the city abounds with facilities and opportunities that are never utilized ... the availability, whether used or not, affects social definitions. ... The absent services seem to make the heart grow fonder.[18]

Additional insights into the role of amenities as locational determinants are provided by a few analytical studies which are based upon a modified human capital migration model, to allow for the existence of amenity factors.[19] Von Boventer (1969) included environmental variables in a regression equation to determine the migration decision into West German cities. For the period 1956-1961, net movement was away from mild climate areas, probably for economic reasons. The trend was reversed in the 1961-1966 period when internal migration to cities was significantly related to mild climate and to the availability of outdoor recreation.[20]

Cebula (1974) analyzed the net migration of the elderly for 48 states in the U.S.A. His model, which explains nearly 60 per cent of the variation in the rate of net migration, isolates climate and recreation variables as important determinants. Both of these variables are statistically significant at the 1 per cent level of confidence, an interesting result when compared to the statistically insignificant economic variables.[21] Although the purely economic factors may be of only small importance to the elderly, it is never-

theless of interest to note the pattern as depicted by Ullman and also by Perloff and Wingo.

A different mode of analysis was undertaken by Liu (1975). Liu constructed a set of 'quality of life indicators' and performed cross-section analysis to measure the rate of migration for 50 states and the District of Columbia. His results conclude that the indicators selected provide "an extremely high explanatory power for non-white migration": ($\bar{R}^2$ = .72). The living-condition indicators, similar to the concept of amenities, appear to be important for both the non-white and white migrants.[22] The addition of economic variables--income and employment--into the model did not alter the results.

Gibson (1969) reports two different approaches to test the amenity hypothesis. The results of the first, a lead-lag analysis, suggest that neither Tucson nor Phoenix is an amenity city.[23] However, the second approach, which reports on four surveys undertaken in Tucson and Phoenix, contradicts the results of the lead-lag analysis. The overall conclusion of the surveys indicates that climate amenities influenced the post-war growth of Arizona. The largest group of in-migrants is comprised of health-seekers (30 per cent of respondents), whereas the retired people make up the second largest group (20 per cent of household heads).[24] Also of some interest is a recent study by Maki (1977), who attempted to link out-migration rates with infrastructure supplied, in particular

television reception. His results indicate a strong correlation between the quality and quantity of television reception and stayer rates.[25]

A Theoretical Regional Amenity Model

Apart from the qualitative statements made about the relevance of amenities, only one serious attempt has been undertaken to develop a comprehensive mode of analysis to isolate the effects of amenities. Klaassen (1968) proposes a theoretical model which observes amenity-demand effects as well as amenity-supply effects, the key characteristic of amenities is seen through these main effects.

First, the greater the distance between location of amenities and consumers, the lower the effective demand for amenities. Thus, the presence of amenities close to the consumer reduces the distance between supply and the consumer; the reduction in transport costs can be interpreted as a reduction in the price of amenities, an effect which will in turn stimulate additional demand for amenities.

Second, amenities such as better housing, education or medical care, are believed to benefit the overall welfare of the population. In the long run the presence of such amenities will improve productivity and income.

Third, and more applicable to this thesis, the better the amenities the more attractive is the area. The influx of new activities will generate an increase in income, which in

turn can be interpreted as the amenity-supply effect.[26]

Thus, in this model, the impact of amenities can best be measured by the increase in per capita income during a given time period. To isolate this impact Klaassen postulates the following model:[27]

$$\frac{dY}{dt} = B_0 A_D^{B_1} A_S^{B_2} \tag{3}$$

$$A_D = \alpha_0 Y^{\alpha_1} A_S^{\alpha_2} \tag{4}$$

$$Y = \varepsilon(t) A_S \frac{\alpha_2 B_1 + B_2}{1-\alpha_1 B_1} \tag{5}$$

where: Y = income;

dY/dt = increase in per capita income;

A_D = effective per capita demand for amenities which is proportional to per capita private expenditure on amenities;

A_S = per capita supply of amenities;

B_1 ; B_2 = co-efficients measuring the size (elasticities) of the two effects;

B_0 = constant;

α_0 = constant;

α_1 = income elasticity of the demand for amenities;

α_2 = the degree to which increased supply stimulates demand.

Unfortunately, this model contains drawbacks which, by Klaassen's own admission, renders this approach inoperative--

at least at the present time. The applicability of the model is constrained by the two effects it is supposed to measure, namely the amenity demand effect and the amenity supply effect.

If we consider the amenity demand effect first, we are primarily interested in establishing a relationship which is proportional to private expenditure on amenities. As in the case with many so-called 'non-priced' goods and services, insufficient data impose a definite constraint on the model. There are some studies which have attempted to obtain measures or approximations of private expenditures for instance for outdoor recreation, however the results are not conclusive.[28]

The amenity supply effect, on the other hand, provides a recursive system. Equations (3) and (4) above stipulate that income depends on the supply of amenities: equation (5). Once the supply of amenities is increased, the direct effects are reflected on income, this again on the demand for amenities, this again on income, and so forth. The total impact of the amenity supply on income may thus be of considerable size due to both the direct and the indirect effect, exercised by the supply of amenities.

To overcome the difficulties of Klaassen's model, two alternative approaches come to mind. First, one could rank the city (or nuclei) with respect to the level of amenities present. The rank attached to a centre can be determined by either (1) the quantity of a particular amenity: i.e., one university, one theatre; or (2) the capacity of the particular

amenity: i.e., the number of faculty members, number of theatre seats, number of performances, etc.

The second approach would attempt to attach a weight to each amenity, usually in monetary terms such as per capita expenditures for different amenities supplied in a given community.

The proper use of amenities, however, as with any other good or service provided, rests more in the use made of them rather than in their capacity. While the quantity-capacity approach only allows us to make certain inferences about one variable, for instance consumption, the economist or policy maker needs to describe the relationship between variables--i.e., how consumption is related to income. To describe this relationship, econometric tools such as Regression Analysis and/or Factor Analysis are used frequently by researchers.

Conclusion

The preceding chapter has outlined some important facets of regional development theory which are of prime importance to this thesis.

First, it became apparent that the leading theory of, for instance, migration cannot fully explain the movement of people from one locale to another. In this respect, numerous efforts have been undertaken, and are still underway, to "complete" the theory of migration and/or location.

Second, because of the limited explanatory power of these theories, the concept of amenities has gained a consid-

erable acceptance as an influencing factor of location, supported by numerous surveys and studies. Amenities are, in general, broadly defined as natural and as urbanization amenities and carry the distinction that the presence of these locational qualities may positively influence the location decision-making process of firms and individuals. We have also noted that a 'threshold level' of amenities must be present in order to attract firms and/or individuals to an area.

Footnotes

[1]Alonso (1975), p. 57. Amenity-oriented location may be important for (1) the film industry; (2) aircraft design and outdoor assembly; (3) electronics and scientific manufacturing; (4) production of sporting and recreation equipment, etc. On the other hand, utilization of pleasant and agreeable natural amenities can lead to the establishment of tourism, recreation and/or retirement centres.

[2]Many firms appear to benefit from amenity-rich locations. To attract specialized manpower a firm will include the amenity benefits associated with the location in its promotional literature.

[3]George (1970) isolates the following factors responsible for the decline of manufacturing industries in Nova Scotia: (1) the inferior location of firms in Nova Scotia vis-a-vis location in southern Ontario; and (2) a poor supply of entrepreneurs in Nova Scotia.

[4]See for instance: Blanco (1963), and Lowry (1966). A survey of migration studies in the U.S.A. is presented in Greenwood (1975).

[5]See for instance: Sjaastad (1962); Becker (1964); Courchene (1970); Stone (1969); Vanderkamp (1970, 1973).

[6]Cordey-Hayes and Gleave (1974, pp. 101-103. This concept is familiar to Stouffer's (1960) intervening opportunity hypothesis theory: the number of persons who migrate a distance is directly proportional to the number of opportunities on the periphery and inversely related to the number of opportunities in the circle:

$$M_{ij} = a \frac{X_j}{X_{ij}}$$

where: M_{ij} = the number of migrants from origin i to destination j;
X_j = the number of opportunities at j;
X_{ij} = the number of intervening opportunities between i and j;
a = constant.

[7]Ullman (1954), p. 119.

[8]Stevens and Brackett (1967), p. 7.

[9]Robinson and Atkinsson (1969).

[10]Perloff and Wingo (1961), reprinted in Friedman and Alonso (1975), p. 314.

[11]Perloff and Dodds (1963), pp. 32-33.

[12]Klaassen (1968), pp. 9-10.

[13]Ibid.

[14]Wallace and Rattan (1961), p. 140.

[15]Cameron and Reid (1966), pp. 15-28. Of interest also are: Muller et al. (1968) reporting that over 60 per cent of the individuals surveyed moved for purely economic reasons; this still leaves approximately 40 per cent of the migration decisions unexplained. Greenhut (1959) noted the amenity influence as the third or fourth reason to relocate, after the economic factors such as markets, labour supply.

[16]Pinfield and Hoyt et al. (1974), pp. 13-17.

[17]Lucas (1971), p. 395.

[18]Ibid., pp. 404-405.

[19]See for instance: Rothenberg-Pack (1973) and Muth (1971).

[20]Von Boventer (1969), pp. 53-62.

[21]Cebula (1969), pp. 62-68.

[22]Liu (1975), p. 331.

[23]Gibson (1969), p. 196.

[24]Ibid., p. 198.

[25]Maki (1977).

[26]Klaassen (1968), pp. 14-17.

[27]Ibid., pp. 16-17.

[28]See for instance: Gordon (1976), for a discussion of the different methods employed to establish a measure of private expenditure on outdoor recreation. These are usually in the form of: willingness to pay; compensation required; trip cost expenditure, and cluster analysis.

CHAPTER IV

THE REGIONAL AMENITY MODEL: HYPOTHESIS AND METHODOLOGY

In the previous chapter, five major amenity groupings were isolated--(a) climate, (b) recreation, (c) urbanization, (d) health, and (e) distance (isolation). Also Klaassen's theoretical amenity model was presented. In the following discussion our familiarity with the role of amenities will be expanded first by formulating an operational regional amenity model and second by selecting regional amenity variables to be used in the amenity model.

The Amenity Model

Prior to developing a framework of analysis, three important assumptions have to be stated. Firstly, it is assumed that individual cities are more homogeneous with respect to socio-economic characteristics than are Census Divisions or larger economic areas. Secondly, it is assumed that a reasonable description of the amenity effect can be obtained by using cross-section analysis of different cities within the area of investigation. Finally, contrary to the existing literature on migration and Klaassen's model, it is assumed that a more tenable inference about the influence of amenities can be reached by observing the change in population rather than the more traditional factors such as changes

in income or employment opportunities.[1]

The regional amenity model can be thought of as having the following functional form:

$$P_i = f(A_i, C_i, D_i, R_i, S_i, H_i, T_i, Y_i) \quad (6)$$

where: P_i = the rate of change in population of city i;

A_i = population characteristics of city i;

C_i = the climate of city i;

D_i = the distance of city i to a larger population centre;

R_i = recreation opportunities in city i;

S_i = gross population density of city i;

H_i = quality of medical care in city i;

T_i = quality of retail services in city i;

Y_i = average income in city i.

To determine changes in the level of amenities present at a particular population centre, two inventories were conducted: (a) the initial supply (availability) of amenities (t = 0), and (b) the level of amenities present at the conclusion of the investigation (t = 1).

The regional amenity model postulated here establishes an initial framework of discussion. Linear multiple regression analysis will be applied in order to isolate the most influential amenity components of this model. The following sections will: (1) define the dependent and independent

variables, and (2) discuss the impact, and applicability, of each variable (or proxy) on the individual's location preference.

The Dependent Variables

If the supposition made about the amenity influence on location behaviour is correct, then the observed change in population size may provide us with sufficient information. Other indicators such as the often used income and employment differentials are unfortunately not independent of economic activities within an area and may thus describe a change which is strongly correlated to economic fluctuations. The presence of amenities, on the other hand, will contribute to population growth regardless of such oscillations. In addition, amenities will alter the composition of the population; shifts in cultural groups, occupational structures, age groups and income distribution may occur. The direct impact of amenities will be made visible by the influx of people, whereas the indirect effect may be in the form of income and employment expansion.[2]

While there may be a slight argument over whether or not the change in population represents the best possible dependent variable, concern over which specific measure to select is well-founded. Normally, the change can be described in two ways: the absolute change, and/or the percentage change.

Using an absolute change variable leads to certain difficulties in assessing the final regression results. Unless the

equation is properly specified, the results will be influenced by the size effect of the dependent variable. To overcome this definitional problem a population size variable has to be included at the right hand side of the equation. Furthermore, the magnitude of an absolute change variable may either result in an upward or downward bias in results, depending upon the mix of centres in the sample. This possible source of bias is not found in the percentage change variable due to the more realistic description of change in relation to the threshold population of a particular centre. To determine any difference between these two variables both are used in the analysis, with the respective results presented in Chapter V.

It was necessary to alter the population size of some cities from that reported by Statistics Canada. During the ten-year period of observation some municipalities annexed certain fringe areas. The inhabitants of these areas were not included in the 1961 city population. It can be assumed that the population of these areas, which were outside the municipal boundary in 1961, had equal access to the amenities present and thus exert an indirect influence upon the level of urbanization amenities supplied. Furthermore, the addition of annexed areas to the 1961 population base will correct for population changes which are not amenity related but which are the outcome of boundary change.

The Independent Variables

Prior to any econometric analysis a clear-cut approach has to be outlined with respect to the selection of variables. Where proxies have to be identified, two major requirements have to be met. First, the proxy must be identifiable with the intended variable. Second, the proxy must reasonably be part of an individual's utility function.[3] Some of the actual or proxy explanatory variables selected for the model were taken at two different times. The 1961 level of amenities indicates the threshold level of amenity supply within a city. A high level of supply will be an influential factor contributing to the change in population level. The second, the 1971 level of supply, is necessary to determine the change in the stock of amenities during the ten-year period. In absence of detailed data, a constant rate of change in supply is assumed. The expected relationships between the dependent and independent variables are outlined in Table 1.

The Amenity Variables

Population Characteristics

The evolution of association of human beings is based upon the traditional concepts of family, the community, and the higher stage of agglomeration--society. Each and every stage of development is accompanied by a gradual easing of traditional laws and regulations. Thus, the urban area and the resulting city life is attractive to many people because

TABLE 1: EXPECTED RELATIONSHIP BETWEEN THE DEPENDENT VARIABLES AND THE INDEPENDENT VARIABLES

Independent Variables	Dependent Variables	
	Change in Population 1961-71	Percentage Change in Population
A = Population Characteristics		
- Percentage change in population 1956-61 (%CHPOP56-61)		+
- Population 1961	+	+
- Number of females as percent of population in 1966 (FE % POP66)		+
C = Climate		
- Average temperature	+	+
- January temperature	+(-)	+(-)
- Average precipitation	-	-
- July temperature	+(-)	+(-)
- Snowfall	+	+
- Moderate temperature fluctuation (Jan. temp.-July temp)	+	+
D = Distance		
- Distance to city of population 30,000 or more	-	-
- Log distance to city of population 30,000 or more	-	-
R = Recreation Opportunities		
- Municipal per capita recreation expenditure (MUREC)	+	+
- Percentage change in municipal recreation expenditure	+	+
S = Gross Population Density		
- Log density (acres per population)	+	+
H = Quality of Medical Care		
- Doctors per population in 1961	+	+
- Percentage change in doctors per population	+	+

... continued ...

Table 1 continued

Independent Variables	Dependent Variables: Change in Population 1961-71	Dependent Variables: Percentage Change in Population
T = Quality of Retail Services		
- Per capita retail trade in 1961	+	+
- Percentage change in per capita retail trade	+	+
Y = Income		
- Average male income in 1961	+	+

NOTE: There are some variables for which it is difficult to predict the proper relationship (sign). The (+), (-) indicates that either a positive or a negative relationship may occur.

of the expected interchange of economic activities, of ideas and also freedom from traditional (not codified) laws and regulations. The sociologist looks upon a city as a natural environment, the development of which depends on three distinct factors. Firstly, the interdependence of man, based upon the same basic belief or condition, warrants that individuals with identical or similar affinity live in the same community. Secondly, localization is also economic in nature. People tend to locate their economic, social and cultural activities at specific places to realize their objectives. Finally, the friction of space and space allocation, usually explained with the 'bid-rent' gradient, tends to collect human beings in a central place.

The economist, on the other hand, allows only economic factors to explain the agglomeration of activities which take place in a so-called central place.[4] The growth of a city, and the resulting hierarchy of centres, depends upon its specialization in urban service functions. Generally, larger centres will offer a number of specialized goods which can be offered to a broader population base. The demand for these services is thus a function of the population potential: "... any population concentration exerts an influence that varies directly with size ... and also distance."[5]

The direct influence of the population concentration (the threshold size of population) is seen in the so-called "urban size ratchet effect." This effect stipulates that "... perhaps a critical size exists, short of which growth is not inevitable and even the very existence of the place is not assured, but beyond which absolute contraction is highly unlikely. ..."[6] Furthermore, the agglomeration pull of a city also provides the benefit of living close to centres of information exchange and to places where economic and social transactions are easier to complete.[7]

The identification of agglomeration amenities is quite complex compared to describing the purely economic components of agglomeration. The difficulty in properly assessing the amenity effect is partly caused by the interdependence of some of the amenity measures such as population and the access to health/medical facilities. In general, a reasonable

explanation of the role of urbanization amenities ought to be found in the size of population and also in the change of the population level.

In this thesis there are three population variables which are believed to isolate the amenity pull. These are the percentage change in population from 1956-61 (%CHPOP56-61), the population of 1961 (POP1961), and the number of females age 20 to 45 during 1966 expressed as a percentage of 1966 population (FE%POP66). There are two reasons for including the population size variables. The first is technical in nature, i.e., the proper specification of the model, and the second is related to the purpose of this thesis.

The specification problem arises with the selection of the appropriate measure of population growth and the consequent specification of the functional relationship with the dependent variable. In a recent article, Young (1975) investigated the proper relationship in migration studies and concludes with the suggestion of a gravity-type normalization model:

> ... the difficulty with any procedure which does not correctly allow for the population size arises from the fact that the economic characteristics ... may be correlated with their population. ... [Furthermore,] if a migration flow that has not been purged of the effects of population level is used as a dependent variable in a regression equation in which population is not an explanatory variable, the co-efficients of the other explanatory variables will be biased by picking up part of the effect actually due to population size.[8]

In a subsequent article, Vanderkamp (1976) agrees with the inclusion of population size variables as explanatory

variables on grounds that, when population is included along with other explanatory variables, it has been successful in the sense of being statistically significant.[9]

Thus the inclusion of the population size variables, on the right hand side of the equation, ought to eliminate the bias outlined by Young.

%CHP056-61: denotes the percentage change in population during the 1956 to 1961 period. Apart from the minor role assigned to it as a normalization agent for the estimating equation, the major purpose of this variable is seen in the possible lag effect exerted upon the level of urbanization amenities provided from 1961 on. It is assumed that the provision of many amenity services is related to the population prior to the start of the analysis period.

POP1961: the population of centre i as reported by Census Canada (1961), adjusted for annexed fringe areas. This variable indicates the importance of the initial concentration of people, as well as denoting among other things the existing state of infrastructure, social interactions and a possible pool of labour.[10] Some migration studies have noted the importance of population size. Areas with a defined level of threshold have been observed to grow faster than cities which did not possess the necessary population size.[11]

FE%POP66: expresses the number of females age 20 to 45 as a percentage of total population during 1966. This variable is purely technical; the proportion of females age 20

to 45 ought to explain most of the natural increase in population.

Climate Amenities

Climate is probably one of the most important determinants of population change. The rapid growth of Florida, Arizona and California--three of the fastest growing states in the U.S.A.--has been linked to the favourable climate conditions present in these states.[12] In general, harsh and long winters are thought to exert a negative influence on growth. The industrial sector is faced with higher construction costs; snow and cold weather conditions also inhibit outdoor production, raise transportation costs, and may increase worker absenteeism. The private sector is faced with similar problems, higher building costs, added insulation and a limited period of comfortable outdoor recreation opportunities. More moderate climatic conditions, on the other hand, appear to be attractive to a number of economic activities.

In general, it is believed that people dislike climatic conditions which will cause a feeling of discomfort or which are very extreme. Equally as important, business executives may object to living in places with an unfavourable climate, not only for personal reasons but for family considerations. This reluctance to move to areas which have a perceived unfavourable climate will in turn influence the location

of footloose industries.

The daily exposure to weather reports by the news media, listing among other things the temperature or level of precipitation at different places, imprints either a positive or negative mental preference map for a specific area.[13] Usually, such climatic conditions as the number of frost-free days, amount of precipitation, hours of sunshine, average temperature, or a combination of these are used to identify possible individual climate preferences. The climate variable we need is one which will present a clear indication that climate amenities do indeed attract or repulse people. Since there exists no single indicator to depict all possible combinations, a total of six variables/proxies have been selected. Four of these variables are temperature-related, while the other two variables measure precipitation.

AVERTEMP: denotes the average yearly temperature in city i. It is hypothesized that a more temperate climate will exert a positive pull compared to either a harsh or widely fluctuating climate.

JANTEMP: the average temperature during the month of January. The interpretation of this variable is unfortunately not as simple as one would prefer it to be. The conventional approach, to identify the effects of January temperature on migration, is based upon the assumption that individuals prefer locations with a milder winter temperature, *ceterus paribus*. There are, however, reasons to believe that

the expected positive relationship may not behave in the hypothesized manner in British Columbia. The close proximity of some centres to the ocean, coupled with the mountain ranges, may cause excessive precipitation in these areas during the month of January. This relationship is strengthened by an observation of January temperature and average precipitation of these particular centres. The temperature for these centres is above the average for all centres, coupled with above average precipitation accumulation. The combination of these two climatic conditions will result in a feeling of discomfort, hence JANTEMP could have a negative relationship with the dependent variable.[14]

For this reason we are not in a position to explicitly specify either a positive or negative sign of the JANTEMP variable with the dependent variable.

JULTEMP: the average temperature during the month of July. If extremely cold places are disliked, so are extremely hot centres in the province. While cold places may cost more to live in, so may an extremely hot centre. The acquisition of air conditioning units may be necessary. There is, however, a second argument which can be brought forward. The present trend in tourism indicates that hot places such as Greece, Spain, and Mexico receive a large proportion of their visitors from cooler parts of the northern hemisphere. Individuals are thus in search of a hot climate, or at least a warm and sunny one, and may eventually take up residence in

these areas.[15]

As was the case with the JANTEMP variable, we cannot specify the direction of the relationship between JULTEMP and the dependent variable.

JAN-JUL TEMP: This variable is the difference between JANTEMP and JULTEMP. It indicates the amount of temperature fluctuation between the two months. The hypothesis is that places which do not experience a wide fluctuation in the range of temperature extremes will be attractive to migrants; a positive co-efficient is expected.

AVERPRECIP: denotes the average amount of precipitation measured in inches. It is assumed that individuals presumably prefer places without excessive precipitation. A high accumulation of rain and/or snow is usually associated with discomfort, thus a negative relationship is hypothesized with the dependent variable.

SNOWFALL: the average snowfall in inches. The main purpose of this variable is to depict the winter recreation availability such as skiing (Nordic as well as Alpine) and snowmobiling. The ever-increasing participation rates for these sports (see Appendix A) seem to indicate that individuals prefer areas with above average snowfall, or recreation areas nearby without the need to travel long distances.[16]

Distance: the Isolation Factor

If one speaks of distance, one usually refers to the vector between two or more points in space. If the points

in the spatial dimension are also defined as cities, one can envisage strong interdependence between the growth of these points and distance. The farther apart the cities are from each other, the slower or weaker the channel of communication or exchange between them. This relationship has been tested by numerous studies and is supported by an extensive literature.

The consensus in the literature is that a rational person will always prefer a more accessible location to a less accessible one. He will attempt to reduce the distance between his residence and the place of shopping, recreation and employment. Accessibility to larger urban areas, expressed in commuting distance, increases the availability of urbanization amenities, the amount consumed or provided decreases after a given distance gradient has been reached. For instance, Fox (1965) proposes a 'functional economic area' which is a distance of 50 miles in radius or roughly one hour of driving time.[17]

The effect of distance upon the growth of specific areas is not only micro-economic in extent but it has also macro-economic consequences. Distance variables are now included in regional macro-economic models to explain or forecast regional economic growth. The exchange between two regions, either in the form of imports, exports, investments or labour supply, is often a function of distance between the two areas. It has been found that larger areas will have a smaller

propensity to import from another area the farther apart the two areas because a degree of specialization has been obtained in the larger region.[18] This in turn has contributed to regional disparities in the form of lack of investment incentives, higher unemployment, etc.

We are looking for the distance between the centres selected and cities which possess the required 'metropolitan' size. The identification of the reference points is carried out within the framework of 'growth-pole' theory; thus, cities which are believed to be able to transmit economic growth to the hinterland are selected as reference points. The exact urban size of such areas is unfortunately ill-defined in the literature, ranging from a population of 50,000 to a population of 200,000.[19] If we adopt the lower minimum size--50,000--only four such centres would exist under this requirement during the period of observation: Vancouver and Victoria in British Columbia and Edmonton and Calgary in Alberta. There are, however, other cities which are thought to meet the criteria set forth for a development pole (growth pole) thus a re-definition of minimum size is in order. After numerous tests with population sizes, arbitrarily selected as 10,000; 15,000; 20,000 and 30,000 inhabitants, centres with 30,000 people or more were selected as reference points. The decision to select these centres can be justified in two ways. Firstly, the variable performs better in a statistical sense. Secondly, centres with a

smaller population may be more homogeneous with respect to activities or services offered, thus one may not be able to detect any differences in population pull. The larger cities will in most instances provide institutions of higher learning, a variety of shopping, social and cultural facilities and also provide specialized medical facilities. The propensity to consume these non-basic goods and services declines as distance between the place of provision and the place of residence increases. For this reason we expect all distance variables tested to depict a negative relationship with the dependent variable.

DISTCIT30+: the distance in road miles between centre i and the nearest city with 30,000 or more inhabitants.

LNDIST: the second distance variable tested; the natural log function of the above variable.

Contrary to the straight linear distance function, it is assumed that the actual effect of distance on population change can be more accurately expressed with the aid of a log-linear distance function. The transformation of the distance variable into a log-linear distance function will convert a non-linear function into a linear relationship. At the same time, the log function isolates the difference between equal ratios and equal differences, thus providing a better 'goodness of fit'. Most important, it is believed that equal ratios rather than equal differences, of commuting distance, are perceived as equal. In other words, a straight

linear distance function suggests that a trip spanning the distance of 200 miles will cost twice as much as a trip for only 100 miles. However, it can be argued that the traveller perceives the travel expenditure for the second 100 miles as being less than twice the amount expended for the first 100 miles.[20]

Recreation Opportunities

Rising incomes, in combination with a considerable increase in leisure time, both in hours per week and days per year, have caused an enormous increase in the demand for recreation facilities. In the case of the weekend participant the demand for recreation opportunities is directed to the immediate neighbourhood of the home, although the availability of the family car has extended the radius of travel distance.

The increase in demand has been accompanied by an increase in research, particularly in outdoor recreation. Studies investigating the various aspects of recreation such as demand for and participation in selected activities, usually link the attractiveness of a park or water recreation area, measured by visits to these areas, to size, number of facilities or special characteristics or a particular site.[21] Even though these studies are reasonable in approach to determine the attractiveness of a specific recreation area (parks, lakes, etc.) they cannot be incorporated into this study. Visits to a particular area are a function of distance and attractiveness

of the site in relation to all other possible recreational opportunities (areas) and are usually of short duration. 'Locational attractiveness', on the other hand, does require a degree of permanency; individuals will locate in areas which exhibit great recreational opportunities.

Any attempt to isolate the locational influences exerted by recreational activities must necessarily differentiate between the natural leisure activities such as hunting, fishing, hiking, etc., and the urbanization leisure facilities such as parks, playing fields, swimming pools, arenas, etc. There are distinct social differences among the participants. Outdoor recreation caters more to the individual who attempts to find solace and leisure away from the crowds whereas the consumption of urban recreation facilities is confined to the less mobile or more team-sport oriented participant.

In general, recreation facilities, or the availability thereof, are believed to influence the individual preference location in two distinct ways. Firstly, coupled with the ever-increasing degree of urbanization, and with its attendant growth in leisure time and disposable income, areas with abundant recreational opportunities attract the urban dweller as a hunter, fisherman, tourist, and traveller for the day, overnight, and for longer vacations. Secondly, the consequent growth in recreation facilities, which collect additional tourist dollars, provides employment opportunities for the local population.[22] The overall locational influence may be

best represented by the in-migration of past tourists and travellers.

The final selection of variables and/or proxies, which will indicate the locational pull, is complicated by (1) the nearly unlimited availability of outdoor recreation opportunities in British Columbia as can be observed by the varying participation rates (see Appendix B), and (2) the absence of perfect information indicating the personal preference function for recreation participation. This second problem is accentuated in the case of urban recreation facilities.[23] Contrary to natural leisure opportunities, the provision of urban facilities requires a substantial financial commitment on the part of the population and the local level of government. In many cases, high capital costs of erecting recreational facilities have prevented their construction. Also, high population growth rates have swamped existing facilities and low tax bases did not enable all civic governments to raise the capital necessary.[24] It may thus be plausible to identify the locational pull by concentrating on municipal expenditures on leisure activities. Reliance on this factor alone to explain the growth of selected centres is based on the belief that the level of provision is directly influenced by individual demand. This may be voiced through elections.

MUREQ61: indicates the municipal recreation expenditure on a per capita basis in 1961.

The selection of MUREC61 as a proxy to isolate the locational pull exerted by recreation amenities may be open to certain criticism. As noted above, the unlimited availability of outdoor recreation opportunities limits the selection of, for instance, parks per capita as an explanatory variable. Other recreation indicators such as number of hunting and fishing licenses sold, visits to parks and ski areas near the residence, may not present a valid indication of the purely local influences exhibited by recreational resources. It can be argued that participation in these activities tapers off after a certain age has been reached and urban-based recreation facilities will be preferred (substituted) for outdoor recreation activities. The importance of MUREC ought not only be viewed in its role as a measure of recreational attractiveness of a particular city; it can also be employed as a policy instrument. The observation of municipal expenditures for recreation facilities signals first of all the demand for such facilities and, secondly, the priority assigned to such facilities by local officials.[25]

MUREC61 then serves as a proxy to signal the availability of recreational activities at a given centre, which is believed to act as an attractive force and which will influence the location decision of individuals.

%CHMUREC: denotes the percentage change in per capita recreation expenditure between 1961 and 1971.

Although more importance has been assigned to the initial level of recreation services offered, the change in this level of services (increase or decrease) must also receive attention. If we recall Klaassen's (1968) postulated relationship between amenity-supply and amenity-demand effect, we realize that there exists a recursive system in which supply may create demand, which in turn may cause an increase in supply to meet demand and establish a market equilibrium.

The percentage change in per capita recreation expenditure thus becomes an important variable in the regional model due to its applicability as a measure of population response to changes in recreation amenities. A note of caution is, however, in order. Even though we are postulating population movements to areas with assumed well-developed recreation amenities, other things held constant, the change in supply does not provide any information with respect to changes in quality and/or quantity. The human response system, expressed by the change in population, must therefore be held accountable to indicate the quality and/or quantity of facilities provided.

Population Density

The selection of an urban size variable to depict population changes is based upon the traditional role of land in economic theory. Land has always been a critical determinant of location of economic activity; most urban areas began by exploiting some natural resources, but for some time

now, the importance of raw material-oriented locations has been declining. The traditional tie to land by the factors of production has been relaxed due to improvements in technology (especially in footloose industries such as electronics), but increased affluence on the part of the consumer has strengthened the link to land. Higher incomes, greater amounts of leisure time, etc., seek land in the form of open space, low population density, recreational properties and thus have considerable locational influence. A positive relationship between the density variable and the dependent variable is expected.

LNDENS: denotes the gross population density of urban areas in acres per population, i.e., the reciprocal of the usual measure of density.

Quality of Medical Care

The availability of medical services, especially the equitable provision of these services, has been of interest to social scientists as well as to governments. To the economist, health services are related to the economic criteria of efficiency and productivity; two conditions which add to the potential effectiveness of the labour force and total man-hours available from the labour force. The political unit, on the other hand, has a different incentive to concentrate on this issue. At a time when government-sponsored medical insurance plans are on the increase, the

question of equal accessibility to medical care for all individuals becomes an important issue.[26]

The introduction of universal medical plans has shifted the financing needed to pay for medical services from the private sector to the public sector. This shift has resulted in a welfare gain on the part of the individual. The individual consumer will look at the opportunity costs associated with obtaining medical services; the farther away the facilities--measured in time and/or distance--the lower will be the consumption of such services.[27] Table 2 provides an indication of the increase in consumption of medical services. The increase is shown as private and public expenditures as a percentage of GNP and as per capita dollar expenditures for medical services.

Any attempt to analyze health services must distinguish between the 'indicator of need' and the 'indicator of provision'. While the former is usually reported in morbidity rates, and may be more applicable to less developed countries, the latter reports the quantity of medical facilities such as doctors per population, hospital beds per capita, etc., within the area of investigation. The most widely used proxy, to denote the welfare of an area with respect to medical services, is in the form of the doctor per population statistic even though some concern has been voiced as to the interpretation of this ratio.[28] The authors of the *Eleventh Annual Review* (1974) suggest a good "social indicator" can be

TABLE 2: PRIVATE AND PUBLIC SPENDING ON MEDICAL SERVICES IN CANADA

I. Expenditures as a percentage of GNP

1955	3.2%
1965	4.7%
1970	7.1%

II. Private and public per capita dollar expenditures

1955	$ 60
1960	114
1967	170
1971	304

Source: Klaassen (1968), pp. 89-90, ECC, *Seventh Annual Review* (1970), pp. 37-53; ECC, *Eleventh Annual Review* (1974), p. 88.

constructed by observing the participation rates of individuals. The participation rate denotes the number of visits to, or use of medical facilities by an individual per year, especially during the years between age 35 and 54. Samples taken in Saskatchewan, New Brunswick and Quebec found a strong relationship between the participation rate and life expectancy: the higher the participation rate, the higher the life expectancy.[29]

To describe the effects of health amenities, the doctor per population proxy has been employed. The selection of this variable, from among a number of alternative choices, is based upon the belief that an individual who inquires or requires knowledge of health provision will be more concerned about the location of the nearest treatment centre rather than any other form of medical care. Other health proxies

such as the number of dentists, number of hospital beds, average length of stay in hospital, etc., have been rejected as variables to denote the effects of health amenities. The argument for not selecting or including any one of these proxies is quite straightforward. For instance, the consumption of dental care is in most cases directly related to the income potential of the patient. This direct relationship is due to the fact that dental insurance plans are not as universal in application as are medical plans. The hospital bed per population ratio, on the other hand, provides no adequate information as to the actual level of services provided. The treatment of patients, either during or after illness, in the private home by nurses and/or physicians does not always appear in the hospital bed per capita statistic. Furthermore, high per capita costs associated with the construction of such treatment facilities, compared to the per capita costs for a doctor's office, do not necessarily suggest 'good' health amenities. Finally, the strong correlation found by Rosenthal (1964), between average length of stay and people covered by medical insurance does not suggest the application of this proxy as an indicator of health amenities.[30]

DOCPOP1961: denotes the number of doctors per 1,000 population in 1961. It is hypothesized that the initial level of health provision, measured by the doctor/population proxy, will exert a positive locational influence. Cities which

exhibit an above average doctor per population ratio are expected to grow at a faster rate than areas with a less favourable ratio.

%CHDOC/POP: the percentage change in the doctor per 1,000 population ratio between 1961 and 1971.

The argument as to the importance of the percentage change variable is seen in the often cited change in the health pattern of the population. The reduction in infant mortality rates, or the increase in life expectancy, are usually attributed to improved access to medical facilities which also contributes to better health education programs for the population.[31]

The increase in population, attracted by the initial level of health amenities, will result in a disequilibrium condition, i.e., increased workload for doctors. The excess demand for medical services will be met by new doctors, or more physician 'extenders' such as nurses. Thus an equilibrium condition is established again. The increase in doctors will in most instances attract specialized medical facilities, a condition which will result in savings for both the general practitioner and the consumer. The availability of specialized health care will attract migrants, especially those groups which require frequent medical attention such as the elderly and retired.

Quality of Retail Services

The effects of shopping amenities upon population growth is unfortunately not as clearly defined as one might expect. Most communities offer an assortment of basic consumer goods but only a few population centres are able to provide an assortment of luxury consumption items. This shopping, or the access to facilities, is often treated as an integrated part of agglomeration and economic activity by linking variety of consumer goods offered to population size.

However, the reverse case may also hold: the variety of consumer goods available may influence population growth. A future migrant may compose a mental image as to the availability and variety of consumer goods available at a particular population centre. The number of items offered may be of vital importance to the footloose specialist or professional and his/her family. The thought of having to travel long distances to purchase clothing or specialty food items or to be forced to purchase via mail-order catalogues may deter an individual from locating at a centre lacking a variety of luxury goods.

61PCTR: the per capita retail trade volume (in dollars) in 1961. It is hypothesized that this variable is the best and most accurate indicator available to isolate the influence of shopping amenities on population growth. Other indicators such as the actual number of stores, number of employees per store, number of specialized item shops, etc.,

require, unfortunately, a more complete set of information than is available. The influence of shopping amenities is to be interpreted as a lagged effect. Centres with established shopping facilities in 1961, regardless of population size, will attract people as indicated by the higher per capita retail trade expenditure. The absence of the opportunity to purchase both a wide variety of standard goods as well as luxury items--without the need to travel long distances--will exert a negative influence on in-migration, especially of households.

%CHPCTRA: the percentage change in per capita retail trade between 1961 and 1971. The decisive factor influencing the shaping of shopping facilities is consumer expenditure. Increased economic activity, i.e., shopping, caused by population growth, will result in higher income. As a result of higher income and leisure, consumer demand will shift from basic goods to a wider variety of shopping goods. This shift will in turn favour larger trade centres due to the nature of goods offered.

Income

Although income is not an amenity factor, it is included for the following reason: income variables and/or income differentials between economic units have been used widely in studies observing the migration behaviour of people. The pecuniary gains to be had from locating in high wage areas are believed to be the primary motive behind the pattern of

migration.[32]

To test the validity of such reasoning, within the context of this investigation, and to determine the possible consequence of the income effect to the outcome of this thesis, an income variable is included in the regional amenity model.

MINC61: the average male income in 1961 as reported by Census Canada. If income differentials between spatial areas are the primary cause for migration, then we ought to expect a positive relationship between population growth and income. With respect to the income variable, an additional assumption had to be made. It is assumed that variations in income levels amongst areas during the ten-year study period moved upward at a constant rate. This assumption is necessitated by the fact that data on average income in 1971 were not available for all population centres.

A Word on Data and Statistics

A common problem facing most researchers in regional analysis is the lack of available data and information. In many instances, the collection of such is still in its infancy stage, particularly in smaller urban areas. Also at times data collected by agencies are not made available to researchers not associated with that particular agency. For example, Statistics Canada publishes only part of its data and some of its data are only published for urban centres

having a population of 10,000 inhabitants or more. Regional analysts focussing upon smaller centres are then faced with the task of individual datum collection which is time consuming as well as expensive. The gathering of regional data is in many cases also constrained by the fact that delineations of regional boundaries do not always coincide. This problem is accentuated in British Columbia where, for instance, school district boundaries are not identical to municipal boundaries, or, federal electoral districts are delineated differently than are provincial electoral districts. There are many expamples of these discrepancies; to list them all would require too much space and time.

Data and information used in this thesis have been collected from numerous publications; a breakdown of these follows:

Population data were obtained from the British Columbia Regional Index for the years 1956, 1961, 1966 and 1971.[33]

Climate variables were taken from the Ministry of Agriculture publication *Climate of British Columbia 1941-1970.*[34]

Distance between centres and larger population areas were computed using a British Columbia road map. An arbitrary five-mile distance measure was assigned to population areas with 30,000 or more inhabitants. This arbitrary five-mile limit states that individuals located in these larger areas will be required to travel to gain access to the amenities available in this centre.

Recreation indicators listing the municipal recreation expenditure were obtained from the *Municipal Yearbooks* of 1962 and 1972.[35]

Density variables indicating the gross population density were taken from the *Municipal Yearbooks*.[36]

Medical amenity indicators, namely the number of doctors in a given centre during 1961 and 1971, were taken from the membership list of the British Columbia College of Physicians and Surgeons.[37]

Trade: the 1961 and 1971 dollar figures for the retail trade of an area was obtained from *Trade and Commerce* magazine.[38]

Income: the average male income in 1961 was obtained from Statistics Canada data.[39]

Conclusion

The preceding chapter witnessed the development of the central concept of this thesis. Whereas Chapters II and III supplied supportive qualitative statements with respect to the importance of amenities, this chapter focussed on (1) the development of the regional amenity model and (2) the explication of the amenity variables. From the five major amenity groupings, specific locational amenity variables were identified to be included in the regional amenity model. As noted in the previous section, data availability greatly influenced the selection of variables and, in some instances, proxy

variables had to be identified. Throughout the discussion, amenity factors and non-economic factors have been treated synonymously, a development which ought not distract from the overall locational influence of these factors.

Some amenity factors which were considered important at the outset of this investigation, and are still prominent, were not noted during the development of this chapter. Among these are: level of air pollution, quality of the educational system, crime rates, and regional variations in amenity attraction. It is believed that the addition of these factors would be beneficial to any study on amenities, however, data availability excluded these factors from further consideration.

Another development of the amenity model brought forth the premise of population change as a measure of amenity related growth. Oscillations in the population level of a given centre will, in most instances, be a reflection of the amenity effect to be found in this centre.

The following chapter will address itself to quantitative analysis to determine whether or not an amenity influence can be observed.

Footnotes

[1]Income or employment measures are generally measures of economic activities in a specific area, regardless of the quality of life available. Also, increased trade union strength in membership and bargaining power has resulted in a wage equalization for union members throughout the province. These wage rates are, however, not representative of the actual income of an area.

[2]Most likely the famous chicken-or-egg argument will be presented by proponents of the traditional neo-classical market system. The question, which was first, is but of relative importance, the primary concern is the increased awareness of individual satisfaction derived from non-monetary factors. Recent attempts by Becker (1971), and Henderson and Quandt (1971) to include measures of leisure into the utility function points towards the realization that non-pecuniary factors may be as important as economic ones. Note also Lancaster (1966) who rephrased consumption theory by defining satisfaction as a function of the levels of attributes of the commodities consumed rather than the quantities of commodities consumed.

[3]The need for this requirement is explained in the first part of Chapter III.

[4]The formulation of "Central Place Theory" is attributed to Christaller (1933); it stresses the interdependence between a city and the region within which it is located.

[5]Richardson (1973), pp. 39-40.

[6]Thompson (1965), p. 22.

[7]Meier (1962), pp. 7-8.

[8]Young (1975), pp. 93-95.

[9]Vanderkamp (1976), p. 509.

[10]The idea of a labour pool has been forwarded by numerous writers: see for instance Boventer (1975); Richardson (1969, 1973). Similar ideas were expressed by some members of the Economic Workshop seminar during the initial presentation of the thesis topic.

[11]See for instance Devoretz (1972), pp. 58-80.

[12]For a discussion see: Ullman (1954); Perloff and Wingo (1961); Svart (1976); *Business Week* (May 1976).

[13]Climate may be considered as a psychic income component and as a form of consumption that has zero cost of production (Sjaastad, 1962).

[14]Note that two centres, out of a total of 31, account for 23 per cent of the total precipitation. Precipitation is computed by adding rainfall and the water equivalent of snowfall, usually one-tenth of rainfall.

[15]The often-cited Canadian contingent in Palm Springs or Mexico comes to mind.

[16]Also, the change in participation rates for outdoor recreation activities as well as the increase of visits to ski areas is indicative of this trend. Appendix A provides a breakdown of visits to selected ski areas in British Columbia, and Appendix B shows the participation rate in outdoor recreation activities.

[17]Fox and Kumar (1965), pp. 57-85.

[18]Richardson (1969), pp. 270-73.

[19]See for instance: Alonso (1975), pp. 434-50.

[20]Of interest is Beaman's (1974) article on distance and the reaction to distance, in which he establishes a set of "impedance due to distance functions" to analyze marginal and absolute elements in various travel decisions.

[21]For a discussion dealing with recreation demand, especially outdoor recreation, see: Clawson and Knetsch (1966); Knetsch (1963); Cesario and Knetsch (1970); Cesario (1976); Nuttall (1977); Gearing, Swart and Var (1974); CORD (1973).

[22]Pearse and Laub (1969); Pearse and Bowden (1973); Archer (1973).

[23]Horsfall, Bradbury, Massiah and McPhee (1974) found that the availability of more recreational facilities are desired in a small company town (Port Alice); a condition

which of course does not stipulate a correlation between increased provision and increased participation.

[24]The provincial government has realized the importance of recreation facilities for different communities and established a "Community Recreational Facilities Fund" in 1973. Appendix C will provide a listing of the financial assistance provided to selected communities.

[25]While it is true that MUREC61 does not indicate the quantity and/or quality of recreation services provided, it may be stipulated that above average per capita recreation expenditures in city i, by definition, will provide more urban recreation services than areas with a lower per capita expenditure.

[26]See for instance: Arrow (1963); Becker (1965); Fuchs (1972); Canadian Royal Commission on Health Services (1964); Foulkes (1973); Reinhardt (1972).

[27]Klaassen (1968) reports on high income elasticity of demand for medical services: 1.4 for Common Market countries.

[28]There are, however, different opinions with respect to the appropriate ration. The World Health Organization (WHO) recommends a ratio of 1:600, the Hall Commission (1964) based their ratio at 1:857, whereas Foulkes's (1974) study cites a ratio of 1:165 (from *Canadian Public Policy*, 11, 2 [1976]: 170). Reinhardt expresses concern as to the interpretation of this ratio. He notes that a doctor can increase his output by as much as 25 per cent, by hiring additional aides such as nurses; this increase in productive capacity is not however reflected appropriately in the doctor/population statistic.

[29]ECC, *Eleventh Annual Review* (1974).

[30]Rosenthal, as cited in Klaassen (1968), p. 97.

[31]See for instance: ECC, *Eleventh Annual Review* (1974), pp. 89-101, 210-15.

[32]See for instance: Blanco (1964); Lowry (1966).

[33]British Columbia, Dept. of Economic Development, *British Columbia Index* (1978).

[34]Dept. of Agriculture (1975).

[35]Dept. of Municipal Affairs (1962, 1972).

[36]Ibid.

[37]British Columbia College of Physicians and Surgeons (1962, 1972).

[38]*Trade and Commerce* (1973), pp. 32-35.

[39]*British Columbia Regional Index* (1966).

CHAPTER V

QUANTITATIVE ANALYSIS: AN EXAMINATION OF THE AMENITY MODEL

So far, the development of the main concept of this thesis has consisted of the presentation of qualitative statements put forth about the influence of amenities and the formulation of the regional amenity model. However, to assess the role of amenities properly, statistical analysis will be required.

Given the regional amenity model, as presented in Chapter IV, 31 population centres within the confines of British Columbia have been selected. Greater Vancouver and Greater Victoria have been omitted from the analysis because of their respective sizes and central roles exercised in the British Columbia urban system. The 1971 population size of the 31 centres ranges from a low of 2,600 to a high of approximately 33,000.

As stated in the previous chapter, individual cities are more homogeneous with respect to socio-economic characteristics. There exists, however, a great divergence with respect to both the physical and human geography within the province. The varied characteristics of British Columbia, economic as well as amenity related, have contributed to a steady growth in population during the period of observation; quantitative

analysis, in this case multiple regression analysis, should enable us to detect possible influences of amenities. The following sections will report on the analysis used and discuss the results.

Table 3 in this chapter provides an overview of population and population changes, and Map 1 indicates the geographic location of these centres.

Regression Analysis: Concepts and Methodology

Researchers in the social sciences are usually presented with a choice of numerous methods of analysis. In general, when a certain type of relationship, linear in unknown parameters, exists, either regression analysis or factor analysis can be employed; the final selection of which type of analysis to choose may in many instances depend upon personal preference.

Although factor analysis and multiple regression analysis have some common objective, there is a considerable difference between them with respect to what they can be expected to accomplish. Multiple regression analysis takes a data matrix and uses it to cetermine the intercorrelations among predictor variables and also correlations of the predictors with one or more criterion variables. The object of the multiple regression analysis is to pick a subset of the predictor variables that will best predict the criterion variable and to determine their relative weights for making

TABLE 3: POPULATION AND POPULATION CHANGE OF 31 SELECTED CENTRES, INDICATING ABSOLUTE CHANGE AND PERCENTAGE OF POPULATION CHANGE (1961-71)

	Pop.1961	Pop.1971	Absolute Change	Percent Change
1. Port Alberni	11,560	20,060	8,500	73.53
2. Kelowna	13,188	19,412	6,224	47.19
3. Cranbrook	5,549	12,000	6,451	116.25
4. Prince George	13,877	33,101	19,224	138.53
5. District of Kitimat	8,217	11,803	3,586	43.64
6. Trail	11,580	11,149	- 431	- 3.37
7. Nanaimo	14,135	14,948	813	5.75
8. Vernon	10,250	13,238	3,033	29.59
9. Penticton	13,859	18,150	4,291	30.96
10. Dawson Creek	10,946	11,885	939	8.57
11. Powell River	10,748	13,725	2,977	27.70
12. Kamloops	10,076	26,165	16,089	159.67
13. Prince Rupert	11,987	15,745	3,758	31.35
14. District of Campbell River	3,737	10,000	6,263	167.59
15. District of Chilliwack	18,296	23,739	5,443	29.75
16. Creston	2,460	3,204	744	30.24
17. Quesnel	4,673	6,250	1,577	33.75
18. Nelson	7,074	9,400	2,326	32.88
19. Revelstoke	3,624	4,870	1,246	34.38
20. Courtenay	3,485	7,155	3,670	105.30
21. Kimberly	6,013	7,640	1,627	27.05
22. Fort St. John	3,749	8,246	4,515	120.43
23. Duncan	3,726	4,388	660	17.71
24. Fernie	2,661	4,422	1,761	66.17
25. Grand Forks	2,347	3,173	826	35.19
26. Merritt	3,039	5,289	2,250	74.03
27. Williams Lake	2,120	4,072	1,952	92.07
28. Vanderhoof	1,460	1,650	190	13.01
29. Smithers	2,487	3,865	1,378	55.40
30. Terrace	5,940	9,990	4,050	68.18
31. Princeton	2,163	2,600	437	20.20
British Columbia	1,629,082	2,184,620	555,538	34.10
CMA Vancouver	892,286	1,082,352	190,066	21.30
CMA Victoria	173,455	195,800	22,345	12.88

Source: *British Columbia Regional Index* (1978).

BRITISH COLUMBIA

1. Port Alberni
2. Kelowna
3. Cranbrook
4. Prince George
5. Kitimat
6. Trail
7. Nanaimo
8. Vernon
9. Penticton
10. Dawson Creek
11. Powell River
12. Kamloops
13. Prince Rupert
14. Campbell River
15. Chilliwack
16. Creston
17. Quesnel
18. Nelson
19. Revelstoke
20. Courtenay
21. Kimberley
22. Fort St. John
23. Duncan
24. Fernie
25. Grand Forks
26. Merritt
27. Williams Lake
28. Vanderhoof
29. Smithers
30. Terrace
31. Princeton

Map 1: Location of various cities and municipalities.

Scale
40 30 20 10 0 40 80 120 160 MILES

Drawn and Produced by the Map Production Division, Surveys and Mapping Branch, Victoria, British Columbia

MAP NO. 1S

that prediction. The function of factor analysis is to analyze the common variance to determine the number and types of common variances which result in the correlation between variables. To understand the objective of factor analysis better, it may help to list two basic assumptions:

(1) A set of intercorrelated variables has common variables running through it and the scores can be represented in terms of these reference factors.

(2) The correlation between two variables, j and k, can be accounted for by the nature and extent of their common factor loadings.

As an overview, we may list the three basic differences of factor analysis from regression analysis:

(1) In the regression model one takes variables on both sides of the equation, whereas in factor analysis one searches (by factor extraction methods) for a set of common variables on one side only.

(2) The factor variables are fixed uniquely by some properties scientifically extra to the statistical system and not just by any linear combination of variables such as set up in regression analysis.

(3) In regression analysis the dependent and independent variables are only independent and dependent in a statistical sense (the direction being the choice of the researcher), whereas in factor analysis the factors are considered as the causally independent variables.

It may have become clear by now that factor analysis is more complex in nature than is regression analysis and can be a very useful supplementary method of analysis.

Since the objective of this thesis is to test the amenity hypothesis, and to provide a selection of best predictors, regression analysis has been selected for the quantitative part of this investigation.

The analysis is carried out for two different forms of the dependent variable. The first uses the percentage change in population and the second the absolute change in population during the same period of observation.

Interpretation of Results

The results of the multiple regression analysis, tabulated in Appendix D, have provided us with some interesting results with respect to the amenity model formulated and the *a priori* assumptions. A brief summary will be presented for each section.

The first equation in both sections was selected from among the total number of regressions in order to obtain an indication of the maximum value of R^2 while maintaining significant t-values. Since the sign of expected relationships was hypothesized for all co-efficients, one-tail tests will be utilized throughout the discussion. Each subsequent regression equation presents a variation in the selection of variables so as to test for the respective amenity influence

in the model while maintaining statistically significant values.[1]

Section 1: dependent variable: percentage change in population (%CHPOP). There are five different regression equations in this section, each of which represents a variation in the number of independent variables.

Equation (7)

$$\%CHPOP = a + bDOC + c\%CHDOC + dMUREC + e\%CHMUREC - fLNDIST + gLNDENS + hPCTRA + i\%CHTRA + jAVERTEM + kMINC + z$$

where: a = constant and z = stochastic error term.

This equation provided a corrected R^2 of .207; however, only the %CHMUREC and LNDIST co-efficients are significant and of the expected sign. The surprising result is the negative significant relationship between %CHDOC, POP61, %CHTRA and the dependent variable. Initially we hypothesized a positive co-efficient for these variables, based upon the assumptions made in Chapter IV. The negative relationship with the dependent variable, however, would suggest the existence of a negative amenity effect. This odd behaviour of these explanatory variables is unfortunately not only restricted to equation (7) but it occurs in all the estimating equations. Rather than speculate about the incidence of this negative significant relationship here, a more detailed attempt will be undertaken at the end of this section.

The correlation between DOC/POP and %CHTRA variables (+.5654) and also between %CHDOC and %CHMURE (+.4440) suggests a possible problem of multicollinearity. Although there is no definite cut-off point, as far as correlation between the independent variables is concerned, a high correlation between the variables coupled with a low t-value for one or both the co-efficients may suggest multicollinearity. The relatively high correlation between the health proxies and the trade proxies may indicate the presence of a variable not specified in the model (Table 4).

TABLE 4: CORRELATION BETWEEN INDEPENDENT VARIABLES

	POP61	%CHDOC/POP	DOC/POP	%CHMURE	%CHTRA	LNDIST	LNDENS	AVPRE
POP61	1.00	.0575	.0128	-.059	-.404	-.361	.160	.330
%CHDOC/POP		1.00	.1045	.444	-.137	-.131	.172	-.158
DOC/POP			1.00	-.261	.565	-.323	-.403	-.169
%CHMURE				1.00	.160	.196	.089	.044
%CHTRA					1.00	.056	-.207	-.080
LNDIST						1.00	.131	.189
LNDENS							1.00	.583
AVPRE								1.00

The mere presence of a high correlation between the independent variables ought not be the decisive factor whether or not one of these variables will be omitted from further estimations. In the absence of information justifying the elimination of one of these correlates, these variables are retained in future multiple regression equations.

The specification of *equation (8)* differs from the previous one in that the July temperature variable was selected as the climate indicator, instead of average temperature. This change in climate variables resulted in an increase of the corrected R^2 ($\bar{R}^2$ = .276) and also higher t-values.

Equation (9) developed a lower R^2 (= .247) and generally lower t-values than those of equation (8). This drop may have been brought about by the omission of MUREC, PCTRA, MINC and the selection of JANTEM as the climate variable.

Equation (10) furnishes the best corrected R^2 (= .327) and generally better t-values than did any previous equation. This appears to have been caused by the omission of the POP61 variable and the addition of the moderate temperature variable. The exclusion of the POP61 variable from the estimating equation and the apparent improvement of it, may suggest that a negative amenity influence is exercised by the POP61 variable.

As noted in the previous chapter, POP61 serves in two capacities. The first, as a normalizing agent and, the second as an amenity-size variable. The specific size effects of this variable may be in either capacity. However, as we are using percentage change in population as the dependent variable, it is assumed that the normalizing effect is of lesser importance than the amenity-size effect.

The t-value of the DOC/POP variable attains a level of significance at the 10 per cent level and the t-value of the LNDENS variable is just over unity.

The final regression of section 1, equation (11), introduces three new variables: DOC/POP71, %CHPOP56-61, and FE%POP66. The latter two variables have been included for two reasons: first, as normalizing population variables, and, second, to explain changes in population levels brought about by lagged effect and by natural population additions (births).

As in the previous equations, the health proxy provides a negative co-efficient, however, the second health proxy used (DOC/POP) experienced a drop in the level of significance. This decline in value of the DOC/POP co-efficient appears to have been caused by the DOC/POP71 variable.

The lagged population variable, %CHPOP56-61, attains a level of significance at the 10 per cent level of confidence. The reduction in the size of the constant co-efficient may support its primary role as a population normalization agent.

The third variable introduced, FE%POP66, the number of females age 20 to 45 as a percentage of total population during 1966, reaches a level of significance at the 1 per cent level of confidence.

Of interest is the income variable in this equation. Whereas in the previous equations, MINC was insignificant, a significant negative co-efficient is presented here. An

inverse relationship may exist between the FE%POP66 and the MINC variables, depicting a shortage in females of age 20 to 45 in centres with high wage rates.

The overall poor performance, in terms of high $\bar{R}^2$ and significant t-values, of this section was probably caused by the data problems noted in the previous chapter.

To summarize the results obtained from the multiple regression equations used in this section, we can note that a consistent performance was observed in the LNDIST (except in equation (11) and %CHMUREC variables). The co-efficient displayed by LNDIST is in agreement with the hypothesis stated in Chapter IV. The strong performance of %CHMUREC and the more or less recognizable influence of the other amenity variables appear to be responsible for the percentage change in population between 1961 and 1971, especially since the economic indicator, MINC, did not perform in a consistent or significant manner.

As noted during the discussion of equation (7), the unexpected negative relationship between the dependent variable (%CHPOP) and some of the explanatory variables, notably %CHDOC/POP, $\%CHPCTR^2$ and POP61, can be observed throughout section 1 whenever these indicators are employed to depict the amenity effect.

There exist among all the possible alternative explanations, at least four plausible avenues which may provide some insight into this interesting relationship. The first

is to disregard the influence of amenities, in particular the attraction exerted by the presence of so-called amenity factors. The amenity pull may not be present after an initial threshold level of amenities has been attained, as in the case of urbanization amenities. A point of satiation may be reached after which any increase in the level of amenities supplied will not influence growth. As the level of amenities is increased, to satisfy initial local demand, a sudden influx of amenity seekers may result in the creation of disamenities such as congestion, air pollution, etc. Thus the amenity pull effect achieves the opposite effect, causing a decline in population levels through possible out-migration.

The second interpretation for the presence of the negative relationship may be found in the mathematical fundamentals underlying regression analysis. The postulated relationship is depicted here as:

$$Y = a + b(\frac{X}{POP}) + \ldots + z \qquad (12)$$

where: Y = dependent variable;

a = constant;

b = regression co-efficient;

$(\frac{X}{POP})$ = the per capita ratio of the independent variable(s);

z = stochastic error.

The condition which must prevail to obtain a positive co-efficient for $(\frac{X}{POP})$ depends upon the ratio of $(\frac{X}{POP})$ and

the rate of increase in X. Only if X, that is the value of the numerator, increases at a faster rate than the $(\frac{X}{POP})$ ratio will a positive co-efficient prevail.[3] The third explanation, and perhaps a more reasonable account, for the negative relationship may be found in the specification of the equations. Throughout the analysis we assumed a linear relationship, whereas in reality a non-linear relationship with the dependent variables may exist. Finally, the location decision-making process of doctors may be responsible for this relationship.

The negative co-efficient for POP61, the initial period's population, suggests the questionable conclusion that the size of a centre does not affect the future growth of the centre in question. In fact, the negative sign stipulates that larger cities in 1961 grew more slowly during the 1961-71 period than did smaller centres. This conclusion is contrary to popular belief and the only valid explanation for it must come from the functional equation postulated as regression is a technique which is designed to measure the *specific* contributions of the X's to changes in Y. In most instances, the 'popular' view observes only one particular X (in this case population) and neglects the other X's in the functional equation.

Section 2: dependent variable: absolute change in population 1961-71. The same variables are employed as in section 1, with the same data base. The analysis undertaken in this

section is more extensive in that it comprises eight different estimating equations. In general, the amenity variables perform better than in the first section.

Equation (13), like equation (7), attempts to isolate the range in which the R^2 may be expected to achieve their maximum value, while maintaining a significant t-value.

Equation (13)

$$CHPOP = a + bPOP61 + cMUREC61 + d\%CHMUREC + eDOC/POP61 + f\%CHDOC/POP - gLNDIST + hLNDENS + iPCTRA + j\%CHPCTR + kJANTEMP + lMINC61 + z$$

The estimating equation looks at the complete amenity model, except that it incorporates only one climate variable. The co-efficients for POP61, MUREC61, %CHMUREC, LNDIST, LNDENS and PCTRA61 perform according to the predicted sign, with an $\bar{R}^2$ of .565. However, only three variables reached a level of significance: MUREC (= 10%), %CHMUREC (= 5%), and LNDIST (= 1%).

The health variables (DOC/POP, %CHDOC/POP), %CHPCTR and the income indicator all display a negative co-efficient, with insignificant t-values for DOC/POP, %CHPCTR and MINC61. The correlation of .5654 between DOC/POP and %CHPCTR may be the cause of the low t-values; there may be multicollinearity present. A promising note can be seen in the t-values of POP61, LNDENS and PCTR61, which are all positive and above unity.

Specification of *equation (14)* differs only in the extent of a different climate variable: AVETEMP. The selection of this amenity proxy resulted in an increase of the corrected R^2 (.589) in association with stronger co-efficients and t-values. The previously positive but insignificant t-value of POP61 is now significant at the 10 per cent level of confidence. This suggests that the initial population level does indeed influence the population growth of a centre, while at the same time exercising a normalizing effect. A considerable improvement in regression co-efficient can be observed in the PCTR61 variable, again lending support to the hypothesis that the initial level of amenities exerts a positive influence.

As in the previous equation, the income proxy failed to conform to the postulated relationship, providing an insignificant co-efficient as well as insignificant t-value. Similarly, the DOC/POP and %CHPCTR are beset by insignificant negative co-efficients.

Variations in the selection of explanatory variables for *equation (15)* furnish a better $\bar{R}^2$ than the previous regressions (.600). Here, MINC61, %CHPCTR and DOC/POP were dropped from the estimating equation and JULTEMP was selected as the climate proxy. All co-efficients attained a significant level of confidence: POP61 (10%), MUREC61 (10%), %CHMUREC (5%), %CHDOC/POP (1%), LNDIST (1%), LNDENS (10%), PCTR61 (10%), and JULTEMP (10%).

In regressing *equation (16)*, %CHPCTR was substituted for PCTRA and two climate variables were used--JANTEMP and JULTEMP. This alteration of the estimating equation improved the $\bar{R}^2$ (.705), with significant t-values for POP61, MUREC, %CHMUREC, %CHDOC/POP, LNDIST, and a significant negative t-value for %CHPCTRA.

The formulation of *equation (17)* saw the exclusion of JULTEMP, the addition of MINC61 and the change from %CHPCTRA to PCTRA. This alteration resulted in a slight drop of the $\bar{R}^2$ (.703), however all variables, except MINC61, attained significant t-values. The surprising observation is the strong t-value (at the 5% level of the LNDENS variable, which in previous equations only attained significant value once.

In regression *equation (18)*, R^2 declined (.692), which may have been caused by selecting a moderate temperature variable and the omission of MINC61. However, all variables maintained the significant t-values, with JANJULTEMP (also noted as MODTEMP) depicting the hypothesized relationship, with the t-value above unity.

The best results are obtained in *equation (19)* ($\bar{R}^2$ = .713), with all but one variable (PCTRA) achieving a confidence level of at least 5 per cent. This equation is similar to equation (17) with the exception of MINC, which is not represented in this regression. The overall improvement in the regression equation may thus be attributed to the exclu-

sion of MINC.

The final regression *equation (20)* is based upon equation (19), however %CHPCTR was substituted for the PCTRA proxy. The equation, however, did not perform as well, with a drop in $\bar{R}^2$ (.702) and a decline in the level of significance for JANTEMP, LNDENS, and POP61 as well as for %CHPCTR (10%).

The only climate variables which correspond to the hypothesized co-efficient are JULTEMP (+)(-) and JANJULTEMP (+) with fairly strong absolute co-efficients and significant t-values (equation 15). If we interpret the inverse relationship of JANTEMP as the correct relationship, for reasons outlined in Chapter IV, we obtain another significant variable which will assist us to explain the movement of individuals.

It may have become apparent that some variables previously noted were never reported upon, or were only presented once in the discussion of the regression results, for example AVERTEMP or FE%POP66. It must be realized that the results reproduced in this thesis are a collection of the *best* regression results obtained. In cases where the requirements of highest $\bar{R}^2$, largest t-values and smallest standard error of the estimate were not met, the results are not reported.

Conclusion

The econometric analysis undertaken to isolate and measure a possible amenity effect was kept very simple. A linear multiple regression model was employed to determine how changes in the independent variables affect the values

of the dependent variable. Overall, the regression estimates are of considerable value, in particular the results of section 2. The reasonably high $\bar{R}^2$ coincident with acceptable t-values seems to indicate that the so-called amenity factors do indeed exert a considerable influence with respect to the locational preference of an individual.[5] For instance, the $\bar{R}^2$ of .713 of equation (19) shows that approximately 70 per cent of the absolute population variation is explained by the amenity variables in the equation.

As for the curious performance of the health indicators, in particular the %CHDOC/POP variable, it is hoped that the explanations put forth above are in agreement with the actual cause of this relationship. Additional examinations of this odd behaviour may provide better insight.

The overall poor performance of the sole economic indicator--average male income--was a bit surprising. Even though we hypothesized that income is not as important a determinant of migration, as is the case with amenity factors, we did not expect such a poor performance. Since it was stated that British Columbia is also known as a resource-extracting and exporting province, with conceivable varying income patterns amongst population centres, the lack of income influence is probably due to strong trade union representation throughout the province, especially in the primary resource industry sectors.[6]

A disturbing outcome of the regression analysis is the difference in results obtained between section 1 and section 2. If we recall, the dependent variable in the first section was the percentage change in population, whereas in the second section the absolute change in population levels was used. To account for possible size effects of the dependent variable, a normalization variable was included. With this correction one would not expect such a divergence in the $\bar{R}^2$ between section 1 and section 2. If we compare the highest corrected $\bar{R}^2$ obtained in the first section (.327) with the lowest corrected $\bar{R}^2$ of section 2 (.565), we must conclude that the cause of this incongruity may be an upward or downward bias of either dependent variable. Future research in this area may be able to detect the cause and isolate the proper dependent variable.[7]

In sum, the results obtained are of particular interest since we were able to detect the influence of amenities. It must be kept in mind that the estimating equations were designed to measure the effects of amenities upon locational preference and therefore caution is recommended before the results are used for predictive purposes. It is of interest to note that the results obtained for British Columbia, in section 2, are close to the results reported by Cebula (1974) and Liu (1975), as discussed in Chapter III of this thesis.

Footnotes

[1]The requirements for this condition are: highest $\bar{R}^2$, the largest t-values associated with the co-efficient and the smallest standard error of the estimate.

[2]If we argue on the premise that the variable assigned to explain the percentage change in shopping amenities actually denotes the 'cost of living' at a particular centre, we would indeed hypothesize a negative relationship.

[3]I am grateful to Drs. L. Boland, P. Cheng and D. Maki for the initial footwork on this problem; note that the percentage change in population is almost twice the percentage change in the doctor per population ratio: 48.9 per cent for population and 26.44 per cent for doctor/population.

[4]The negative co-efficient may be the result of an error in measurement, for both the POP61 and POP71 time period. It was previously noted that many centres amalgamated with subdivisions at the fringe areas, thus it is possible that the actual population size has been underestimated. This would result in a downward bias and therefore a negative correlation and co-efficient.

[5]Although F-ratios have not been reported, it must be noted that the F-ratios obtained for equations (7), (12), and (13) exceed the critical $F_{.05}$ and $F_{.01}$ ratios. In combination with the noted $\bar{R}^2$, acceptable t-values and F-ratios, we are in a position to assert with a considerable degree of confidence, that these equations can be used to measure the influence of the amenity factors.

[6]For instance, the IWA wage rates for a particular job (i.e., sawmills), are the same in Prince George, Williams Lake or Dease Lake; the level of amenities offered in these centres, however, is not identical.

[7]There may also be an interaction problem, that is, the relationship between two variables, say Y and X, is dependent upon the value of a third variable, say X_2.

CHAPTER VI

CONCLUSION

Summary

From the preceding chapters, several general conclusions can be drawn about amenities and their prospective role in regional development.

As we have observed, regional development policies and programs are initiated to lessen the gap between regions with respect to income, employment opportunities or any other form of economic indicators. Within the context of attaining this policy goal, economic criteria and principles are employed to ameliorate a condition which is believed to have been caused by a state of disequilibrium in the marketplace. This preoccupation with development programs based on economic criteria alone is readily understood if one realizes the difficulties involved in defining amenity factors. Although their existence and possible influence is more or less acknowledged, these factors are still an obscure component of regional economic analysis. This is partially due to the difficulties encountered when trying to interpret human behaviour or preference. One of the major obstacles encountered throughout this analysis was to gather sufficient information to support the argument of this thesis and then to quantify the data.

A common definition of the amenity factor (or attraction) had to be sought out; the amenity literature review presented in Chapter III, in addition to Klaassen's (1968) hypothetical amenity model, indicated the existence of two types of amenities--natural and urbanization. The further specification of amenity-demand and amenity-supply effects served as the basis for postulating a regional amenity model.

The specification of the regional amenity model differs from Klaassen's in that observed population movements, rather than changes in income levels, are depicted as indicators of amenity influences. The final selection of the variables was largely guided by (1) the groupings of amenity factors isolated in Chapter III, and (2) the lack of a sufficient data base for all of the 31 population centres chosen.

At the outset of this thesis it was stipulated that the main objective of this analysis is to test the amenity hypothesis and to test whether or not an amenity influence can be detected and/or measured. The quantitative part of the thesis resorted to multiple regression analysis, the results of which are discussed in Chapter V. Although there exists a wide divergence in the results obtained, we were able to isolate a possible amenity influence as measured by the change in population levels, in both sections of the analysis. The curious behaviour of some variables with respect to their expected relationship with the dependent variable(s) was entertained in detail during the discussion of results.

The overall conclusion which can be drawn from this analysis is one of support for the amenity hypothesis postulated. The pattern which emerged is that the lure of urbanization amenities are of considerable importance, whereas the often acclaimed influence of climate features did not support this trend. Of interest also is the apparent unimportant presence of the lone economic indicator in the model--average male income in 1961.

The lure of urbanization amenities, as well as natural amenities, lends credence to the possibility of encouraging the development of regional growth centres in British Columbia. A growing regional market permits the establishment of new businesses that cater to local demand, as industry sales thresholds are surpassed, and this in turn reduces capital outflows for consumption expenditures. Some local firms may also be converted into exporters of goods and services.

Investors and entrepreneurs generally, who analyze regional growth and migration trends in terms of plausible explanations, act in ways that make a reality of their resulting prediction. When a region is expected to grow because people like the climate, recreation opportunities, etc., then business will expand to provide for anticipated increase in activity, and the consequent employment expansion will stimulate the in-migration originally predicted, as footloose industries are joined by firms now able to produce for local consumption in an enlarged market. Conversely,

businessmen expect that places with unpleasant natural environments will experience out-migration and economic stagnation or decline.

Within this framework, regional development policies ought to combine programs currently used to attract economic activities to lagging areas with programs to enhance the amenity attributes of an area. In particular, more attention ought to be directed towards the planned enhancement and utilization of natural amenity factors such as climate, ski areas, lakes, etc.

Extensions of this Analysis

As noted above, the objective of this thesis has been satisfied. Although an amenity related population movement took place between 1961 and 1971, further research is required before a development program based on amenities could be established. In particular, the relationship between amenities and income level has to be observed further as the results of this study seem to indicate that individuals are willing to substitute amenities for economic advantage. Also, more exhaustive regional studies are needed to explain (1) the role of environmental preferences in business location, and (2) the effects of regional promotion literature and employee recruitment practices upon the decision-making process of footloose industries and individuals. Methods in choosing populations, functional regional areas and selections of variables have to be improved also.

Due to the varied mix of amenity variables linked with some unexpected relationships, no attempt has been made to establish a predictive value of this study. It is hoped that the absence of the practice to state predictive values will not detract from the overall general conclusion reached about the impact of amenities upon location decisions. It is assumed, that with additional research in this area, a comprehensive regional amenity development policy will be established.

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APPENDIX A

VISITS TO SELECTED SKI AREAS IN BRITISH COLUMBIA

WINTER 1972-73, 1973-74

Area Code	1972-73	1973-74
A	210,000	223,880
B	180,000	265,000
C	30,000	45,600
D	75,000	87,660
E	55,000	105,600
F	96,000	110,000
G	87,600	108,040
H	41,000	62,660
I	12,500	14,375
J	18,572	26,300
K	10,000	10,000

Source: As reported by area operators.

APPENDIX B

PARTICIPATION RATE IN OUTDOOR RECREATION ACTIVITIES IN 1967, 1969 AND 1972

PERCENTAGE OF INDIVIDUALS IN BRITISH COLUMBIA WHO DID PARTICIPATE IN OUTDOOR RECREATION ACTIVITIES IN 1967, 1969 AND 1972

Activities	% 1967	% 1969	% 1972
Swimming	49	46	--
Tent camping	21	14	24
Trailer camping	10	7	11
Pick-up camper	--	6	15
Hunting	15	16	15
Power boating	20	24	31
Canoeing	3	5	12
Sailing	--	2	7
Other types of boating	11	--	--
Water Skiing	9	7	--
Nature study or bird watching	9	16	--
Looking at scenery	48	--	--
Outdoor photography	21	28	--
Visiting historic sites/parks	--	40	37
Historic sites	21	--	--
Visiting other parks	--	54	--
Just driving around	57	--	--
Driving for pleasure	--	65	61
Sightseeing from private vehicle	--	55	56
Seeing new places	39	--	--
Climbing	8	10	--
Snow skiing	7	5	13
Snowmobiling	4	2	5
Snow sledding/tobogganning	--	11	--
Picnics/cookouts away from home	45	58	55
Walking/hiking	--	45	46
Hiking	17	--	--
Golfing	--	16	--
Ice skating	--	16	20
Horseback riding	--	9	10
Bicycling	--	9	24
Tennis	--	7	--
Fishing	31	--	39
Relax and get away from it all	49	--	--

Source: CORD (1973), Technical Note No. 23, p. 30.

APPENDIX C

COMMUNITY FACILITIES FUND

Selected Communities	Projects	$ Total
Campbell River	2	15,999.99
Chilliwack	1	26,666.00
Courtney	5	671,233.00
Cranbrook	4	343,929.37
Creston	3	81,533.23
Dawson Creek	5	209,709.65
Duncan	2	15,873.00
Fernie	4	63,059.00
Fort St. John	7	348,709.35
Grand Forks	1	12,750.00
Kamloops	8	817,972.56
Kelowna	13	1,007,151.98
Kimberly	5	354,600.00
Merritt	1	1,303.44
Nanaimo	14	967,087.68
Nelson	8	770,399.19
Penticton	4	81,624.16
Port Alberni	10	102,989.22
Powell River	7	1,337,095.66
Prince George	11	740,209.04
Prince Rupert	13	604,383.29
Princeton	2	102,474.30
Quesnel	4	20,592.41
Revelstoke	2	65,153.55
Smithers	4	104,076.00
Terrace	7	711,729.57
Trail	3	158,999.66
Vanderhoof	3	83,670.00
Vernon	5	143,874.67
Williams Lake	7	106,038.09

Source: Province of British Columbia, Department of Recreation and Conservation, July 1975.

APPENDIX D

PRESENTATION OF

MULTIPLE REGRESSION RESULTS

SECTION 1: DEPENDENT VARIABLE: PERCENTAGE CHANGE IN POPULATION 1961-1971

	Constant	Correlation of Independent Variables with Dependent Variable															
		DOC/POP -.126	%CHDOC -.262	MUREC .109	%CHMURE .112	LNDIST -.2075	POP61 -.142	LNDENS -.084	PCTRA .067	%CHTRA -.240	AVTEMP -.299	JANTEMP -.303	JULTEMP -.287	MODTEM .210	AVPRECIP .0718	SNOW .170	MINC61 .145
Regression 7: =Form of a+bX																	
Co-efficient	182.97	5526.55	-.32	1.05	.0166	-15.14	-.0030	4.64	.023	-.069	-1.85						.0071
t-values		.407	-2.41**	.741	1.756*	-2.29**	-1.737*	.576	.630	-1.40*	-1.23						.374
$\bar{R}^2$ = .207 SEE = 31.72 11/19 df																	
Regression 8: =Form of a+bX																	
Co-efficient	353.37	2043.0	-.347	1.57	.0172	-15.18	-.002	.632	.036	-.065			-3.47				-.0038
t-values		.167	-2.70**	1.14	1.90**	-2.705**	-1.77*	.083	.988	-1.38*			-1.86**				-.200
$\bar{R}^2$ = .276 SEE = 30.30 11/19 df																	
Regression 9: =Form of a+bX																	
Co-efficient	168.57	3089.7	-.33		-.015	-14.54	-.0025	2.52		-.075		-.62					
t-values		.26	-2.77***		1.87**	-2.25**	-1.64*	.33		-1.67*		-.89					
$\bar{R}^2$ = .247 SEE = 30.91 8/22 df																	
Regression 10: =Form of a+bX																	
Co-efficient	369.57	2164.93	-.382		.023	-19.9		9.53		-.073	-4.72			-.343			
t-values		1.45*	-2.5**		2.29**	-2.71***		1.09		-1.99**	-1.66*			-.27			
$\bar{R}^2$ = .327 SEE = 37.40 7/23 df																	
Regression 11: =Form of a+bX			DOC/POP 71				%CHPOP 56-61								FE%POP 1966		
Co-efficient	15.28	14576.38	-21344.69	2.20	-.0092	-8.84	.355		.0109					.087	8.0		-.026
t-values		1.12	-2.574**	1.67*	-.59	-1.145	1.73*		.33					.12	2.9***		-1.39
$\bar{R}^2$ = .299 SEE = 29.82 10/20 df																	

One-tail test: * = significant at the 10% level of confidence
** = significant at the 5% level of confidence
*** = significant at the 1% level of confidence

SECTION 2: DEPENDENT VARIABLE: ABSOLUTE CHANGE IN POPULATION 1961-1971

	Constant	Correlation of Independent Variables with Dependent Variable															
		POP61	MUREC	%CHMURE	DOC/POP	%CHDOC	LNDIST	LNDENS	PCTRA	%CHTRA	AVTEMP	JANTEMP	JULTEM	JANJUL TEMP	AVPRE	SNOW	MINO61
		.511	.313	.0028	-.047	-.173	-.589	.0327	.232	-.378	-.012	-.051	-.064	.029	.1149	-.011	.249
Regression 11 =Form a+bX Co-efficient	13494.74	.172	178.5	1.659	-516582.4	-30.58	-2241.09	671.32	3.38	-1.97		-55.399					-.368
t-values		1.25	1.58*	2.22**	-.48	-2.93***	-4.23***	1.05	1.15	-.504		-.98					-.245
$\bar{R}^2$ = .565																	
SEE = 2498.72 11/19 df																	
Regression 14 =Form a+bX Co-efficient	19489.80	.192	193.71	1.72	-3557784.14	-31.89	-2251.9	729.26	3.74	-1.94	-168.8						-.48
t-values		1.44*	1.68*	2.38**	-.344	-3.13***	-4.45***	1.18	1.31	-.513	-1.46*						-.33
$\bar{R}^2$ = .589																	
SEE = 2427.81 11/19 df																	
Regression 15 =Form a+bX Co-efficient	10310.5	.207	178.54	1.72		-29.53	-2132.4	882.39	3.79				-80.83				
t-values		1.74*	1.74*	2.55**		-3.16***	-4.42***	1.62*	1.44*				-1.68*				
$\bar{R}^2$ = .600																	
SEE = 2396.69 8/22 df																	
Regression 16 =Form a+bX Co-efficient	23326.3	.19	225.58	1.91		-34.64	-2613.46	580.09		-4.03		-61.8	-94.70				
t-values		1.74*	2.25**	2.89***		-3.70***	-6.11***	1.06		-1.40*		-1.26	-1.07				
$\bar{R}^2$ = .705																	
SEE = 2138.36 9/21 df																	
Regression 17 =Form a+bX Co-efficient	10526.23	.186	249.10	1.88		-29.82	-2693.39	1054.54	3.79			-80.6					.617
t-values		1.64*	2.51**	2.67***		-2.77**	-6.21***	1.97**	1.38*			-1.72*					.44
$\bar{R}^2$ = .703																	
SEE = 2346.78 9/21 df																	
Regression 18 =Form a+bX Co-efficient	8644.25	.17	243.1	1.98		-31.03	-2703.59	1156.53	4.14					61.26			
t-values		1.50*	2.40**	2.88***		-3.30***	-6.13***	2.18**	1.59*					1.20			
$\bar{R}^2$ = .692																	
SEE = 2386.98 9/22 df																	
Regression 19 =Form a+bX Co-efficient	12635.46	.194	251.10	1.97		-32.11	-2693.76	1119.39	4.25			-81.82					
t-values		1.76**	2.58**	3.10***		-3.53***	-6.33***	2.22**	1.70*			1.78**					
$\bar{R}^2$ = .713																	
SEE = 2303.40 8/22 df																	
Regression 20 =Form a+bX Co-efficient	16326.89	.200	209.86	1.97		-33.35	-2604.29	781.92		-4.049		-65.62					
t-values		1.75*	2.11**	2.98***		-3.58	-6.07***	1.51*		-1.40*		-1.34*					
$\bar{R}^2$ = .702																	
SEE = 2347.04 8/22 df																	

One-tail test: * = significant at the 10% level of confidence

** = significant at the 5% level of confidence

*** = significant at the 1% level of confidence