"AN ANALYTICAL FRAMEWORK FOR EVALUATING THE BENEFITS AND COSTS OF FOREIGN STUDENTS AT THE UNIVERSITY OF MANITOBA"

by

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To my lovely sister

Mika

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ABSTRACT

In this thesis we develop an analytical framework for evaluating the benefits and costs of the presence of foreign students at a Canadian university; in particular the University of Manitoba.

Using some theoretical tools such as: the theory of clubs and the export multiplier, combined with a survey of some 160 foreign students on campus, we arrived at a tentative conclusion that the benefits of a foreign student presence exceeds the costs.

We examine two alternative frameworks for cost-benefit analysis: a strictly Canadian framework and an international framework. In the Canadian framework there is no significant difference between the present value of costs and benefits from foreign students. However, the international framework which includes the benefits to foreign students as well, shows a significant net benefit from the presence of foreign students in Canada.

Our analysis of the quantifiable and the non-quantifiable benefits from foreign students studying in Canada, reaches the conclusion that foreign students do not impose a burden on Canadian society and may well confer a net benefit.

CONTENTS

CHAPTER I

Introduction and Overview

As the highest institution for education, university has a leading role in educating high school graduates towards a degree and/or whatever profession they desire.

This requires large amounts of funds and resources for faculty salaries, capital, facilities and support staff. If the tuition fee is to cover all of these costs, then, only wealthier people would be able to attend universities.

In Canada and many other advanced industrialized countries, the tuition fee is subsidized by the government. Moreover, universities depend on donations and support from private and public institutions which usually donate funds in order to build new facilities and acquire modern accessories such as computers, laboratories and so on.

A trend in recent years is the increase in the number of foreign students who come to study in North America's universities. Some years ago when the local enrollment was well below capacity, there was a need for more students in order to increase revenues (the marginal cost is decreasing when adding more students to "empty" universities), and therefore, foreign students were welcome.

However, the recent recession and the high rate of unemployment have changed the picture and many unemployed Canadians have returned to school. The opportunity cost of

education in such a case is approaching zero, which in turn reduces the cost of education to domestic students. As the number of students goes up, we have the phenomenon of a congested good.

The enrollment at the University of Manitoba is at its peak, and foreign students are asked to pay more in most of the provinces in Canada. Ontario and Quebec have decided to increase the tuition fees for foreign students with very little subsidy. In most other provinces, foreign students pay $1,000 to $2,000 more than Canadian students. Only Manitoba and Saskatchewan have yet to increase the tuition fees for foreign students. (American students are also considered to be foreign students when applying to universities in Canada).

Is it "fair" for Canadian taxpayers to subsidize foreign students? This question is asked again and again but is difficult to answer. The demand for education by the local population has increased and more space is needed in order to accommodate this demand; therefore, a related question to pose is whether Canadians should have priority when applying to a Canadian university.

Before proceeding further, we should examine the economic benefits that foreign students bring to Canada as well as the costs which they impose. Whichever is greater will suggest whether, on balance, foreign students under a highly subsidized tuition fee structure create an economic burden on Canadian society. A final judgement about

admission and tuition fee policy with respect to foreign students would have to consider, as well, the non-economics (i.e. cultural) benefits inferred by the presence of foreign students in Canada.

In this thesis we develop an analytical framework for evaluating the benefits and costs of the presence of foreign students at a Canadian university; in particular, the University of Manitoba.

As will be shown later, the assessment of the costs which foreign students impose on the economy is easier and more accurate than the assessment of the benefits which they generate. Our modest objective is, therefore, to shed some light on the application of a cost-benefit analysis to this issue, by using some theoretical tools and then by combining them to try and come to a tentative conclusion concerning university policy with respect to foreign students.

Sims and Stelcner developed a methodological framework for analyzing the costs and the benefits of foreign students to Canada. Our study differs from theirs in so far as we undertake an empirical analysis within the same basic methodological framework. Moreover, they confine their framework strictly to the costs and benefits to Canadians while we consider as well a broader framework which includes the involving costs and benefits to the foreign students themselves.

The cost-benefit measure is highly subjective when many groups and individuals are involved. Moreover, one needs accurate data and information in order to analyze the issue and come to a definite conclusion.

In analyzing the cost side of the question of foreign students in Canadian universities, we can identify several distinct groups which incur costs. First, the foreign students themselves incur expenses relating to their presence at a Canadian university; for example, tuition fees and living expenses. Federal and provincial governments provide a higher subsidy to universities because of the presence of foreign students, (assuming that the university's enrollment would be reduced if foreign students were not admitted); this subsidy constitutes a cost borne by Canadian taxpayers. In addition, foreign aid agencies such as Canada International Development Agency (CIDA) provide financial assistance for some foreign students; the funds for CIDA are of course, derived from Canadian taxpayers.

On the benefit side, we can identify both quantifiable and non-quantifiable benefits. For foreign students, the quantifiable benefits are reflected in the value that they attach to higher education. Such benefits can be estimated by deriving a demand curve for foreign students for higher education. The non-quantifiable benefits from the presence in Canada of foreign students accrue to both Canadian and foreign students as well as to Canadian society at large

from cultural interaction. The major quantifiable benefit to Canada from the presence of foreign students is the income generated by their expenditures on Canadian goods and services through the export multiplier. The concept is discussed in principle and some tentative estimates of this benefit are provided. The money that foreign students spend in Manitoba may well utilize otherwise unemployed resources, but it is highly complicated to measure its net effects.

Each chapter is largely self-contained, introducing various aspects of the issue of foreign students in a Canadian university. However, all chapters are interrelated in focusing on different aspects of the same issue.

We begin Chapter II by introducing some relevant theoretical models based on the theory of clubs. The two main contributors to this literature are James Buchanan and Y.K. Ng. Buchanan's club constitutes an "organization of membership or sharing arrangements where 'exclusion' is possible."[1] The club can be a sport club or a university in our particular case. The central question in the theory of clubs is that of determining the optimal capacity of the facility and the optimal size of the membership; in our example, the issue is the optimal capacity of the university or a particular faculty and the optimal number of students to be accepted.

Buchanan's model assumes that the goal of members of a club is to maximize the average net benefit per individual

member. In contrast to this, Ng's model examines the welfare implications of the club maximizing total net benefit. Buchanan is more concerned with the club members' interest whereas Ng adopts the viewpoint of society at large.

If the economic literature on the theory of clubs is to be of use to policy makers, they must identify which groups are appropriately modelled as club members in their analysis of university policy, for example, should the students in a professional faculty comprise the club membership? Or should the club comprise a particular professional group? Or should the club be viewed as Canadian society as a whole? We have adopted the approach of analyzing the issue from the perspective of each of the parties involved.

It is interesting to note that it is not uncommon for an individual's attitude and perspective to reflect his own interests. Thus, a new student who wishes to enter the Law Faculty may advocate a relaxation in entry standards, while his attitude after being accepted to the Law Faculty may well be to make entry much more difficult. After becoming a lawyer it may be in his economic interest to limit still further the number of students entering the Law Faculty.

In Chapter III, we estimated how much money foreign students spend in Manitoba, and how much they would be willing to spend on tuition fees by means of a survey. A questionnaire was distributed among 200 foreign students

currently enrolled at the University of Manitoba. Of this number, 160 usable replies were received. The questionnaire asked the students to outline their expenditures in Canada such as tuition fee, books, rent, food, clothing, entertainment, transportation, and other costs.

From the above information, we calculated the amount of money which foreign students spent in Manitoba. This information provided the basis for determining the income generate in Manitoba by foreign students. Such a provisional quantitative exercise was undertaken even though an accurate calculation requires knowledge of the export multiplier as well as knowledge of the extent to which resources employed by foreign student expenditures would otherwise have been idle.

It is important to note that foreign students can engage only in limited types of work when staying in Canada, and therefore, most of the money which they spend here originates outside Canada, thereby increasing Canada's foreign exchange reserves, particularly reserves of American dollars (since in most cases, the money which foreign students bring from abroad is American currency).

The second part of the questionnaire was designed to determine how much of the foreign students' income is derived from sources outside Canada and how much is earned from jobs permitted by the University of Manitoba and the immigration authorities.

Foreign students were also asked to estimate their demand for higher education in Manitoba. The demand curve that we estimated differs from the usual demand curve and explanations for its introduction and a detailed discussion of its properties is also provided in Chapter III.

As noted above, the benefits that foreign students bring to Manitoba are of both the quantifiable and non-quantifiable variety. To use the cost-benefit approach, only quantifiable benefits can be compared with the costs impaired by foreign students. The comparison of non-quantifiable benefits and costs is a very subjective exercise. In Chapter IV we provide an analytical framework for determining the economic benefits generated by foreign students expenditures on Canadian goods and services. Although such economic benefits are, in principle, quantifiable, they are in practice extremely difficult to calculate with much confidence, because information about the export multiplier needed for the analysis is highly unreliable.

Chapter IV describes in general terms the economic theory of fiscal policy introducing the reader to the concept of the national income multiplier. The second part of this chapter calculates the present value of the national income generated by expenditures by foreign students in Canada. The data was gathered from the survey described in Chapter III; utilizing the multiplier contained in the RDX2 model we derived an estimate of

national income generated by foreign students expenditures in Canada.

Moreover, the total net benefit to foreign students was derived from the expectational demand curve discussed in Chapter III, and was included in the more comprehensive international framework of cost-benefit analysis.

The costs to taxpayers of educating a foreign student (and indeed any student) is the subsidy to that student by the Canadian government. The private resource cost of educating a student minus the tuition fee he/she pays is the public subsidy provided for that particular student. Chapter V examines and compares the concepts of average student cost and average incremental student cost. Using constant 1981 dollars, we calculated the average cost and the average incremental cost of a student during the past five years at the University of Manitoba. It is obvious that the average student cost is considerably higher than the tuition fees paid by the students.

Finally, the comparison of the estimated benefits with the costs of educating foreign students is presented in Chapter VI, where we reach some tentative conclusions.

CHAPTER II

Some Relevant Theoretical Tools

A university is a non-profit organization with the objective of producing the service of higher education. The manager of a non-profit organization is expected to maintain a balance between the efficiency of resource allocation and the effective achievement of the production of services.

The university can also be treated as a labour-managed enterprise. The objective of the enterprise is "to maximize the welfare of its members subject to the production functions, the budget constraint and any other externally imposed constraints."[1]

The actual allocation of resources in universities tends to be made on a historical basis within the political process.[2] The result is not always an efficient allocation of resources. To achieve efficiency one should determine resource allocation (e.g., the size of faculties) on the basis of the demand for and supply of particular courses and professional training.

In order to determine the efficient size of universities and the optimal number of students, the theory of clubs, as introduced by James Buchanan,[3] will be discussed. This theory is useful in shedding light on the

issue of whether, in fact, restriction on foreign students' enrollment should be implemented.

It should be noted that what is meant by the "socially optimal number of students" enrolled at the university depends upon whether we adopt a strictly national (i.e., Canadian) viewpoint and exclude the net benefits derived by foreign students from higher education in Canada, or whether we adopt a comprehensive international viewpoint and include the net benefits accruing to foreign students. This issue will be further examined in the final section of this chapter.

The Formal Theory of Clubs

We begin by defining some relevant terms. Public goods are commodities which provide benefits to more than one individual at the same time. Such goods as services of defence and flood control are jointly consumed.[4] Some goods can be called pure public goods when one individual's consumption of a particular good does not detract at all from the benefits of other people. Moreover, the use of pure public goods may be non-excludable. It may be impossible or very costly to exclude individuals from the consumption or use of the public good.[5]

Impure public goods are neither private nor public. They exhibit the phenomenon of "congestion" in the economic literature.[6] One such congested good is what Buchanan has

called "club goods", such as golf courses, swimming pools, and so on. The capacity of a club good is limited and subject to congestion costs. Moreover, as an impure public good, a club good is a good from which exclusion is possible.[7]

The analysis of the theory of clubs is concerned with the optimal size of a club good and with the optimal number of users. Local government services have the characteristics of club good; for example, public libraries, fire and police protection, and a public swimming pool are all club goods.

In this thesis, we take the view that the university is also a club good, and therefore the theory is highly relevant to the analysis of university policy. In Buchanan's model, which is the foundation of the theory of the club, all members are assumed to be homogeneous and to share equally the public good and its associated costs. In addition, it is assumed that the club does not discriminate against any of its members, i.e., all pay a uniform price and enjoy the identical level of services. The "Buchanan club" is a decentralized, voluntary organization. no centralized control is needed, because all members have the same goals.

Buchanan presents the utility function for an individual, including public goods and with the assumption of equal sharing as:

$$U^i = U^i \left[(X_1^i, N_1^i,) \ (X_2^i, N_2^i), \ldots, (X_{n+m}^i, N_{n+m}^i) \right] \quad [8]$$

where: U^i = the utility function for individual i

X = good x

N^j = number of people who are sharing good x_j;

where: $j = 1,...n+m$

$1,2,3,...,n+m$ = type of commodity

The cost of production function is:

$$F = F^i[(X_1^i, N_1^i), (X_2^i, N_2^i), ..., (X_{n+m}^i, N_{n+m}^i)]$$ [9]

The addition of members to a sharing group will affect the cost of the good to any one member. If students had to pay the full cost of operating a university, then increasing the number of students in the university would reduce the average cost and thus the cost borne by each student. In fact, all students pay just part of the costs and the rest is subsidized by the government. Moreover, tuition fees in the short-run are independent of the number of students attending the university. If fewer students enrolled in the university, then in the long run tuition fees would go up.

From the above two functions, Buchanan derives the necessary marginal conditions for Pareto optimality with respect to consumption of each good: $\frac{U_j^i}{U_r^i} = \frac{f_j^i}{f_r^i}$ [10]

For the i^{th} individual the marginal rate of substitution (MRS) between good x_j; and x_r in consumption must equal the marginal rate of substitution between the same goods in production. (x_r is a numeraire good).

Buchanan adds $\frac{U^i_{Nj}}{U^i_r} = \frac{f^i_{Nj}}{f^i_r}$ [11], which says that the "marginal rate of substitution in consumption" between the size of the group sharing in the use of good x_j and the numeraire good x_r, must be equal to the marginal rate of substitution "in production."[12] In other words, when an additional member joins the club, the previous member obtains full equilibrium in club size only when marginal benefits (with a negative sign) equal marginal costs (also with a negative sign).

We combine the last two conditions to get:

$$\frac{U^i_j}{f^i_j} = \frac{U^i_r}{f^i_r} = \frac{U^i_{Nj}}{f^i_{Nj}}$$ [13]

This is the necessary marginal condition with respect to the consumption of x_j.

By the use of geometry we clarify the argument. The following diagram (figure 1)[14] shows the optimal number of members in a club at N_i^* with all individuals assumed to be identical and the size of the club facility given. When marginal benefit equals marginal cost, and average benefit is maximized for each identical member of the club, the optimum size is achieved; i.e, at N_i^* in figure 1.

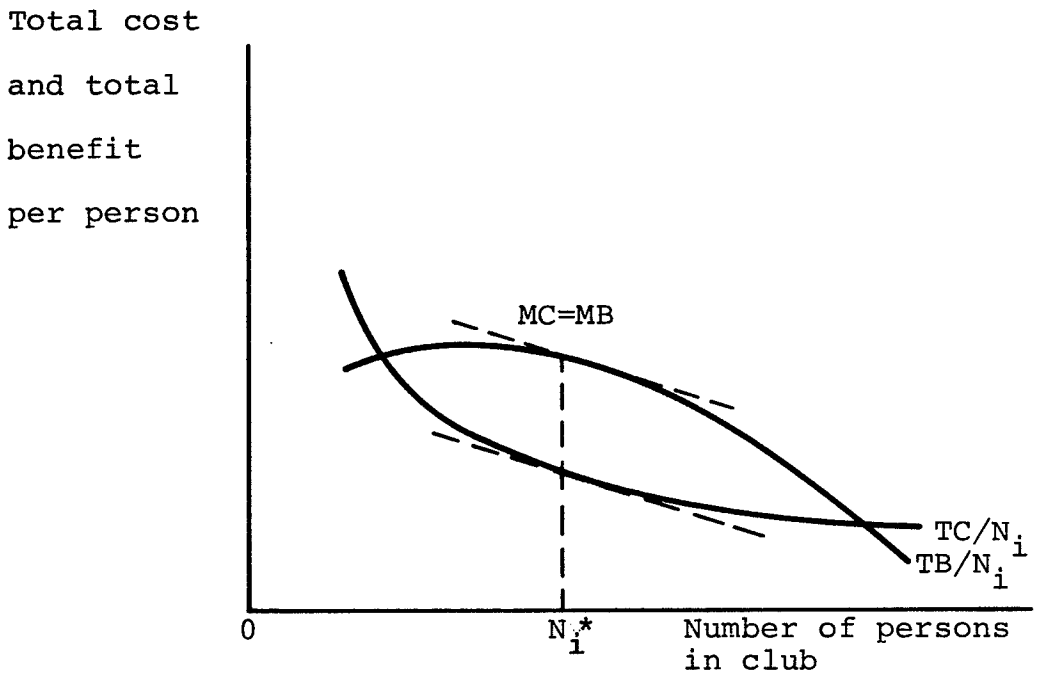

Figure 1

As more people are allowed to share the facility, the marginal benefit declines and the marginal cost declines as well. In our case, more students in a classroom will create more crowding conditions and each student will receive, on average, less attention by the professor. On the other hand, the presence of many students in university may be considered desirable from a social point of view.

The next diagram (Figure 2) depicts two cases. When one individual is considered, the costs are greater than the benefits; thus a one-person club is not desired.

However, when the number of members is a fixed number, k, marginal cost is assumed constant and marginal benefit is assumed to be falling. Q_k is the optimal club size for a club of membership size N = k.[15]

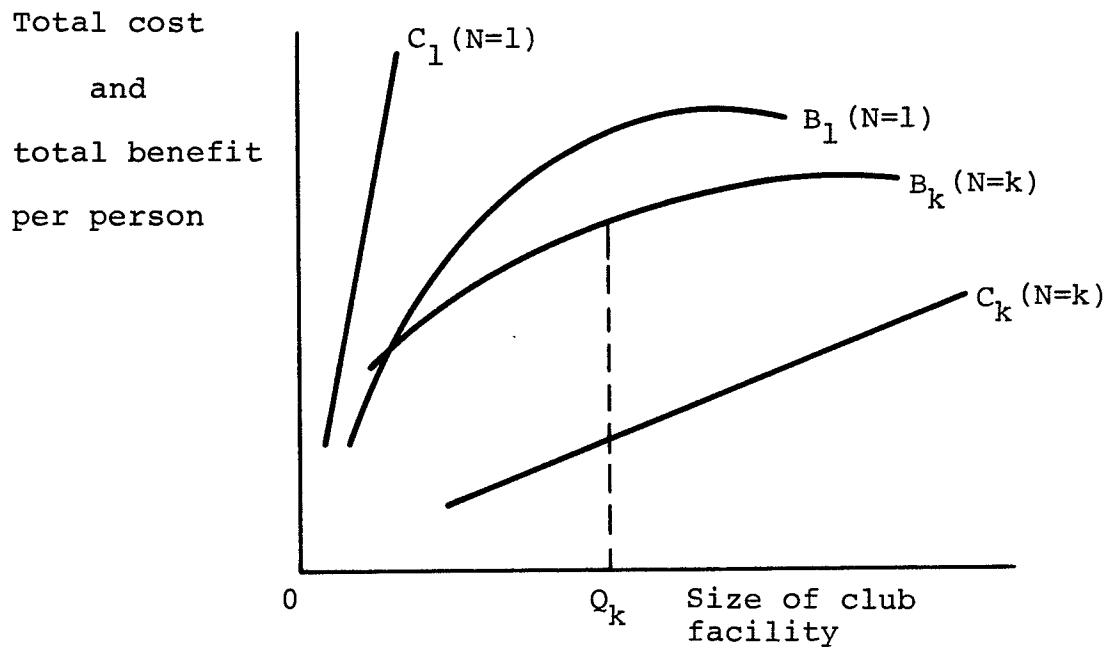

Figure 2

We combine the above two diagrams in order to get the equilibrium point, G.[16] in figure 3.

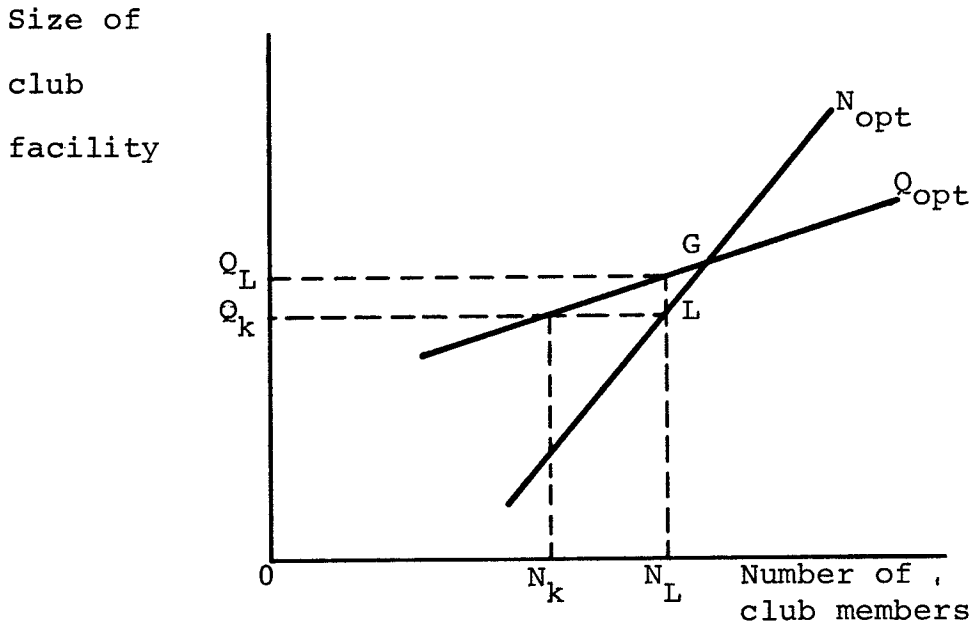

Figure 3

The point G is the full equilibrium. N_{opt} and Q_{opt} are lines of optima; N_{opt} depicts the locus of the optimal number of club members for each possible club size; Q_{opt} depicts the locus of the optimal club size for each possible fixed number of club members; and G is the top of the ordinal utility mountain. The relationship in this example is of complementarity between increasing the size of the club and increasing the size of the sharing group.

Suppose, for example, that the sharing group is limited to size N_k as is the case in many faculties, e.g., law, medicine, business administration. Then, the club size Q_k enables the sharing group N_k to maximize its average net

benefit. However, if the size of the club facility is Q_k, the number of sharing members which would maximize net benefits per member would be N_L. But for membership N_L, the optimal size of club facility to maximize net benefits per member would be Q_L. Thus it can be seen that full equilibrium would be attained uniquely at G.

Assume the size of the university is fixed (e.g., at Q_k). Now what is left to determine is the number of students in order to maximize average net benefits per student. If the decision is made on the basis of maximizing average net benefit per student, the number of students that would be admitted would be N_L in the diagram. In fact, the basis upon which admissions are set will depend as well on the market needs for these professions.

While Buchanan maximizes the utility function of a single individual in deriving the Pareto-optimality conditions, Y.K. Ng considers the aggregate marginal valuation rather than the individual marginal valuation. According to Ng, N_j enters into the utility function of the club members, where N_j = number of individuals consuming the j^{th} collective good, and they cannot vary N_j at will.

$$\sum_{i=1}^{N_j} \frac{U^i_{xj}}{U^i_{xN}} = \frac{f^i_{xj}}{f^i_{xN}} \quad 12$$

where: x_n is a numeraire.

x_j = the good consumed by the club members.

Ng maximizes <u>total net benefit</u> (in contrast to Buchanan's assumption of maximizing average net benefit per club member), as can be seen in the following diagram:[18] (figure 4)

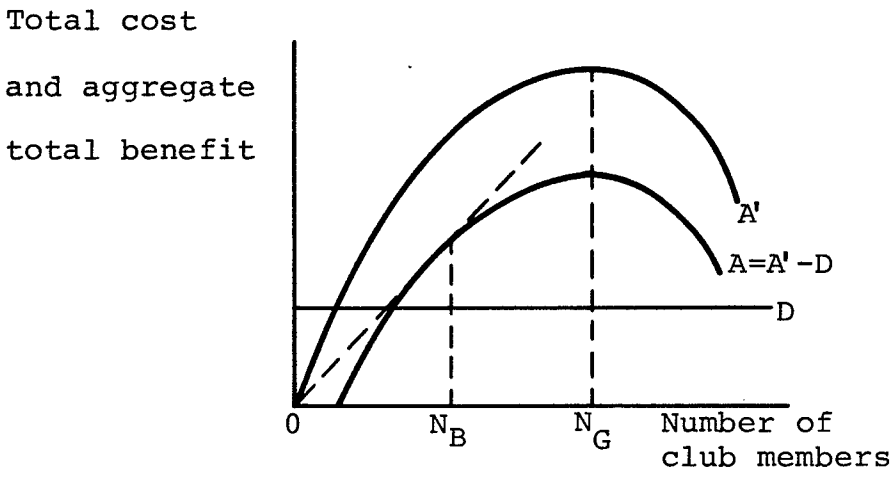

Figure 4

Where: A' = aggregate total benefit curve, i.e., the total benefit per person aggregated over all members in the club, for a given size Q' of the club facility.

where: D = total cost curve

A = A' - D = aggregate net benefit curve

N_G = Ng's optimal number of the club members, where both A' and A obtain their maxima.

N_B = Buchanan's optimal number of the club members for fixed size Q', maximizing <u>average</u> net benefit per club member.

The next diagram [19] (figure 5) depicts a number of "A" (i.e., net benefit) curves. Each curve A_i corresponds to a different fixed size Q_i of the club facility. The larger the size of the club facility, the higher the aggregate benefit, but also the higher the total cost. Therefore, the aggregate net benefit may increase or decrease.

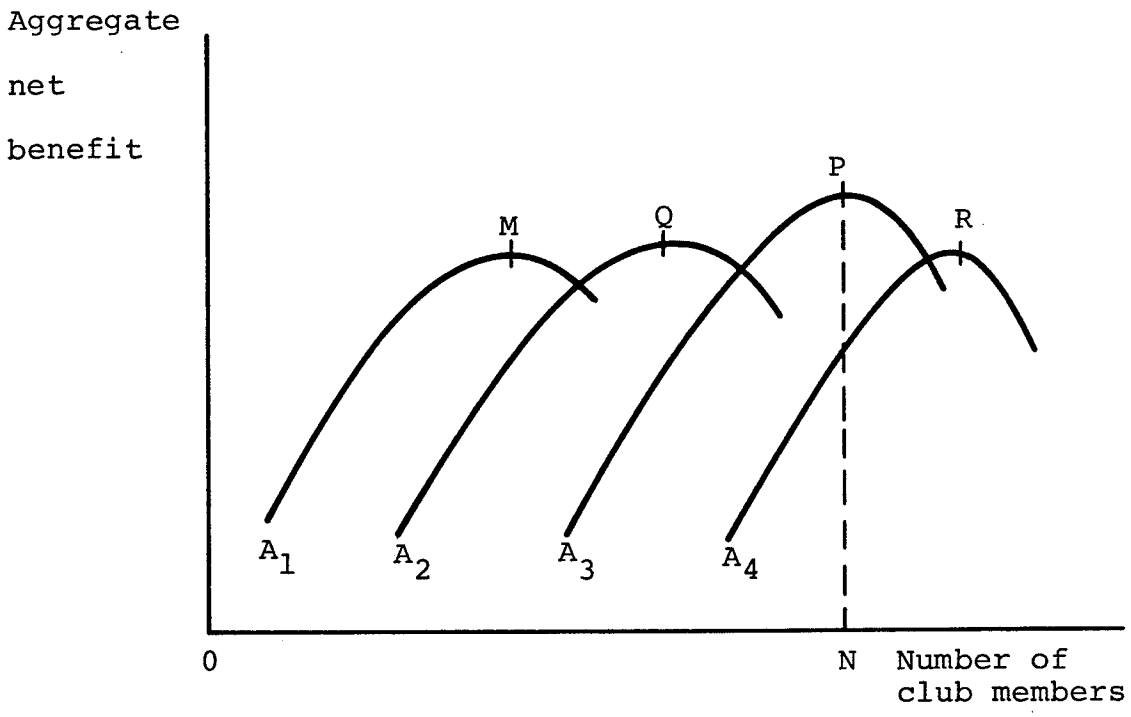

Figure 5

We choose the highest maximum amongst M, Q, P and R in the diagram, which is point P, determining both the optimal size of the club facility Q3 and the optimal number of members N, as shown by the curve A3.

The equilibrium point will occur when marginal benefit equals marginal cost, or when marginal net benefit equals zero.

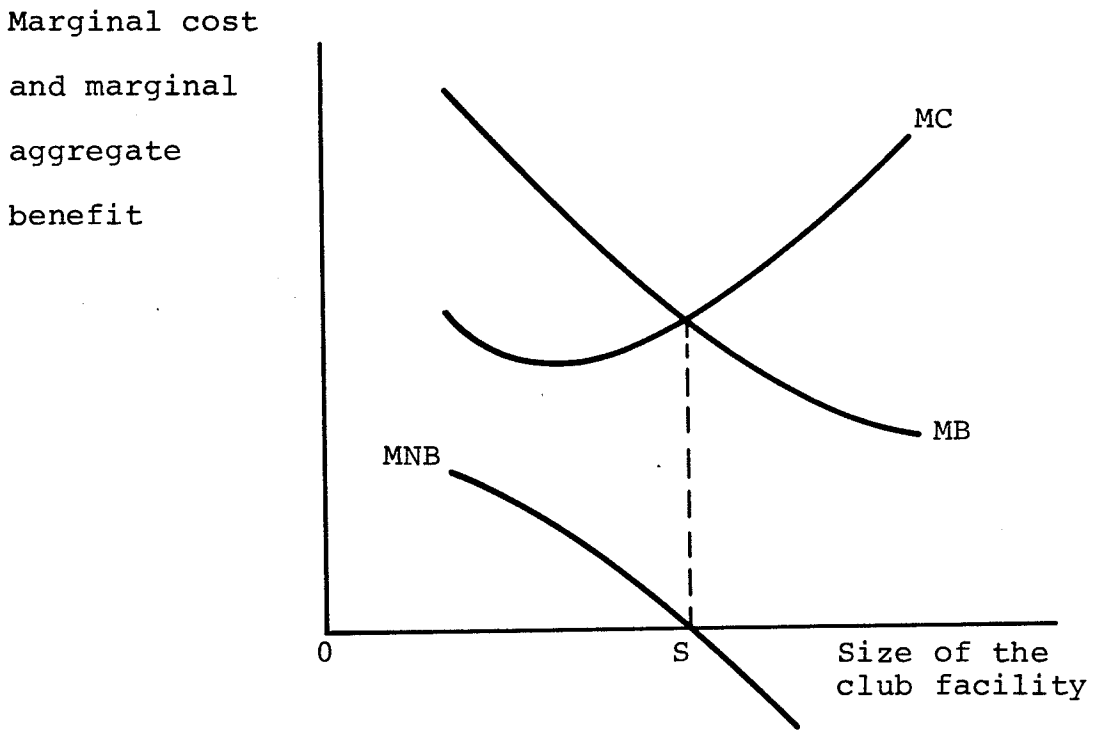

Figure 6

In the diagram above[20] (figure 6) the membership size is fixed. The optimal size of the club facility is where

marginal net benefit equals zero. When the size of the club facility is larger, marginal cost exceeds marginal benefit and Pareto optimality will not occur.

Ng's solution would appear to be more relevant to the setting of the university. From the view point of the central administration of the university, maximization of <u>total</u> net benefit seems plausible. From the view point of students currently in a professional faculty, the narrower goal of maximization of <u>average</u> net benefit would be a reasonable objective.

Buchanan and Ng's analysis can be summarized in the following diagram[21] (figure 7):

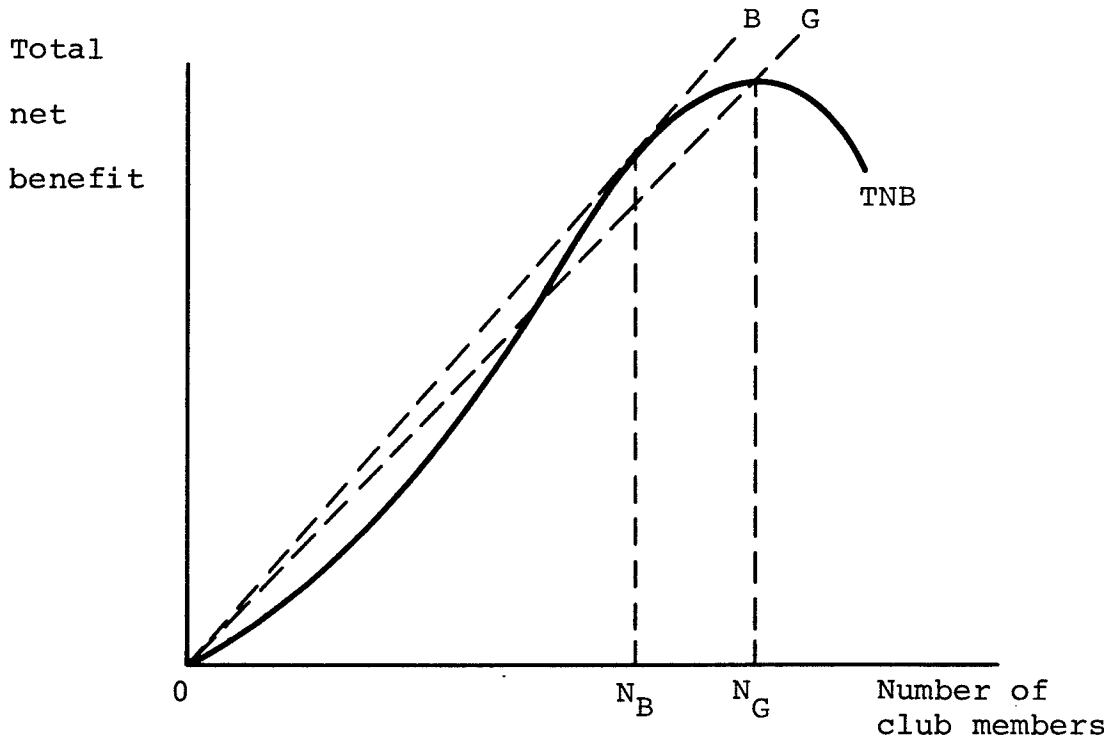

Figure 7

where: N_B = the number of club members which maximize average net benefit, i.e., Buchanan's optimum; and,

N_g = the number of club members which maximize total net benefit so that marginal net benefit equals zero, i.e., Ng's optimum.

The slope of a ray from the origin to the total net benefit (TNB) curve equals the average net benefit. OB has a steeper slope than OG, therefore average net benefit at N_B is greater than average net benefit at N_G, whereas total net benefit is at a maximum at N_G club members.

According to Ng the equilibrium size of a club occurs where average net benefit is maximized, i.e, at N_B in the above diagram. Buchanan's equilibrium number of members is smaller than the socially optimal size where total net benefit is maximized, i.e., at N_G in the above diagram. There arises the welfare question of whether to increase the Buchanan equilibrium number of members. Ng argues that an appropriate subsidy will cause an increase in the number of members until total net benefit to the members is maximized.[22]

In the diagram: (figure 8 below)

N = number of members

S = subsidy

T = total net benefit

S/N = average subsidy per member

MNB = marginal net benefit

$\frac{T + X}{N}$ = average net benefit <u>after</u> subsidization

ANB = T/N = average net benefit <u>prior</u> to subsidization.

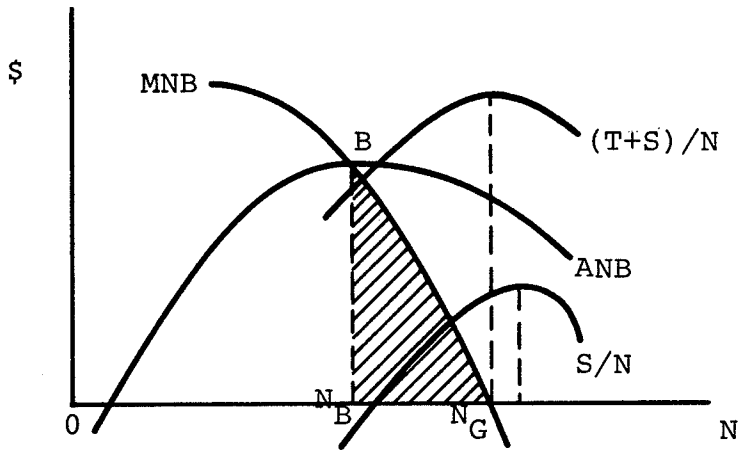

Figure 8

The potental welfare gain of increasing the club membership from N_B to N_G is the area of N_BBN_G (it can be seen also as a consumer surplus). Ng suggests, therefore, that subsidy will increase the number of members until

total net benefit to the members is maximized at N_G. In other words, with the assumption of equal cost sharing, the number of members will increase until marginal benefit of the last member equals average cost per person.

All the diagrams above are two dimensional. They all illustrate the relationship between two variables: for example between the size of a club facility and the number of persons in the club, or between total net benefit to club members and the number of members in a club and so on. The relationship between all three variables can be shown by means of a single three-dimensional diagram, illustrated in Figure 9 on page 26.

In the horizontal plane we depict the size of the club facility, S, and the number of members in a particular club, N, while on the vertical axis we depict the total net benefit to the club members, Z.

The optimum occurs where total net benefit, Z, is maximized. In our diagram, this occurs at point M where S = S' and N = N' and total net benefit attains its maximum value Z'. The three-dimensional graph depicts Z = Z (S,N), i.e., the total net benefit is shown as a function of S and N. At its maximum point M' = (S', N', Z')

$\frac{\partial Z}{\partial S} = \frac{\partial Z}{\partial N} = 0$, the first order condition for a maximum.

The second order condition for a maximum value of Z is also satisfied at M'. M' occurs in the diagram at the top of the hill; any movement away from M' will result in a decrease in Z.

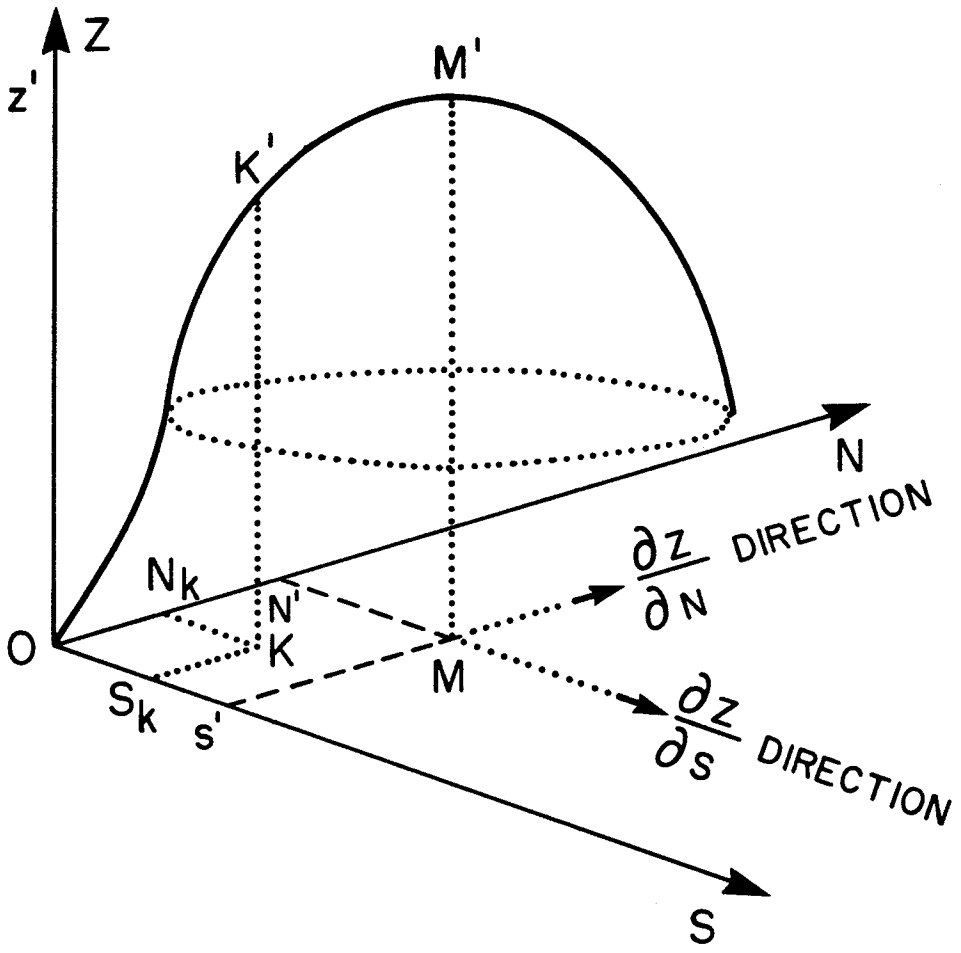
Z
z'
M'
K'
N
N_k
$\frac{\partial z}{\partial N}$ DIRECTION
N'
K
O
M
S_k
s'
$\frac{\partial z}{\partial s}$ DIRECTION
S

Figure 9

If a club facility such as a university were free to vary simultaneously both S and N, it would select (S', N') to achieve maximum total net benefit Z'.

Students all over the world pay lower tuition fees in public universities subsidized by governments. Because of a policy of limiting enrollment on the basis of higher academic entrance requirements in many universities, some students are denied the opportunity to study, even if they can afford to study. If a general increase in the tuition fee replaces high academic entrance requirements as a device to limit enrollment, wealthier students with lower academic qualifications might be able to study by replacing students who are unable to afford the high tuition fee and drop out. If instead only the tuition fee for foreign students is increased, this policy would not induce academically qualified lower income Canadian students to leave the university.

In the following section, we examine the economic effects of price discrimination between club members.

Some Theoretical Insights on Price Discrimination

Price discrimination occurs when tuition fees are not the same for everyone. In many provinces foreign students must pay higher tuition fees. On the other hand, the acceptance of foreign students who apply to study in a

Canadian university may preclude some Canadians from attending university because of capacity limitations.

Thus, the concept of discrimination can be quite ambiguous and may require different approaches in its analysis. Our analysis is concerned only with the economics of discrimination. An example of Sandler and Tschirhart[23] illustrates the issues involved:

Club Size	1	2	3	4	5	6	7	8	9	10
Total net benefit	0.4	1.5	9	16	17.5	18	14	8	0	0
Average net benefit	0.4	0.75	3	4	3.5	3	2	1	0	0

When the number of members is 4, each receives a payoff of 4 and no member can do better by abandoning the club. Here, average net benefit is at its maximum. If discrimination is practiced against member 1, the payoffs are (0.4, 5.2, 5.2, 5.2). The total net benefit is 16 which is the same as before; however, the benefit to member 1 is different than that occurring to all the other members-an example of economic discrimination. Member 1 could do not better by dropping out of the club since he cannot get more than 0.4 when forming a one-member club. If two members were the victims of economic discrimination, where the payoffs are (0.4, 0.4, 7.6, 7.6) members 1 and 2 could abandon the club and form a new club of two where average net benefit for each will be 0.75 (which is greater than 0.4).[24]

In general, economic discrimination can occur without inducing members of a group to leave, so long as the following condition holds: $\sum_{i \in S} X_i \geq V(S)$ where $V(S)$ = the payoff which coalition S can secure on its own, and x_i = the payoff to member i in coalition S. If the payoff vector is (0.75, 0.75, 7.25, 7.25), then members 1 and 2 could be the victims of discrimination with still no incentive to form their own club.

Now, imagine discriminatory tuition fee increases assessed only for foreign students at the University of Manitoba. In such a case, foreign students either will have to bear the discriminatory increased tuition by remaining at the University of Manitoba, or they will have to study elsewhere.

Going back to our example, assume that two identical clubs differ only in their respective payoffs of (0.4, 5.2, 5.2, 5.2), and (4, 4, 4, 4), with the first club discriminating against member 1 and the second club following a policy of equal payoffs to all members. Clearly, member 1 could leave the first club and join the second club and receives a payoff of 17.5 / 5 = 3.5 which equals the average net benefit per member. This result suggests that multi-club world provides safeguard against price discrimination.[25]

Applying this result to the issue of foreign students, as was noted above, if only some universities charge higher tuition fees for foreign students, they can change

universities. However, differential tuition fees are not imposed because of a desire to discriminate against a minority group; they are motivated essentially to avoid subsidizing students who are not Canadian citizens. Moreover, in order to reduce the demand by foreigners for Canadian education and to allow more Canadians to enroll in universities, the concept of differential tuition fees, has been applied in many parts of Canada, particularly where the demand is elastic.

From the table above one can see that club of four members would maximize average net benefit (as in Buchanan's model), whereas a club of six members would maximize total net benefit (as in Ng's model). However, in order to yield a Pareto optimum, a club of six members is required. Therefore, economic efficiency would require that universities adopt the goal of maximizing total net benefit rather than average net benefit.

Defining the Appropriate Club

The previous discussion dealt with the benefits and costs perceived by the members of a club; such members were interpreted to be students at a university. However, there are two alternative interpretations of club groups which should be considered: the professional community and society as a whole.

Lawyers, accountants and physicians each comprise a distinct professional community. in order to secure their revenues, such groups, in cooperation with their respective professional faculties, establish a limit on the number of students to be accepted and/or graduated.

for example, some professional faculties accept approximately one hundred to two hundred students each year. Since in the legal profession, for example, some lawyers die or retire or leave the province each year, the new supply of graduates may just offset this loss in numbers. Some years the total may rise or fall, but on average, the number of lawyers may well remain constant assuming that a given population of lawyers is operating at full capacity with zero population growth in the community.

We adopt the view that the professional community wants to maximize its average net benefit. Of course, each individual professional wants to maximize his/her own personal net benefit. One can view the professional group as a monopoly of lawyers, accountants or physicians which wants to maintain the earnings of its members at as high a level as possible. Moreover, for the effective provision or services, a minimum number of people is required in each profession. Therefore, every year a new supply of professionals to the market will keep their numbers in balance.

Using the same tools as before, the following diagram (figure 10) illustrates the net benefits of new graduates to the professional community.

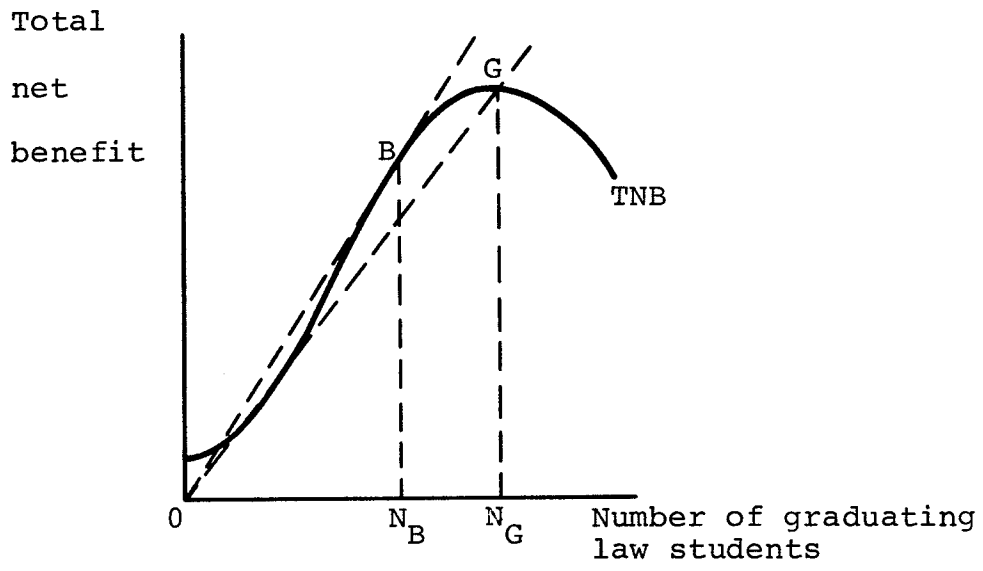

Figure 10

A ray from the origin tangent to the total benefit curve at point B determines the number of graduates required to maximize the legal profession's average net benefit; the number of graduates would, if the decision were left to the legal community, of course, be less than the socially optimal number.

Let us assume that the university at large has the same net benefit schedule as above. The university's goal would be to maximize total net benefit which, in the

diagram above, would require that the number of graduating lawyers be N_G.

The above analysis has implicitly assumed that the TNB schedule includes costs and benefits to Canadians only. However, if we adopt a broader framework of analysis and include the net benefits realized by foreign students as well, we derive the <u>revised</u> total net benefit schedule, TNB', which of course lies above TNB.

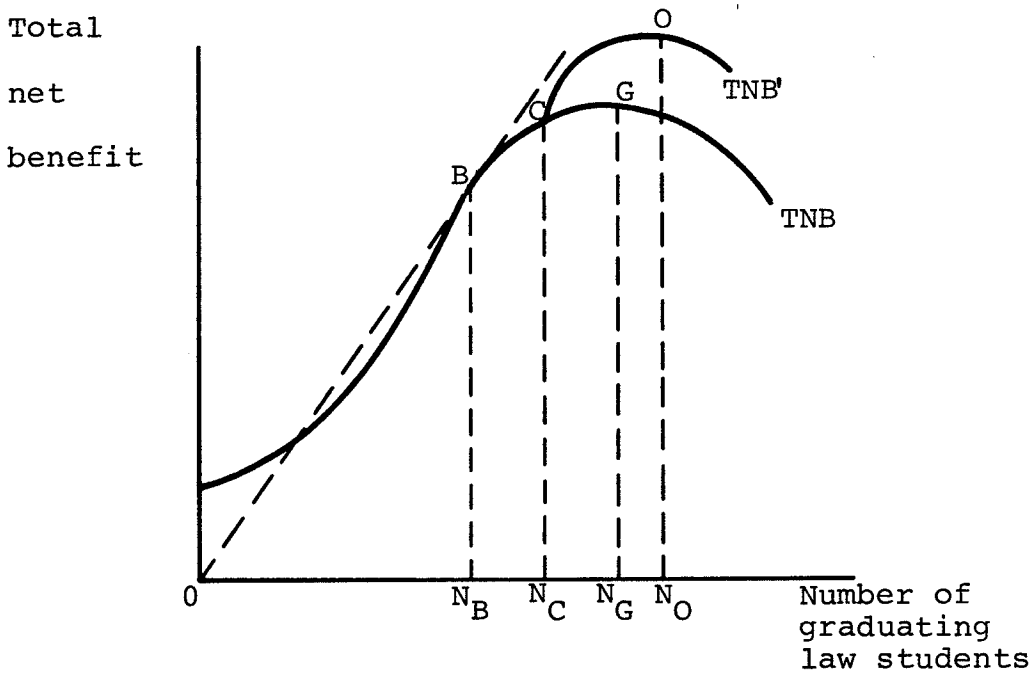

Figure 11

In the diagram above, (figure 11) we make the following two assumptions:

(i) N_C = number of Canadian students who fulfill university entrance requirements in, say, the faculty of law.

(ii) the university adopts a "Canadian first" policy; i.e., it accepts all eligible Canadian students subject to capacity limitation; only if capacity has not been reached would foreign students then be accepted.

We reach the following conclusions:

1. From the strictly Canadian viewpoint, the optimal number of foreign students = N_C N_G; and
2. From the international viewpoint, the optimal number of foreign students = N_C N_O.

We note that, with our assumptions,

$$N_O > N_G > N_C > N_B$$

The divergence between TNB and TNB', beginning at N_C students, reflects the fact that TNB' <u>includes</u> the net benefits accruing to foreign students, whereas TNB <u>excludes</u> such net benefits and therefore lies below TNB'.

It should be noted that the empirical derivation of the total net benefit schedule requires knowledge of the marginal cost and marginal benefit to Canada of admitting students to the university, whereas the TNB' schedule includes knowledge of net marginal benefits to foreign students as well.

The computation of the benefits to foreign students of university education requires knowledge of their demand curve for such education. In Chapter III, we discuss our procedure for estimating a probabilistic variant of such a demand curve.

CHAPTER III

Empirical Analysis

Survey Description, Results and Interpretation

This chapter is essentially the survey that was done to determine the amount of money spent yearly by foreign students in Manitoba. The purpose of the thesis as was described in Chapter I is to calculate the costs and benefits of foreign students to Manitoba. This in turn will help us to decide whether the province of Manitoba can benefit by accepting these students to its universities.

The survey was done only at the University of Manitoba. In the academic year of 1982-83 there were 1,429 foreign students while in the academic year of 1983-84 there were 1,853 foreign students. The survey included one hundred and sixty foreign students which is approximately ten percent of the average number of foreign students who studied at the University of Manitoba in the last two years.

Because the population of foreign students originates from many nations and attends various faculties, a cross-section survey was needed. The students were randomly selected in various places on campus. There is available information as to the number of females and males among

foreign students, so they were not arbitrarily chosen as far as their gender is concerned.

The number of males in the survey amounts to 115 while the number of females is 45. One can accept these numbers as a true representation of the foreign students group according to their gender.

However, the students were chosen according to their country of origin. The Institutional Statistics Book presents every year a list of all the countries of origin of foreign students attending the University of Manitoba. Therefore, the purpose of a cross-section sample is to have sample representatives from various places. In our case ten percent of the total population of foreign students was chosen and the distribution of students by country of origin in our random sample approximately equals to the distribution in the total foreign students population.

Most of the foreign students came from Hong Kong and Malaysia. Many came from Africa and India, and quite a few from Trinidad-Tobego. The following is the list of countries represented in our survey: Botswana, China, Ethiopia, France, Ghana, Great Britain, Guyana, Hong Kong, India, Iraq, Israel, Kenya, Korea, Mecao, Malaysia, Mauritius, Nigeria, Pakistan, Singapore, Sri Lanka, Sudan, Tanzania and Trinidad-Tobego.

It was much easier to identify students from Asia, Africa, and Central America than students from Europe.

Therefore, the representative percentage of the latter group is smaller than the former group.

Another consideration was the type of studies. Again no official information is available, so by observations alone, the students were selected from various faculties. Faculties such as Administrative Studies and Engineering, and some other professional faculties put a limit on the number of foreign students admitted. One can observe many foreign students (especially from Hong Kong and Malaysia) enrolled in the Science Faculty. Some are in Arts and quite a few in Graduate School. The following is the list of faculties represented in our survey: Administrative studies, Agriculture, Architecture, Arts, Education, Engineering, Graduate School, Human Ecology, and Science.

The students were asked to complete a questionnaire that asked them to estimate the components of their yearly expenditure in Manitoba. The questionnaire can be found in Appendix I.

Foreign students were first asked to provide some personal details such as: country of origin, faculty attending, gender and number of years spent in Canada. The last detail is varied, and the average was found to be 3.57 years. the standard deviation in this case being 1.22 years.

The first section of the questionnaire deals with annual expenses. the tuition fee is the first item on the list. On average, foreign students pay $1,109.00 per year.

Some students included inter-session fees as part of the tuition fee estimates, but others did not. Therefore, one would conclude that because they are not allowed to work, they spend more than $1,100.00 per year on tuition fees.

The same can be applied to books. On average, foreign students (according to the sample) spend $244.80 per year on books. Those who attend summer school may spend more. Some students included stationary and typing services as part of this category of expenditure.

Health insurance is the same for all single foreign students. It is $215.00 per year for a twelve month period. Some of the answers on the questionnaire were $220.00 - $250.00; thus the average was $222.26 with a standard deviation of $21.71. The real price is $215.00 and the deviation occurred because of inaccurate responses by some students (perhaps based upon inaccurate recollection, carelessness, or a preference for "round" numbers).

Rent and food are two major items of expenditure. On average foreign students pay rent at the rate of $1,804.84 per year with standard deviation of $782.56. On food they spend $1,424.10 on average, with standard deviation of $656.73.

There are many foreign students living on campus. No information is available as to their number. However, the cost of a double occupancy at University College residence for 1984-1985 is $1,217.00 for the eight months of school (or $35.20 per week). Board for the same period is

$1634.00. Total costs are $2,851.00 per eight months or $356.38 per month. This is more expensive than renting and sharing an apartment according to our findings. Thus, the students who live on campus pay even more than the others.

Another type of expenditure that was mentioned is: clothes with an average of $332.10 per year. Because it is assumed by many that women spend more on clothes than do men, the sample in question of these foreign students shows the following results: the forty-five female students spend an average $309.55 with eight answers (or almost eighteen percent of the sample) of zero expenditure on clothes. The male students on the contrary spend an average $344.12 with only seven answers (approximately six percent of the sample) of zero expenditure on clothes.

Most of the expenditure patterns were the same for males and females. Therefore, there was not positive correlation between the student's gender and the pattern of expenditure. Even the twenty-one students who own cars are distributed in a ratio of almost 4:1 (males to females) while the total ratio of males to females is approximately 3:1 (this is elaborated in greater detail further on in this chapter).

Expenditures on bus transportation was found to be $277.70 on average for a one year period, with a standard deviation of $107.10. Most students pay $25.00 a month (to buy a bus pass) or $300.00 per year. However, some drive a

car and hardly take the bus and some live on campus so the average arrived at is lower than $300.00.

Miscellaneous expenditure on average was found to be $566.05 with a standard deviation of $414.23. This may include expenditure on entertainment, music, trips, presents, etc. Some did not include the ticket price of going home for visit. However, as will be shown below, an adjustment is made for this lack of information.

The last item in the expenditures category is the cost of owning and operating a car. Twenty-one students out of the hundred and sixty that responded bought a car. One of the students did not indicate the price of the car, so the average for the rest was calculated as $3,012.25 with a standard deviation of $2,282.54. If we include everyone in our study, the average cost of buying a car drops to $378.90 per student with a standard deviation of $1,285.74.

Car expenses such as insurance, gas, etc., for the twenty-one students who bought cars is $1,236.24 on average with a standard deviation of $786.81. Again, if all the students in the study are included, the average cost of having a car drops to $162.26 per student with a standard deviation of $505.48.

The annual total cost per foreign student at the University of Manitoba in 1984 arrived at, by calculating the mean of the sum of the above expenditures, was found to be $6,358.24; with a standard deviation of $1,656.94. This

does not include the price of the cars bought by some of the students.

These cars will be sold presumably before the owners return to their home countries. They may sell the car for a lower price, but they also may sell it for a higher price, depending on the market condition and on the condition of the particular car at the time of the sale. however, one could calculate depreciation per year and add it to the total cost.

Using a study done for the Canadian Automobile Association[1], and by observation alone we assume the depreciation rate for a used car to be approximately 10% per year (see footnote number 1). Therefore, 10% of $378.90 is $37.89 per year per student and the average total cost figure for all students was calculated to be $6,396.13.

Having reviewed the expenditure patterns, the revenue patterns will be discussed in the following paragraphs. The students were asked to decompose their revenue sources. Revenue outside Canada is defined as money coming in from the students' families. The mean revenue from outside Canada was found to be $6,556.33 per student for a one-year period, with a standard deviation of $2,264.02.

It should be noted that the African students generally receive their spending money from Canadian International Development Agency (CIDA). Each student receives $6,600.00 a year for his/her own expenses other than tuition fees and

health insurance which are paid directly by CIDA, to the respective institutions.

We decided to treat this type of allowance as revenue coming from outside of Canada. One could assume that this money would have been transferred to those African countries unconditionally to finance the higher studies of their students at any universities. However, in this particular case, CIDA ensures that the money given to the African students is spent in Canada and thus benefits both parties.

Revenue from inside Canada, i.e., revenue from relatives or other sources in Canada, was reported by just four students. The mean for the whole group was found to be $93.75. It is not a significant source of revenue, especially considering that most foreign students do not have relatives in Canada, so that the only other source of revenue in Canada can be from earnings.

Foreign students are not allowed to engage in any type of work that a Canadian can perform. However, many graduate students are allowed to work in the university as teaching assistants and markers. Twenty-one students in the sample reported that they are in Graduate School. Twelve of them receive salaries as markers and teaching assistants. The mean for the whole group (hundred and sixty students) from teaching was found to be $344.38.

The average total revenue per foreign student was found to be $6,994.46 for the year of 1984 (the standard

deviation was $1,861.65). More than ten percent of the students reported total revenue of $10,000.00 or more per year. Some spent as much as this sum, but the usual case involved saving some of the money.

The difference between the average expenditure and the average revenue was found to be $636.22. One can assume this money is deposited in the local banks and earns interest. However, one can argue that part of it is spent by the students on personal expenses, and probably on trips to and from their home countries. Because it is just their estimates, the results cannot be perfectly accurate and one should expect some distortions and difficulties when analyzing the final results. It is easier to record the total amount of money received each year than to break down the expenses. Therefore, one could, with some justification, assume that foreign students probably spend more than the information given by them (based upon the difference between revenues and expenditures). Thus, we have assumed that their revenues represents a reasonable estimate of the true amount of money spent in Canada.

In any case, according to this questionnaire, foreign students spent on average over $6,000.00 a year. Since the standard deviation is $1,656.94, this suggests that many students have the means to study in Canada, pay the required tuition fees and the cost of living. One should remember that in the provinces of Ontario and Quebec, foreign students are required to pay much more for their

education than their counterparts in Winnipeg. Therefore, one can conclude that students who come to study in Canada are generally able and willing to spend the amount of money required in order to receive higher education in return.

It was observed that many students from Hong Kong and Malaysia who comprise the majority of the foreign students at the University of Manitoba came from a well-to-do families. They seem to live comfortably and spend money according to their means. Moreover, the African students are supported by CIDA, so typically those few students, especially from India, Pakistan and some other countries in Asia and Central America are not as well off as the others and their expenditures are minimal.

One serious problem arises when foreign students do not get continued financial support from their families. The blame usually lies with the respective governments which, for political reasons, prohibit any transfer of money out of the particular country. In some cases there are Canadian and international organizations which support such students until the situation is improved. Some students from dictatorial countries (especially from Africa, South America and East Europe) can apply for a landed immigrant status as political refugees. Of course if their application is accepted, they are not under the student visa criterion anymore.

The extent to which foreign students benefit the Canadian economy will be discussed in detail in the next chapter.

Before proceeding to the next chapter, the following section will deal with the derivation of the foreign students' expected demand curve for education at the University of Manitoba

The Mathematical Expectation Demand Curve

The one hundred and sixty foreign students in our survey were indirectly asked to derive their expected demand for Canadian education. This was done by asking them to estimate the probability (in percentage terms) of their attending university for various hypothetical tuition fees. The first one was a tuition fee of $1,500, the second was $2,000, the third was $3,000 and so on in $1,000 increments until a tuition fee of $8,000 and over.

Twelve students from Africa did not respond to this question, because they are supported by CIDA which pays their tuition fees and thus they are not directly concerned with fee increases and were unable to provide an estimate. The rest of the students surveyed put down numbers from zero (quitting university) to one hundred percent (certain attendance). Here we just discuss the results and derive the demand curve. However, before proceeding further, some points must be made regarding the general derivation of

demand curves, the collection of the necessary information, and some definitions, critiques and various problems associated with this process.

The demand curve expresses the relation between the price charged for a product and the quantity demanded, holding constant the effects of all other independent variables. Usually, a demand curve is shown in the form a graph, and all the independent variables in the demand function, except the price of the product, are assumed to be fixed.[2]

A firm or any institution such as a university must have reasonably good information about its demand function in order to undertake effective long range planning and short-run operating decisions.[3]

There are several known techniques of demand estimation. In some cases it is relatively easy to obtain accurate estimates of demand relationships, but in other situations it is difficult to obtain the necessary information. This information is needed in order to forecast or to determine how changes in the price variable or in shift parameters such as credit terms, advertising expenditure, prices of competing products, population, income level and so on, will affect demand.

The three primary methods used to estimate the demand function are: 1) the interview or survey method, 2) market experimentation, and 3) regression analysis.[4] Each method

has its advantages and disadvantages, which we will not discuss here.

The method used by us was the survey method. The usual way is to ask the potential consumer to estimate the maximum price he would pay for a unit of a particular product. Initially this was done by us when asking students for the maximum tuition fee they would be willing to pay to attend the University of Manitoba. The answers were highly suspect; none of the students thus polled indicated a willingness to pay more than $3,000 per year.

A possible explanation is that students did not want to reveal their true preference. A second possibility is that students did not know how to respond to such a question. Another deficiency was found to be that if a particular student claims he/she will not pay more than $2,000 for tuition fees, how about $2,001? There is almost no doubt in our mind that whenever we raise the tuition fee by one dollar the student will definitely agree to pay the particular amount. By a "slippery slope" type of argument, students could be induced, by raising the hypothetical tuition fee by increments of one cent, to raise their maximum willingness to pay estimates to an arbitrarily high level.

Therefore, the mathematical expectation demand method was used in order to determine the expected demand for education at the University of Manitoba by our surveyed foreign students. In this method, as was described earlier,

the students were asked to write a probability of attending university estimate for each hypothetical tuition fee. If the student felt strongly about attending university for a given tuition fee, he/she gave a probability estimate of 100 percent. For higher tuition fees, where they were less certain to attend, they gave less than 100 percent but still attached some positive probability to attending university.

If the usual method were applied for these levels of tuition fees nobody would have enrolled at the University of Manitoba. It is interesting to see that for a very high tuition fee most of the students gave a zero chance of enrolling, but some students still attached some positive probability to attending university.

The results that were obtained through the questionnaire seem more accurate than otherwise. It is still not the perfect way of deriving the demand curve, but is seemed more appropriate in this particular case.

We shall first review the results, then derive the expected demand curve and finally calculate the price elasticity of demand. Further explanation concerning the structure of the demand curve is provided below.

Most of the students surveyed would attend university if tuition fees were raised to $1,500 per student. Eighty-two students stated that, with certainty, they would attend the University of Manitoba, when the tuition fee is $1,500. Forty others gave 80 to 99 percent chance. Only one

student gave a 30 percent chance and thus slightly affected the average which was found to be 89.64 percent. Thus, the expected number of students attending university when tuition fee is $1,500 per student is about 90 out of a 100 students. In our case, 89.64 percent of 148 students or 133 students (assuming indivisibility) would be expected to attend.

When tuition fee is $2,000 per student per academic year, only 63.89 percent of the foreign students would be expected to attend the University of Manitoba. In our case this means 95 students out of 148 students responded.

The rest of the results obtained are as follows: 39.76 percent or 59 students would be expected to attend university when the tuition fee is $3,000. When tuition fee is $4,000 only 22.49 percent of the students or 33 students in our case, would be expected to attend the University of Manitoba. When tuition fee is $5,000, 13.38 percent or 20 students would be expected to attend university. For $6,000, only 7.86 percent of 12 students in our survey would be expected to enroll in university. For $7,000 the number of students continues to decline to 4.45 percent or 7 expected students. When tuition fee is $8,000, 1.86 percent or 3 students would be expected to attend university. For $8,000 and over just 0.76 percent or one student would be expected to attend the University of Manitoba. For computational purposes, we assume that $9,000 is the maximum any student would be willing to pay.

The mathematical expectation demand curve derived accordingly to our sample answers is illustrated below in figure 12.

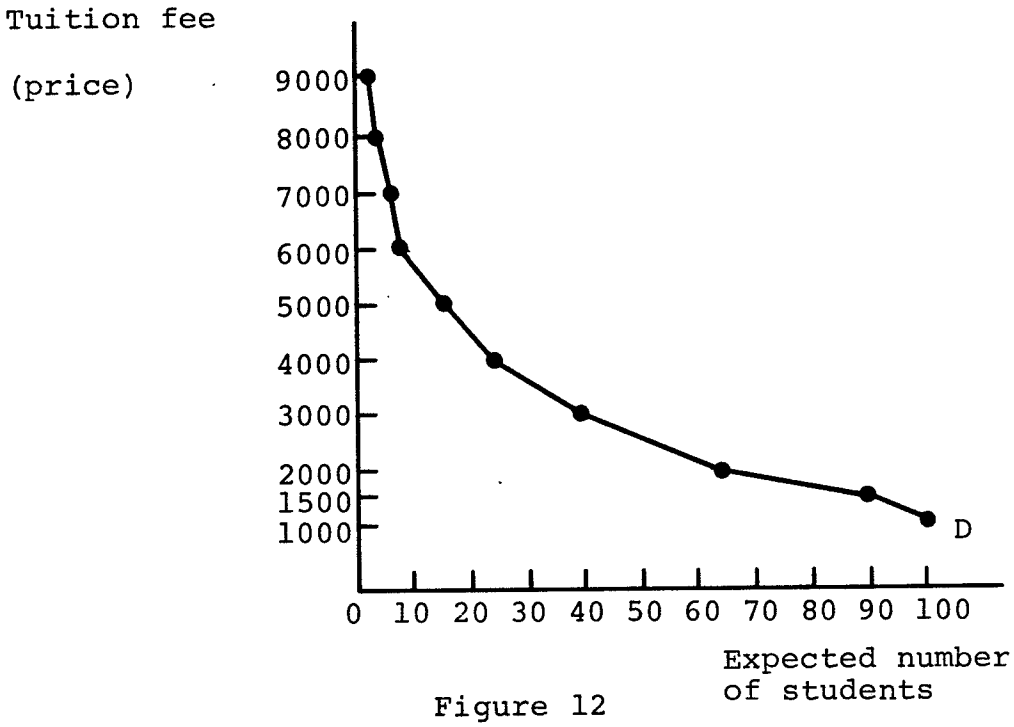

Figure 12

On the vertical axis the price of the hypothetical tuition fee is recorded. On the horizontal axis the expected number of students surveyed is recorded. The expected demand curve is negatively sloped after plotting the relevant points. For a normal good, such as education, when price increases the quantity demanded decreases.

By deriving the mathematical expectation demand curve, we can measure two important aspects of it. The first one is the calculation of the gross expected benefits to the foreign students in our survey as compared to their actual tuition costs. The second measure is the price elasticity

of demand which helps the university determine the most desired tuition fee in order to maximize its revenues.

The first measure mentioned above involves calculating the area under the expectational demand curve in order to measure the expected total benefits to the foreign students surveyed, from attending the University of Manitoba. The results of this calculation are presented in Chapter IV which deals with both domestic and foreign benefits from the study of foreign students in Canada.

Price Elasticity of Demand

For planning purposes, the university needs to know how sensitive demand is to changes in the independent variables in the demand function. One measure of responsiveness frequently employed in demand analysis is elasticity. It is the percentage change in quantity demanded resulting from a one percent change in the value of one of the demand determining variables[5].

The equation for calculating any elasticity is:

$$\text{Elasticity} = \frac{\text{Percentage change in } Q}{\text{Percentage change in } X} = \left| \frac{\Delta Q}{Q} : \frac{\Delta X}{X} \right| = \left| \frac{\Delta Q}{\Delta X} \cdot \frac{X}{Q} \right|$$

where:

Q = quantity demanded

X = any independent variable

The most widely used elasticity measure is the price elasticity of demand. This provides a measure of the

responsiveness of the quantity demanded to change in the price (tuition fee in our case) of the product or service.

Price elasticity of demand is found as:

$$\text{Elasticity} = \frac{\text{Percentage change in Q}}{\text{Percentage change in P}} = \left| \frac{\Delta Q}{Q} : \frac{\Delta P}{P} \right| = \left| \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \right|$$

where:

Q = quantity demanded

P = the price of the product

Elasticity can be measured as point elasticity or as arc elasticity. The one that is applied here is the price arc elasticity and the equation is as follows:

Price Arc Elasticity of Demand =

$$\frac{\frac{\text{Change in Q}}{\text{Average Q}}}{\frac{\text{Change in P}}{\text{Average P}}} = \left| \frac{\frac{Q_2-Q_1}{(Q_2+Q_1)/2}}{\frac{P_2-P_1}{(P_2+P_1)/2}} \right| = \left| \frac{\frac{\Delta Q}{(P_2+Q_1)/2}}{\frac{\Delta P}{(P_2+P_1)/2}} \right| = \left| \frac{\Delta Q}{\Delta P} \cdot \frac{(P_2+P_1)/2}{(Q_2+Q_1)/2} \right|$$

There are three specific ranges of elasticity (in absolute values):

1. Elasticity $>$ 1: defined as elastic demand
2. Elasticity = 1: defined as unitary elasticity
3. Elasticity $<$ 1: defined as inelastic demand

The importance of the price elasticity concept lies in the fact that it provides a useful local measure of the effect of a price change on total revenue. These relationships are summarized below[6]:

1. Elastic demand; $|\varepsilon_p| > 1$ Total revenue declines with price increases and rises with price decreases.

2. Unitary elasticity; $|\varepsilon_p| = 1$ Total revenue is unaffected by changes in price.
3. Inelastic demand; $|\varepsilon_p| < 1$ Total revenue rises with price increases and declines with price decreases.

Below are the arc price elasticities of demand as obtained from the expected demand curve (in absolute values):

Tuition fee (x) Ranges	Expected Number of students	Price Elasticity of Demand
$0 \leq x \leq \$1,100$	148	
$\$1,100 < x \leq \$1,500$	133	0.27
$\$1,500 < x \leq \$2,000$	95	1.17
$\$2,000 < x \leq \$3,000$	59	1.17
$\$3,000 < x \leq \$4,000$	33	1.98
$\$4,000 < x \leq \$5,000$	20	2.21
$\$5,000 < x \leq \$6,000$	12	2.75
$\$6,000 < x \leq \$7,000$	7	3.42
$\$7,000 < x \leq \$8,000$	3	6.00
$\$8,000 < x$	1	8.50

The expected demand curve is very elastic over a considerable range, but a detailed examination indicates the following results. Between a tuition fee of $1,100 and $1,500, the demand curve is inelastic suggesting that a tuition fee increase in this range would increase total revenue to the University of Manitoba. Between tuition fees

of $1,500 and $3,000, the demand curve is only slightly elastic. In this range, although it would seem that a tuition fee increase would lower revenue to the University of Manitoba, the somewhat unreliable nature of the survey estimates and the fact that our estimate is only slightly above unitary elasticity would render this conclusion quite tentative. For tuition fees above $3,000, elasticity of demand is clearly greater than unity.

If the hike in the tuition fee results in a lower level of demand for education by foreign students, and the vacant seats were then occupied by Canadian students, total revenue would then increase. (This assumes, of course, that the foreign students who drop out of the university because of the tuition fee hike are replaced by new Canadian students.)

CHAPTER IV

Measuring the Benefits of Foreign Students in Canada

One must not only consider the costs but also the benefits to society of a policy toward foreign students. These students contribute to the well being of the host country. The benefits can be divided into two groups, quantifiable and non-quantifiable. The first group of benefits can be measured whereas the second group cannot be expressed in terms of market transactions.

The non-quantifiable benefits are mainly cultural benefits, although some of them are also political and economic in nature. These benefits are discussed in a study done by Sims and Stelcner[1] and will not be repeated here. This chapter, however, is going to concentrate on the quantifiable benefits to Canada and to the province of Manitoba.

The major macroeconomic benefit is that subsistence expenditures by foreign students are beneficial to the host country. Moreover, money spent by foreign students increases the revenues of foreign exchange and in essence educating these students is economically equivalent to increasing exports.[2]

Before coming to Canada, foreign students usually exchange their currency for Canadian dollars, thereby increasing Canada's foreign exchange reserves. However, the

spending of money in Canada by foreign students while buying local goods and services is, for Canada, equivalent to exporting goods and services to the rest of the world. The foreign exchange implications for Canada are also identical to those arising from tourists visiting from abroad.

The next section discusses in detail the macroeconomic benefit of foreign students to Manitoba. Some definitions, models, and tools of fiscal policy will be reviewed and applied to our study.

The Economic Theory of Fiscal Policy

The government is assumed to play the role of guardian of its own citizens' interests. One of the most important national objectives is to maintain full employment of labour. Moreover, the government can influence the size of the national expenditure by its own expenditures on goods and services and by changing the tax rate.

Before proceeding any further, some definitions to clarify the subject are needed. The amount of extra consumption generated by an extra dollar of income is called "the marginal propensity to consume" (MPC). On the same note, the extra saving generated by an extra dollar of income is called "the marginal propensity to save" (MPS).[3] The sum of the ratios of MPC and MPS must always equal unity.

The simplest model of national income does not include the government and the international sector. In this paper we are concerned with an open economy, and therefore, we introduce the general model of national income in an open economy. The model is as follows:

$$Y = C + I + G + (X-M)$$

$$C = Co + cYd$$

$$Yd = Y - Tx + R$$

$$M = m\,Yd$$

$$I = \overline{I}$$

$$G = \overline{G}$$

$$X = \overline{X}$$

where: Y = national income

C = consumption function

I = investment

G = government expenditures

X = exports

M = imports

Tx = taxes

R = transfers

c = marginal propensity to consume

m = marginal propensity to import

Yd = disposable income

Co = an exogenous positive constant parameter

In this model, investment (I), government expenditures (G), exports (x), taxes (Tx), and transfers (R), are treated as autonomous variables.

The equilibrium level of national income is:[4]

$$Y = Co + C(Y - Tx + R) + \bar{I} + \bar{G} + \bar{X} - m(Y - Tx + R)$$

$$Y = Co + cY - CTx + cR + \bar{I} + \bar{G} + \bar{X} - mY + mTx - mR$$

$$Y - cY + mY = Co - cTx + cR + \bar{I} + \bar{G} + \bar{X} + mTx - mR$$

$$Y\ (1 - c + m) = Co + cTx + cR + \bar{I} + \bar{G} + \bar{X} + mTx - mR$$

$$Y = \frac{Co - cTx + cR + \bar{I} + \bar{G} + \bar{X} + mTx - mR}{1 - c + m}$$

Any change in one of the above variables will cause the income level to expand or contract. The change in the income level is not in general equal to the amount changed but is greater, because of the multiplier effect as will be shown below.

Samuelson defines the multiplier as "the numerical co-efficient showing how great an increase in income results from each increase in one of the variables."[5]

In order to calculate the benefits that foreign students contribute to Canada, we can treat their expenditures in Canada as Canadian exports of goods and services. However, using the export multiplier we can calculate the change in the level of national income arising from the increase in exports due to foreign students' expenditures in Canada

We derive the export multiplier as follows:

$$Y + \triangle Y = \frac{1}{1-c+m}\ (Co-cTx+cR+\bar{I}+\bar{G}+mTx-mR+\bar{X}+ X)$$

$$Y + \triangle Y = \frac{1}{1-c+m}\ (Co-cTx+cR+\bar{I}+\bar{G}+mTx-MR+\bar{X}) + \frac{1}{1-c+m}\ \triangle X$$

$$(Y + \triangle Y) - Y = \frac{1}{1-c+m}(Co - cTx + cR + \bar{I} + \bar{G} + mTx - MR + \bar{X}) + \frac{1}{1-c+m}\triangle X -$$

$$- \frac{1}{1-c+m}(Co - cTx + cR + \bar{I} + \bar{G} + mTx - mR + \bar{X})$$

$$\triangle Y = \frac{1}{1-c+m}\triangle X$$

This export multiplier can be derived directly using calculus by differentiating national income (Y) with respect to exports (X):

$$\frac{\partial Y}{\partial X} = \frac{1}{1-c+m}$$

The multiplier itself is the ratio $\frac{1}{1-c+m}$

A change in the export value multiple by the multiplier which must be positive, will raise the income level by the amount greater than the original change in exports.

It only remains to find the value of the marginal propensity to consume, and the value of the marginal propensity to import. For example, let us assume that MPC = 0.8 and m = 0.05, then the export multiplier is:

$$\frac{1}{1-c+m} = \frac{1}{1-(0.8)+(0.05)} = \frac{1}{0.25} = 4$$

If foreign students spend their money in Manitoba, the change in the equilibrium level of national income will be four times greater than the foreign students' expenditure level.

Thus, foreign students contribute to the Manitoban economy by studying and spending money here. It is important to note that this multiplier analysis is valid only on the assumption that the Canadian economy, prior to

the advent of foreign students, was operating at less than full employment at level Y, so that the real equilibrium national income could increase from Y to Y + $\triangle$Y.

Empirical Results

As noted earlier the exact export multiplier was not available. In an input-output study of the Atlantic provinces done by Statistics Canada[6] in 1965, the export multiplier was calculated. However, the results are not relevant to our study because technological coefficients do change significantly over a twenty year period and because there are special regional characteristics which are not found in Manitoba.

Another source dealing with the export multiplier is the CANDIDE model[7] which again does not provide us with the export multiplier variable. However, a model called RDX2[8] developed for the Bank of Canada illustrates better the concept in question.

RDX2 model constructs the real GNE (Gross National Expenditure) multiplier generated by an increase in government expenditure. We decided to utilize the model with the following assumptions: prices are endogenous, real wage share is constant, wages are endogenous, labour supply is endogenous and investment is endogenous. Because the export multiplier in our model is identical to the government multiplier, we use the latter in our study.

Investment in machinery and equipment shows a mild cyclical tendency especially in the first five years. We assume that student spend approximately four years in university. Therefore the multiplier will be calculated for four years and the expenditures by the foreign students surveyed will be discounted using a real interest of 3% as is commonly done.

The RDX2 multiplier is variable overtime: for the first year it is 1.18, for the second year 1.42, for the third year 1.45, and for the fourth year 1.34. When the average expenditure level by each foreign student is $6,396.13 (according to our survey), it generates an income over a four year period, having a present value of $32,950.90[9]. However, if we consider the amount of money that students receive from their families, relatives or from work as a more accurate measure of their true expenditure level in Winnipeg (see earlier discussion in Chapter 3), then the revised figure calculated to be $6,994.46, would generate a present value of $36,033.32[10] in income.

In an Interprovincial Input-Output Model[11] done in 1976, the provincial expenditure multipliers for many industries were calculated. The industries most related to our study are the health, education and hospital ones. It was found that a $100.00 increase in their output will generate $141.94 in income. It is interesting to note that

one of the multipliers calculated in the RDX2 model is exactly the same (i.e., 1.42).

If we are to calculate the relevant figures it comes to be $34,773.37 for the first case and $38,026.27 for the second case. The new results are approximately $2,000.00 higher than the ones under the RDX2 model. For the remaining of the analysis we will use the former figures.

As was mentioned earlier, there are two types of cost-benefit analysis which we considered. The first one was described above and includes only costs and benefits to Canadians. The second one, the "comprehensive" approach includes benefits to the foreign students themselves.

The total benefits figure which we arrived at was $397,170.30 (i.e., each student has recorded his/her expected willingness to pay for university education). The total costs for tuition for the 148 responding students was found to be equal to $164,132.00 which is clearly less than the total gross benefits figure. The costs are calculated as follows: the average tuition fee that each student pays (according to the questionnaire) x the number of students responded to the question.

The difference between the area under the expected demand curve and the cost of the current tuition fee to these students is the total net benefit which is positive; in this particular example the total net benefit is $233,038.30. Therefore, one can conclude that these foreign

students derive a net benefit from studying at the University of Manitoba.

It should be noted that the actual net benefit to foreign students may differ from the figure above inasmuch as they incur other expenses while studying in Canada. However, such additional expenses may not necessarily represent costs attributable to higher education, as they would have incurred a cost of living had they remained in their home countries. Moreover, even travel costs cannot necessarily be imputed as costs of higher education, since travel abroad confers cultural and other benefits quite apart from formal educational goals.

Other Quantifiable Benefits

A benefit related to the previous discussion is the extra demand for domestic final goods and services ultimately created by the inflow of foreign exchange. Given the current high level of unemployment that exists in Canada, this extra demand leads to increased employment of Canadians. Although there may be more effective ways to reduce unemployment using fiscal and monetary policies, the benefits from foreign students expenditure could complement these policies. However, in an economy with full employment the extra demand and expenditures by foreign students generate no net increase in the national income of Canada.

However, even with the economy operating at full employment it may still be desirable to improve Canada's foreign exchange reserves. Because we can treat the impact of foreign students as equivalent to that of tourists, their expenditures on Canadian goods and services would help the exports sector and improve Canada's balance of payment position.

Another benefit that can be measured is the one that involves the value to the host country (i.e., Canada) of a foreign student's failure to return home. According to immigration regulations, the Canadian government will not grant landed immigrant status unless such foreign student possess skills which are not available in the pool of unemployed workers in Canada, so that such foreign student would not displace Canadian workers in the job market. The method of measuring such benefits is to measure the value of the education the non-returning foreign student received in his home country prior to arrival in Canada, and to include as well the value of the resource savings to Canada on the rearing of the foreign student who was maintained abroad prior to coming to Canada.

An identifiable group of people which benefits from foreign students studying in Canada is the landlords who rent out more units, i.e., have a lower vacancy rate than would otherwise be the case. For example, in Manitoba, the vacancy rate is less than one percent. Moreover, the

University of Manitoba accommodates several hundred foreign students studying in Winnipeg.

One might be tempted to treat students from other provinces who come to study in Manitoba as foreign students since they also spend money on goods and services in Manitoba and may contribute to Manitobans in other respects as well. However, such students would fail to generate benefits to Canada as a whole and only cause an interprovincial transfer of resources. Foreign students on the other hand, benefit Canada as a whole and the province in which they decide to pursue their studies.

CHAPTER V

Economic Analysis of Resource Costs of Higher Education

When discussing the issue of foreign students the estimates of the costs they impose must be accurate. Usually the cost estimates for students are based on average costs. The appropriate measure of cost must reflect the costs that would be avoided if there were no foreign students being educated in Canada, or in Manitoba for our purposes. In essence, this is the incremental cost of foreign students, and is related to the concept of the marginal cost.[1] The main difference between the two concepts is that marginal costs are cost changes associated with unitary changes in output whereas the incremental cost concept is employed when output decisions involve multi-unit increases in production.[2] Moreover, the incremental cost is not equal to the average cost of educating a student times the number of foreign students as will be shown later in the discussion.

Average cost is inappropriate to measure the cost that a foreign student imposes on the Canadian economy. Because the university is analogous to a firm transforming a set of inputs into a set of outputs, it can be characterized with a multi-product production function. Some of the output such as teaching and research can be treated as joint production. A problem that emerges from the phenomenon of

joint production is the existence of common costs. Therefore, there arises a problem of allocating costs to output and there is no unique average costs for any single output. However, one can still calculate the marginal cost of a given output, when the level of other outputs remains unchanged.

R.H. Coase from the University of Chicago defines the concept of cost as follows: "...the cost of doing anything is what is given to do it."[3] When an industry increases its supply of goods, the cost is the value of what would have been produced elsewhere if that particular expansion had not taken place. In other words, if the output were not increased the value of the resources released would be added to a different industry. Thus, the expansion of the services by the University of Manitoba in order to accommodate the influx of foreign students must be considered very carefully. Why then should one not use the concept of average cost rather than the concept of marginal cost? Coase argues that fixed costs are irrelevant in such a calculation. The reason he provides is that fixed costs are not really affected by the expansion of supply, but only items that vary when the supply is undertaken should be considered.[4] (Coase treats historical costs in the same manner as fixed costs.)

Costs are also divided into short-run and long-run costs. In the short-run some inputs of the firm are fixed.

In the long-run, on the other hand, the firm can expand without restrictions.[5]

It has been suggested in several university cost studies[6] that marginal cost of additional students is less than average cost. The reasons for it, to be discussed shortly, are the concept of "economies of scale" and the existence of "excess capacity." Both phenomena result from the indivisibility of inputs.[7]

The existence of economies of scale in universities (as in any business firm) implies that larger universities can produce a given quantity at a lower cost than smaller universities can. The explanation for such economies of scale is specialization or division of labor. Large scale of operation may use more advanced techniques (e.g., computerization of library system) which may not be feasible at smaller scales and this in turn would lower unit costs at larger institutions.

The presence of economies of scale at universities is an empirical question. If they do exist, then, unit costs decline as universities get larger. In such a case, the marginal cost of education must be less than the average cost of education and as a result the true "avoidable" cost per foreign student studying in Canada would be less than the amount calculated using the concept of average cost.

A related issue is the effect of capacity utilization on costs. It can be observed in education, that the addition of students to a particular program with excess

capacity would incur negligible marginal cost.[8] (In a classroom of 30 seats, if there are only 28 students enrolled, the addition of another two students will impose marginal cost close to zero).

The main purpose of this chapter is to calculate the average and marginal cost of educating a particular student at the University of Manitoba. The calculation of average cost is done as follows:

$$\text{Average cost} = \frac{\text{total cost}}{\text{number of students}}$$

For this calculation we had to determine the number of full-time equivalent students. The University of Manitoba calculates the number of full-time equivalent students as follows:[9]

number of full-time equivalent students = number of full-time students + (number of part-time students/2)

Except for graduate students in the Faculty of Education where the formula is:

number of full-time students + (number of part-time students/4)

Full time students are students who enrolled for 80% or more of a normal full academic year program. (Some exceptions can be found in Administrative Studies and in Engineering).

The University Grants Commission has an alternative formula for full-time equivalent students:

number of full-time students + (number of part-time students x 0.35)

Adopting the first approach used by the University of Manitoba, the following are the results:

Academic Year	Full-time equivalent # of students	C.P.I	Total expenditures in Current $	Total expenditures in 1981 $	Average cost in Constant 1981 $
1979-80	15,574	80.7	105,349,259	130,544,300	8,382.19
1980-81	15,803	88.9	116,395,592	130,945,040	8,286.09
1981-82	17,017	100.0	130,862,779	130,862,779	7,690.12
1982-83	18,710	110.8	154,476,496	139,067,780	7,432.80
1983-84	19,857	117.2	170,507,780	152,620,640	7,685.99

In the table above,[10] the years mentioned are the last five academic years. The total expenditures for each academic year are given in current dollars and therefore some adjustments had to be made. Using the consumer price index (C.P.I.) the year 1981 is taken as the base year with 100 points. Each following year has to deflated and each preceding year has to be inflated, in order to calculate the expenditures in real terms.

In order not to complicate the matter, the inflation rate we are using is for each calendar year and not for each academic year. Since the difference is not significant, no further adjustment was made.

As we can see from the above table the average cost per student has been decreasing with the exception of the academic year 1983-84 which is slightly higher than the previous year. The number of students has increased over

the past five years, but the total real expenditures has not increased as much.

Determining the marginal cost is a more complex task. The total expenditures by the university include some fixed costs as well as variable costs. Some expenditures such as on computer facilities, special projects, scholarships, interests and anxillary enterprises will not increase by much as the number of students increases. Moreover, if there is an excess capacity at the university, more students can be accepted without building additional facilities to accommodate them.

Therefore, the only item to be used for calculating marginal cost is the total operating expenditures. This includes the salaries of academics, special academics and support staff. Also included are staff benefits and supplies and expenses.

Marginal cost is calculated as:

$$\text{Marginal cost} = \frac{\text{total operating expenditures}}{\text{number of students}}$$

We estimate marginal cost over the past five years. The increase in total operating expenditures (adjusted for the inflation rate) divided by the increase in the number of full-time equivalent students gives us the average incremental cost. (See the earlier discussion on the difference between marginal cost and incremental cost.) It is true one can argue that adding another student may not impose any extra cost to the operation of the university.

However, adding several hundred students should impose some extra cost to be financed somehow.

The table on the following page shows the calculations of the average incremental cost at the University of Manitoba for the past five academic years.

It is interesting to examine the results in the table.[11] There is not a definite trend and therefore one cannot conclude much from these results. In some years the average incremental cost is higher than the average cost and this might be accounted for when expenditures on buildings and other fixed costs are very low in a particular year. There are other possible explanations such as salaries which may increase drastically in a particular year.

Up to this point the discussion of the two concepts of costs (i.e., average cost and average incremental cost) was in general terms. The increase in the number of students can come from Canada and not just from foreign countries. However, one can treat the number of Canadian students as given and consider the foreign students as an addition to the "student force".

The average incremental cost of $11,726.59 for the 1983-84 academic year means that on average, assuming that the entire increase in operating expenditures can be attributed to the increase in the number of foreign students, each additional student has imposed an extra cost

Academic Year	Increase in Full-time Equivalent # of students	Operating Expenditures in current $	Operating Expenditures in 1981 $	Increase in Operating Expenditures in Constant 1984 $	Average Incremental Cost
1979-80	306	89,014,163	110,302,560	N.A.	N.A.
1980-81	229	100,688,086	113,274,090	2,971,530	12,976.11
1981-82	1,214	113,504,412	113,504,412	230,322	189.72
1982-83	1,693	132,513,040	119,295,140	4,790,728	3,420.39
1983-84	1,147	148,303,327	132,745,540	13,450,400	11,726.59

of $11,726.59 on the University of Manitoba. Because the tuition fee charged in Manitoba is well below this figure, it would mean that all students, both foreign and domestic, pay only a small portion of the real cost to the university. Even the average cost which should be higher than marginal cost as discussed earlier is well above the tuition fee charged in Manitoba.

The present value of the benefits of foreign students to Canada was calculated in the previous chapter. However, in the following paragraph the present value of the cost of educating foreign students will be calculated.

In this chapter we calculated the average cost in constant 1981 dollars over a five year period, from 1979-80 to 1983-84. Moreover, we calculated the average incremental cost over the same period. The former figure has shown considerable stability over the last five years whereas the latter one has been extremely volatile over the same period. However, for reasons discussed earlier, we decided to use the average incremental cost figure of educating a student at the University of Manitoba as the one to be compared with the benefit side of our cost-benefit analysis.

The five year period as described above, was averaged in order to calculate a single figure. This figure was discounted over the next four year period and was found to be $27,099.68[12].

CHAPTER VI

Summary and Conclusions

The previous chapters provided a theoretical framework for, and an analysis of the issue of the costs and benefits of foreign students in Canada. Because only quantifiable variables can be measured and compared with each other in order to arrive at a numerical figure for the conclusion, we carried out a survey which provided us with some numerical estimates for our analysis.

The benefits (both the quantifiable and non-quantifiable ones) were discussed in Chapter IV, and the costs were discussed in Chapter V. In this chapter, we compare the present value of both benefits and costs and provide some results and conclusions from our cost-benefit analysis.

When considering the cost-benefit framework from a strictly Canadian viewpoint, one can see that the benefit side is greater than the cost side. Using either of two alternative present value figures on the benefit side, i.e., $32,950.90 or $36,033.32 (see Chapter IV), we observe a positive difference over the present value of costs, i.e., $27,099.68, during a four year period.

However, when considering the international cost-benefit framework, which includes the benefits to foreign students as well, the benefit side is much greater

than the cost side. The new figure is as follows: the present value of the income generated in Canada of $32,950.90 (our lower estimate) plus the present value of the average net benefit to foreign students of $6,028.47 equals $38,979.37, which may be compared with the present value of costs of $27,099.68.

The results of our analysis show very clearly that benefits exceed costs in both cost-benefit frameworks, and together with some non-quantifiable benefits, one can give a positive answer to the question concerning the desirability of a foreign student presence at Canadian universities.

The welfare criterion of maximizing total net benefits adopted in this thesis to consider the issue of foreign students in Canadian universities, is consistent with that advocated by Ng[1], as described in Chapter II above. It will be recalled that Buchanan's criterion[2] for optimality was the maximization of average net benefit for club members. Buchanan's criterion would result in a policy of restricting admission to the university below the socially optimal level.

One conclusion which we reach is that assuming that foreign students do not displace Canadian students, and that their benefits to Canada exceed their costs as shown to be the case in our analysis, one could conclude that foreign students should be welcomed to Canadian universities in pursuit of their studies.

A second conclusion, derived from the estimated demand curve is that total revenue to the University of Manitoba could be increased by its raising tuition fees up to $1,500. If tuition fees were set between $1,500 and $3,000, it is not clear whether total revenue would be affected because our estimate of demand elasticity was close to unity. If tuition fees were dramatically increased to levels above $3,000, our results suggest that total revenue to the University of Manitoba would decline.

APPENDIX I

The Questionnaire

Hi,

My name is Eli Billauer. I am an M.A. student in Economics, who is working on my thesis, which deals with the university budget, the allocation of funds, and the benefits and costs of foreign students at the University of Manitoba.

I would like you to answer the questionnaire as accurately as possible. No name is needed because confidentiality will be observed.

Thank you very much for your co-operation

Country of origin: _____ Faculty: _____

Sex: _____ Estimated years in Canada: _____

A. Expenses (per year)

1. Tuition Fee: _____
2. Health Insurance: _____
3. Books: _____
4. Rent: _____ or Room and Board: _____
5. Food: _____
6. Clothes: _____
7. Transportation (other than car): _____
8. Others (such as: entertainment, music, trips): _____

B. Do you own a car? _____

If yes: how much did you pay for it? _____

Insurance: _____

Gas: _____

Others: _____

C. Estimated total cost per year: (not including the car): _____

D. Revenues

1. Outside Canada (from family, etc.): _____
2. Inside Canada (from relatives, etc.): _____
3. From working (as T.A., grants, etc.): _____

E. Estimated total revenue per year: _____

Thank you again.

What will the probability be of attending university when the tuition fee is: $1,500 _____ $2,000 _____

$3,000 _____ $4,000 _____ $5,000 _____ $6,000 _____

$7,000 _____ $8,000 _____ over $8,000 _____

ENDNOTES

Chapter I

1. Buchanan, 1965:13.

Chapter II

1. Layard and Jackman, 1972:175.
2. Cyert, 1975:18.
3. Buchanan, J.M., "An Economic Theory of Clubs," Economica, 1965.
4. Boadway, 1984:57.
5. Ibid.
6. Boadway, 1984:58, 59.
7. Boadway, 1984:96.
8. Buchanan, 1965:4.
9. Ibid.
10. Ibid.
11. Buchanan, 1965:4, 5.
12. Buchanan, 1965:5.
13. Ibid.
14. Buchanan, 1965:7.
15. Buchanan, 1965:9.
16. Buchanan, 1965:10.
17. Ng, 1973:293.
18. Ng, 1973:295.
19. Ng, 1973:296.
20. Ibid.
21. Brennan and Flower, 1980:156 (see also the reply by Ng in "Al 'Ng' on Clubs? A "Bran-New Flower" of Brennan-Flower," 1981).

22. Ng, Y.K. "The Economic Theory of Clubs, Optimal Tax/Subsidy," 1973:313.

23. Sandler and Tschirhert, 1980:1500.

24. Ibid.

25. Sandler and Tschirhert, 1980:1501.

Chapter III

1. The Canadian Automobile Association has published a booklet designed to calculate the costs of owning a car for the year 1985-86. The easiest way to measure depreciation according to this booklet is to subtract the trade-in value of the car from the purchase price and then divide it by the number of years the car is in use by the owner.
   The example given in the booklet is of a "1985 Plymouth 4-cylinder - Reliant SE four-door sedan equipped with standard and optional accessories including AM radio, automatic transmission, power steering, power disc brakes, rear window defogger and engine block heater, driven 24,000 kilometers per year."
   A depreciation rate of approximately 15% per annum of the remaining value of the car was calculated. The absolute depreciation rate for used cars is lower than for new cars. We decided to use a 10% depreciation rate for our study. (It should be noted that almost all cars owned by foreign students in our study were used cars.)

2. Pappas and Brigham, 1979:126.

3. Pappas and Brigham, 1979:128.

4. Pappas and Brigham, 1979:161.

5. Pappas and Brigham, 1979:130.

6. Pappas and Brigham, 1979:134, 135.

Chapter IV

1. Sims and Stelcner, 1981.

2. Overseas Students: A subsidy to Britain: 1979; as cited in Sims and Stelcner, 1981:20.

3. Samuelson, 1964:216.

4. McKenna, 1977:84.

5. Samuelson, 1964:232.

6. Input-Output Study of the Atlantic Provinces, 1965. Statistics Canada, Volume II, Kari Levitt.

7. CANDIDE Project Paper No. 7, Economic Council of Canada for the Interdepartmental Committee on CANDIDE, November 1973, J.R. Downs.

8. An analysis of the Major Dynamic Properties of RDX2, Technical Report 13, June 1978, Bank of Canada, L.D. Bener, U. Kohli and T. Maxwell.

9. The calculations are as follows:

$$(6{,}396.13 \times 1.18) + \frac{6{,}396.13 \times 1.42}{1.03} +$$

$$\frac{(6{,}396.13 \times 1.45)}{(1.03)^2} + \frac{(6{,}396.13 \times 1.34)}{(1.03)^3} =$$

$$= \$32{,}950.90$$

10. The calculations are as follows:

$$(6{,}994.46 \times 1.18) + \frac{(6{,}994.46 \times 1.42)}{1.03} +$$

$$\frac{(6{,}994.46 \times 1.45)}{(1.03)^2} + \frac{(6{,}994.46 \times 1.34)}{(1.03)^3} =$$

$$= \$36{,}033.32$$

11. An Interprovincial Input-Output Model-Version III. Economic Development Analysis Division, Department of Regional Economic Expansion, May, 1976:59.

Chapter V

1. Sims and Stelcner, 1981:11.

2. Pappas and Brigham, 1979:308.

3. Coase, 1970:123.

4. Coase, 1970:124.

5. Pappas and Brigham, 1979:313.

6. Verry and Davies, 1976.

7. Sims and Stelcner, 1981:11.

8. Brovender, 1974:663.

9. The Institutional Statistics Book, 1983 and 1984:11.

10. 11. Canadian Statistical Review:
April, 1985:XI,63.
August, 1983:63.
February, 1981:63.
The Institutional Statistics Book:
September, 1981:26.
1981 - 1982:7,26.
1982 - 1983:27.
1983 - 1984:30.

12. The calculations are as follows:

$$7{,}078.20 + \frac{7{,}078.20}{1.03} + \frac{7{,}078.20}{(1.03)^2} + \frac{7{,}078.20}{(1.03)^3} =$$

$$= \$27{,}099.68$$

Chapter VI

1. Ny, Y.K., "The Economic Theory of Clubs, Pareto Optimal Conditions", Economica, 1973.

2. Buchanan, J.M., "An Economic Theory of Clubs", Economica, 1965.

BIBLIOGRAPHY

Bener, L.D., U. Kohli and T. Maxwell, An Analysis of the Major Dynamic Properties of RDX2, Technical Report 13, June 1978, Bank of Canada, June, 1978.

Boadway, R.N. and D.E. Wildasin., Public Sector Economics, (Second Edition), Little, Brown & Company (Canada) Limited, 1984.

Brennan, G., and M. Flowers., "All 'Ng' up on clubs?: some notes on the current status of club theory", Public Finance Quarterly, 1980.

Brovender, S., (1974), "On the Economics of a University: Toward the Determination of the Marginal Cost of Teaching Services". Journal of Political Economy, 1982.

Buchanan, J.M., "An Economic Theory of Clubs", Economica, 1965.

Canadian Automobile Association, The, Car Costs, 1985-86.

Coas, R.H., "The Theory of Public Utility Pricing and its Applications". The Bell Journal of Economics and Management Science, 1970.

Cyert, R.M., The Management of Non-Profit Organization, Lexington Books, U.S.A., 1975.

Downs, J.R., CANDIDE Project Paper No. 7, Economic Council of Canada for the Interdepartmental Committee on CANDIDE, November, 1973.

Layard, R. and R. Jackman, "University Efficiency and University Finance", in M. Parkin, (ed.), Essays in Modern Economics, Proceedings of the Association of University Teachers of Economics; Aberystwyth, 1972. Harper and Row Publishers, Inc., U.S.A. 1973.

Levitt, Kari, "Input-Output Study of the Atlantic Provinces", Statistics Canada, Volume II, 1965.

McKenna, J.P., Aggregate Economic Analysis, (5th edition) The Dryden Press, U.S.A., 1977.

Ng, Y.K., "The Economic Theory of Clubs: Pareto Optimal Conditions", Economica, 1973, pp. 291-293.

----- "The Economic Theory of Clubs. Optimal Tax/Subsidy", Economica, 1973, pp. 308-321.

----- "All 'Ng' on Clubs? A Bran-New Flower" of Brennan-Flowers, Public Finance Quarterly, 1981, pp. 75-78.

Pappas, J.L., and E.F. Brigham, Managerial Economics (Third edition), The Dryden Press, Illinois, 1979.

Samuelson, P.A., Economics: An Introductory Analysis (6th edition), McGraw-Hill Book Company, New York, 1964.

Sandler, T., and J.T. Tschirhart, "The Economic Theory of Clubs: An Evaluative Survey", JEL, 1980, pp. 1481-1521.

Sims, A. and M. Stelcner, The Costs and Benefits of Foreign Students in Canada: A Methodology. Canadian Bureau for International Education, 1981.

Verry, D.W., and B. Davies, University Costs and Outputs. Elsevier Scientific Publishing Company, Amsterdam, 1976.

Other Sources

1. Canadian Statistical Review
   April, 1984, pp. XI, 63
   August, 1983, pp. 63
   February, 1981, pp. 63.

2. The Institutional Statistics Book, 1981-1984.