APPENDIX 1: REDUCED FORM DERIVATION

From (8) and (9), (8B) $R = rP_0 + rp_1Y$

From (4) and (8B) (4B) $G = t_1Y + t_bC + rP_0 + rp_1Y$

Therefore,

$$Y = C + I + G + X + U - M$$

$$= C + I_0 + t_1Y + t_bC + rP_0 + rp_1Y + X_0 + U_K + U_S + U_W + U_B - m_g(t_1Y + t_bC + rP_0 + rp_1Y) - m_cC - m_KU_K - m_BU_B$$

$$= C + I_0 + t_1Y + t_bC + rP_0 + rp_1Y + X_0 + U_K + U_S + U_W + U_B - m_gt_1Y - m_gt_bC - m_grP_0 - m_grp_1Y - m_cC - m_KU_K - m_BU_B$$

$$Y - t_1Y - rp_1Y + m_gt_1Y + m_grp_1Y = C - m_cC + t_bC - m_gt_bC - m_grP_0 + X_0 + U_S + U_W + I_0 + (1 - m_K)U_K + (1 - m_B)U_B$$

$$Y - t_1Y - rp_1Y + m_gt_1Y + m_grp_1Y = C(1 - m_c + t_b - m_gt_b) + (1 - m_g)rP_0 + X_0 + U_S + U_W + I_0 + (1 - m_K)U_K + (1 - m_B)U_B$$

$$Y - t_1Y - rp_1Y + m_gt_1Y + m_grp_1Y = (C_0 + c_1Y(1 - t_n - t_1))(1 - m_c + t_b - m_gt_b) + (1 - m_g)rP_0 + X_0 + U_S + U_W + I_0 + (1 - m_K)U_K + (1 - m_B)U_B$$

$$Y - t_1Y - rp_1Y + m_gt_1Y + m_grp_1Y = C_0(1 - m_c + t_b - m_gt_b) + c_1(1 - t_n - t_1)(1 - m_c + t_b - m_gt_b)Y + (1 - m_g)rP_0 + X_0 + U_S + U_W + I_0 + (1 - m_K)U_K + (1 - m_B)U_B$$

$$\emptyset Y = \partial C_0 + f Y + \Omega P_0 + X_0 + U_S + U_W + I_0 + \delta U_K + \theta U_B$$

where:

$$\emptyset = 1 - rp_1 + m_g t_1 - t_1 + m_g rp_1$$
$$\partial = 1 - m_c + t_b - m_g t_b$$
$$f = c_1(1 - t_n - t_1)(1 - m_c + t_b - m_g t_b)$$
$$\Omega = (1 - m_g)r$$
$$\delta = 1 - m_K$$
$$\theta = 1 - m_B$$

$$\emptyset Y - fY = \partial C_0 + \Omega P_0 + X_0 + U_S + U_W + I_0 + \delta U_K + \theta U_B$$

$$(\emptyset - f)Y = \partial C_0 + \Omega P_0 + X_0 + U_S + U_W + I_0 + \delta U_K + \theta U_B$$

$$Y = [1/(\emptyset - f)](\partial C_0 + \Omega P_0 + X_0 + U_S + U_W + I_0 + \delta U_K + \theta U_B)$$

(10) $$Y = K(\partial C_0 + \Omega P_0 + X_0 + U_S + U_W + I_0 + \delta U_K + \theta U_B)$$

where $K = 1/(\emptyset - f)$

$$1/(\emptyset - f) = 1/(1 - rp_1 + m_g t_1 - t_1 + m_g rp_1 - c_1(1 - t_n - t_1)(1 - m_c + t_b - m_g t_b))$$
$$= 1/(1 - c_1(1 - t_n - t_1)(1 - m_c + t_b (1 - m_g)) - rp_1 + m_g t_1 - t_1 + m_g rp_1)$$
$$= 1/(1 - c_1(1 - t_n - t_1)(1 - m_c + t_b (1 - m_g)) - (t_1(1 - m_g) + rp_1 (1 - m_g)))$$
$$= 1/(1 - c_1(1 - t_n - t_1)(1 - m_c + t_b (1 - m_g)) - ((1 - m_g)(t_1 + rp_1)))$$

APPENDIX 2: LITERATURE REVIEW

INTRODUCTION

A university impact study's theme is quite straightforward, with the economic logic being to measure the additional spending that is generated within the community by the university. The analyst must be careful to count all spending that should be counted, while not double counting. Also, careful track must be kept of the secondary rounds of impact that result from the initial spending, known as the multiplier effect.

The general approach is to first carefully divide the new spending into various categories and then, secondly, calculate the multiplier so that the total spending impact can be estimated by multiplying the new income by this multiplier.

Traditionally, university impact studies have divided the new spending into four categories:

1) University employee spending

   Here we are concerned only with the employee's after-tax income, since those tax dollars do not make any impact on the local community (at least via the university or its employees). As well, any spending by the employees that occurs outside the community (e.g. buying a car from an out-of-town dealer) should be excluded from a local impact study.

2) Non-salary spending by the university

   In this category would be included such things as capital goods, lab equipment, books, library acquisitions, utilities, etc. Again, only those goods and services that are purchased locally, outside the university, should be included.

3) Non-university expenditures by full-time students

University expenditures by these students are excluded because this money will show up as expenditures by the university, which we have already counted. For example, if a student bought a beer at the university pub, the university would turn around and spend that money purchasing the beer, paying wages, running the pub, etc. Also, non-university expenditures by part-time students are not measured because it is assumed that they would be living in the community even if they did not attend university and in turn would have spent their "education" money on other locally sold items. In other words, expenditures by part-time students represent spending that would occur even if the university was not operating.

4) Non-university expenditures of visitors who come to the community because of a university-sponsored event

We only want to include those local expenditures that occur because the university is in the community. Spending by visitors that would have come to the community even if the university was not operating should not be included.

Once these four spending streams have been measured then they are applied to the multiplier to determine the university's final impact on the local community, with most studies rely on someone else's estimate of the actual multiplier.

LITERATURE PERTAINING TO METHODOLOGY

Before examining specific impact studies, it is useful to examine other works that are concerned more with the "hows" of undertaking such studies. Two of the papers are case studies with different "twists"; the other paper is concerned with methodological considerations pertinent to any large project.

A. Brownrigg, M. "The Economic Impact of a New University ." Scottish Journal of Political Economy, Vol. XX, No. 2 (June 1973): 123-39.

The relevance of this study to the U.N.B.C. situation is obvious - in both cases the situation is that of a new university.

The geographic area in which the then new University of Stirling was situated had a population base of 95,600 in 1966 and was quite prosperous economically, both characteristics similar to those faced by U.N.B.C. Moreover, the University was initially a small one, with the first intake of students being about 200 in 1967-68, with plans for a student population of about 3800 by 1976. The faculty and staff contingent was expected to be 440 and 430, respectively, by 1976. The construction period was not just an initial one or two year process, but stretched out over several years.

Four main sources of regional income generation are noted at the outset:

(1) expenditures on employee salaries/wages
(2) expenditures generated via student incomes
(3) expenditures on construction materials
(4) construction expenditures on other private and public sector projects induced by the existence of the new university

Brownrigg computes two separate economic impacts - one that includes all four of the above expenditure categories, and one that excludes (3) and (4). The rationale for leaving out the latter two in a separate estimation is that eventually, construction on the University and its induced "spin-off" projects will

cease, and the only on-going impact will be the actual operation of the institution. Note that this latter impact is the one calculated by the Case Studies II through XI outlined below, since they are all existing rather than new universities.

It should be noted provision for the on-going operational expenditures (i.e. expenditures made on everyday goods and services not associated with construction) incurred by the University of Stirling is largely ignored as is the impact of visitors coming to the region due to the existence of the University. Both of these sources are included in virtually all the other studies and are consistent with the Caffrey-Isaacs methodology.

There is an important statement made early in the paper that is extremely relevant to any economic impact study, as it concerns what economists call the 'multiplicand'. A project's multiplicand is the initial injection of spending on locally-produced goods and services. The dollar value of the multiplicand is the 'first-round' of incomes earned locally, e.g. by local cement firms who supply the University with concrete, by University employees who reside in Prince George, or by those who sell goods/services to the University and its students, etc. A common mistake is to include all expenditures made during a particular year, regardless of whether the goods/services were purchased in the local region or imported from other areas. Common sense tells us that spending on non-local items, termed leakages, must not be counted, as it does not generate local economic activity. In other words, the multiplicand must net out any leakages. As stated by Brownrigg, "multiplicand components must be stated net of their import leakages" (125). Thus, when analyzing UNBC's impact on in Prince George, we must not include spending on materials purchased outside the region nor the incomes of non-local construction workers.

Related to the multiplicand is the (expenditure) 'multiplier' process. The multiplicand's initial injection will be respent ("second-round") in the community, thus becoming income for others in Prince George, who in turn respend much of their new income ("third-round"). This respending process is called the 'multiplier' effect, and the result is that total incomes generated over time (usually a couple of years) will be larger than the initial multiplicand. As will be seen below, the usual estimate for a regional multiplier in Canada is around 1.5, implying that an initial expenditure multiplicand of $100 million will result in, over time, incomes of approximately $150 million being earned.

Therefore, the multiplicand and the multiplier are two important but separate phenomena. The reader should also be aware that the larger and more economically diversified is the region, the larger the multiplier will be; more of the respending will remain within the local community as opposed to being spent on goods and services originating outside the region.

Brownrigg estimates the expenditure multiplier to be in the range of 1.24 to 1.54, which is consistent with the other works investigated.

The author goes on to estimate the impact on local employment, both during and after the construction period. With respect to the former, the University estimated that by 1976 there would be 1,369 permanent employees and 310 construction jobs, implying a direct employment level of 1,679 at that time.

Of course, these jobs support other jobs in the region and, similar to the expenditure multiplier discussed above, an employment multiplier can be estimated.

Briefly, the employment multiplier tells how many indirect jobs should be created from the institution's direct employment. Brownrigg uses Greig's (1971a) employment multiplier estimates to speculate that the indirect job creation would be between 900 and 1,740, for total direct plus indirect employment by the end of the construction phase of 2580 to 3420 jobs. The implication is that the employment multiplier lies between 1.54 and 2.04.

Once the construction period is over, the University expects to employ about 2700 individuals on a student base of 7000, implying total direct plus indirect job creation of 4158 to 5508.

B. Wilson, J. H. and R. Raymond. "The Economic Impact of a University upon the Local Community." Annals of Regional Science, Vol. 7, No. 2 (1973): 130-43.

This paper, concerned with the theoretical and practical validity of some common techniques employed in certain university economic impact studies, is not a case study, but more of a critique of methodology. In fact, the paper argues that "the persistence of serious conceptual errors in these studies often renders the empirical findings so inaccurate as to be completely useless." It should be noted that the criticisms are of studies done prior to 1970. This contrasts with the studies contained in Part III of this literature review, which predominantly consists of summaries of work done since the early 1970's.

The study's main criticism focuses on the multiplier. It is argued that many of the multipliers used were too high, caused by an underestimation of the extent to which spending (i.e. by employees, students, as well as direct institutional purchases) leaks out of the local community to be spent elsewhere. In addition, much local spending is on goods with a low local value-added, as it is often assumed that if $X is spent on a local purchase then all of the $X is supporting local industry. Usually, of course, this is not the case; if one buys shoes locally, only part of the selling price remains in the community as value-added, since much of the cost is paid to an outside supplier.

As an example, the authors estimated a multiplier for Kent State University of 1.82 using the standard economic base technique common to other studies. They then estimated a multiplier of 1.09, which they feel to be far more accurate, by taking into consideration:

1) the percentage of total university spending which occurred locally for each category of expenditure (e.g. housing, food, clothing, etc).

2) the payroll-to-sales-ratio for each expenditure category, which served as a proxy for the proportion of total sales that is local value-added (a precise definition of value-added for a good should be provided at this point: it is the selling price of an item less

the materials purchased that were used to produce the item; it is out of value-added that wages and profits are paid)

Therefore, the total dollar injection of first-round spending into the community is:

$$\text{Eq. (1)} \qquad Z = x \bullet \sum_{i}^{n} b_i \bullet a_i$$

where:

- x = total university spending
- Σ = the summation operator
- a_i = percentage of university spending occurring locally in the i^{th} expenditure category
- b_i = payroll-to-sales ratio for each i^{th} expenditure category
- i = the expenditure category
- n = the number of expenditure categories

Dividing both sides of this expression by x gives us the proportion of the initial injection of university spending that remains within the local economy, leaving us with $\Sigma (b_i \bullet a_i)$ as what economists refer to as the marginal propensity to consume locally-produced items. The local multiplier is therefore $1/(1 - \Sigma (b_i \bullet a_i)) = 1/(1 - 0.083) = 1.09$. The reader should note that this multiplier is significantly less than those used in most studies, including those summarized in this literature review. Wilson and Raymond justify their low number as follows: "This multiplier appears quite small but the (survey data) provide a ready explanation. A large portion of the spending of university employees occurs outside the Kent community. In addition, much of the value-added for the various spending categories is generated outside of Kent." At face value, one would expect similar parallels between U.N.B.C. and the Prince George area.

The final methodological problem dealt with by the authors involves student spending and the erroneous assumption that all value-added is local value-added. For example, they cite one paper which calculates the employee- equivalence (i.e. number of jobs created) of student spending by simply dividing total student spending by the average wage for the area. They note, for example, that a student purchasing a $6000 car will not support one local job paying $6000 for a year, since the dealer had to pay most of that $6000 on the wholesale purchase of the car. Wilson and Raymond promulgate

what they believe to be a much more accurate method of estimating employee-equivalence of student spending in a particular jurisdiction by utilizing:

$$\text{Eq. (2)} \qquad EE = \sum_{i}^{n} S_i / R_i$$

where

- EE = the Employee Equivalence
- Σ = the summation operator
- i = the expenditure category
- n = the number of expenditure categories
- S_i = the amount of local student spending in the i^{th} expenditure category
- R_i = the sales per employee in the i^{th} expenditure category

C. Rioux, J. and J. Schofield. "The Economic Impact of a Military Base on Its Surrounding Economy: The Case of CFB Esquimalt, Victoria, B.C." Canadian Journal of Regional Science, Spring 1990; 47-61.

While not a university, a military base's are virtually the same. Both are government institutions supported by injections of public funds generated predominantly from outside the community, are quite labor intensive with employees tending to reside within the jurisdiction, and both make significant materials purchases from community suppliers. Therefore, this study has direct bearing on our investigations. Moreover, this particular study is very recent and employs relatively sophisticated techniques of economic impact analysis.

The economic jurisdiction which the paper concerns itself is the Capital Regional District, comprised of the City of Victoria and its surrounding municipalities/islands and having a 1986 population of 262,000. As of June 1987, CFB Esquimalt employed 7722 civilian and military personnel. Also note that the spending figures utilized below are from the 1986-87 fiscal year for the Base.

Like the Brownrigg study, great emphasis is placed on calculating an accurate multiplicand and therefore care is taken to estimate the proportion of institutional procurement expenditures devoted to local purchases. This work also estimates the sectoral distribution of both institutional and employee spending within the Capital Regional District Economy, something that the university impact studies discussed below do not attempt.

Briefly, CFB Esquimalt expenditures injected into the local economy are disaggregated into four categories:

1) the portion of the institution's procurement budget spent locally
2) the portion of the incomes of civilian employees spent locally
3) the portion of the incomes of military personnel spent locally
4) grants paid to local municipalities in lieu of property taxes

The sectoral allocation to local business was also approximated for each of the above categories by delving into the payment records of CFB Esquimalt for Category (1), and by using a survey technique for Categories (2) and (3). For the latter, 1000 surveys were distributed to a 13% sample of the personnel with a response rate of 30.4% in terms of usable questionnaires. An intermediate result of this work is the estimate that 60% of total CFB Esquimalt expenditures remain within the Capital Regional District as first-round spending (i.e. netting out out-of-region institutional procurement spending from the total expenditures of the Base), amounting to $239 million.

Four alternative approaches are considered for estimating an appropriate multiplier. The first is referred to as the short-cut input-output technique, but the authors argue that this methodology is questionable. The second is the Keynesian method, as employed by Brownrigg above, but this route is also thought to be inferior in that indirect (as opposed to induced) multiplier effects emanating from inter-industry production linkages are only partially taken into account and usually multipliers disaggregated by sector are not produced. The economic base multiplier method is useful in that it captures both indirect and induced multiplier effects, but the process of determining which local firms export out of the region and which simply sell goods/services within the region is felt to be far too cumbersome and expensive. Rioux and Schofield therefore decide to employ a multiplier estimation technique similar to the one used by Wilson and Raymond (1973), as detailed above. The result is an

expenditure multiplier estimate for the Capital Regional District ranging from 1.64 to 1.86 and an employment multiplier estimate of between 1.86 and 2.15.

The implication of the estimated expenditure multiplier/multiplicand is that as a result of its $239 million of direct expenditures in the Regional District, CFB Esquimalt created approximately $392 million of income that was retained in the local economy. As for the employment effect, it would appear that in addition to the 7722 jobs at the Base as of June 1987, another 6600 to 8900 were created in the regional economy.

The authors add that the above estimates include neither the effects of capital expenditures at CFB Esquimalt nor of visitors to the Base.

CASE STUDIES

We now turn to a sampling of some of the many Canadian studies that have employed the generally accepted "Caffrey-Isaacs Technique" as endorsed by the American Council of Education.

A. Interior University Society. "The Economic Impact of a Northern University." Building a Future of Excellence - A University for Northern British Columbia. Volume I . Prince George, B.C.: 1988.

It is perhaps most fitting to begin this section with a summary of the economic impacts as predicted by the Society which initiated the efforts that culminated with the provincial government's commitment to establish a university in Northern B.C.

The authors of this work, like those below, also endorse the Caffrey- Isaacs methodology. There is, however, no analysis of the expected short-run economic impact of expected university-related spending on the region. Instead, the chapter primarily consists of a brief literature review of other university economic impact studies as a means of illustrating the short-run economic value of a university to its surrounding community.

Nonetheless there are some items worthy of note. First, the authors expect the relevant multiplier for the region to be 1.7 for the "catchment area," which apparently is calculated as the average of the 1.5 to 1.9 multiplier estimates contained in their literature review. Second, this multiplier is applied to the total expenditures of the College of New Caledonia, the Prince George Regional Hospital, School District #57, and the City of Prince George in the attempt of arriving at the total additional income generated in the community as a result of the existence of these institutions. It must be noted that this methodology is erroneous, in that "transfers" within the community have not been netted out. (For example, virtually all of the spending of the City has not been injected into the local economy from outside, but is simply a transfer of tax revenues from Prince George residents to the City.) Third, the report estimates that it will take approximately six years from the date of opening for the Northern University to have 2000 full-time students in attendance. (For purposes of comparison, the College of New Caledonia has approximately 2500 F.T.E. students enroled in the sum total of its offerings at the Prince George campus.) Fourth, the report estimates the "full community employment impact"

emanating from university spending to be 91 jobs per million dollars of expenditure; their source for this estimate is the Economic Development Analysis Division of the Department of Regional Economic Expansion, a federal ministry which no longer exists. Finally, the report stresses that the most important economic effects are the ones most difficult to quantify, i.e. contribution to technological improvements that benefit all of society, a more educated populace, and greater retention of the area's educated young people in the long run.

B. Ministry of Advanced Education and Job Training, British Columbia. Implementation Planning Group. **A Degree Granting Institution for Northern British Columbia - A Report Submitted to the Minister of Advanced Education and Job Training for B.C.** **Victoria: 1989.**

The success of the lobbying efforts of the Interior University Society led the provincial government to form a task force, the so-called "Implementation Planning Group," with the mandate of recommending what particular form a degree-granting institution located in Northern B.C. should take. The I.P.G, which consisted primarily of residents of the Northern B.C., suggested the establishment of a new autonomous university with full status under the provincial University Act, complete with research and graduate school functions and not to be directly affiliated with any existing university nor with the local Colleges. The government has committed itself to following these recommendations, which obviously entails the construction of a brand new facility. (Since the I.P.G. report was released, a site for the University has been chosen - it is to be situated on Cranbrook Hill, located a few miles west of the downtown core of Prince George.)

Like the Interior University Society's report discussed above, the I.P.G.'s work devotes little space (and properly so, in our view) to any discussion of the short-run economic benefits of the subsequently-named University of Northern B.C. Instead, most of this section of the report emphasizes the more important, but less easily quantified, long-run economic benefits that universities bring not only to their communities but to society in general. These include the benefits emanating from research and development, enhanced population growth in the local area, a more knowledgeable workforce, retention of locally- trained professional personnel, decreased costs to students due to local access to university education, and other as yet unknown "spin- offs" such as increased business development, etc.

But the report does make some mention of what is referred to as the "tangible benefits" of the establishment of a university locally, which we interpret to mean the short-run increases in spending and employment as a result of the outside injection of funds into the region.

The I.P.G. estimates that the total capital expenditures are estimated to be approximately $169 million over 12 years, which is expected to create approximately 3000 person-years of employment. The task force also forsees those directly employed by the university to number some 250 - 300 by year 10 of its existence, and annual operating expenditures (i.e. payroll plus university expenditures on goods and services) to be, on average, $12.3 million annually for the first 10 years. (Note that all dollar amounts are in constant 1989 dollars.) The section concludes that this approximate $290 million worth of direct spending, creating an estimated 3500 person-years of employment over 10 years (this latter number appears to be too low when compared with the above figure of 3000 person-years for construction only) will "...contribute approximately $200 million to GDP over the initial 10 years of operation." (p.71)

We are unsure as to what exactly is meant by this $200 million figure, but assume that the report is referring to the multiplier effect of 1.7 employed in the Interior University Society's study noted above (i.e. $290,000,000 x 1.7 = $493,000,000). If what we are surmising is correct, the I.P.G.'s assertion is misleading. First, the report is implying that the ADDITION to Canada's Gross Domestic Product (supposedly caused by the multiplier effect of the original $290 million injection into the local economy) would be approximately $200 million in constant 1989 dollars over a ten year period; this is likely very optimistic in that the $290 million would almost certainly have been spent by the public sector on some other project were U.N.B.C. not created. Secondly, and related to the previous point, the report is confusing "economic impact" with our country's Gross Domestic Product. Specifically, the $493 million of economic impact is an estimate of the increased spending occuring over 10 years in Northern B.C. as a result of the creation of the University, while the increase it causes to Canadian GDP will be minimal. (GDP is the value at market prices of new goods and services produced in a country during a given year.)

Subsequent to the tabling of the I.P.G.'s report, more recent information regarding anticipated U.N.B.C. expenditures has been made available. (Note that an Interim Board of Governors was appointed in 1990 and a President was hired in January of 1991.) In the Spring 1991 issue of the "U.N.B.C.

Newsletter" (Vol. 1, No. 2), it is stated that "...approval for capital expenditures for actual construction and development (will amount to) a total of $137,542,534." It would thus appear that the actual capital monies granted by the provincial government will be some $32 million less than what was called for by the I.P.G. (In fairness, it should be noted that the I.P.G. stated that its $169 million was in constant 1989 dollars, was to be expended over a 12 year period, and was predicating the construction of a facility designed to accommodate 2000 F.T.E. students.)

Over the longer term, the direct economic stimulus to the community will be predominantly in the form of operating as opposed to capital expenditures. Based upon information obtained from internal U.N.B.C. sources as well as from various media reports, the University's annual operating budget will total some $20 million annually based on an initial enrollment of approximately 1200 F.T.E. students & growing to roughly 2000 F.T.E. students by the third year of operation. Two observations concerning this statement are worthy of note. First, for purposes of comparison, the $20 million figure is approximately equal to the annual operating budget of the College of New Caledonia and is also equal to approximately 20% of School District #57's operating budget. We therefore cannot expect the operating monies to comprise a substantial injection into the local economy. Second, U.N.B.C.'s enrollment projection is at odds with both that of the I.P.G. (which forecasted 1800 F.T.E. students by the tenth year of operation) as well as the Interior University Society's estimate of reaching the 2000 level by year six of operation. (Again in fairness, U.N.B.C.'s revised estimates may be based on better data.)

C. Gallagher, C. The Economic Impact of the University of Victoria . Victoria: Office of Institutional Analysis, University of Victoria, 1978.

The year for which figures were compiled was 1976 and the results were as follows:

1) Employee Spending: All of the $19.1 million in disposable income was assumed to be spent locally

2) Non-salary Direct Local Spending by the University: It was estimated that approximately one-half of the capital/operating budget amount for goods and services was spent locally, totalling some $7 million.

3) Non-University Spending by F/T students: Statistics Canada Cat. #81-543 "Post-Secondary Student Population Survey" was employed to estimate the following annual per-student expenditure amounts:

Undergraduate Students	
Living in Residence On-Campus	$1000
Living with Parents Off-Campus	$1800
Single Person living Off-Campus	$2500
Married Person living Off-Campus	$4900
Graduate Students	
Single living Off-Campus	$3800
Married living Off-Campus	$6400

A summation of these figures over the entire full-time student body resulted an economic impact for this category of $14.6 million.

4) Non-University Expenditures by Visitors to the Campus: It was estimated that there were a total of 40,000 visitor-days spent at the University, with one-third of this total estimated to

be visiting from outside of Greater Victoria, and each person spending $30 per day off-campus; the total for this category is therefore $0.4 million.

The above four expenditure streams sum to $41.1 million, but $1.9 million in cafeteria, bookstore, and parking fees is subtracted (while the reason for this adjustment is left unstated, we assume it is because these monies would be spent in the community even if there were no university, i.e. they are a "transfer") to arrive at a total direct impact of $39.2 million in "first-round" spending.

The local multiplier is assumed to be 1.9, therefore giving rise to a total direct plus indirect economic impact on the Greater Victoria economy of $74.5 million due to the University in 1976.

The author then uses the Caffrey-Isaacs assertion that each $1 million in final spending creates 47 - 60 jobs to estimate that the number of non-university jobs amounts to an estimate that the $35.3 million of "indirect spending" (i.e. $74.5 million less $39.2 million) is responsible for between 1600 and 2100 jobs in the local economy.

D. Gibson, C. <u>The Impact of the University of British Columbia on the Economy of the Greater Vancouver Regional District</u>. Vancouver: University of British Columbia, Office of Institutional Analysis & Planning, 1982.

The year for which the expenditure data is taken for this study is the fiscal year ending March 31, 1981.

1) Employee Spending: It was estimated that 76% of the gross salaries was received by the employees as disposable income, and given an estimated propensity to save of 2%, a figure of $118.4 million was calculated for this expenditure category. Statistics Canada Cat. #62-550 "Family Expenditure in Canada" was used to estimate the proportion of net disposable income that was used to consume goods and services. Note that the extent to which these monies are expended outside of the G.V.R.D. is ignored in that this leakage is assumed to be offset by consulting fees, etc. earned and spent by faculty within the Regional District. The study notes that U.B.C. employed 7500 F.T.E. positions within the G.V.R.D. in 1980-81.

2) Non-salary Direct Local Spending by the University: It was estimated that approximately 70% of University total direct purchases accrued to the G.V.R.D., for a total of $64.4 million, once salaries, employee benefits, and academic awards are netted out.

3) Non-University Spending by F/T students: Three categories of students were assumed, as shown below, with the estimates of the annual per-student expenditure amounts being as follows:

Resident of the G.V.R.D. living at home	$2150
Non-resident of the G.V.R.D. in Residence	$1914
Non-resident of the G.V.R.D. off-campus	$2550

This study also notes explicitly that tuition fees and related academic expenditures paid to the university have not been included in order to avoid the "double counting" problem.

Once the above per-student expenditure figure is applied to the 19,778 full-time students enroled in 1980-81, the estimate for total student spending as a result of the existence of U.B.C. is $48.3 million.

4) Non-University Expenditures by Visitors to the Campus: It was noted explicitly that in order to avoid over-estimating this impact, "only those individuals who attended conferences on the campus and were accommodated in university facilities were considered visitors." (p. 13) It goes on to state that 60,000 bed-nights were provided to conference visitors between 1 May and 31 August 1980, and an average of $62.50 was spent off-campus per visitor per day, implying that total visitor spending in the G.V.R.D. due to the existence of U.B.C. this particular year was $3.8 million.

The above four expenditure streams sum to $234.9 million, implying a direct economic impact of U.B.C. on the G.V.R.D. of $234.9 million for 1980-81.

This work uses a multiplier of 1.99 as estimated by Craig Davis of U.B.C., whose multiplier-building methodology is also employed in our study. This magnitude thus leads to the conclusion that the total

economic impact was approximately $468 million on the area as a result of the existence of U.B.C. in 1980-81.

With respect to the employment multiplier, while there is no reason for its value to be identical to that of the expenditure multiplier, in fact this study does assume the values of the two are the same. Thus, given the 7512 F.T.E. positions at U.B.C. during this fiscal year, the author draws the conclusion that the total direct plus indirect jobs created by the University with the G.V.R.D. amounts to a total of 14,948.

E. McNeill-Hordem, A. The Economic Impacts of Brandon University Brandon: Planning Office of Brandon University, March 1990.

This is an especially pertinent study for our purposes given the similar size and distance from major population hubs of Brandon and Prince George. According to the study, Brandon had a population 38,708 in 1986 and the University had a full-time enrollment of 1477 as of 1989.

The year for which figures were compiled was 1988 and the results were as follows:

1) Employee Spending: All of the $10 million in disposable income was assumed to be spent locally

2) Non-salary Direct Local Spending by the University: It was estimated that approximately 40% of the capital/operating budget amount for goods and services was spent locally, totalling some $5.1 million.

3) Non-University Spending by F/T students: Three categories of students were assumed, as shown below, with the estimates of the annual per-student expenditure amounts being as follows:

Out-of-town students living in Residence	$2500
Out-of-town students living off-campus	$5450
Students living with Parents in Brandon	$2500

Note that for each of these amounts, all monies paid to the University (i.e. tuition, residence fees, books, etc.) have been subtracted to avoid the "double counting" problem, in that these monies have already been accounted for in the University spending given that they are a source of revenue.

A summation of these figures over the entire full-time student body resulted an economic impact for this category of $4.4 million.

4) Non-University Expenditures by Visitors to the Campus: It was estimated that there were a total of 5000 "visits" to Brandon annually as a result of the University, with $35 being spent per visit on non-university items, for an annual total of $0.175 million.

The above four expenditure streams sum to $19.8 million, giving us the direct economic impact on the City as a result of the University's existence.

The author employs a multiplier range of 1.4 to 1.7, giving us a total direct plus indirect economic impact of between $27.7 million and $33.6 million due to 1988 Brandon University expenditures.

F. University of Calgary. Office of Institutional Analysis. <u>The Economic Impact of the University of Calgary on the Calgary Economy</u> . 1987.

The year for which the expenditure data is taken for this study is 1985-86.

1) Employee Spending: It was estimated that 73% of the gross salaries was received by the employees as disposable income, and given an estimated propensity to save of 10%, a figure of $96.5 million was calculated for this expenditure category. The study notes that there were 4,689 FTE faculty and staff employed during the 1985-86 year.

2) Non-salary Direct Local Spending by the University: It was estimated that approximately 44% of University total direct purchases accrued to the City of Calgary, for a total of $78.9

million. It should be noted that the study makes a disclaimer to the effect that these figures may be suspect in that some of the capital expenditures were directly related to the preparation for the 1988 Winter Olympics.

3) Non-University Spending by F/T students: Like the McMaster work discussed later, this study also makes the assumption that all full-time University of Calgary students would attend university elsewhere if there were no opportunity to do so in Calgary. It goes on to say "While the presence of alternative post-secondary institutions in Calgary makes this assumption a bit unrealistic, there are not data upon which to make an educated guess as to the proportion of students that would go elsewhere." (p. 8)

   The Alberta Student's Finance Board provided estimates of 1985-86 living expenses, and an average per-student figure of $4825 was calculated, based upon 8 months per year of student residence in Calgary. It is stated that this $4825 is higher than the appropriate figure for students living at home and lower than that for students living on their own, but should act as a reasonable compromise.

   This study also notes explicitly that tuition fees paid by students to the university have not been included in order to avoid the "double counting" problem.

   Once the above per-student expenditure figure is applied to the 15,412 full-time students enroled in 1985-86, the estimate for total student spending as a result of the existence of the University of Calgary is $74.4 million.

4) Non-University Expenditures by Visitors to the Campus: It was estimated that there were a total of 21,200 "bed-nights" arising from conferences at the U. of C., with each visitor spending an estimated $67 to $94, depending on where he/she was staying on or off-campus. These figures result in an estimate of $1.6 million worth of visitor spending accruing to the Calgary area.

The above four expenditure streams sum to $251.4 million, but $19.0 million worth of internal revenues are netted out in order to arrive at a direct economic impact of $232.4 million for 1985-86.

The study employs a multiplier of 1.7, implying a direct plus indirect economic impact of approximately $395.1 million on the area emanating from the existence of the University of Calgary in 1972.

It is interesting to note that this is one of the few studies which actually discusses multiplier derivation and refers to the generally accepted level of multiplier that is commonly used in studies of this nature (i.e. local economic impact studies). "Nine (similar studies of the local economic impact of Canadian universities) used multipliers ranging from 1.32 to 2.0, with most in the 1.5 to 1.9 range. One review of American studies shows a similar range and states that the value is usually 2.0 or less." (p. 18). The derivation of both the expenditure (or income) and employment multipliers are contained on the following pages.

With respect to the employment multiplier, the study notes that there is no reason for the value to be identical to that of the expenditure multiplier, and notes that the studies alluded to above use employment multipliers ranging from 1.4 to 2.0. The rationale for this study using an estimate of 1.75, as noted above, is provided on the following pages, and results in the claim that about 8200 jobs exist in Calgary due to the University and its 4689 FTE individuals.

G. Fardoe, G. <u>The Economic Impact of the University of Alberta on the Edmonton Economy</u> Edmonton: University of Alberta Management Advisory Institute, 1986.

The year for which the expenditure data is taken for this study is 1985-86, at which time the University enroled 23,828 full-time and 4,574 part-time students.

1) Employee Spending: The University of Alberta employs 3828 faculty and 4316 staff, the disposable income of whom amounted to some $163.5 million. To the extent that some of this income was spent outside of the Edmonton area, this "leakage" was assumed to be offset income earned by faculty from sources external to the University.

2) Non-salary Direct Local Spending by the University: Goods and services purchased from Edmonton suppliers were estimated to be some $52.7 million during 1985-86, which amounted to approximately 65% of total material expenditures for that year. The study notes explicitly

that the crucial variables which affect this percentage (which varies widely from study to study!) are:

(i) the University's commitment to purchase goods locally

(ii) the size of the city in which the University is located

(iii) the methodology used to determine where the purchased goods and services originate from

3) Non-University Spending by F/T students: Four categories of students were assumed, as shown below, with the estimates of the annual per-student expenditure amounts being as follows:

Students from other countries	$7252
Students from other provinces	$4450
Students from other cities	$4450
Students from Edmonton (assumed to be living with parents)	$3055

Again, be aware that all monies paid to the University have been subtracted to avoid the "double counting" problem, in that these funds have already been accounted for in the University's expenditures.

Once the above per-student expenditures are summed over all the students in each category, total student spending is estimated to be $76.8 million.

4) Non-University Expenditures by Visitors to the Campus: The study noted that according to a survey undertaken by the Division of Public Affairs of the Chancellor's Office of the California State University, expenditures by visitors to a University usually amount to one per-cent of local spending faculty, staff, and students. In U. of A.'s case, therefore, this would amount to approximately $2.4 million.

The above four expenditure streams sum to $295.4 million, implying a direct economic impact of the University of Alberta of this amount on the Edmonton area economy emanating from these 1985-86 expenditures.

An expenditure multiplier of 1.49 as estimated by the Alberta Bureau of Statistics is used to approximate the overall short run impact of the University on the local economy. Application of this multiplier to the multiplicand of $295.4 million results in a total estimated direct plus indirect economic impact of $440.1 million.

Indirect employment arising from the University was estimated using an employment multiplier of 2.4, again calculated by the Alberta Bureau of Statistics. A curious statement then follows. It is stated that given that the University has 8144 people, "The injection into the Edmonton economy by the students can be translated into an additional 2608 employees. Since the employment multiplier is 2.4, the resulting number of jobs generated by expenditures associated with the University is 25,979." (p.17) We are at a loss to explain the reasoning behind this assertion and note that it appears to be very optimistic.

H. University of Western Ontario. Department of Information Analysis and Systems. The Economic Impact of the University of Western Ontario on London . 1976.

This study pertains to the expenditures made during the 1975/76 academic year, and the results were:

1) Employee Spending: All of the $47.0 million in disposable income by the 89% of employees living within the City of London was assumed to be spent locally.

2) Non-salary Direct Local Spending by the University: It was estimated that approximately 30% of operating budget purchases, 25% of the purchases of ancillary enterprises, 10% of the research budget, and all capital expenditures were made locally; the figure calculated was $10.3 million.

3) Non-University Spending by F/T students: Six categories of students were assumed, as shown below, with the estimates of the annual per-student expenditure amounts being as follows:

Students living in Residence	$509
Students living off-campus	$2117
Students living with Parents in London	$1445
Married Students living in Residence	$4800
Married & Graduate Students (12 months)	$7200
Graduate Students (9 months)	$2100

Note that for each of these amounts, all monies paid to the University (i.e. tuition, residence fees, books, etc.) have been subtracted to avoid the "double counting" problem, in that these monies have already been accounted for in the University's expenditures. As well, the estimates are based on government allowance for student aid rather than actual spending by the students.

A summation of these figures over the entire full-time student body resulted an economic impact for this category of $27.9 million.

4) Non-University Expenditures by Visitors to the Campus: It was estimated that there were a total of 32,000 "visits" to London annually as a result of the University, with various amounts being spent per visit (depending on the type of visitor) for an annual total of $0.77 million.

The above four expenditure streams sum to $86.0 million, giving us the direct economic impact on the City as a result of the University's existence.

The author employs a multiplier range of 2 to 3, thus implying a total direct plus indirect economic impact of of between $172 million and $258 million due to 1975/76 expenditures by the University.

I. McMaster University. Office of the Assistant to the President for Special Projects. The Economic Impact of McMaster University on the City of Hamilton and Surrounding Localities . 1973.

The year for which the expenditure data is taken for this study is 1972.

1) Employee Spending: All of the $24.6 million in disposable income of employees was assumed to be spent within Hamilton and its surrounding localities.

2) Non-salary Direct Local Spending by the University: It was estimated that approximately 60% of University total direct purchases accrued to the City of Hamilton, for a total of $40.4 million.

3) Non-University Spending by F/T students: Four categories of students were assumed, as shown below, with the estimates of the annual per-student expenditure amounts being as follows:

Undergraduate Students living in Residence	$450
Undergraduate Students living off-campus	$1650
Undergraduate Student living with Parents	$1200
Graduate Students (12 month period)	$3380

Again, be aware that all monies paid to the University have been subtracted to avoid the "double counting" problem, in that these funds have already been accounted for in the University's expenditures. Also note that this study states explicitly that it is operating under the assumption that "if McMaster did not exist, students would go elsewhere to University." (p. 8)

Once the above per-student expenditures are summed over all the students in each category, total student spending is estimated to be $11.7 million.

4) Non-University Expenditures by Visitors to the Campus: It was estimated that there were a total of 12,000 visitors to conferences at McMaster, with each visitor spending $15 off-campus. There were also 3,000 additional visitors coming for non-conference activities, with each

estimated to spend $40 off-campus. These figures result in an estimate of $0.3 million worth of off-campus spending accruing to the Hamilton area.

The above four expenditure streams sum to $77.0 million, giving us the direct economic impact on the City as a result of the University's existence.

The author employs a multiplier of 2, implying a direct plus indirect economic impact of approximately $154 million on the area emanating from the existence of McMaster University in 1972.

J. Nagarajan, P. The Impact of the University on the Economy of Prince Edward Island . University of Prince Edward Island: Department of Economics, 1972.

The year for which the expenditure data is taken for this study is 1969-70, at which time the population of metropolitan Charlottetown was approximately 25,000 with the entire province being at 110,000. The F.T.E. enrollment at the University at that time was 1566.

1) Employee Spending: A questionnaire on local spending habits was distributed to all 281 members of the faculty and staff, and an approximate 50% response rate was obtained. Monthly expenditures were multiplied by 12, implying annual expenditures (net of taxes) of $1.7 million.

2) Non-salary Direct Local Spending by the University: Operating monies spent locally were estimated to be 1.6 million in 1969-70 and because capital expenditures were fluctuating a great deal at this time, a four-year average was taken as a proxy for the year under study. This average was $0.9 million, of which $0.65 million was thought to be spent locally, giving a total for this category of $2.25 million.

3) Non-University Spending by F/T students: A survey of local spending patterns of the 1566 students was also done, achieving about a 25% response rate. Monthly expenditures were multiplied by eight for this group, under the conservative assumption that all students leave the province for the four-month summer break. An annual expenditure total of $2.8 million was calculated for this category.

This study also notes explicitly that only student spending above and beyond "direct educational expenses" (p. 13) is counted.

4) Non-University Expenditures by Visitors to the Campus: This category is ignored in this study.

The above four expenditure streams sum to $6.8 million, implying a direct economic impact of the University of P.E.I of this amount in the year 1969-70.

This work uses a multiplier of 1.47 as estimated for P.E.I. by Kari Levitt in a 1969 macroeconomic analysis of the Atlantic economy. The study goes on to note that this magnitude is consistent with those of other similar studies, including that of Ernest Bonner in his work "The Economic Impact of a University on its Local Community" in the American Institute of Planners Journal, Vol. 34, September 1968. Application of this multiplier to the multiplicand of $6.8 million implies a total direct plus indirect economic impact of the University on the local area of $9.95 million.

Indirect employment arising from the University was estimated using a "value-added" approach. Briefly, employing the survey data referred to above, the value-added resulting from the direct expenditures of the University community which accrued to the local economy was calculated for each sector (e.g. housing, clothing, food, etc.). Then, for each sector, the value-added was divided by the average wage for the sector to arrive at the number of indirect jobs created as a result of the existence of the University in each of housing, clothing, food, etc. sectors. This analysis resulted in the conclusion that the University of P.E.I. created 397 indirect jobs in 1969-70, in addition to the 281 direct employees of the institution.

K. Jeacock, R. <u>The Economic Impact of Malaspina College on the Local Economy</u>, Malaspina College: Business and Public Administration, 1983.

It is fitting to conclude this review with this study, in that while its general logic is similar to that of the above studies, there are some important "twists" added. It should also be noted at the outset that the geographic boundaries for the local economy are assumed to be those of the local School District, in that anything larger or smaller was deemed to be inappropriate.

1) Employee Spending: Malaspina College employed 325 full-time personnel in 1982/83, of which 298 were surveyed in order to discern their spending habits; 115 of the surveys were completed and returned. Based upon the results that 90% of the employees lived within the local economy & 65% of total expenditures were on "non-housing goods & services," the author estimates that $3,911,293 was available to spend locally by College employees. The total disposable income paid by the College to its employees was 6,685,970.

It should be stated at this point that we believe that netting out owner-occupied housing expenditures in arriving at the multiplicand is wrong, in that the object of the study is to determine the total local expenditures/incomes generated by a non-local government funded institution. Regardless of what a College employee does with his/her income, it is still income to the local community. It is proper, however, to net out College materials purchases made outside of the region in that these expenditures never do become income of individuals living within the area.

2) Non-salary Direct Local Spending by the College: This amount was calculated by subtracting from total operating funds the salaries/benefits of College employees, obvious non-local expenditures such as debt payments and book purchases, & payments to local government for municipal services. Then, by utilizing purchase order information for 1982-83, the author estimated that 44.7% of non-salary purchases by the College were made in the local economy that year. This proportion was then estimated to consist of $1,241,120.

3) Non-University Spending by F/T students: Local expenditures by this group were estimated by surveying 20% of the student body, resulting in an estimate of $6,545,596 of direct local spending. Of this total, $2,207,497 was estimated to be rent, $3,114,041 was spent by renters for non-housing items, and $1,224,058 was devoted to non-housing items by non-renters. In this context, non-renters are defined as "paying room and board or living at home." It is interesting to note that of the four types of students surveyed, i.e. University Transfer, Vocational, Career-Technical, and Adult Basic Education, the U.T. students tended to spend the highest proportion on local items (between 86% and 94% of total expenditures) but also spent the lowest amount in absolute terms on both housing and non-housing items.

The author then goes on to note the following positive and negative economic impacts of the College on the community, but it does not appear that these figures are used to adjust the total economic impact amount calculated (see below).

1) Income of College-related Enterprises: This figure, amounting to $983,000, does not appear to be netted out anywhere to avoid the "double-counting problem." The author simply calculated it

and then states that "The operation of College-related enterprises that reduce the market potential of local firms represents a cost to the local economy." (p. 9)

2) The Positive Impact on Local Government: Unlike the other works, included here as a positive economic impact on the community are the revenues received by local government as a result of the existence of the institution. Specifically, a figure of $2,292,375 was estimated to have been collected by: i/ local government as real estate taxes paid by College employees; ii/ businesses that were deemed to exist because of the College; iii/ provincial grants to public schools resulting from the attendance of children of College faculty/students, and iv/ various fees paid by College faculty/students to local government other than real estate taxes noted above.

3) The Negative Impact on Local Government: The author estimated that the annual cost to local government of providing services to the College and/or College faculty and students in 1982-83 was $5,930,305. Approximately two-thirds of this amount was attributable to municipal services and the remaining $1,867,060 was the estimated cost incurred by the local School District for educating family members of College faculty and students. We would like to note at this point that in our view these "costs" do not constitute a negative economic impact to the community in that they are simply a transfer of funds within the economic region. (Note that an economic impact study is not the same as a Cost-Benefit Analysis.) What is a real cost though, are the property taxes foregone by the city due to the College being exempt from this taxation. However, the author does not provide a realistic estimate of this amount.

The aggregate economic impact of Malaspina College on the region defined by the local School District boundaries is then calculated as follows:

1) College Employee Spending: The $3,911,293 available to workers for local spending on non-(owner-occupied) housing items is considered to have a direct economic impact. This figure is then applied to a multiplier of 1.31 to arrive at a total impact for this category of $5,123,793. As noted above, we believe the multiplicand should not be reduced by the amount spent on owner-occupied housing, as the effect of this "leakage" is on SUBSEQUENT rounds of income/expenditure generation and thus will be accounted for in the multiplier formula.

2) Non-salary direct local spending by the College: The TOTAL purchases of $2,776,555 were applied to a multiplier of 1.18 at an aggregate impact figure of $3,276,335. It appears that the author has made an error with respect to this calculation, in that it is the TOTAL LOCAL purchase figure of $1,241,120 noted earlier which should be the multiplicand.

3) Non-University spending by F/T Students: Of the $6,545,596 of total spending by students, the author estimated that $5,158,736 was spent on non-housing items. Application of this latter figure to a multiplier of 1.42 results in a total direct plus indirect economic impact for this sector of $7,325,405. Again, we feel that exclusion of owner-occupied housing expenditures from this figure constitutes an error.

Therefore, addition of $5,123,793, $3,276,335, and $7,325,405 results in a total direct plus indirect economic impact of $15,725,553 as concluded by the author. It goes without saying that we take issue with the methodology employed in the calculation of all three of the multiplicands utilized.

With respect to the multipliers employed, the author states he employed the same methodology as that used in the B.C. Department of Economic Development's B.C/N.K.K. Joint Steel Mill Feasibility Study, the formula being:

$$\frac{1}{1 - \text{propensity to spend locally} \times \text{local income generated} \times \frac{\$ \text{ of local expenditures}}{}}$$

From the survey data and the purchase order information, the propensity to spend locally was estimated to be 0.68 for College employees, 0.85 for students, and 0.44 for the College non-salary expenditures. A figure of 0.35 was used for the last term in the denominator of all three multipliers; this proportion is apparently the one recommended by Caffray and Isaacs. It is worth noting that in the referenced Steel Mill study, a multiplier of 1.4 was generated for the Prince George area.

Finally, an employment multiplier is calculated in this study. The author employs Economic Base Theory for its estimation, which can best be explained by use of a direct quotation from the study:

This theory states that the growth and income level of any particular region depends upon its ability to export goods and services. The proportion of goods and services exported is allocated to the basic sector, while the proportion consumed within the economy is considered to be non-basic or service oriented. The service sector is viewed as being dependent primarily on the export sector for income and jobs. By assuming that there is a stable relationship between the employment levels in both sectors, economic base theory predicts that a change in the level of employment in the export sector leads to a change in the level of employment in the local service sector by some multiple of the growth in export jobs. The economic base of a regional economy such as School District 68 consists, therefore, of those economic activities that result in the production of goods and services for sale outside of the region or else in-region to outsiders. It is on the basis of this latter criterion that Malaspina College is included in the basic or export sector of the local economy. (p. 26)

So, the entire regional labor force is assigned to either the basic or the non-basic sector and the employment multiplier is calculated by dividing total local employment by total basic employment. Based on the author's calculations of total local 1982-83 employment being 28,430 workers and basic employment being 13,385, an employment multiplier of 2.12 is estimated. However, the author feels this figure is too large, as Caffrey and Isaacs suggest that a city the size of Nanaimo should have an employment multiplier of 1.2 to 1.5.

In addition to the 325 full-time employees in 1982-83, 128 direct jobs in the Nanaimo area were estimated to exist due to student and institutional spending on non-salary items. Therefore, the author implies that anywhere from 544 to 960 jobs in the area attributable to the existence of Malaspina College.

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