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# Where Are They Now? Migration Patterns for Graduates of the University of British Columbia

John F. Helliwell and David F. Helliwell<sup>1</sup>

## Introduction

Records of university graduates provide a promising source of new information on domestic and international migration of the highly skilled. If it is possible to keep track of a high enough proportion of a university's graduates, then their locations, classified by degree and year of graduation, can provide a valuable history of migration patterns. When the Alumni Association of the University of British Columbia (UBC) asked us to assist them in analyzing the results of a survey of graduates currently living outside Canada, we were immediately attracted by the possibilities for enriching the amount and quality of data relating to the migration of the highly educated. We concluded that the survey results could best be interpreted in the context of the overall trends and patterns of the distribution of graduates.

This paper summarizes the results of our research in several stages. First we present the location data by degree type and year of graduation, with graduates classified according to whether they are living in British Columbia (BC), in the rest of Canada (ROC), in the United States, or in the rest of the World (ROW). This first analysis of the patterns and trends evident in the data is followed by analysis using statistical models of migration to show the importance of distance, population size, income differentials and national borders as determinants of the locations chosen by UBC graduates. Then we

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The analysis in this paper, which was prepared for the "Re-Thinking the Line" Conference, Vancouver, October 25, 2000, was initiated at the request of the UBC Alumni Association. Thanks are due to the Alumni Association for compiling the addresses of alumni, to Alan Marchant, to the UBC Faculty of Graduate Studies, and to Statistics Canada for supplementary data and advice. An earlier abbreviated report on the project was published as Helliwell and Helliwell (2000). We are grateful for research support from the Social Sciences and Humanities Research Council, and from the UBC Hampton Fund. Interpretations and opinions are those of the authors.

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will consider the extent to which the data for the graduates are consistent with aggregate migration patterns, and whether the UBC experience is likely to be indicative of what would be found if similar research were available for other universities. We then discuss the responses to the Alumni Association survey of UBC graduates living outside Canada. Our concluding section summarizes the results and suggests issues that seem to require or invite further research.

## Geographic Distribution by Degree

The current location of all UBC bachelor's graduates by year of graduation, starting in 1930, is shown in Figure 1. There is a four-way distribution of locations in all of the figures shown in this section. We use the proportionate distribution to remove the strong upward trends in actual numbers, caused both by the growth of BC population and the increasing fraction of the population obtaining higher education.

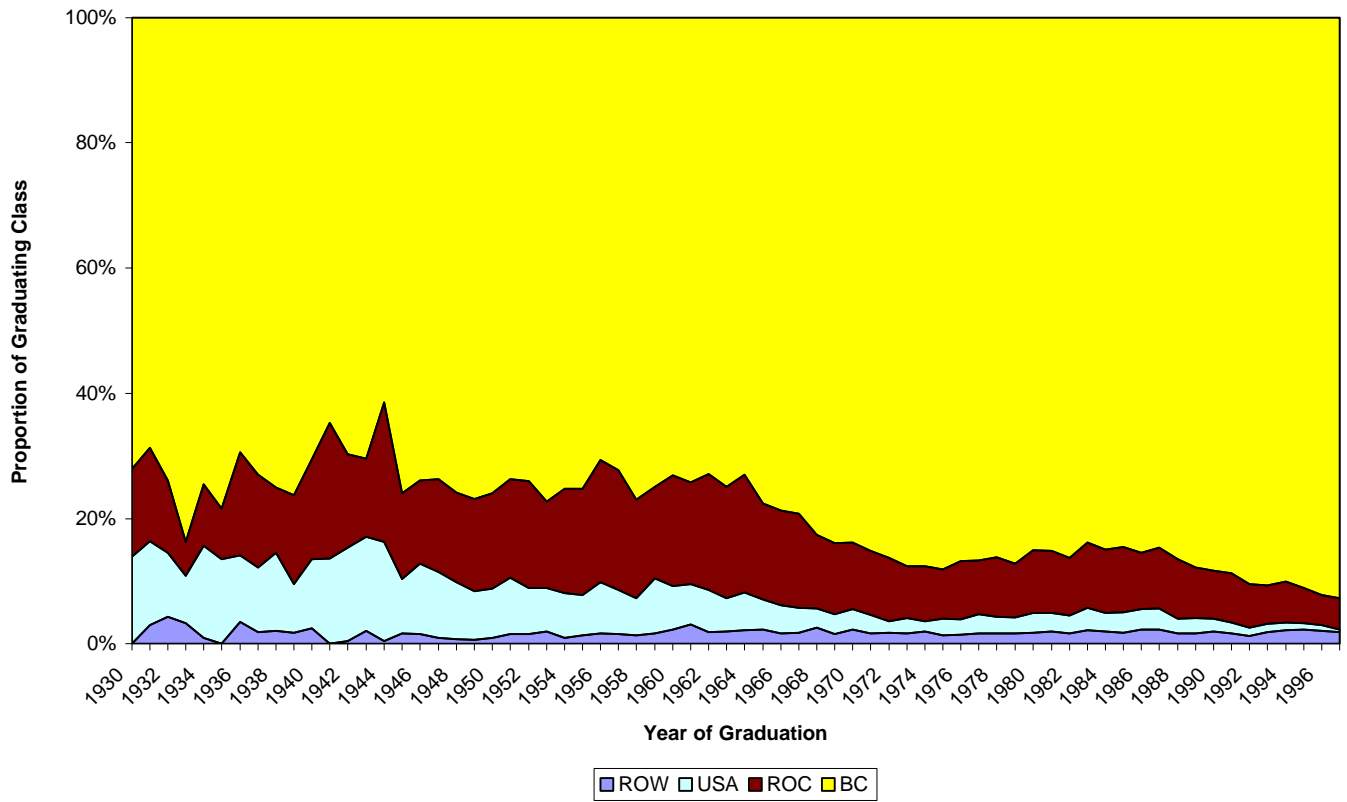
About two-thirds of UBC graduates of the 1930s and 1940s live in British Columbia, with about 15 per cent in the United States, an equal number in the rest of Canada, and a sprinkling over the rest of the world. By 1950 a downward trend has started to appear in the share living in the United States, matched by an increasing share going to the rest of Canada. By the late 1950s the ROC share is more than twice that going to the United States. From 1960 on, there is an increase in the share of UBC bachelor's degree holders staying in BC, so that more than 85 per cent of UBC's mid-1970s bachelor's degree graduates are still living in BC in the late 1990s, with about 10 per cent in the rest of Canada, 3 per cent in the United States, and 2 per cent in the ROW. For the 1980s graduates, there are slight increases in all of the shares living outside BC, with that trend being reversed again in the 1990s. For 1990s grads, roughly 90 per cent live in BC, 6 per cent in the rest of Canada, and 2 per cent each in the United States and the rest of the world.

Figures 2 through 15 show the current locations of the holders of UBC's undergraduate and graduate degrees. These figures start in different years, according to when each program or degree achieved sufficient numbers of graduates for each subsequent year.<sup>1</sup> Figures 2 and 3 show the locations of the holders of degrees from the two largest degree groups, the Bachelor of Arts and the Bachelor of Science. The figures start in 1960, since before that time the Faculty of Arts and Sciences was a single unit, with less clear demarcation between degrees in the sciences and those in the humanities and social sciences. The two degrees follow similar patterns of distribution,

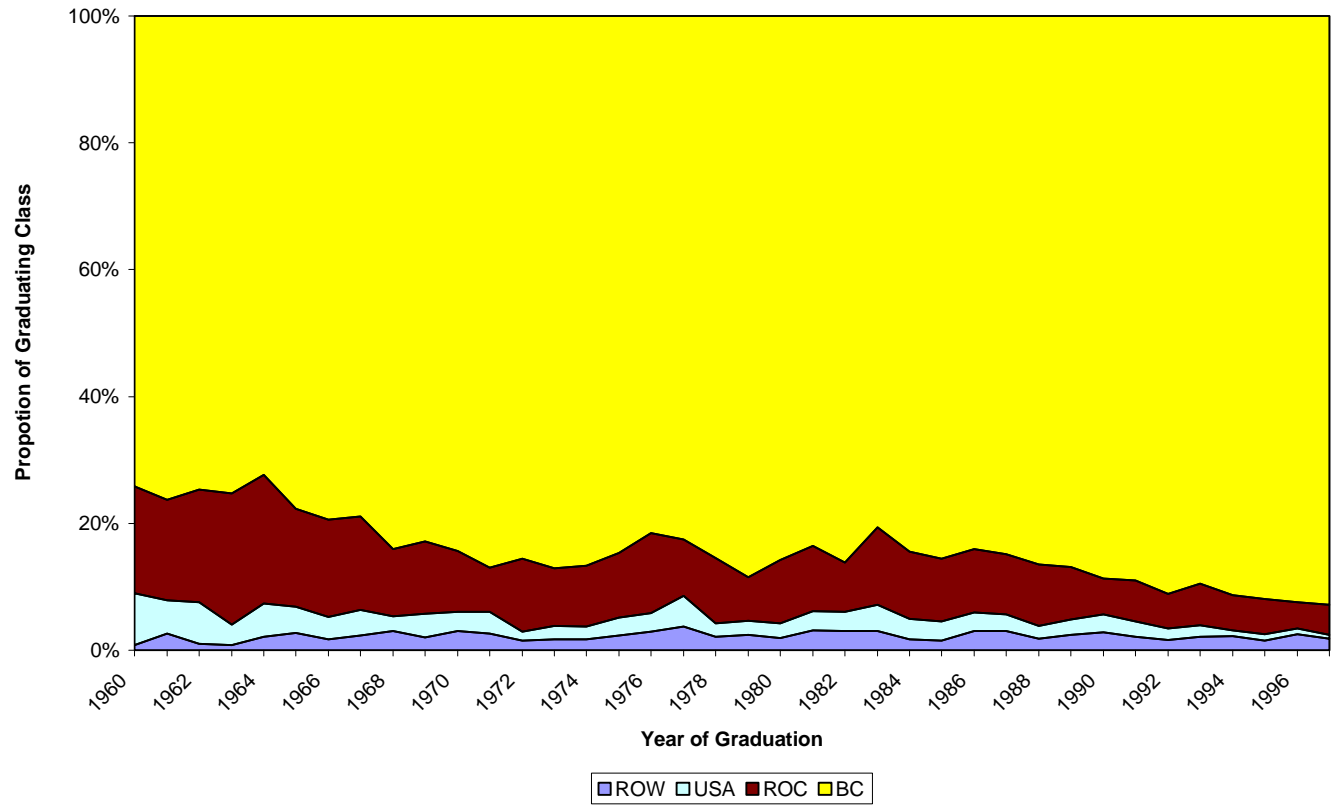
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<sup>1</sup>An appendix showing the total number of degrees granted for each program and each year is available from the authors on request.

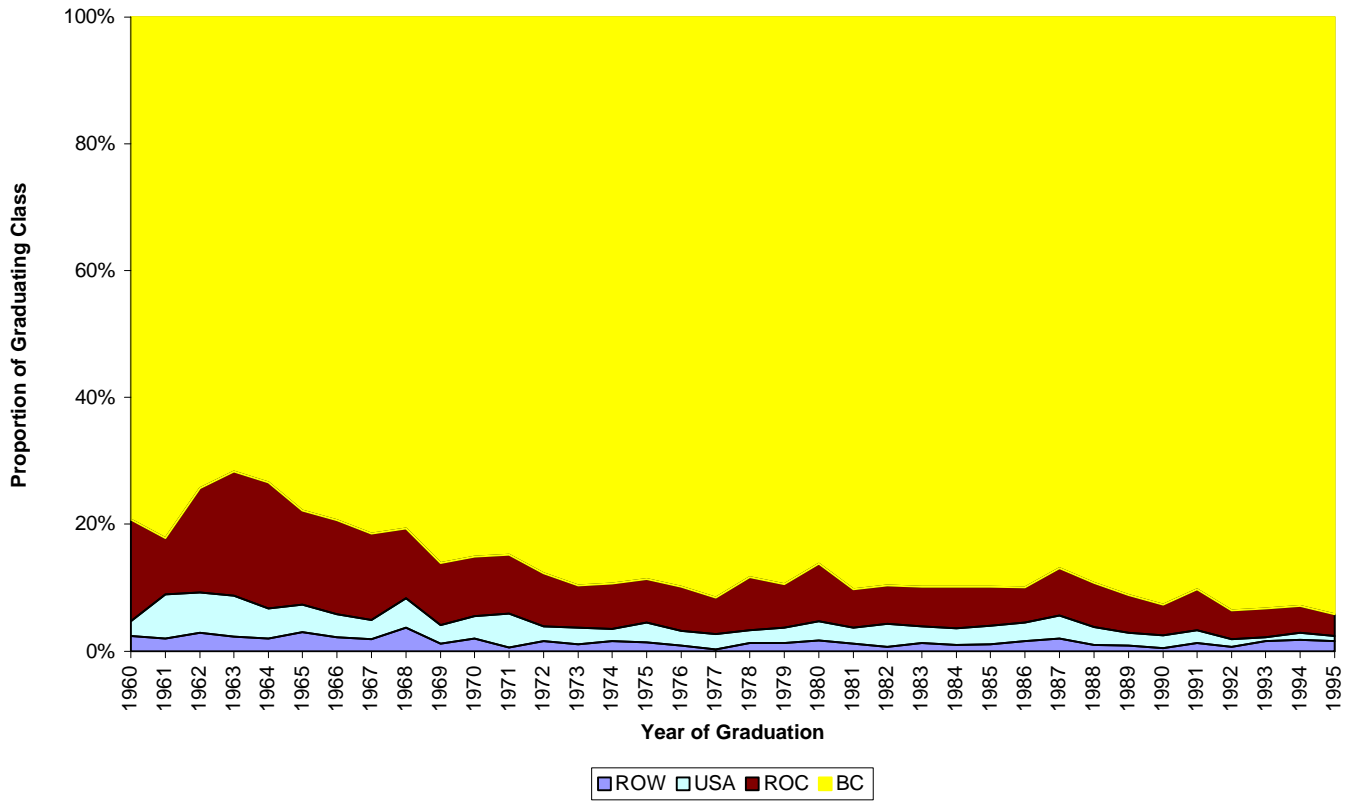
**Figure 1**  
**Current Location of UBC Bachelor's Graduates 1930 to 1997**



**Figure 2**  
**Current Location of UBC Bachelor of Arts Graduates 1950 to 1997**



**Figure 3**  
**Current Location of BSc Graduates**



which in both cases are similar to those described for the totals in Figure 1. Figures 4 through 7 show bachelor's degrees in applied science, education, commerce and law. Since the number of graduates is large enough, the figures for engineering, commerce and law go back as far as 1950. For education, the number of graduates was very small in the 1950s, so Figure 5 starts in 1960. Figure 4 shows that more than two-thirds of the engineering grads of all decades still live in BC, with the proportion rising with each decade, so that more than 90 per cent of the 1990s grads are in BC. The proportion living in the rest of Canada has the largest downward trend over the decades, with the U.S. share always being small but declining only slightly over the decades. The rest of the world's share has generally been larger than the U.S. share.

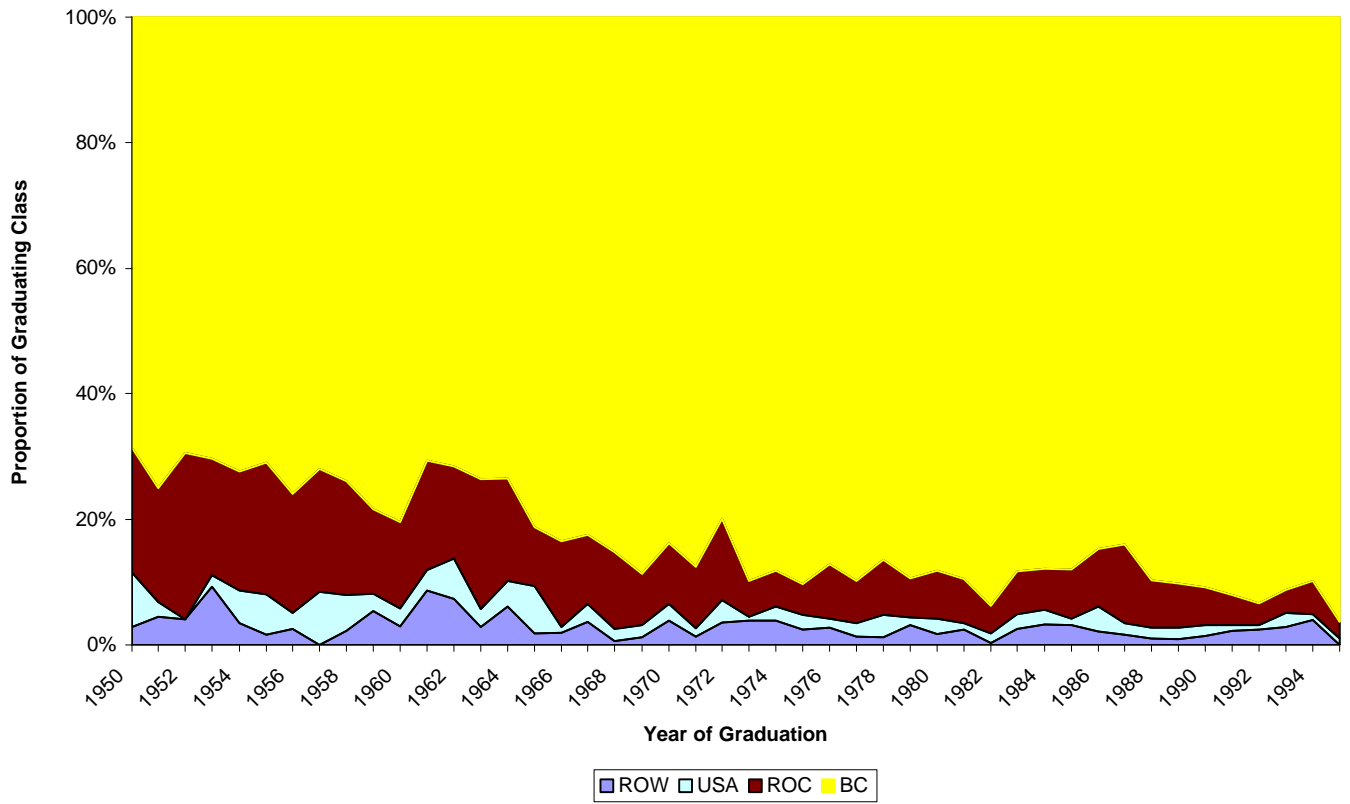
Figure 5 for education shows the striking extent to which teachers, at least those trained in British Columbia, remain living and working in the province. The proportions living in the United States and the rest of the world have seldom been as high as 1 per cent each, and have generally shrunk over the decades. The proportion living in the rest of Canada has averaged about 5 per cent, with an upwards movement, to almost 10 per cent, for graduates in the first half of the 1990s.

The distribution of commerce grads, shown in Figure 6, is rather similar to that shown for engineers, with the exception of the rising ROW share in the 1990s. This is related to the increasing share of commerce students originally from Asia, and especially Hong Kong and Singapore, who have returned there to live and work after graduation.

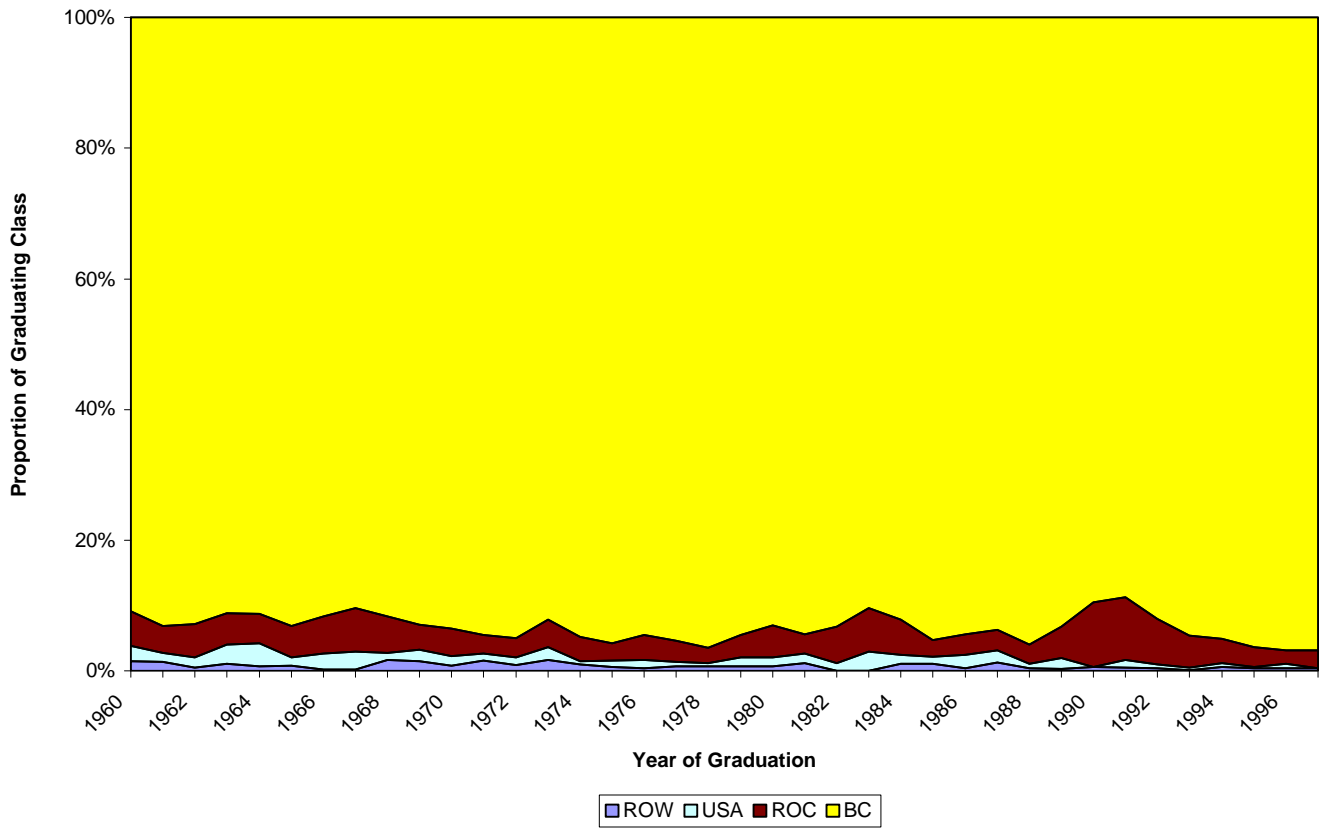
Figure 7 shows that the large majority, averaging almost 90 per cent, of UBC LLBs living in British Columbia, with almost all of the remainder living in the rest of Canada. The proportion living in the rest of Canada shows bulges for the graduates of the 1960s and the 1990s.

Figures 8 and 9 show the main health science degrees, the bachelor's degree in nursing and the MD degree, respectively. In both cases there are substantial drops over time in the share of graduates living in the United States. However, the two health professions show quite different patterns for the shares of graduates living elsewhere. For BSNs, for which the data start in the 1960s, when the program first attained significant scale, the U.S.-resident share has dropped from 9 per cent for 1960s grads to less than 4 per cent for 1980s grads and less than 2 per cent for 1990s grads. There has been a parallel drop in the larger proportion living elsewhere in Canada, which falls from 17 per cent for 1960s grads to 4 per cent for 1990s grads. The MDs also show a large drop in the U.S.-resident share, from 12 per cent

**Figure 4**  
**Current Location of BAsC Graduates**

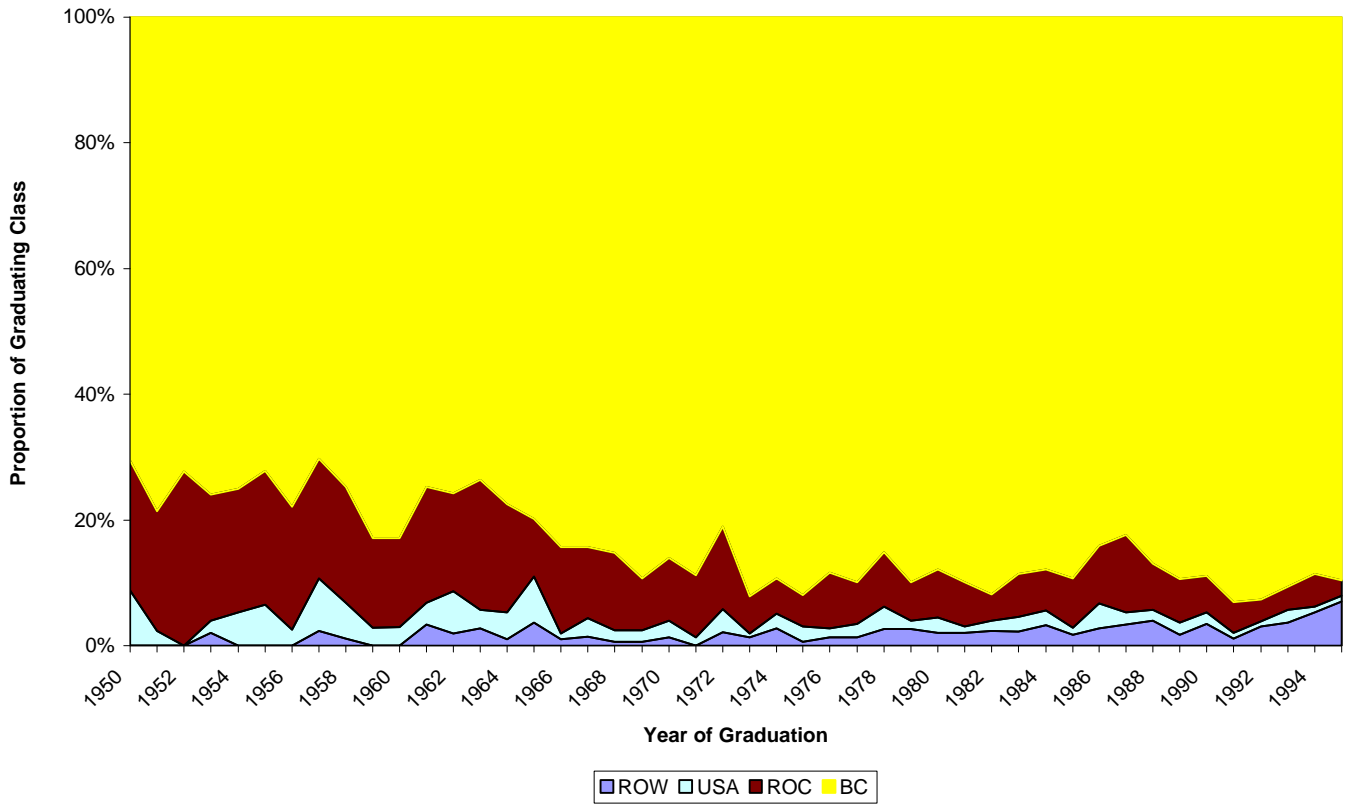


**Figure 5**  
**Current Location of B.Ed. Graduates**

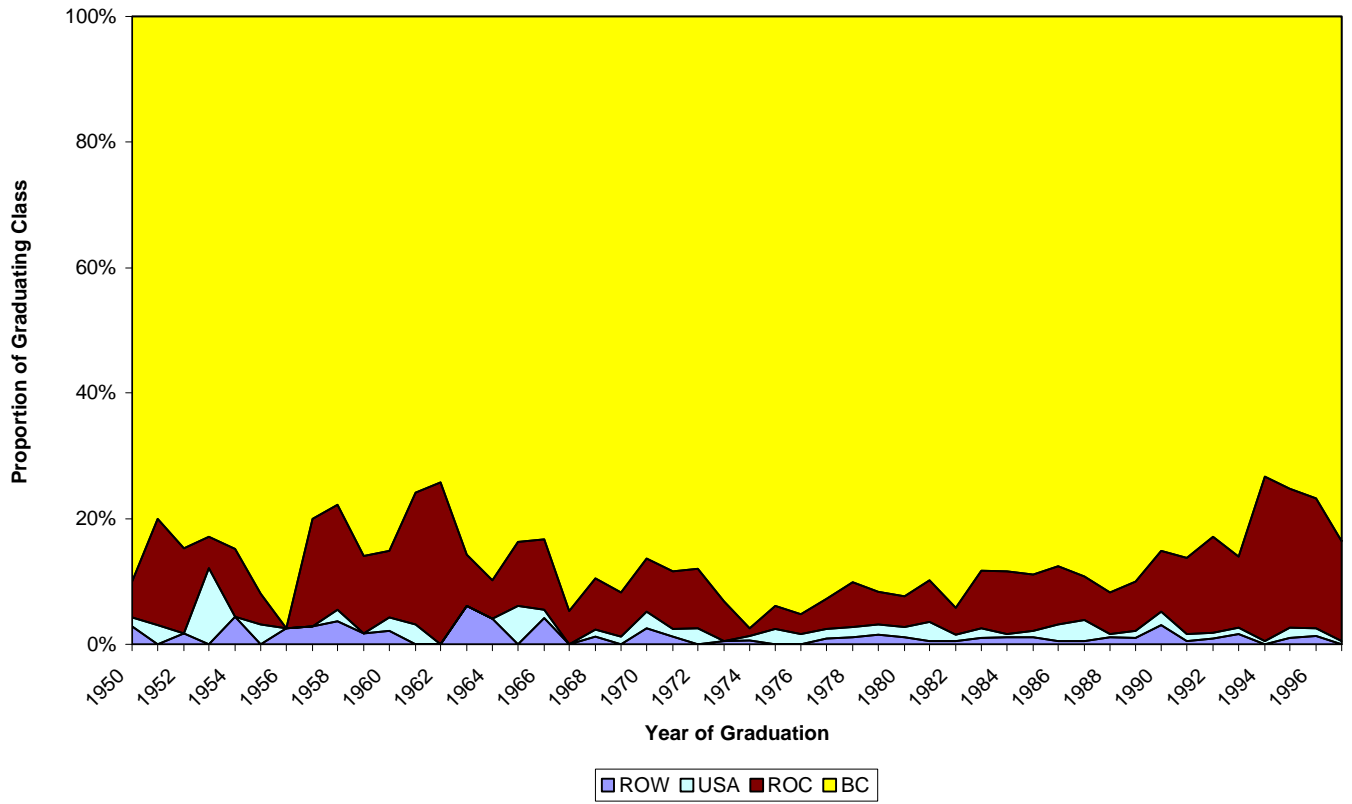




**Figure 6**  
**Current Location of BCom Graduates**



**Figure 7**  
**Current Location of LLB Graduates**



**Figure 8**  
**Current Location of BSN Graduates**

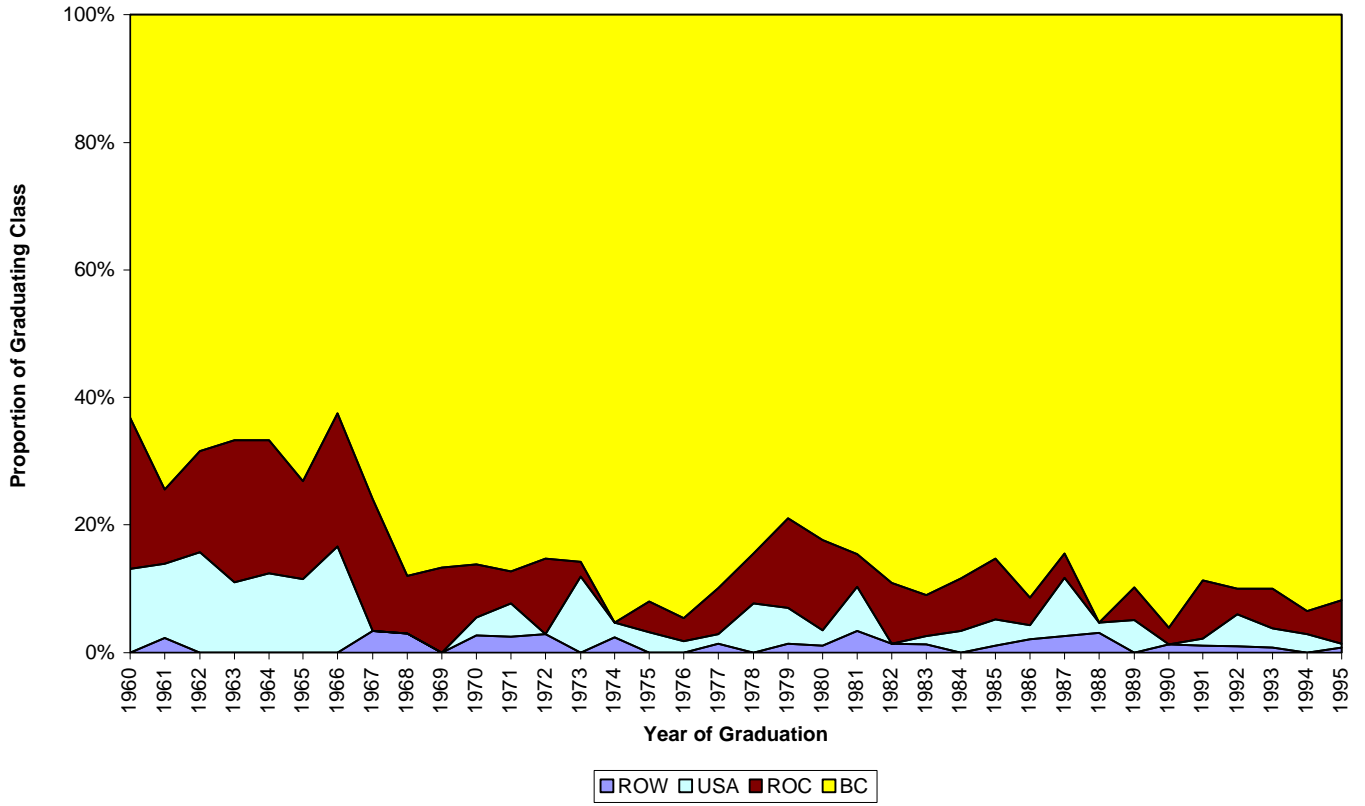
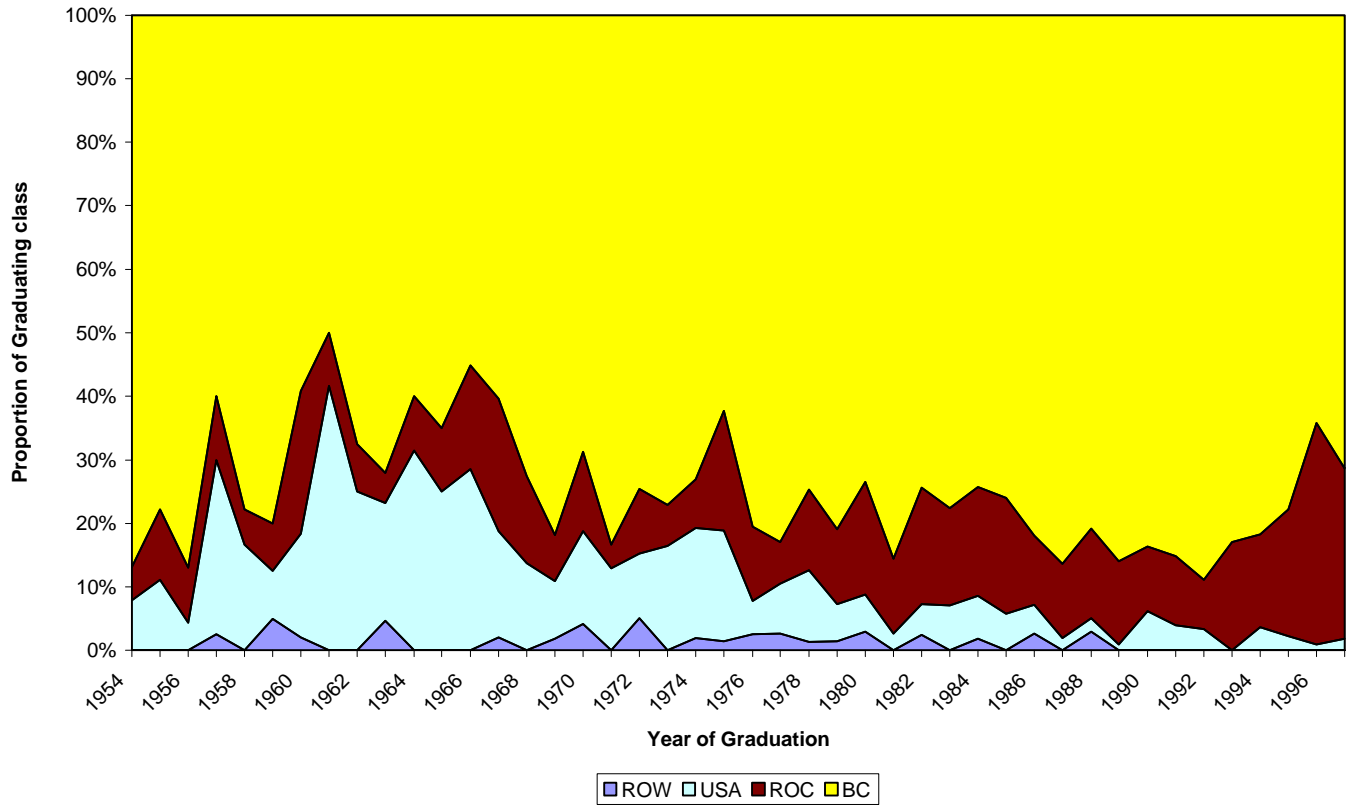


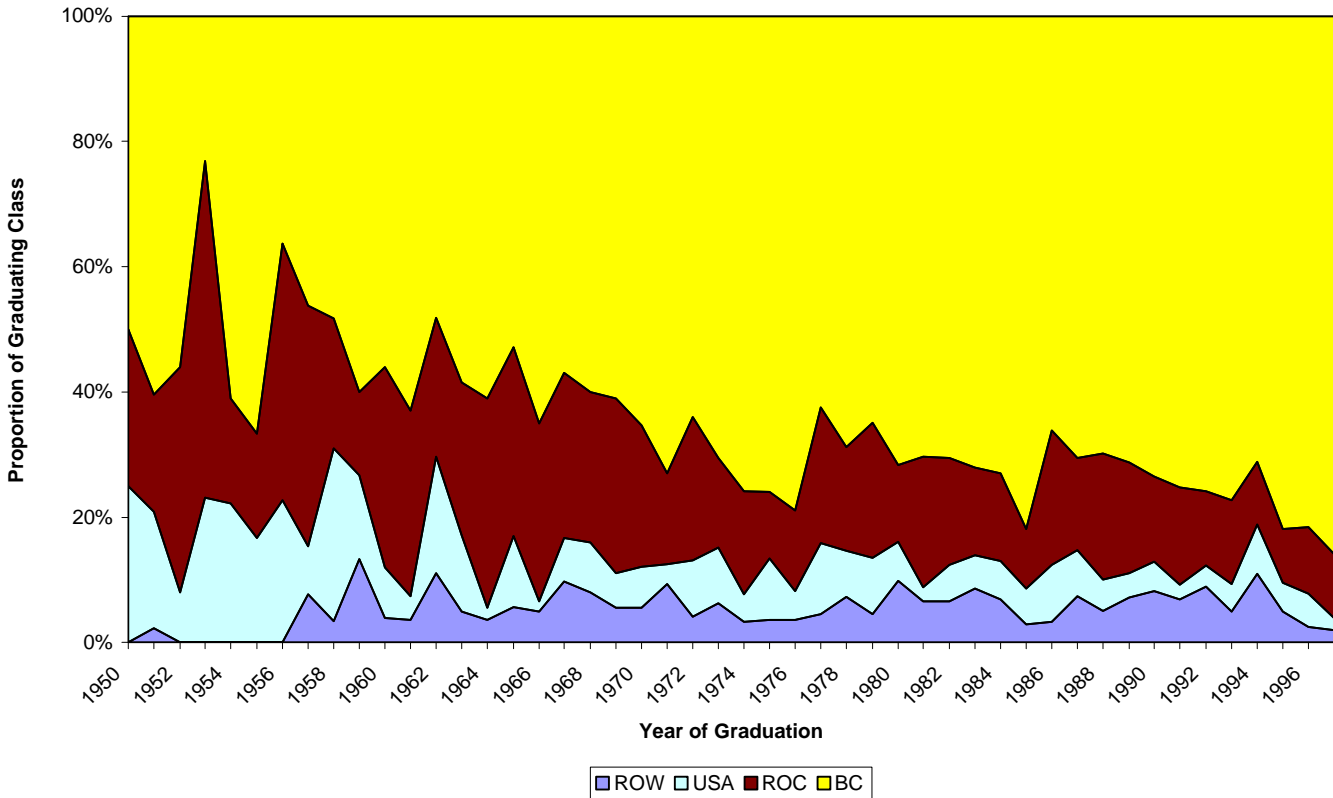
Figure 9  
Current Location of Medical Graduates



for 1950s grads to 4 per cent for 1980s grads and 3 per cent for 1990s grads. But there has been a substantial increase of the share living in the rest of Canada, which is 8 per cent for 1950s grads, rising to 15 per cent for 1980s grads and 18 per cent for 1990s grads. The pattern for MDs probably reflects, among other things, the extent to which there have been increases in the scale and quality of specialist post-graduate medical training in Canada. Students who go away for training also make contacts, friends and often families while there, and sometimes put down roots there as well. Thus the shift from U.S. to ROC residence is likely to reflect the shift from U.S. to Canadian locations for post-graduate medical training over the past four decades. The 1990s grads, of course, include many who are still in the midst of their residencies and specialist training, and have yet to choose the locations where they will practice.

In Figures 10 through 15, the spotlight turns to the graduate degrees. The graduate student populations are drawn from all over, and are correspondingly likely to go farther afield after graduation. They are also much more likely than are students in bachelor's or professional degrees to be employed in teaching and research during the course of their studies. There is a systematic database available for the citizenship of the incoming master's and doctoral classes for 1993 to 1997, but unfortunately nothing comparable for earlier years or for the bachelor's programs. The citizenship data reveal that the master's students are much more likely to be Canadian citizens than are the PhD students, and Figures 10 through 15 show that they are also more likely to be living in Canada after their graduation. Of the roughly 4,500 students who entered UBC master's degree programs 1993–98, 62 per cent were Canadian citizens, compared to 46 per cent of the 1,300 PhD en-trants. Figures 14 and 15 show that similar, but slightly higher, proportions of 1990s master's and PhD graduates are now resident in British Columbia, and much higher proportions resident somewhere in Canada, roughly 85 per cent for master's grads and 75 per cent for PhDs. Figures 10 to 13 show the distribution of locations of residence for the graduates of the largest master's programs. The patterns generally match that for the total, although for engineers the decline of the U.S. and rest-of-Canada shares is most evident, just as it was for the undergrad engineers. For both master's and PhD programs there is thus a substantial net flow of foreign citizens into Canadian residence. Many of these students would have established their Canadian residence before undertaking graduate work, although the current data do not permit the extent of this to be measured. In addition, of course,

**Figure 10**  
**Current Location of MA Graduates**



**Figure 11**  
**Current Location of MSc Graduates**

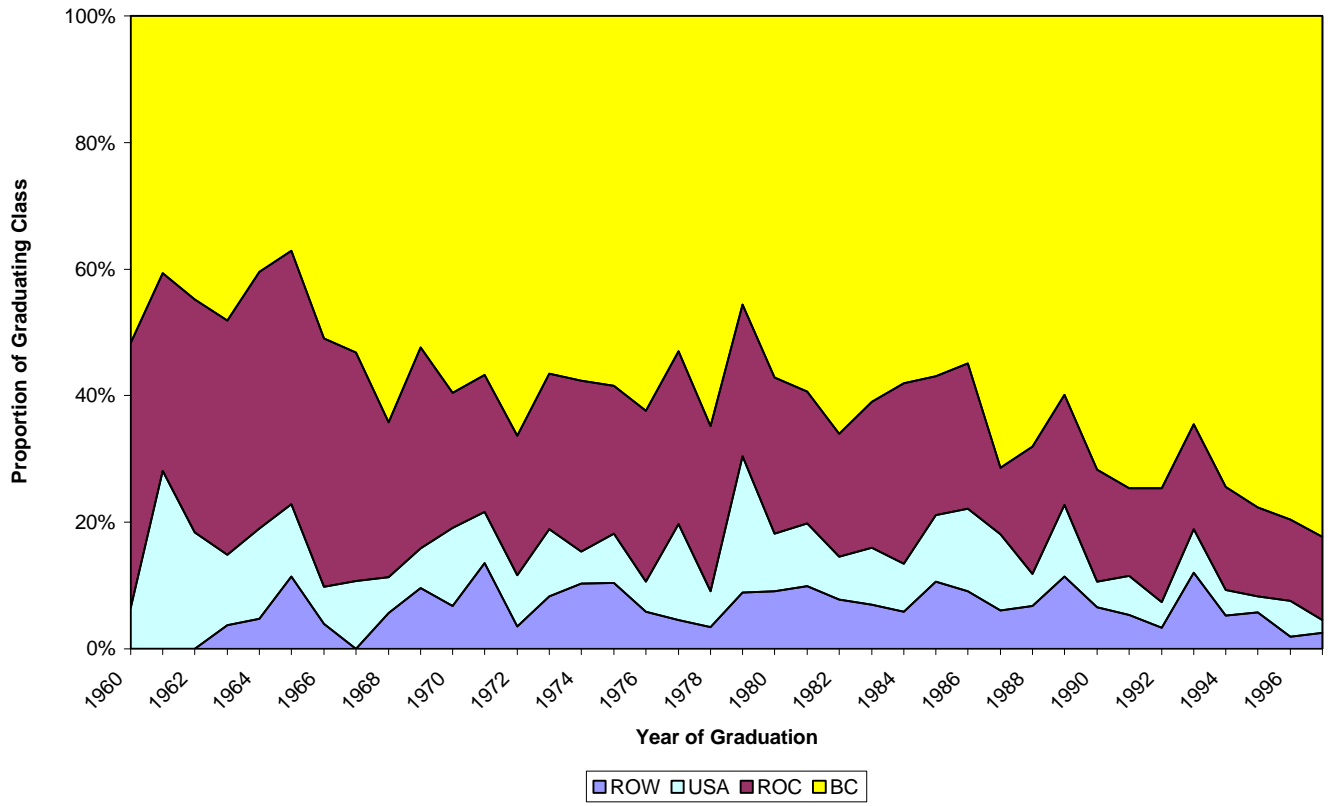
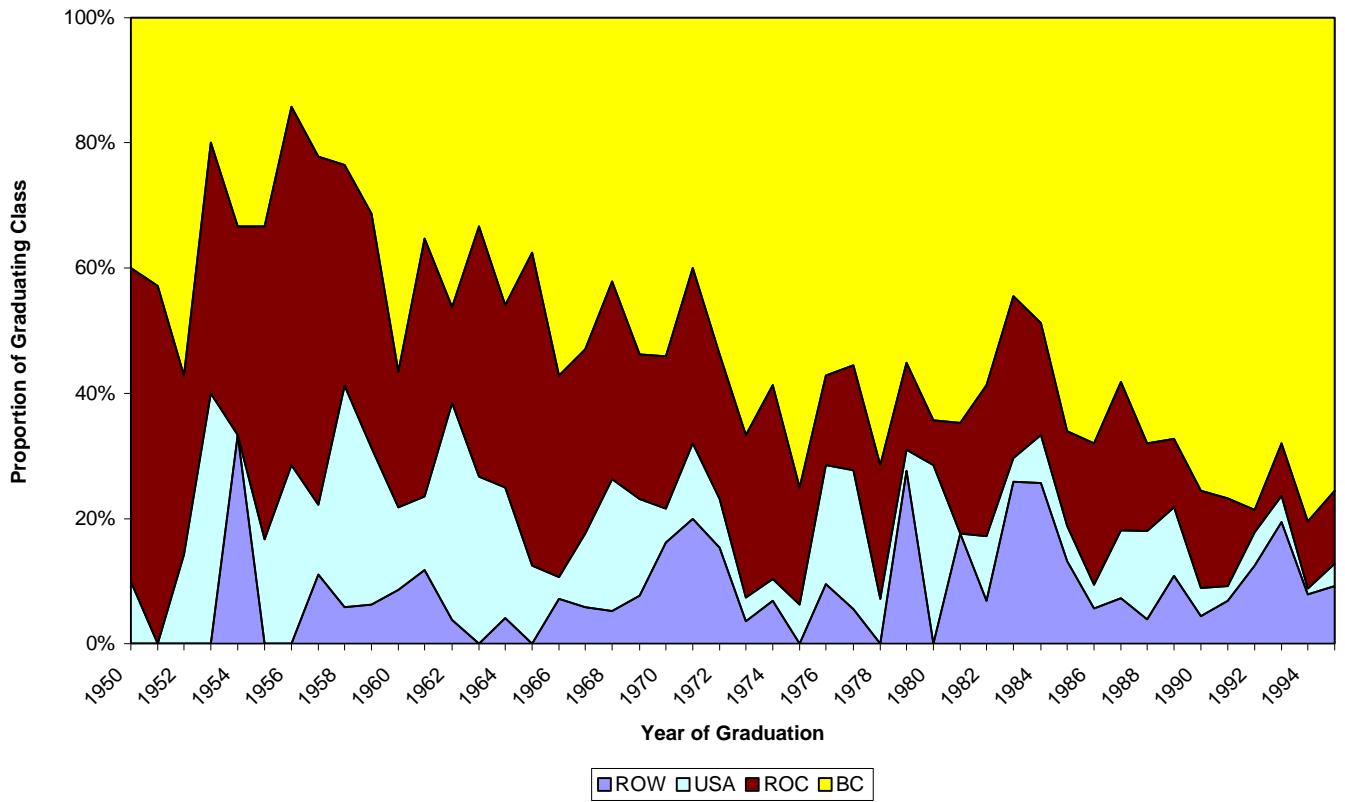


Figure 12  
Current Location of MASc Graduates





**Figure 13**  
**Current Location of MBAs 1970 to 1997**

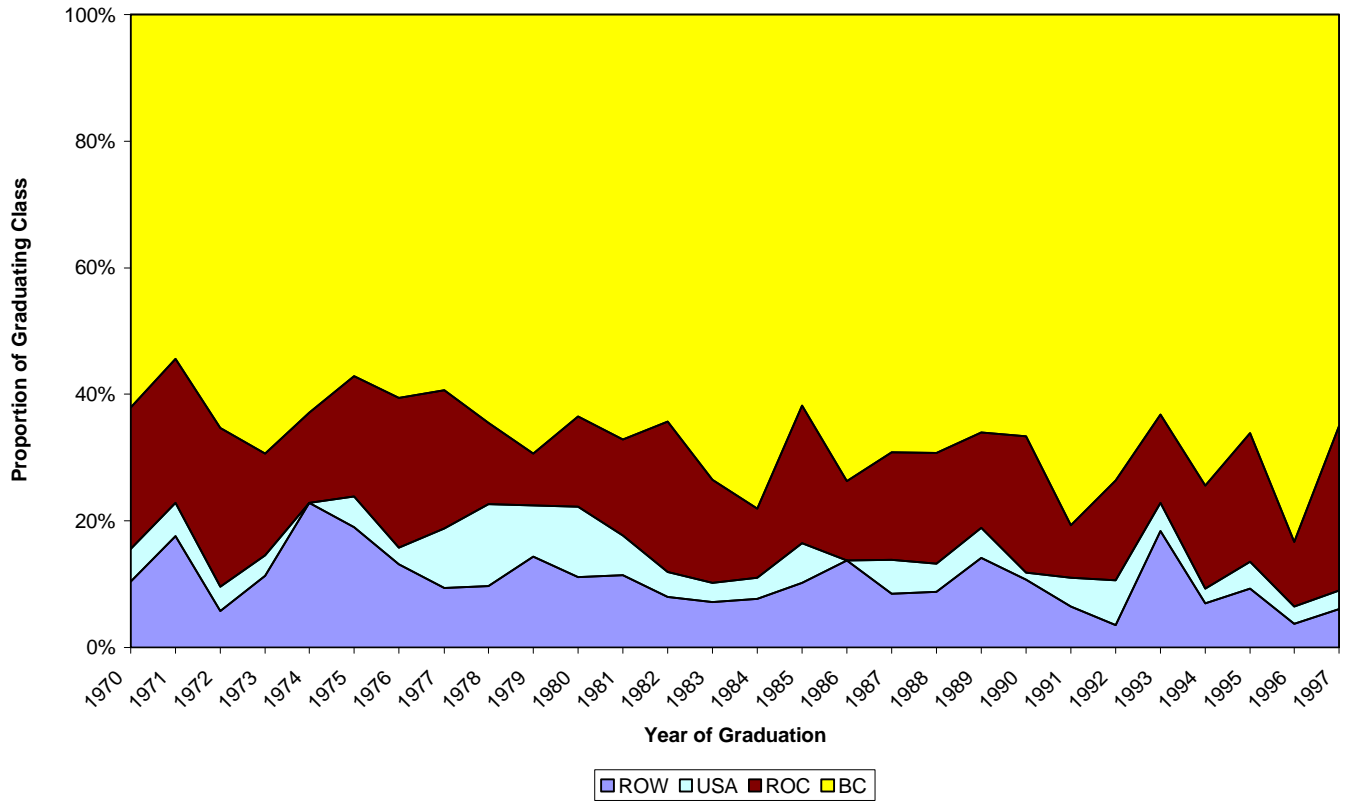
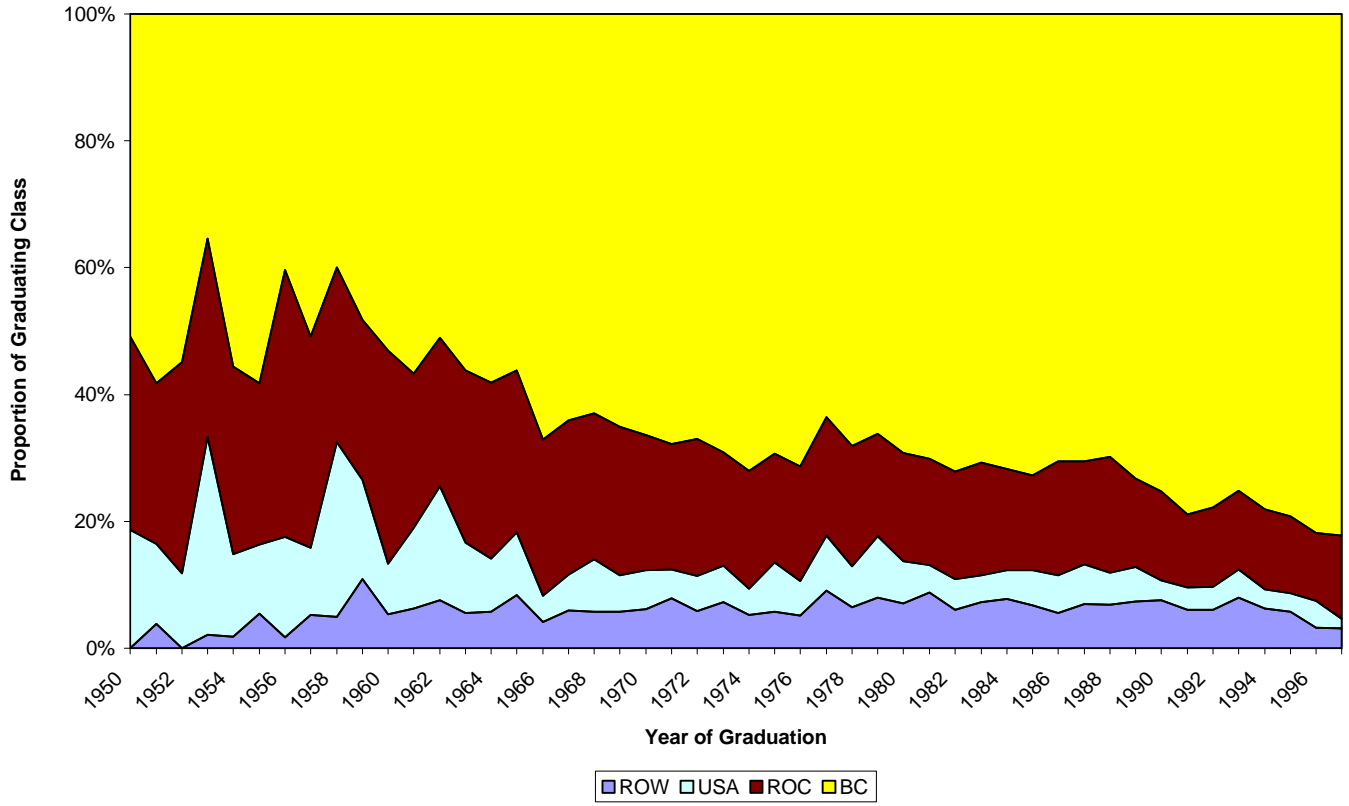
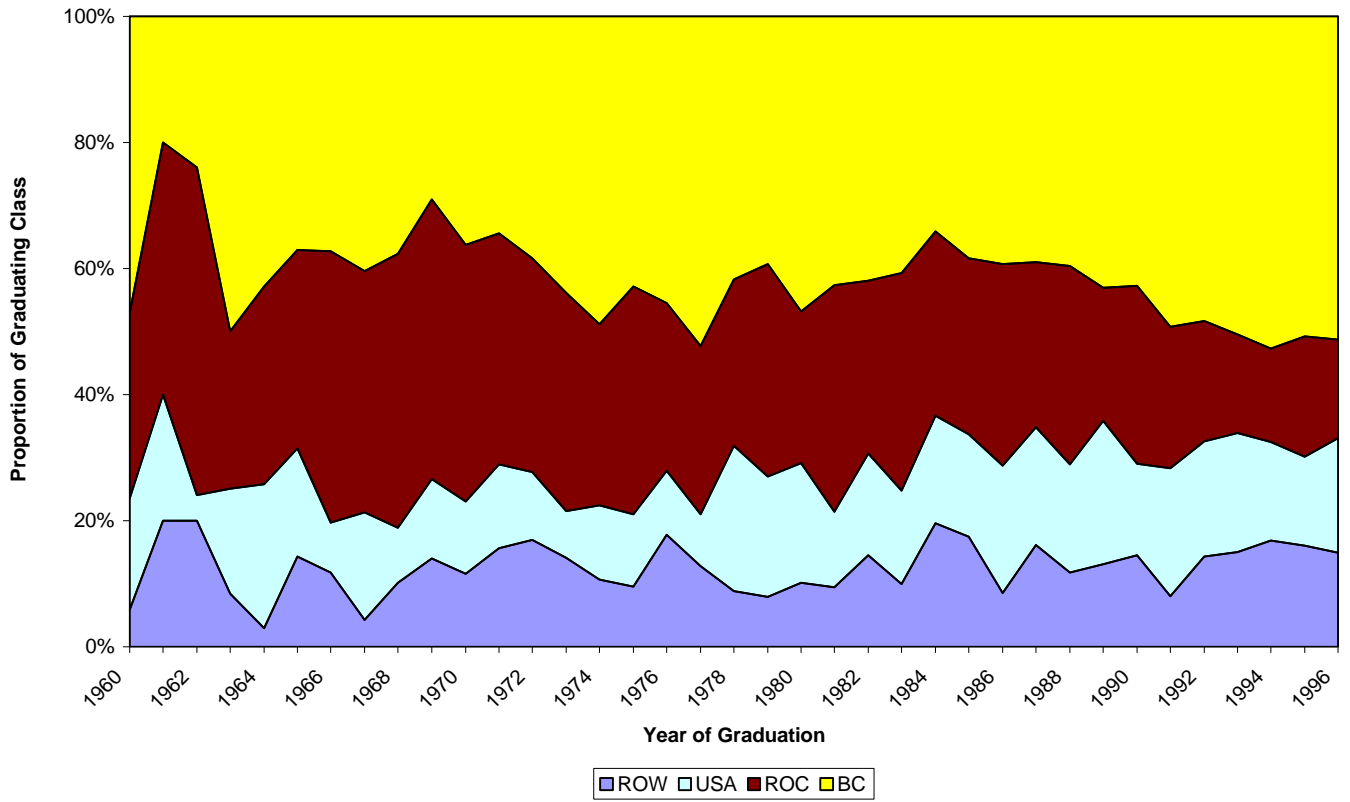


Figure 14  
Location of UBC Masters Graduates



**Figure 15**  
**Current Location of PhD Graduates**



the students covered by the 1993–98 entry class data are not the same individuals as the 1990s graduates, since the latter generally started and finished earlier. However, there is a large overlap, and the general distribution patterns of entrants have remained fairly stable over the period for which data are available, so that the citizenship patterns for the 1990s grads are likely to match fairly closely those of the 1993–98 intake.

There is some evidence of a net pass-through effect, of foreign students receiving PhD degrees at UBC and then moving to the United States for employment. U.S. citizens represent 7 per cent of PhD entrants, while the United States is the current residence of more than 15 per cent of 1990s UBC PhD graduates. There is no similar pattern in master's degrees, where the U.S. citizenship share among entrants (6 per cent) is larger than the share of 1990s master's degree recipients now living in the United States. It is reasonable that the magnet effect of the United States should be larger for PhDs than for master's degrees, since the PhD is a specialized degree, with positions scattered widely, with concentrations in areas with many well-funded research institutions, such as in Massachusetts and California. Since the U.S. population is more than 80 times that of British Columbia, and the total of teaching and research positions much more than 100 times as great, it is remarkable that there are roughly three times as many of UBC's 1990s PhDs resident in BC as in the United States. Many PhD graduates scan the world as a whole for possible positions after their graduation, while no doubt some others set down roots where they receive their training, as was suggested earlier for the case of medical post-graduate training. Later research will analyze the extent to which graduate students' countries of origin are linked to their post-degree choices of residence and employment. For some students, the PhD is a ticket to the outside world, with no return ever planned, while others no doubt arrive, or are sent, in the expectation that they will return home at some stage to their original countries of citizenship.

Among the intake classes, there is evidence of a strong China/Hong Kong linkage, with more than 10 per cent of master's intake and 13 per cent of PhDs holding citizenship from China, Chinese Taiwan or Hong Kong. The Commonwealth ties also appear to be strong, as the per capita representation of students from Australia, New Zealand and the United Kingdom is more than three times that for the United States, even without taking account of the fact that the distances to UBC are far greater for the Commonwealth students. We turn now to consider more systematically the effects of distance and other factors in determining the place of residence of UBC grads from different degrees and decades.

## Factors Influencing Migration Trends and Patterns

We have two sorts of evidence to report in this section, statistical analysis based on the data already described in Figures 1 through 15, and the responses submitted to the questionnaire aimed at non-resident UBC graduates. The statistical analysis will receive most of our attention, because it covers a large majority of all of UBC's graduates, wherever they may be living, and because the responses to the survey questions are summarized in a later section.<sup>2</sup>

The central device we use to explain the geographic distribution of UBC graduates is the gravity model of migration. The theory and related literature are described elsewhere (see Helliwell, 1998, especially ch. 5), but the central idea is simple, and the results are fairly straightforward to interpret. The basic gravity model of economic and social interaction, true to its Newtonian namesake, hypothesizes that the intensity of trade, social interaction and migration between two cities, countries or regions increases with their size and decreases with the distance separating them. In Newton's version, these effects are all proportional, so the interaction increases proportionately with the product of the sizes of the two bodies and decreases proportionately with the distance between them. This translates into an equation that is linear in logarithms. When this is applied to migration or trade data, the extent of the proportionality is estimated rather than assumed on theoretical grounds.

When we apply the model to the determination of place of residence of UBC graduates, we measure the size of the destination region by its population, and measure its economic attractiveness by its income per capita. Distance is measured by the distance separating UBC from the destination in question. We have restricted our analysis to UBC grads living in Canada and the United States, since those living in the rest of the world are spread among so many countries that there are generally too few observations for each country to make statistical analysis reliable. We divide the U.S.-resident grads among the 50 states and the District of Columbia, and the Canadian grads among the ten provinces. For each equation we eliminate those observations representing states or provinces where there are no resident UBC grads of the decade or degree in question. Our desire to keep the sample large enough to produce significant results has therefore led us to restrict our main equations presented to those covering major degree types, and by decades for the largest degree type. Our early results showed that the distribution patterns were quite different as between bachelor's, master's and PhDs. The change in distribution patterns from decade to decade proved to be significant only for bachelor's degrees. Both of these main statistical results were

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<sup>2</sup>The detailed survey results are also available from the authors on request.

foreshadowed by the patterns in Figures 1 through 15. What we can gain in addition from our statistical work is some idea of the determinants of the patterns as well as measures of the extent to which the visible patterns are statistically significant.

Table 1 shows our results for the distribution of all UBC grads among states of the United States and provinces of Canada, with separate equations for each of the three major degree types.<sup>3</sup> The dependent variable in each case is the logarithm of the number of UBC grads of the type in question resident in a particular state or province, and the independent variables include the logarithms of distance, per capita income, and population. Because earlier research has shown that migration is much more likely within a country than across national borders, even after allowing for the effects of distance, we add a variable called *Canada*, which takes the value of one for each of the Canadian provinces. To test for the possibility that UBC grads also have a preference for remaining in British Columbia (perhaps reflecting their place of birth and the locus of family, social and professional contacts), we also add a variable that takes a value of one for the BC row in the matrix.

Several patterns are evident in the results shown in Table 1. We already saw, from Figures 1 through 15, that the holders of graduate degrees were more likely to be widely spread. We could not tell at that stage why this was the case, although we inferred that it was primarily because graduate students come from farther away in the first place, so that going far away after graduation is likely to be a return home. In our equation, we cannot adjust for the differing mixes of incoming students, since we do not have the necessary information. However, we can see that there is a steady decrease

**Table 1: Distribution of UBC Alumni among States and Provinces (by degree type)**

	<i>ln(distance)</i>	<i>ln(y/capita)</i>	<i>ln(pop)</i>	<i>Canada</i>	<i>BC</i>	<i>R</i> <sup>2</sup>
Bachelor's	-0.97 (7.4)	1.74 (5.0)	0.92 (11.2)	3.84 (15.4)	1.50 (2.1)	0.91
Master's	-0.75 (5.4)	1.55 (4.0)	0.79 (8.7)	3.7 (13.4)	1.1 (1.3)	0.87
PhD	-0.43 (3.4)	0.98 (3.0)	0.74 (9.5)	3.1 (12.8)	1.29 (1.8)	0.86

<sup>3</sup>The three equations are estimated as a system, using the Zellner SUR estimator, as implemented in the SHAZAM statistical package. Since the three equations are estimated as a system, they need to have the same number of observations. Thus any destination is excluded unless it has at least one of UBC's bachelor's, master's or PhD degree holders.

Note: Absolute values of t-statistics are shown in parentheses below the coefficients. There are 54 observations for each equation.

in the effects of distance, income per capita, and population size as one moves from the bachelor's through the master's to the PhD results. We also find that the preference for other provinces relative to the United States, as indicated by the size of the Canada coefficient, drops as the level of degree increases. This could be entirely due to the more international citizenship mix of the graduate degrees, although it may also reflect differing patterns of job availability.

The results for distance, income and population are consistent, and are likely to have similar underlying explanations. As already discussed, higher levels of education tend to provide more specialized skills, with a corresponding reduction in the number of available jobs in any particular region. To obtain a job in one's specialty is likely to require a longer move the higher the degree of specialization. Thus, it is no surprise to find that the effect of distance drops steadily as the degree level rises. The distance effect for PhDs is less than half as large as that for bachelor's, with the effect for master's in between, but closer to the bachelor's effect.

The effect of income differentials is also markedly different by degree type. All three types of degree holders are significantly drawn towards states or provinces with higher per capita incomes, but these effects are much larger for bachelor's than for PhDs, with the master's in between. There are likely to be three reasons for this: many of those entering PhD programs have already opted for specialized research over higher income options, the distribution of research and teaching positions does not match per capita income differences very closely, and there may also be a loose relation between research salaries and general income levels within a state or province. PhDs are thus more likely to go where their research interests take them, with relative income levels relegated to a lesser role. For bachelor's, the relative income effects are large and significant, with a 1 per cent increase in a state or province's income per capita being associated with a 1.7 per cent larger number of UBC graduates. For master's degree holders, the income differences are also large and significant, although smaller than for bachelor's. Interestingly, and supportive of the results for the PhD grads, when the master's grads are split between the more research-oriented programs (MA and MSc) and the master's degrees with a more professional focus, the relative income effect is significantly higher for the holders of professional degrees than for the more research-oriented degrees.

Table 2 shows the significance of the coefficient differences discussed above. As already noted, the differences between the bachelor's and PhD results are most marked, with all the coefficient differences except the BC border effect being significant. For the master's, the relative income and border effects are insignificantly different from the bachelor's, while for the distance and population effects the master's are part-way between the bachelor's and PhDs and significantly different from both. As for the border effect, Table 3 shows the likelihood of a degree-holder choosing to live in BC rather than the United States (in the first column), and the likelihood of choosing to live in the rest of Canada relative to living in the United States (in the second column), in both cases after adjusting for the effects of size and distance.<sup>4</sup>

For example, the value of 61 for the bachelor's Canada effect means that a UBC bachelor's grad (who is not living in BC) is 61 times more likely to be living elsewhere in Canada than to be living in the United States, after adjusting for the effects of population size, distance and relative incomes. The border effects are much larger for grads living in British Columbia, as foreshadowed by Figures 1 through 15. The border effects for PhDs are significantly less than for bachelor's, with a typical PhD who is not living in BC being 22 times more likely to be living in the rest of Canada than in the United States.

**Table 2: Significance of Coefficient Differences between Degree Types**

<i>Test of Equality of Coefficients</i>	<i>Probability of Coefficients Being Equal</i>				
	<i>ln(distance)</i>	<i>ln(y/capita)</i>	<i>ln(pop)</i>	<i>Canada</i>	<i>BC</i>
Bachelor's = PhDs	0.000	0.006	0.000	0.003	0.986
Bachelor's = Master's	0.013	0.330	0.005	0.826	0.473
Master's = PhDs	0.021	0.021	0.019	0.003	0.669

<sup>4</sup>The Canada effect is the anti-log of the Canada coefficient, while the BC effect is the anti-log of the sum of the BC and Canada coefficients. The sum is used in the second case because the BC and Canada variables both take the values of one for the BC observations.



**Table 3: Border Effects**

	<i>BC vs. U.S.</i>	<i>Canada vs. U.S.</i>
Bachelor's	240	61
Master's	161	59
PhDs	89	22

We turn now to consider trends by decade in the choices of residence by UBC grads. Analysis on a decade-by-decade basis for the graduate degrees does not show significant differences. This is partly evident in the data reported in Figures 10 through 15, but is also due to the relatively small number of graduate degrees, and hence of destinations, in the earlier decades. This is because UBC's graduate programs are of much more recent vintage than the main bachelor's degrees. Although the number of degrees has been growing rapidly, it is not adequate to support much in the way of decade-by-decade analysis.

Our results for bachelor's grads, reported in Tables 4 and 5, show that there has been a slight but not significant drop in the distance effect from the 1950s to the 1990s, and no significant change in the relative income and population effects. However, there have been significant increases in both the BC and Canada border effects, especially from the 1950s to the 1990s. We have two different samples to calculate equations for the 1990s. One includes

**Table 4: Distribution of UBC Bachelor’s Alumni among States and Provinces (by decade — each with 46 observations)**

	<i>ln(distance)</i>	<i>ln(y/capita)</i>	<i>ln(pop)</i>	<i>Canada</i>	<i>BC</i>	<i>R</i> <sup>2</sup>
1950s	-1.14 (6.93)	1.60 (2.08)	0.87 (7.01)	3.40 (10.75)	0.45 (.53)	0.88
1960s	-0.82 (4.87)	2.69 (3.42)	0.73 (5.71)	3.83 (11.81)	1.18 (1.34)	0.88
1970s	-0.91 (5.72)	2.54 (3.44)	0.68 (5.69)	3.86 (12.64)	1.65 (1.99)	0.90
1980s	-0.85 (5.3)	3.27 (4.4)	0.79 (6.52)	3.98 (12.98)	1.57 (1.88)	0.91
1990–94	-0.78 (4.68)	2.03 (2.62)	0.78 (6.19)	4.05 (12.61)	2.33 (2.68)	0.90
1990–97	-0.83 (4.53)	1.90 (2.22)	0.84 (6.08)	4.30 (12.2)	2.31 (2.41)	0.89

Note: Absolute values of t-statistics are shown in parentheses below the coefficients.

only the five years from 1990 through 1994, while the other includes 1990 through 1998. The results are different, showing that the most recent grads are more likely to show addresses in British Columbia. To some extent, however, this is likely to be due to the continued appearance of local addresses for ex-students who may have moved elsewhere without the UBC mailing records having yet been brought up to date. There will also be students who are undertaking further education in British Columbia, or are traveling with

**Table 5: Significance of Coefficient Differences between Decades**

<i>Test of Equality of Coefficients</i>	<i>Probability of Coefficients Being Equal</i>				
	<i>ln(distance)</i>	<i>ln(y/capita)</i>	<i>ln(pop)</i>	<i>Canada</i>	<i>BC</i>
1950s = 1990s	0.050	0.689	0.853	0.001	0.019

addresses of convenience still in British Columbia, before establishing their longer-term residences. Even if the analysis is restricted to the 1990–94 grads,

there is still a significant reduction from the 1950s to the 1990s in the likelihood that graduates are living in U.S. states rather than in British Columbia or elsewhere in Canada.

Table 6 shows that the relative likelihood of a UBC bachelor's graduate moving elsewhere in Canada, compared to the United States, rose from around 30 in the 1950s, to between 50 and 60 for the following decades, with some further increases showing up in the 1990s. The relative likelihood of a UBC bachelor's grad living in BC, compared to moving to the United States, has shown an even larger increase, from about 50 in the 1950s to more than 500 in the 1990s.

**Table 6: Border Effects for UBC Bachelor's Graduates**

	<i>BC vs. U.S.</i>	<i>Canada vs. U.S.</i>
1950s	47	31
1960s	150	54
1970s	246	51
1980s	246	58
1990–94	590	57
1990–98	726	79

### **How Do the UBC Data Compare with other Measures of Graduate Migration?**

Thanks to a recent national survey of 1995 graduates of Canadian universities who have moved to the United States (Frank and Bélair, 1999, hereafter *South of the Border*), it is now possible to fit the UBC data into the national picture. If the UBC and the national data correspond well for the national survey year of 1995, then the UBC data can be used to add a valuable time dimension to the national data. Without such a time dimension, the survey of 1995 graduates provides a precise and valuable snapshot, but cannot be used

to assess trends in the numbers, degree mix and fields of graduates who move.

Our data cover all UBC graduates, wherever they are from, and wherever they may now be living, while *South of the Border* deals especially with Canadian graduates who moved to the United States, leaving aside graduates who have moved to other countries, and removing graduates who were U.S. citizens at the time of graduation. As we shall see, these differences are important in the case of graduate students, while being much less important for bachelor's graduates, who are much more likely to be Canadian citizens and are much less likely to move outside Canada after graduation. We plan further efforts to obtain data from the national survey that are more exactly comparable to the UBC data, but we are already able to see that the two data sources are remarkably consistent, thus increasing their separate and joint usefulness.

One general question that might be raised is whether the migration patterns of BC graduates are likely to be very different from those of other provinces, perhaps because British Columbia has had population growth exceeding that of other provinces for most of the decades under review. In fact, *South of the Border* (Figure 3-6, page 13) reports that British Columbia is closer to the national average than any other province, providing 9 per cent of the movers to the United States as well as 9 per cent of graduates who remained in Canada. By contrast, Quebec graduates are less than half as likely to leave for the United States, compared to the national average, while Ontario graduates are almost 40 per cent more likely to move south of the border. Studies of migration show that both distance and a common language are important determinants of migration, so both of these effects are to be expected, with Ontario much closer to large U.S. centres of population, and Quebec graduates mostly having French as their first language.

When we come to consider the details of the data, we find some interesting differences arising between the UBC and national data, most of which are sensibly explained by UBC's geographic and educational position among Canadian universities. Tables 7 and 8 show the U.S.-bound graduates as measured nationally in *South of the Border* and for UBC by our data set. The most striking thing about the table is how close the two measures are, and how they contain similar levels and patterns of migration among degree types. The closest comparison is provided by using the UBC totals including

**Table 7: Current Location of 1995 Graduates**

<i>Location of Graduates</i>	<i>Bachelor's</i>	<i>Master's</i>	<i>PhD</i>	<i>All Degrees</i>
<b>Canada</b>				
From UBC	4,484	878	183	5,545
From Canada	134,044	20,539	2,626	157,209
UBC share	3.3%	4.3%	7.0%	3.5%
<b>U.S.*</b>				
From UBC	51	30	37	118
From Canada	2,376	683	359	3,418
UBC share	2.1%	4.4%	10.3%	3.5%
<b>Canada + U.S.</b>				
From UBC	4,535	908	220	5,663
From Canada	136,420	21,222	2,985	160,627
UBC share	3.3%	4.3%	7.4%	3.5%
<b>Rest of World</b>				
From UBC	108	59	42	209
From Canada**	5,654	1,845	684	8,183
<b>Worldwide</b>				
From UBC	4,643	967	262	5,872
From Canada	142,074	23,067	3,669	168,810
UBC share	3.3%	4.2%	7.1%	3.5%

Notes: \* The Statistics Canada (National) data cover graduates who went to the United States after graduating, but may not still be there. The UBC data are for UBC graduates who are currently in the United States.

\*\*From an unpublished estimate based on the 1997 National Graduates Survey.

**Table 8: Proportion of 1995 Graduates Living in the United States**

	<i>Bachelor's</i>	<i>Master's</i>	<i>PhD</i>	<i>All Degrees</i>
	(%)	(%)	(%)	(%)
<b>Share of (Can+U.S.) in U.S.</b>				
UBC	1.1	3.3	16.8	2.1
National	1.7	3.2	12.0	2.1
<b>Share of Total in U.S.</b>				
UBC	1.1	3.1	14.1	2.0
National	1.7	3.0	9.8	2.0

only those graduates living in Canada or the United States.<sup>5</sup> By this measure, Table 8 shows that 1.1 per cent of UBC 1995 bachelor's graduates are living in the United States, compared to 1.7 per cent of national graduates who moved to the United States between 1995 and 1997. These figures become more equal if account were taken of the fact that 18 per cent of the national movers returned to Canada between 1995 and 1997. If this adjustment is appropriately applicable to bachelor's, it would lower the national estimate from 1.7 per cent to 1.4 per cent.<sup>6</sup> In addition, British Columbia is farther from U.S. centres of population, and hence less likely to have graduates move to the United States. Finally, population growth has been greater in British Columbia than in the rest of Canada, thereby increasing the share of local graduates likely to remain in the province of graduation. As shown by our gravity model equations in the previous section, the distance effect is more likely to show up for bachelor's than for master's and PhDs, since the latter graduates are much less deterred by distance. The adjustment for U.S. citizens would not make much difference for bachelor's, since the U.S. citizen share is very low at that level of study.

For master's graduates, the UBC measure of 3.3 per cent is very close to the national 3.2 per cent. Not too much should be made of a very close match, since there are noticeable year-to-year fluctuations, as evident in Figures 1 through 15, due to the relatively small number of migrants. Both sources of data show master's graduates to be two to three times more likely to move south than are the bachelor's graduates, for reasons discussed in the previous section.

For PhD graduates, the basic UBC measure for U.S.-resident 1995 UBC PhDs is 14.1 per cent, rising to 16.8 per cent if the graduates in the ROW are excluded to make our data more comparable with the reported national numbers. The number from *South of the Border* is 12 per cent. Thus both sources of data show that PhDs are much more likely to move to the United States than are either bachelor's or master's graduates. Why might the UBC numbers be higher than the national total? There are several reasons. Adjusting for U.S. citizens is important at the PhD level. As we have seen in

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<sup>5</sup>This gives a higher estimate of the share of graduates living in the United States, since the denominator excludes graduates living in the rest of the world. The difference is negligible for bachelor's, noticeable for master's, and quite substantial for PhDs.

<sup>6</sup>Supplementary data from Statistics Canada show that bachelor's were a slightly smaller share of the returnees (43 per cent) than they were of the original movers (51 per cent). Using this additional adjustment reduces the proportion of bachelor's returning to 15 per cent. This raises the 1.4 per cent national estimate for bachelor's movers who also stayed, but by little enough that it still rounds down to 1.4 per cent.

the previous section, 7 per cent of the 1993–98 PhD intake at UBC were U.S. citizens, who are excluded from the *South of the Border* calculations. They are included in the UBC data. If 7 per cent of the 1995 UBC PhDs were U.S. citizens, and half of them returned to the United States after graduation, then removing the U.S. citizens from the UBC data would reduce the 16.8 per cent to 13.3 per cent, very close to the national 12 per cent. Our data for residence do not include citizenship, so we cannot know exactly what fraction of the U.S. citizens returned to the United States, but the factor is clearly important. The geography effect is not likely to be important, since distance was not found to be important for the subsequent location of PhDs.

Other possible reasons for greater southern mobility of UBC PhDs might include a more international and more specialized composition of UBC's PhD programs, compared to the national average. Table 7 also shows that UBC is much more than proportionately represented in national PhD production, and is thus also likely to be accompanied by a greater range of specialized programs. The more international mix of PhD students (fewer than 50 per cent of UBC PhD students are Canadian students, and citizenship is spread widely over more than 100 countries) is also likely to produce a crop of graduates who are mobile, and perhaps as likely to be attracted to U.S. as to Canadian opportunities. Offsetting these reasons for higher PhD export from British Columbia to the United States is the growing relative size of the BC population, and the rapidly expanding number of UBC PhDs resident in the province (see Figure 15).

Given the fact that the UBC and national numbers are quite similar degree by degree, with smaller UBC export of bachelor's being offset by greater PhD export, it might be thought surprising to find that for all degrees taken together, 2.1 per cent of North American resident UBC grads live in the United States, compared to 1.5 per cent as reported in *South of the Border*. The reason for this difference is that the Statistics Canada national number includes degrees below the bachelor's level. When the total is constructed, as in Table 8, for bachelor's degrees and above, the UBC share living in the United States is exactly equal to that for the national sample. The similarity for the aggregate of the degree types is made up, as Table 8 shows, of a U.S.-bound share of UBC grads that is less than the national average for bachelor's, equal for master's, and higher for PhDs. Thus UBC produced 3.3 per cent of Canada's 1995 bachelor's graduates now living in North America, compared to 4.3 per cent of the master's grads and 7 per cent of the PhDs.

Another expected difference between the UBC and national results is in the distribution of graduates among the different U.S. states. In the national results, the main recipient states were Texas, California, New York and Florida, with 16 per cent, 11 per cent, 10 per cent and 8 per cent of the U.S.-

resident Canadian graduates, compared to U.S. population shares for these same states of 7 per cent, 12 per cent, 7 per cent and 5 per cent. Thus Texas received more than twice its population share of U.S.-bound graduates at the national level, while California received its population share, with New York and Florida 50 per cent more than their population shares. The UBC pattern, which we have calculated for the average of the period 1990–97 to make the sample sizes usefully large, shows the effects of its western location and its higher proportion of research degrees. Thus the largest recipient states for UBC graduates are California 23 per cent (twice its population share),<sup>7</sup> Washington State 15 per cent (seven times its population share), New York 8 per cent (slightly above population share), and Massachusetts 4 per cent (twice its population share).

How do the UBC data compare with the national totals across different fields of study? As we have already seen in Figures 1 through 15, most degrees have fairly similar shares of U.S.-bound graduates, except that the U.S. shares are traditionally lower than average in certain professional areas, such as education and law. The national data for 1995 show unusually high proportions of south-bound migrants in the health professions, who were more than twice as likely to have moved south than were graduates in other fields. For the UBC nursing and MD grads, however, the U.S.-resident share of 1995 graduates, and of 1990s graduates in total, remained stable at slightly below 2 per cent, and thus below the university-wide average for all specializations. The over-representation of health-care professionals in U.S.-bound 1995 graduates in the rest of Canada is perhaps reflective of health care spending and employment cuts in other provinces that were not mirrored in British Columbia.<sup>8</sup>

*South of the Border* also reports that graduates with degrees in engineering and the applied sciences were twice as numerous among the south-bound migrants as they were among the graduating class. The UBC data do not reflect this part of the national data either. For the national sample, engineers and applied scientists were almost twice as numerous among the migrants as

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<sup>7</sup>Roughly one-quarter of both UBC and national U.S.-resident PhDs are resident in California, so the difference between the UBC and national numbers is due to a higher proportion of PhDs in the UBC total and also to California-bound migration at the bachelor's and master's levels that is greater for UBC than for other Canadian universities.

<sup>8</sup>*South of the Border* reports that one in five of the national south-bound migrants of the class of 1995 were nurses, and suggests that this was likely to reflect dramatic changes that were taking place in the health-care sectors of several provinces.



they were among those who stayed in Canada. UBC engineering grads, by contrast, were no more likely to move south than all bachelor's taken together, with 1.1 per cent of 1995 grads, and a corresponding share of all 1990s BAsSc grads, now living in the United States.<sup>9</sup> Given the relatively large flows from UBC to Washington State, it is possible that some applied scientists appearing as BSc graduates in the UBC data, such as computer science graduates, may have been over-represented even if engineers were not. We do not have data for sub-programs within each degree, but for the Bachelor of Science degree as a whole, of which computer science is a part, 20 of the roughly 1,300 BSc graduates in 1995 in the alumni data file are now living in the United States. This is about 1.5 per cent, not materially above the average for all bachelor's programs.

In addition to the one-shot Statistics Canada data for the graduating class of 1995, there are additional cross-checks possible with some time series for total emigration of degree-holders from Canada to the United States. Zhao, Drew and Murray (2000) report sample data from the Statistics Canada reverse records check that there was an increase from the 1986–91 period to the 1991–96 period in the numbers of permanent and temporary migrants moving from Canada to the United States. For the two types of movement considered together, the annual average increased from 23,000 in the 1986–91 period to just under 30,000 per year from 1991–96. They also report data from Revenue Canada that the number of taxfilers moving from Canada to the United States increased from something like 10,000 in 1991 to between 14,000 and 23,000 in 1997. How can we reconcile these data with the data for UBC graduates? We can probably rule out the possibility that the recent migrants are less likely than earlier migrants to have university degrees, since the post-FTA changes in immigration rules have made it relatively easier for Canadian degree-holders to work in the United States. The most likely explanation for the different trends is the fact that the UBC data show only the current locations of degree-holders, and not when they moved. Thus it is likely that the higher number of movers during the 1990s included migrants from a number of different graduating classes. There is supporting evidence for this interpretation from the U.S. CPS data, which show that almost 70 per cent of the post-1990 adult (aged over 16) Canadian-born movers to the United States were in the 25 to 44 age group. This suggests that during the 1990s there may have been an increase in the proportion of several pre-1990s UBC degree recipients now living in the United States. These increases have

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<sup>9</sup>The same pattern is true for the MASc, with 3 per cent of the 1995 graduates living in the United States, the same share as for UBC master's graduates in general. We have not split the PhDs by specialty, since the annual numbers in each field are small enough to make the year-to-year changes subject to considerable random fluctuation.

not, however, been large enough to reverse the general trend showing more recent graduates to be less likely to be living in the United States. However, as already noted, for the most recent years it is likely that the UBC address records will not have fully caught up with the latest addresses, especially for those who have not yet chosen long-term locations.

We turn now to a review of the UBC Alumni Association survey of UBC graduates living outside Canada.

## The Survey Evidence

The UBC Alumni Association has had a survey posted on its Web page ([www.alumni.ubc.ca](http://www.alumni.ubc.ca)) since early in 1998. Since then, about 300 UBC alumni have responded, answering the questions and often offering their opinions, as requested, on whether a “brain drain” is taking away Canada’s “best and brightest”, and, if it is, how such a problem should be resolved.<sup>10</sup> Due to the low response rate, small sample size, and strong risk of self-selection bias, it is difficult to make any firm conclusions from the survey evidence. However, the answers given do seem consistent with the larger Statistics Canada survey and our regression analysis, although the sample is too small to permit us to see if there are the same differences by level of degree.

For the first question (Why did you move away?), the majority of respondents (76 per cent of U.S. residents and 69 per cent of ROW residents) cited better job or graduate school opportunities. Better pay was a distant second in terms of frequency, with 26 per cent of U.S. residents and 6 per cent of ROW. Lower taxes were an important factor to 18 per cent of the U.S. residents, 13 per cent of ROW. In general, ROW respondents in Europe (especially northern Europe) were paying more tax than they had in Canada, while many Southeast Asian ROW respondents were paying lower taxes. The net effect is that moves to the United States are more financially driven, while moves to other countries are often motivated by personal or cultural factors. This is reflected in responses to the second question (What do you like most about your new home?) where “culture” scored 25 per cent for ROW residents, but only 10 per cent for U.S. residents.

In some cases, the difference between U.S. and ROW responses can be illustrative of underlying decision factors in the migration decision. For

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<sup>10</sup>The survey is described, and answers recorded, accompanied by some responses to the open-ended questions, in an Appendix to this paper available from the authors.

example, in the third question (What do you dislike about your new home?) there are several answers with significantly different responses from the two groups. Residents in the ROW were more likely to not like the crowds (18 per cent ROW to 7 per cent U.S.), the pollution (18 per cent to 5 per cent) and the weather (11 per cent to 7 per cent). On the other hand, U.S. residents were more likely to not like peoples' attitudes (27 per cent of respondents living in the United States compared to 20 per cent of ROW respondents), crime and gun control (21 per cent to 3 per cent), or lack of Canadian activities such as skiing and hockey (8 per cent to 2 per cent). Thus, from the survey results there seems to be a clear trade-off between lifestyle priorities for those going to the ROW, versus financial priorities for those going to the United States.

When describing what they missed most about Canada, ROW respondents first mentioned Canada's geography and weather (56 per cent), while U.S. respondents first mentioned friends and family (41 per cent). The second most missed thing for ROW respondents was friends and family (32 per cent), and geography and weather for U.S. respondents (36 per cent). These results fit with several factors identified in this paper. First, the fact that ROW respondents are less likely to miss friends and family in Canada mirrors the fact that UBC graduates not born in Canada are much more likely to have been born in the ROW than in the United States. For example, there are increasing numbers of Asian students returning to Southeast Asia (27 of 91 ROW respondents were in Southeast Asia), where they already have established networks of friends and relatives.

## Conclusion

Our analysis of the UBC graduate data, and our comparisons of the UBC data with those from the national survey reported in *South of the Border*, show a striking degree of consistency. Differences only appear where they are expected, principally due to the western position and unusually high proportion of research degrees among UBC's graduates. We found a slightly higher proportion of UBC graduates living in the United States than is true for the national sample, but this is fully explained by UBC's relatively high production of master's and especially PhD graduates, who are and have always been more mobile than bachelor's graduates. UBC's PhD students are drawn to UBC from more than 100 countries, and are widely distributed after their graduation. Some countries receive more of the completed PhDs than

their citizens make up of the student body, while for others the reverse is the case. United States citizens make up about 7 per cent of incoming PhDs, while twice that many UBC PhD graduates live in the United States. This no doubt reflects the fact that research and teaching positions, especially those with high incomes and research grants, are more concentrated in high income countries, and especially in the United States, than is the citizenship distribution of incoming PhD students. This international transfer of high level students, who come from one country, obtain graduate education in another, usually contributing teaching and research assistance while so doing, and then often choosing either country, or a third country, to continue their careers, provides the potential for increasing the fluidity of the international transfer of productive ideas. When viewed from the perspective of countries that provide many of the students but receive few of the eventual PhDs, this process has been described as a “brain drain”. This has frequently been the case for many developing countries, many of which do not have the resources to provide adequate facilities to even make the best use of their highly trained expatriates.<sup>11</sup> Under the same name, the issue was studied in the 1960s in Canada, with respect to what were then seen as large flows from Canada to the United States of those with high levels of education and skills. Our UBC data show how much the basic situation has changed between the 1960s and the 1990s. Canadian research and graduate education have expanded dramatically, leading many more undergraduates to stay in Canada for their graduate work. This is perhaps the single most important reason why the south-bound flows of bachelor’s graduates has fallen so much from the early 1960s to the 1990s. The resurgence of discussion of a brain drain in the 1990s has much less basis in the data, and probably represents factors specific to a number of specific sectors where funding support has risen much less rapidly than in the United States, such as some components of health spending, research and university financing. It has also been fuelled to some extent by sharp increases in the numbers in temporary NAFTA visas to Canadians working in the United States, and in part to increasing 1990s gaps, favouring high-income earners in the United States, relative to their Canadian counterparts, in salaries and tax rates.<sup>12</sup>

The UBC graduate data provide a valuable time dimension to the data available from *South of the Border*, enabling us to see whether the 1995 flows are part of a rising or falling trend. This can provide at least a partial

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<sup>11</sup>For an example focused on developing countries, see Bhagwati and Martington (1976). For a summary of the evidence and issues with more attention to the Canadian situation in the 1950s and 1960s, see Grubel and Scott (1977).

<sup>12</sup>For evidence on both these aspects, see Iqbal (1999); and Helliwell (1999).

answer to the question of whether there is evidence of an increasing flow of highly skilled Canadians, and citizens of other countries trained in Canada, to the United States. The UBC graduate data show, consistently with the data from the U.S. Bureau of the Census, that the past five decades have seen continuing reductions in the shares of UBC graduates living in the United States. Neither body of data is perfect, as the accuracy of the UBC data depends on the validity and coverage of address lists, and the U.S. Current Population Surveys done during the 1990s are on a sample basis. Thus it will take the 2000 Census in the United States to show with full precision whether there has been, during the 1990s, some resurgence of Canadian university graduates moving to the United States. The UBC data do not show any evidence of this so far, because for all of the large-scale bachelor's programs the proportion of graduates living in the United States has continued to fall during the 1990s.

For the graduate programs, the proportion living outside Canada is and has always been high, reflecting a very international mix of both the student intake and the available career positions. For all degrees, the proportion of 1990s UBC graduates living in the rest of the world is higher than that in the United States. For the graduate degrees, the proportion of the graduates subsequently living and working in Canada, and especially in British Columbia, is much higher than the share of Canadian citizens among the incoming students. With respect to the international distribution of those with the highest level of educational aptitude and attainments, as represented by the master's and PhD graduates of UBC, Canada and British Columbia stand in the middle ground between the United States and the rest of the world. Comparing the citizenship of UBC's graduate intake with the country of residence of the graduates, the United States is the largest proportionate net recipient (7 per cent U.S. citizen intake, 14 per cent U.S.-resident 1990s PhDs), Canada is the largest recipient in terms of numbers of PhDs (46 per cent Canadian citizen intake, 70 per cent Canadian-resident 1990s PhDs), with students from 100 other countries providing a net flow into Canada and the United States.

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