The Canadian Journal of Higher Education
La revue canadienne d'enseignement supérieur
Volume XXXI, No. 1, 2001 pages 141–176

Fields of Plenty, Fields of Lean: The Early Labour Market Outcomes of Canadian University Graduates by Discipline

ROSS FINNIE*
Queen's University

ABSTRACT

This paper reports the results of an empirical analysis of the early career outcomes of recent Canadian Bachelor's level graduates by discipline based on three waves of the National Graduates Surveys, which comprise large, representative databases of individuals who successfully completed their programmes at Canadian universities in 1982, 1986, and 1990, with information gathered during interviews conducted two and five years after graduation for each group of graduates (1984–87, 1988–92, 1990–95).

Many outcomes conform to expectations, typically reflecting the different orientations of the various disciplines with respect to direct career preparedness, with the professions and other applied disciplines generally characterised by lower unemployment rates, closer skill and qualification matches, higher earnings, and so on. On the other hand, while the

* This research was made possible by financial support received from the Human Capital and Education Studies Division of the Applied Research Branch of Human Resources Development Canada, while a Social Sciences and Humanities Research Council grant aided an earlier phase of the work. Helpful comments were received from Doug Giddings, Philip Jennings, Garnett Picot, Wayne Roth, Manon Rouleau, and Ted Wannell. Excellent research assistance was provided by Marc Frenette, Roger Sceviour, and Michel Villeneuve. This research has benefited greatly from other work using the same data undertaken with Marie Lavoie.

"applied" fields also tend to perform well in terms of the more subjective measures regarding job satisfaction and the overall evaluation of the chosen programme, these outcomes also depart from what job market outcomes alone might have predicted (e.g., fine arts and humanities graduates are more satisfied than many others). Some implications of the findings are discussed and avenues for future research are suggested.

RÉSUMÉ

Cet article présente les résultats d'une analyse empirique de l'évolution de la carrière des récents diplômés d'universités canadiennes, par discipline, basée sur trois enquêtes nationales auprès des diplômés qui comprennent des bases de données d'envergure représentatives d'individus qui ont terminé avec succès un programme canadien d'études universitaires en 1982, 1986 et 1990. Les renseignements ont été recueillis dans le cadre d'entrevues effectuées deux et cinq ans après que chacun de ces groupes d'étudiants aient obtenu leur diplôme (1984–87, 1988–92, 1990–95). Plusieurs résultats sont conformes aux attentes, c'est-à-dire qu'ils reflètent généralement les différentes orientations des diverses disciplines en ce qui a trait à la préparation immédiate à la carrière; par exemple, les professions et autres disciplines appliquées sont généralement caractérisées par des taux de chômage plus faibles, une meilleure concordance emploi-étude, un revenu plus élevé, etc. D'un autre côté, bien que les domaines « appliqués » ont tendance à obtenir de bons résultats pour ce qui est des mesures plus subjectives concernant la satisfaction au travail et l'évaluation globale du programme d'études, ces résultats diffèrent des prédictions des indicateurs relatifs au marché du travail. Les implications de ces conclusions sont discutées et des pistes de recherche sont suggérées.

INTRODUCTION

It is generally understood that early career, as well as longer-term, outcomes of university graduates vary significantly by field of study, but there is not a great deal of empirical evidence on the issue, especially in Canada.[1]

One of the principal reasons there is not a more extensive literature on comparative outcomes by field of study, with the record of recent graduates being particularly neglected, is that existing databases have not really been up to the task. The contribution of this paper is, then, to report the results of an empirical analysis of the early career outcomes of recent Canadian bachelors level graduates based on three waves of the National Graduates Surveys (NGS), which comprise large, representative surveys of individuals who successfully completed their programmes at Canadian universities in 1982, 1986, and 1990, with information gathered during interviews conducted two and five years after graduation for each group of graduates (1984–87, 1988–92, 1990–95).

The size and representative structure of the NGS databases, their panel nature, the existence of three cohorts of data, and the availability of a range of interesting variables, many of them focused on the particular circumstances of the school-to-work transition, thus provide the opportunity for an interesting, multi-faceted study of early labour market outcomes amongst bachelors level university graduates by discipline in Canada in the 1980s and 1990s.

The outcomes analysed include the following: the distribution of graduates by field and the percentage of female graduates; the percentage of graduates who subsequently completed another educational programme; the overall evaluation of the choice of major; unemployment rates and the percentage of workers in part-time jobs, in temporary jobs, and self-employed; the job-education skill and credentials matches; and earnings and job satisfaction.

The discussion of the findings is focused on the following themes:

- The cross-discipline patterns which hold most generally — for both men and women and across all surveys.

- The evolution of the patterns over the early years in the labour market — from two to five years following graduation.
- The patterns by sex.
- Comparisons of the patterns across cohorts — noting any shifts from the first through third cohorts.

The next section of the paper describes the National Graduates Surveys databases, the construction of the working samples, and the variables used in the analysis. This is followed by the presentation of the empirical results. The final section summarizes the major findings, and outlines some of the practical purposes to which they might be put.

THE DATA [2]

The National Graduates Surveys

The National Graduates Surveys (and Follow-Up) databases, created by Statistics Canada, are well suited to this analysis for a number of reasons. First, the NGS files comprise large, stratified, random samples of those who successfully completed their postsecondary programmes of study in 1982, 1986, or 1990, with more than 30,000 individuals in each survey and over-sampling of graduates in the less common disciplines, thus facilitating the meaningful analysis of post-graduation outcomes by field of study.[3]

Second, the NGS databases have a longitudinal aspect, stemming from the two interviews carried out for each cohort, two and five years after graduation. This extension permits a dynamic analysis of the school-to-work transition precisely situated as of the two points in time relative to graduation corresponding to the interview dates, while covering a relatively extended period of time — the first five years after leaving school.

Third, data are available for three separate cohorts of graduates — those who finished in 1982, 1986, and 1990 — thus permitting the comparison of outcomes over a period generally thought to have been characterised by important changes in labour market outcomes, especially for younger workers, while also bringing the record as up-to-date as possible.[4]

Finally, the NGS databases include an interesting array of variables covering the educational experiences, general labour market outcomes, and job attributes of graduates. These include not only more conventional measures, such as employment status and earnings levels, but also others which are more specifically related to the particular experiences of recent postsecondary graduates and the school-to-work transition, such as the extent to which the skills learned at school were being used in the job and evaluations of both the current job and the education programme from which the individual graduated.

In summary, the three NGS databases uniquely provide for a focused, detailed and dynamic analysis of early labour market outcomes by field of study amongst Canadian postsecondary graduates in the critical early years following graduation from the early 1980s into the mid-1990s. The NGS data are interesting and unique not only in a Canadian context, but to the best of this author's understanding, are also unequalled in the world in terms of offering large representative surveys of postsecondary graduates covering various elements of the school-to-work transition over the last decade and a half.

Selection of the Working Samples[5]

The entire analysis excludes graduates who had already accumulated five or more years of full-time work experience or who were 35 years of age or older at graduation, thus focusing the study on "fresh" graduates who had followed more-or-less conventional career profiles with respect to school and work. These deletions exclude, in particular, women returning to school after having spent time raising children, as well as both men and women who undertook major re-tooling of their education-related human capital. While such individuals certainly comprise interesting groups, their study is best left to a separate project.

After analysing the distribution of graduates and their overall evaluations of their programmes of study, those who obtained an additional degree by one of the two interviews were deleted from the analysis at that point. Such graduates no longer belonged to the original education group (e.g., a bachelors graduate might have become a masters graduate and perhaps changed disciplines) and had in any event been mixing

school and work in a way likely to affect the labour market outcomes upon which this analysis is focused. Including "additional degree graduates" would also have thrown off the precise post-graduation time frame corresponding to the two interview dates (i.e., two and five years after graduation) which holds for the non-continuing group. Finally, it is impossible to identify the discipline of any new degrees in the 1984 survey for the 1982 graduates.

For the labour market outcomes analysed below, part-time workers who cited school as the reason for their only partial involvement in the labour market were also deleted on the grounds that such individuals were — by definition — still principally students and had, therefore, not yet entered the school-to-work transition phase of their careers in earnest. Other part-time workers were, on the other hand, generally included in the analysis, thus lending it a broad base.[6]

Finally, graduates in non-conventional jobs (i.e., not paid, not self-employed) were eliminated from the analysis of labour market outcomes, as were individuals deemed to have unreasonably low earnings, while those missing the required information were dropped where necessary, resulting in a small numbers of other deletions (typically no more than 1% of the sample).

The Field of Study Classifications and the Variables Included in the Analysis

The field of study classifications employed in the analysis are as follows:

- No Specialization
- Elementary/Secondary Teacher
- Other Education
- Fine Arts & Humanities
- Commerce
- Economics
- Law
- (Other) Social Sciences
- Agricultural & Biological Sciences
- Veterinary Sciences
- Engineering
- Medical Professions (doctors, dentists, etc.)
- Other Health
- Computer Science
- Mathematics and Other Physical Sciences

This classification scheme resulted from the desire to keep the number of fields as small as possible (for the sake of a focused analysis), while allowing for important cross-discipline differences in the outcomes being studied. The starting point was the standard Canadian discipline groupings employed in the NGS data, with certain adjustments then made according to a detailed preliminary analysis of cross-field earnings patterns (e.g., economics graduates were split apart from the other social sciences).

The variables used in the analysis are listed and defined, and their construction explained, in the appendix.

THE EMPIRICAL FINDINGS

The Distribution of Graduates by Field of Study and Sex

The distribution of graduates by field of study and the gender shares within each discipline are shown in Table 1. Interestingly, the distributions by field were relatively stable across cohorts. The only significant shifts were a moderate decline in the percentage of engineering graduates and an increase in fine arts and humanities amongst men, and declines in teaching and other education amongst women, offset most particularly by increases in commerce and general social sciences.

This stability in the distribution of graduates by field is perhaps somewhat surprising and leads to a number of related questions. Was it primarily due to demand side or supply side factors — that is, students' preferences or the spots available at universities? Is this stability — "rigidity" — cause for worry as the economy moves in directions which favour certain types of graduates over others and, presumably, students' preferences move with these shifting opportunities? As a concrete example, the share of computer science graduates did not increase in any dramatic fashion across cohorts (3% of male graduates in 1982 and 4% in 1990, and 2% and 3% of female graduates in the same years), despite what would seem to be a clear need for greater numbers of such graduates. More generally, the entire set of "science and technology" disciplines — the sciences, health, engineering — were similarly stagnant in terms of the shares of graduates.[7]

The Canadian Journal of Higher Education
Volume XXXI, No. 1, 2001

Table 1
The Distribution of Graduates and Gender Shares by Field of Study*

	Distribution			Gender Shares		
	1992 Cohort %	1986 Cohort %	1990 Cohort %	1982 Cohort %	1986 Cohort %	1990 Cohort %
Males						
No specialization	2	4	3	51	49	50
Elementary/Secondary Teaching	4	5	5	21	27	28
Other Education	5	4	5	34	36	35
Fine Arts & Humanities	10	11	12	37	37	39
Commerce	15	15	15	62	56	53
Economics	6	5	6	79	67	72
Law	5	3	4	57	54	48
Other Social Sciences	13	11	14	43	33	36
Agriculture & Biological Sciences	6	6	6	49	48	42
Veterinary	1	1	1	53	58	44
Engineering	19	17	15	89	87	85
Medical Professions	4	3	3	65	61	57
Other Health	2	1	2	17	14	18
Computer Science	3	5	4	76	69	80
Mathematics & Other Physical Sciences	6	7	6	70	70	64
	100	100	100	50	48	46

* In this and all following tables, the samples exclude those who were older than 35 or who had more than five years of full-time experience by the date of graduation.

Table 1 (continued)
The Distribution of Graduates and Gender Shares by Field of Study*

	Distribution			Gender Shares		
	1992 Cohort %	1986 Cohort %	1990 Cohort %	1982 Cohort %	1986 Cohort %	1990 Cohort %
Females						
No specialization	2	3	3	49	51	50
Elementary/Secondary Teaching	16	12	12	79	73	72
Other Education	9	6	7	66	64	65
Fine Arts & Humanities	17	18	17	63	63	61
Commerce	9	11	12	38	44	47
Economics	2	2	2	21	33	28
Law	4	3	3	43	46	52
Other Social Sciences	18	21	22	57	67	64
Agriculture & Biological Sciences	6	6	7	51	52	58
Veterinary	1	1	1	47	42	56
Engineering	2	2	2	11	13	15
Medical Professions	2	2	2	35	39	43
Other Health	8	8	7	83	86	82
Computer Science	1	2	1	24	31	20
Mathematics & Other Physical Sciences	2	3	3	30	30	36
	100	100	100	50	52	54

The overall share of female graduates rose over time, from 50% in the first cohort, to 52% in the second, to 54% in the third — women thus coming to represent a clear majority of bachelors level graduates. At the same time, there are large differences in the gender patterns by discipline. Female graduates have been significantly over-represented in teaching/education, fine arts/humanities, general social sciences, and other health disciplines (i.e., apart from doctors, dentists, pharmacists, optometrists, and the like and effectively dominated by nursing graduates). Women have, on the other hand, been under-represented in economics, engineering, computer science, and mathematics and the physical sciences. The other fields have either had more or less similar numbers of male and female graduates (agricultural and biological sciences, veterinary sciences), or have seen women largely catch up to, or even overtake, men (commerce, law, medical professions).

The points raised above regarding the relative stasis in the distribution of graduates by field of study could again be made in the context of these gender patterns, especially as there has been relatively slow entry of women — or even declines — in some historically male-dominated disciplines that are generally perceived as needing to attract greater numbers of students to meet a generally rising demand, such as engineering, computing, and the pure sciences, while the significant under-representation of females in economics is also notable. In short, why are women still staying away from these disciplines, what are the consequences of this penury, and what should and/or can be done about it? These male-female differences are also important in an analytical sense, as they typically play an important role in the overall differences in outcomes by gender reported below.

Overall Evaluation of the Educational Programme

Graduates' overall evaluations of their choices of major are given in Table 2, with these figures interpretable as representing the percentage of graduates who said that, given the chance, they would have chosen the same field of study again (see the appendix). Overall, approximately three-quarters of all graduates were satisfied with their choices, with female graduates' scores running slightly lower than males' scores in all years.

Yet while the clear majority of graduates were happy with their choice of discipline, the fact that approximately one-quarter were not similarly content should perhaps be cause for question, concern, and further investigation as to why this might be and what could be done to improve matters — this being such an important decision in an individual's career and life generally, and for the nation's economic performance.

The generally high satisfaction fields include the professional programmes — teaching (especially for women), commerce (although less so for females than males, especially in the most recent cohort), law (again excepting the 1990 female graduates), engineering (only of late for women), medical professions, other health — as well as computer science. The next tier of disciplines with medium or more mixed levels of satisfaction includes other education, fine arts and humanities, veterinary sciences, and mathematics and physical sciences, the latter being generally weaker than the others. The lowest levels of satisfaction have been amongst graduates with degrees in economics, other social sciences, and agricultural and biological sciences.

Although the highest approval ratings went to the disciplines most directly connected to labour market skill sets and career paths (the professionals and computer scientists), fine arts and humanities graduates, who are the polar opposite in this respect, scored in the middle rank, placing them almost uniformly ahead of social science and pure and applied science graduates. It would appear that satisfaction with the educational programme is more than a matter of job market preparation — at least for some graduates.

One particularly noteworthy group is female economics graduates, who had the lowest scores in all periods, with astoundingly low approval ratings of just 41% and 34% as of the two interview dates for the last cohort in particular — that is, as many as two-thirds of these graduates said that, given the chance, they would have chosen another field of study. The economics discipline is presumably given reason to consider the meaning of these results, their underlying causes, and what might be done to improve matters. (Male economics graduates have, on the other hand, generally expressed levels of satisfaction similar to those in the other social sciences — although this is not setting the bar particularly high).

Table 2
Index of the Overall Evaluation of the Educational Program (Field)*

	1982 Cohort	1986 Cohort		1990 Cohort	
	1987	1988	1991	1992	1995
	%	%	%	%	%
All	**73**	**77**	**76**	**73**	**70**
Males					
All	*74*	*78*	*78*	*75*	*71*
No specialization	69[c]	71[b]	69[c]	68[c]	65[c]
Elementary/Secondary Teaching	65[c]	84[b]	84[b]	81[b]	76[c]
Other Education	67[c]	68[c]	73[c]	75[c]	69[c]
Fine Arts & Humanities	73[b]	78[b]	77[b]	72[b]	74[b]
Commerce	79[a]	81[a]	80[a]	79[a]	76[b]
Economics	67[c]	70[c]	66[c]	59[c]	64[c]
Law	86[c]	89[b]	90[b]	88[c]	77[c]
Other Social Sciences	67[b]	65[b]	61[b]	60[b]	56[b]
Agriculture & Biological Sciences	69[b]	68[b]	72[b]	70[b]	69[b]
Veterinary	77[c]	87[c]	88[c]	77[c]	70[c]
Engineering	75[a]	83[a]	83[a]	83[a]	79[a]
Medical Professions	90[b]	90[b]	97[a]	96[a]	92[b]
Other Health	87[c]	90[c]	87[c]	84[c]	79[c]
Computer Science	83[b]	90[a]	86[b]	88[b]	90[b]
Mathematics & Other Physical Sciences	70[b]	68[b]	69[b]	67[b]	66[b]

Table 2 (continued)
Index of the Overall Evaluation of the Educational Program (Field)*

	1982 Cohort	1986 Cohort		1990 Cohort	
	1987	1988	1991	1992	1995
	%	%	%	%	%
Females					
All	*72*	*76*	*74*	*71*	*68*
No specialization	63[c]	69[c]	71[c]	68[c]	66[c]
Elementary/Secondary Teaching	75 a	82[a]	79[a]	84[a]	76[a]
Other Education	66[c]	74[b]	70[b]	73[b]	65[c]
Fine Arts & Humanities	70 b	76[a]	75[a]	68[a]	64[b]
Commerce	77 b	81[a]	78[b]	71[b]	69[b]
Economics	55[c]	64[c]	62[c]	41[c]	34[c]
Law	79[c]	81[c]	83[c]	71[c]	63[c]
Other Social Sciences	62 b	67[a]	65[a]	59[a]	60[a]
Agriculture & Biological Sciences	68 b	70[b]	66[b]	61[b]	63[b]
Veterinary	73[c]	76[c]	75[c]	75[c]	71[c]
Engineering	71[c]	76[c]	77[c]	82[c]	77[c]
Medical Professions	94 b	91[b]	91[b]	94[b]	90[b]
Other Health	79 b	82[a]	81[b]	83[a]	79[b]
Computer Science	82[c]	86[c]	90[b]	84[c]	87[c]
Mathematics & Other Physical Sciences	70[c]	72[c]	69[c]	69[c]	71[c]

* See appendix for a definition of the index. The means with no letter subscript have standard errors below 1; those with an "a" have standard errors between 1 and 2; those with a "b" have standard errors between 2 and 3; and those with a "c" have standard errors greater than 3.

These findings are presumably related to the declines in enrolments which many economics departments have faced in recent years.

The relatively low levels of satisfaction amongst graduates in mathematics and the physical sciences, as well as those with degrees in the agricultural and biological sciences, might be cause for concern at a broader social level, since science and technology are so critical to the wealth of nations in the new "knowledge based economy" (see Lavoie & Finnie, 1999).

There are no clear trends in the scores from the first interview to the second for each cohort, even as job outcomes changed to a considerable degree over this interval (see below), perhaps reflecting the "rational" and informed nature of individuals' choices of discipline and the relation of their choices to longer-run labour market outcomes. Neither were there any general shifts in the scores across cohorts (see in particular the first and third groups, for which labour market conditions and rates of further education were similar), with these relatively stable satisfaction levels contrasting with the common belief that things have become increasingly difficult — more miserable — for succeeding cohorts.

Further Studies

Table 3 shows that, overall, 15% to 19% of all bachelors level graduates had obtained another diploma by two years following graduation, and from 22% to 36% had done so by five years out. Interestingly, the rates are similar for male and female graduates. (Recall that such individuals are deleted from the remainder of the analysis for the reasons given above.)

The rates are lower for the second cohort — which faced distinctly better labour market conditions than the others — especially as of the second interview. This suggests the existence of two types of bachelors graduates who continue with their studies: those who go straight through after finishing their undergraduate degrees and are committed to this path more-or-less regardless of the prevailing labour market conditions, and those who make initial forays into the labour market and subsequently return to school if they find their employment opportunities to be relatively limited.

With the precise mix of graduates at the college, bachelors, masters, and doctoral levels — in terms of both their numbers and their quality — comprising an important element of the "knowledge based economy," the patterns by field are interesting and important. Focusing on the second interview cumulative totals, obtaining an additional degree tended to be more common in arts and humanities, general social sciences, agricultural and biological sciences, and mathematics and physical sciences. More average or mixed rates are seen for teaching/ education, economics, law, and veterinary sciences. The lowest rates are for commerce, engineering, and computer science, as well as medical professions and other health graduates.

Some of the higher rates presumably reflect natural career progressions — that is, in areas such as the social and natural sciences, the bachelors degree essentially provides an introduction to the discipline and individuals who wish to work in these areas typically require an advanced degree. In other cases, however, such as fine arts and humanities, the higher rates probably reflect a good number of individuals switching from one discipline to another and going on to professional school in order to improve their labour market opportunities.

At the other end of the spectrum, the relatively low rates of further studies in the case of engineering and (especially) computer science graduates might be cause for concern, even as these patterns presumably largely stem from the good job opportunities faced by such graduates. Are we, in particular, producing sufficient numbers of such graduates at a time when science, technology, and computers are at the fore (Lavoie & Finnie, 1999)?

Employment Rates and Job Status

Unemployment Rates. Table 4 shows that unemployment rates for all graduates in the working samples taken together were initially quite low and then declined significantly, registering at 9% and 3% at two and five years following graduation for the most recent cohort. Interestingly, the rates show no clear trend across cohorts, with the rates for the first set of graduates similar to those of the last, interviewed at roughly comparable points in the business cycle. (In this and subsequent tables, only

Table 3
Percentage Who Completed a New Diploma by the Relevant Interview

	1982 Cohort		1986 Cohort		1990 Cohort	
	1984	1987	1988	1991	1992	1995
	%	%	%	%	%	%
All	**19**	**36**	**15**	**22**	**16**	**36**
Males						
All	*17*	*36*	*13*	*20*	*16*	*35*
No specialization	42	62	11	19	19	48
Elementary/Secondary Teaching	12	29	6	22	12	21
Other Education	28	42	25	30	19	40
Fine Arts & Humanities	25	42	18	29	24	45
Commerce	13	31	13	18	16	30
Economics	25	44	15	20	23	34
Law	24	27	18	23	21	40
Other Social Sciences	21	44	17	26	13	37
Agriculture & Biological Sciences	14	43	13	20	18	52
Veterinary	11	32	11	21	8	40
Engineering	10	30	10	16	9	26
Medical Professions	18	31	9	16	16	33
Other Health	10	28	7	14	8	21
Computer Science	6	18	4	5	6	19
Mathematics & Other Physical Sciences	18	37	16	24	20	48

Table 3 (continued)
Percentage Who Completed a New Diploma by the Relevant Interview

	1982 Cohort		1986 Cohort		1990 Cohort	
	1984 %	1987 %	1988 %	1991 %	1992 %	1995 %
Females						
All	*21*	*35*	*17*	*24*	*17*	*36*
No specialization	32	30	12	22	26	52
Elementary/Secondary Teaching	16	26	16	25	8	20
Other Education	35	47	23	32	15	31
Fine Arts & Humanities	26	40	26	30	24	47
Commerce	11	29	11	15	9	22
Economics	12	28	10	20	17	42
Law	32	39	19	26	29	43
Other Social Sciences	24	42	17	26	20	45
Agriculture & Biological Sciences	14	41	18	25	22	52
Veterinary	14	22	7	9	10	33
Engineering	16	33	11	16	7	27
Medical Professions	7	18	5	15	11	21
Other Health	12	23	10	18	8	20
Computer Science	10	12	10	16	7	11
Mathematics & Other Physical Sciences	15	27	18	26	23	41

Table 4
Labour Force Status and Job Characteristics, 1990 Cohort*

	Unemployment Rates		Part-time		Temporary Jobs		Self-employed	
	1992 %	1995 %	1992 %	1995 %	1992 %	1995 %	1992 %	1995 %
All	**9**	**3**	**8**	**6**	**20**	**11**	**6**	**10**
Males								
All	*9*	*3*	*6*	*3*	*18*	*9*	*8*	*13*
No specialization	11	2	12	1	27	4	4	13
Elementary/Secondary Teaching	5	2	9	5	23	11	0	1
Other Education	10	3	20	10	34	19	0	6
Fine Arts & Humanities	13	3	13	5	29	11	14	18
Commerce	9	3	3	2	11	8	7	8
Economics	10	5	4	3	14	5	9	13
Law	7	0	0	1	8	3	19	43
Other Social Sciences	13	6	8	2	22	10	7	16
Agriculture & Biological Sciences	15	2	4	5	30	14	6	19
Veterinary	--	--	--	--	--	--	--	--
Engineering	7	1	1	1	10	4	5	6
Medical Professions	4	3	4	3	41	29	33	63
Other Health	7	2	1	3	10	4	12	25
Computer Science	3	5	1	0	9	8	4	4
Mathematics & Other Physical Sciences	10	4	6	2	17	5	8	6

Table 4 (continued)
Labour Force Status and Job Characteristics, 1990 Cohort*

	Unemployment Rates		Part-time		Temporary Jobs		Self-employed	
	1992 %	1995 %	1992 %	1995 %	1992 %	1995 %	1992 %	1995 %
Females								
All	*9*	*3*	*10*	*10*	*22*	*12*	*4*	*6*
No specialization	13	10	9	6	38	10	2	7
Elementary/Secondary Teaching	6	2	11	9	17	11	1	2
Other Education	17	1	21	21	39	33	2	3
Fine Arts & Humanities	10	8	13	11	26	15	7	13
Commerce	8	4	5	3	10	6	3	3
Economics	6	--	3	--	9	--	0	--
Law	26	3	4	6	20	3	12	26
Other Social Sciences	10	3	13	13	31	12	4	4
Agriculture & Biological Sciences	12	3	6	3	24	18	7	6
Veterinary	8	--	6	--	12	--	15	--
Engineering	10	1	1	1	11	9	2	3
Medical Professions	2	2	8	10	43	12	39	60
Other Health	2	2	8	16	13	12	3	4
Computer Science	6	0	2	0	16	8	0	2
Mathematics & Other Physical Sciences	14	4	7	2	19	4	0	2

* In this and the following table, the samples exclude those who obtained a new diploma by the relevant interviewer or who stated that they were part-time workers because they were students. Dashes indicate disciplines with too few observations to report.

the results for the most recent cohort are shown. See Finnie (1999b) for the findings for the other cohorts. Here we focus on the trends by field, while any noticeable differences across cohorts are mentioned.)[8]

The generally low unemployment disciplines include teaching (except for female graduates in 1984 and 1991), engineering (except female graduates in 1991), medical professions, and other health, and computer science. The next tier of medium and more mixed rates includes other education (mixed), commerce (tending towards the lower side of average), economics (on the higher side), law (the most boom-and-bust record), other social sciences (again tending towards above average but with sharp variations), and mathematics and physical sciences (quite mixed). The generally high unemployment fields include fine arts and humanities, which was predictable, and agricultural and biological sciences, which is perhaps more surprising.

Part-Time Employment. Rates of part-time employment (also Table 4) have been much higher for women than men and have grown from two to five years following graduation: 6% and 3% for men (all fields together), a steady 10% for women. The men's rates undoubtedly primarily reflect current employment opportunities and the improvements in these conditions in the years following graduation, while the women's rates also reflect labour supply decisions related to having and raising children and related factors which have traditionally led to a generally looser labour force attachment.[9]

The patterns by discipline point to certain differences in the structure of employment opportunities along this dimension, especially when the part-time rates are viewed along side the unemployment rates seen above. For example, commerce, economics, and law graduates are almost uniformly characterised by low rates of part-time work — low in absolute levels and/or low relative to what their unemployment rates might have suggested in terms of demand side forces. Rates of part-time work amongst law graduates were, for example, very low even in the years when unemployment rates were relatively high; there would, therefore, appear to have been less scope for the part-time option in general — there was either a full-time job available or there was no job at all. These patterns are especially strong for men, but largely hold for women as well.

The other fields tending to have low rates of part-time work were fairly predictable in this respect, as they were also characterised by generally low unemployment rates: engineering, medical professions, other health, computer science. The generally full-time nature of the jobs found by graduates in these disciplines would, therefore, appear to be the result of the combination of: (1) the generally good employment opportunities available in these areas; (2) the desire of employers to hire workers on a full-time basis; and (3) the willingness of graduates to work on a full-time basis.

The reverse seems to hold for graduates in teaching, other education, and fine arts and humanities, where the rates of part-time work have been generally higher and moved (inversely) with demand conditions. The labour market for graduates in these disciplines would, therefore, appear to have been more flexible in terms of employment status in general, while recessionary periods have been characterised by increases in the relative number of part-time jobs.

It is also worth noting that the disciplines associated with apparently more flexible employment options (for men and women alike) are generally those dominated by women. Perhaps the presence of women has made the associated labour markets generally more amenable to "non-standard" work conditions. It will be interesting to see what happens in occupations where the numbers of female graduates have been increasing, such as commerce and law.

Turning to the other disciplines, part-time rates amongst social science graduates (apart from economics) have tended to be above average for men, but about in the middle for women; the agricultural and biological sciences rates have generally been in the middle range for men and women alike; while for mathematics and physical sciences, the rates have been about average for men, but low for women. The latter result is especially interesting — perhaps part-time work is less of an option for women trying to crack the hard sciences; alternatively, perhaps these disciplines attract the sort of women who are particularly focused on their careers and are thus less interested in working part-time.

Temporary Employment. Female graduates were more commonly in temporary jobs than were men (again Table 4), but any simple supply-side

explanation comes up against the fact that for the one year such data are available, the proportions of men and women in temporary jobs voluntarily were similarly low (Finnie, 2000a). In short, temporary employment would appear to generally be due to the absence of permanent jobs, and the results reported here should be interpreted accordingly. With respect to the dynamics of temporary employment, there were large declines from two to five years following graduation, from 20% to 11% overall, presumably again reflecting the improvements in job opportunities over this interval.

By field, the patterns are fairly similar to those for part-time work — presumably driven by similar factors relating to labour demand and institutional arrangements. Thus, fields with lower rates of temporary employment include commerce, economics, law, engineering, other health, computer science, and mathematics and other physical sciences (the latter for women only). The other fields tend to have higher rates, although the patterns are in some cases fairly mixed (over time, by gender). Medical professions appears at first to be an outlier case, but the relatively high rates found here probably reflect internships, residencies, and other such standard transitional elements of careers in these areas.

Self-Employment. Being self-employed — as opposed to being a wage or salary worker — could be for one of two broad reasons: (1) not being able to find suitable employment of a more conventional status;(2) preferring self-employment for personal reasons or the short-term monetary benefits and/or enhanced longer-term career opportunities which can accrue. The NGS surveys do not, unfortunately, contain information which allow us to entangle these elements, thereby leaving us with the simple rates shown in Table 4.

Self-employment rates generally increase over time and are higher for men than women, 8% and 13% for the former, 4% and 6% for the latter. Given that labour market opportunities generally tended to improve over this interval (as seen above), these results would seem to suggest that self-employment has more often stemmed from the advantages of the self-employment option rather than the lack of suitable opportunities with respect to wage and salary positions — at least at the margin.

The patterns by field are mostly quite predictable, but also include a few surprises. Thus, by far the highest rates are for doctors and lawyers,

with veterinarians following somewhat behind, presumably reflecting the private practice option for these professionals. Perhaps more surprising are the consistently higher than average rates among fine arts and humanities graduates, although a more detailed analysis would be required to find out what is driving this outcome: independent artists? cab-driving philosophy majors? English majors who have become by-the-hour copy editors? Also of surprise are the relatively high rates amongst agricultural and biological science graduates in certain years, especially for men — with no obvious explanation for this finding. Beyond this, the rates are all moderate to low.

Skill and Qualifications Matches

The Job-Education Skill Match Index. Table 5 reports the mean scores of a job-education skill match index, with higher values indicating greater use of the skills learned in the programme from which the individual graduated (see appendix) The great majority of graduates seem to have been using skills learned at school in their current jobs to at least some degree, as the mean scores in the 70% range represent an average response of slightly more than "to some extent" where the other options were "not at all," "very little," and "to a great extent."

By discipline, the professional fields again scored well — with high match scores amongst graduates in teaching, commerce, law, medical professions, other health, computer science, and engineering (although considerably less so in this latest cohort than earlier ones, especially for men). Fields with consistently lower scores include fine arts and humanities, economics, other social sciences, and agricultural and biological sciences — again representing disciplines which are either not particularly linked to specific job market skills or for which a career in the area typically requires an advanced degree, leaving these bachelors level graduates on uncertain ground in terms of career options related to their fields of specialization. Fields with middle rank or more mixed scores include other education, veterinary sciences (a bit of a surprise), and mathematics and physical sciences.

Educational Pre-requisites and Graduates' Qualifications Job-education credentials matches are analysed by focusing on the percentage

Table 5
The Job-Education Skill Match and Over/Under-Qualification, 1990 Cohort*

	1992			1995		
	Match %	Over %	Under %	Match %	Over %	Under %
All	**70**	**27**	**3**	**71**	**25**	**3**
Males						
All	*69*	*27*	*3*	*70*	*25*	*3*
No specialization	56[a]	48	0	58[a]	56	0
Elementary/Secondary Teaching	83	6	4	79	8	2
Other Education	71[a]	30	2	73[a]	31	2
Fine Arts & Humanities	59	52	7	62	48	7
Commerce	74	24	1	74	23	4
Economics	53	36	3	53	35	2
Law	84[a]	6	2	86	11	5
Other Social Sciences	54	52	3	59	47	5
Agriculture & Biological Sciences	63[a]	41	2	58[a]	38	3
Veterinary	--	--	--	--	--	--
Engineering	73	11	2	72	12	1
Medical Professions	97	1	12	98	--	--
Other Health	90	14	3	87[a]	16	6
Computer Science	80	12	1	75	13	1
Mathematics & Other Physical Sciences	62	28	3	64[a]	28	1

Table 5 (continued)

The Job-Education Skill Match and Over/Under-Qualification, 1990 Cohort*

	1992			1995		
	Match %	Over %	Under %	Match %	Over %	Under %
Females						
All	*71*	*27*	*3*	*72*	*24*	*3*
No specialization	60[a]	48	3	54[a]	30	5
Elementary/Secondary Teaching	80	4	4	74	4	2
Other Education	75	25	2	74	29	4
Fine Arts & Humanities	63	45	2	64	45	3
Commerce	71	29	2	71	23	2
Economics	44[a]	--	--	--	--	--
Law	85[a]	7	8	82	--	--
Other Social Sciences	60	39	2	67	36	5
Agriculture & Biological Sciences	66	32	2	64	30	0
Veterinary	79[a]	--	--	--	--	--
Engineering	71	12	1	72	18	1
Medical Professions	97	0	6	95	1	23
Other Health	90	29	2	90	24	1
Computer Science	80[a]	18	2	82[a]	13	3
Mathematics & Other Physical Sciences	61[a]	26	6	69[a]	9	7

* See appendix for definitions of these measures. For the "Match" scores, means with no letter have standard errors below 1; those with an "a" have standard errors between 1 and 2.

of graduates who were over-qualified for their jobs, also shown in Table 5 (along with the generally very low and more difficult to interpret rates of under-qualification). Overall, a substantial proportion (around 25% overall) of graduates appear to have been over-qualified for their jobs in each year. These results could, however, at least partly reflect a certain ambiguity regarding the formal educational prerequisites versus the true requirements of many jobs. It might, for example, often be the case that a bachelors degree is not officially required, but is needed to successfully compete for a position — a case which might be registered as an "over-qualification" (depending on how the graduate responded). The results should, therefore, be meaningful, but interpreted with some caution.

By discipline, the professions show the best job-education qualification matches, with low rates of over-qualification for teaching, law, engineering, medical professions, other health (men), and computer science. Fields with medium or more mixed rates include other education, commerce (perhaps a bit of a surprise), agricultural and biological sciences, other health (women), and mathematics and other physical sciences. Fields tending to have higher rates of over-qualification include fine arts and humanities, economics, other social sciences, and agricultural and biological sciences (men).

Earnings and Job Satisfaction

Earnings Levels and Growth Rates.[10] Table 6 reports the earnings of graduates (constant 1995 dollars). Across all fields, mean earnings were $32,400 for men at the first interview and $39,200 at the second, and $31,300 and $35,900 for women. The gender earnings gap was thus rather negligible at first, then grew substantially over time.[11]

The clear earnings leaders are, not surprisingly, medical professionals, with this advantage rising substantially from two to five years following graduation. The second tier fields include law (especially as of the second interview), engineering, other health, computer science, and (less consistently across cohorts) mathematics and physics. The next rank includes teaching, commerce, and economics. The fields with the lowest earnings levels include other education, arts and humanities, other social sciences, and agricultural and biological sciences.

Regarding growth rates from two to five years following graduation, medical and law graduates of both sexes typically had amongst the largest increases in earnings, while teaching and other health graduates (especially on the female side) had amongst the smallest gains, these figures presumably giving us a glimpse of the longer-term earnings profiles amongst different sets of graduates.

Job Satisfaction. Table 6 also shows graduates' levels of satisfaction with their earnings levels according to the index constructed for these purposes (see appendix). To some degree, the earnings satisfaction results conform to the patterns of actual earnings levels just seen, but there are clearly many departures from any strict rule in this regard. Thus, the most earnings-satisfied graduates are those in the medical professions, other health (men only), computer science, and mathematics and the physical sciences (although less so for the 1990 cohort shown here) — all amongst the higher paying fields. But law and engineering graduates (especially men) are not as consistently satisfied with their earnings as their higher-than-average levels might have suggested, some disciplines are characterised by satisfaction scores which belie their low earnings levels in at least some years, some of the disciplines in the middle rank in terms of actual earnings have amongst the lowest satisfaction scores in certain periods, and the cross-discipline differences in satisfaction levels are generally proportionally smaller than the differences in earnings levels (although this result could be at least partly due to the nature of the underlying questions and the index which has been constructed from there).

Perhaps the most intriguing result, however, is that the earnings satisfaction scores are very similar for men and women — despite the fact that men had significantly higher earnings levels (as seen above). In short, while many of the differences in earnings satisfaction scores are statistically significant and there is obviously a relationship between actual earnings levels and individuals' satisfaction with those rates of pay, other factors are involved, including — presumably — *expectations,* which presumably vary by discipline and gender.

Roughly similar comments might be made about the overall job satisfaction scores (also Table 6): many of the differences are statistically significant and there is clearly a general correlation between earnings

Table 6
Mean Earnings (1995 $) and Job Satisfaction, 1990 Cohort*

	Mean Earnings			Satisfaction (Earnings)		Satisfaction (Overall)	
	1992	**1995**	**1995**	**1992**	**1995**	**1992**	**1995**
	$	$	%	%	%	%	%
All	**32,400**	**39,200**	**21**	**67**	**66**	**80**	**80**
Males							
All	*33,500*	*42,900*	*28*	*67*	*66*	*80*	*81*
No specialization	30,800[a]	37,800[a]	23	66[a]	67[a]	80[a]	76[a]
Elementary/Secondary Teaching	34,000	37,600	11	77	63	90	86
Other Education	28,000	35,100	25	70	66	75	79
Fine Arts & Humanities	24,900	32,400	30	59	57	72	75
Commerce	33,300	42,800	29	63	69	79	80
Economics	33,100	44,200[a]	34	67	67	79	83
Law	37,100	52,100[a]	40	64	66	85	77
Other Social Sciences	28,500	36,800	29	67	61	77	80
Agriculture & Biological Sciences	28,700[a]	34,800[a]	21	64	66	72	82
Veterinary	--	--	--	--	--	--	--
Engineering	37,500	45,900	22	68	67	81	81
Medical Professions	54,400[b]	88,900[b]	63	71	74	92	87
Other Health	45,500[a]	51,300[a]	13	74[a]	73[a]	88	82[a]
Computer Science	37,800	46,300	22	73	74	83	83
Mathematics & Other Physical Sciences	35,200	44,500[a]	26	68	67	79	80

Table 6 (continued)
Mean Earnings (1995 $) and Job Satisfaction, 1990 Cohort*

	Mean Earnings			Satisfaction (Earnings)		Satisfaction (Overall)	
	1992	**1995**	**1995**	**1992**	**1995**	**1992**	**1995**
	$	$	%	%	%	%	%
Females							
All	*31,300*	*35,900*	*15*	*67*	*66*	*80*	*80*
No specialization	24,700	34,600[a]	40	63[a]	72[a]	77[a]	80
Elementary/Secondary Teaching	32,600	35,800	10	76	69	89	86
Other Education	26,300	29,600	13	64	64	81	82
Fine Arts & Humanities	27,400	31,400	15	64	66	76	79
Commerce	31,300	37,000	18	62	63	74	77
Economics	29,800[a]	--	--	63[a]	--	--	--
Law	38,400	55,300[b]	44	63[a]	71	80	88
Other Social Sciences	27,600	31,700	15	64	65	74	74
Agriculture & Biological Sciences	27,800	32,900	18	65	68	78	78
Veterinary	33,000[a]	--	--	70[a]	--	--	--
Engineering	38,200[a]	42,700	12	72	66	80	79
Medical Professions	55,300[b]	71,300[b]	29	70	73	88	87
Other Health	37,900	40,000	6	71	68	83	80
Computer Science	36,100[a]	41,800[a]	16	70[a]	71[a]	81[a]	73[a]
Mathematics & Other Phys. Sci.	31,200	39,200[a]	26	73[a]	68	78[a]	77

* See appendix for definitions of the job satisfaction measures. The earnings means with no letter subscript have standard errors below 500; those with an "a" have standard errors between 500 and 1000. The satisfaction index means with no letter subscript have standard errors below 1 ; those with an "a" have standard errors between 1 and 2.

levels and overall job satisfaction, but that relationship is far from perfect and there are many interesting outliers (e.g., teachers) and generally much less cross-discipline variation in the satisfaction earnings scores than in actual earnings levels — although more here than with the earnings satisfaction measure.

CONCLUSION

This paper has provided an empirical analysis of a range of post-graduation outcomes by major field of study based on three waves of the National Graduates Surveys of Canadian postsecondary graduates, each group interviewed two and five years following graduation in 1982, 1986, or 1990.

The first major finding is the relative stasis of the distribution of graduates by discipline, raising questions as to what is driving these patterns: relatively stable preferences of students or supply side rigidities in the form of the universities offering relatively fixed numbers of places even as the demands for different degrees — by individuals and the economy in general — have been shifting.

The second significant result is that relatively large numbers of graduates have gone on to further studies, with the shifts over time suggesting that current labour market conditions affect the decision to continue on, while the overall levels and cross-discipline patterns raise the question as to whether Canada has been obtaining the right levels and mix of graduate students for the emerging "knowledge based economy."

The third general finding is that many of the patterns of post-graduation outcomes conform to expectations, typically reflecting the different orientations of the various disciplines with respect to direct career preparedness, with the professions and other applied disciplines generally characterised by lower unemployment rates, closer skill and qualification matches, higher earnings, and so on. But while the "applied" fields also tend to perform well in terms of the "softer," more subjective measures regarding job satisfaction and the overall evaluation of the chosen programme, graduates' assessments appear to be based on more than simply adding up standard measures of labour market

"success," as the satisfaction/evaluation scores often depart from what the objective measures (unemployment rates, earnings levels, etc.) might have predicted.

These findings should be useful in a number of ways. First, they identify the returns to different the different forms of human capital which disciplines represent in a manner which goes beyond the usual earnings measures. Second, they should be useful for policy makers seeking to direct students — and shift the size of university programmes (which seem surprisingly rigid) — towards those areas where students have high evaluations of their programmes and are doing better in their post-graduation careers. Third, universities themselves — singly or in a co-operative fashion — might think about what certain weaker programmes are offering and how they are carrying out those missions and perhaps try to borrow lessons from those areas where students are more satisfied and doing better (while acknowledging the limits of the "job preparation" which certain disciplines can and should offer). Finally students at the point of choosing their programmes should be able to make more informed choices regarding their choice of discipline, while those who have already graduated might be interested in comparing their records to those of others.

Notes

[1] See Côté & Sweetman (1997) for a review of the Canadian and American literature on earnings patterns by discipline, the former including Dodge & Stager (1972), Finnie (1995, 1999c), Mehmet (1977), and Vaillancourt (1995).

[2] See Finnie (1999b) for more detailed discussions of the material presented in this and the following sections.

[3] The databases also include college and university graduates at the masters and doctoral levels, but these individuals are not included in the present analysis. The stratified sample framework of the NGS databases (by province, level of degree, and field) is established through the use of institutions' administration files, which also provide the basic educational information on the databases. All results reported below take the sample weights into account.

[4] Beaudry &Green (1997), Beach & Slotsve (1996), Finnie (1997, 2000b, c), Morissette & Bérubé (1996), Morissette, Myles, & Picot (1995), Picot (1997), Riddell (1995), and Zyblock (1996) all report that the earnings levels of younger workers have been declining in relative and/or absolute terms, while Beaudry & Green, Morissette & Bérubé, and Finnie (the latter two articles) report that younger workers are not moving up the earnings ladder as rapidly as before.

[5] See Finnie (2000a) for a more detailed discussion of the selection of graduates into the surveys and the creation of the samples used in a similar context.

[6] Separate calculations for most of the outcomes presented below have also been carried out for full-time workers only, and the major findings all hold.

[7] It should be noted that the absolute number of graduates increased over this period, as reported in Finnie (1999d, 2000a).

[8] See Finnie (1999a) for further discussion of employment and earnings patterns (see below) amongst graduates by sex and level of education (College, bachelors, masters, doctorate).

[9] Finnie (2000a) shows that women were much less likely to be in part-time jobs involuntarily than men, and that the involuntarily part-time rates generally declined significantly from the first interview to the second (as employment opportunities improved) for each cohort of female graduates — thus resembling the male patterns in this respect.

[10] Finnie (1999c) investigates earnings patterns by discipline econometrically.

[11] See Finnie (1999a) and Finnie & Wannell (1999, 2000) for further investigation of the gender gap and its evolution over the early years in the labour market.

[12] More detailed documentation is provided in Finnie (1999b), especially Annex B.

References

Beaudry, P., & Green, D. (1997). *Cohort patterns in Canadian earnings: Assessing the role of skill premia in inequality trends.* Memo. Vancouver, BC: Department of Economics, University of British Columbia.

Beach, C.M., & Slotsve, G.A. (1996). *Are we becoming two societies?* Toronto, ON: C.D. Howe Institute.

Coté, S., & Sweetman, A. (1997). *Does it matter what I study? Postsecondary field of study and labour market outcomes in Canada.* Unpublished mimeo. Victoria, BC: University of Victoria.

Dodge, D., & Stager, D.A. (1972). Economic returns to graduate study in science, engineering and business. *Canadian Journal of Economics, 5*(2) May, 182–198.

Finnie, R. (1995). *Steppin' out: An analysis of recent university graduates into the labour market.* Paper prepared for Industry Canada, Working Paper Number 5.

Finnie, R. (1997). Stasis and change: Trends in individuals' earnings inequality, 1982–92. *Canadian Business Economics, 5*(4), October–December/ Fall.

Finnie, R. (1999a). Holding their own: The employment patterns and earnings of Canadian postsecondary graduates in the 1980s and 1990s. *Canadian Business Economics, 7*(4), 48–64.

Finnie, R. (1999b). *Fields of plenty, fields of lean: A cross-cohort, longitudinal analysis of the early labour market outcomes of Canadian university graduates by discipline.* Human Resources Development Canada (Applied Research Branch) Research Paper R-99-13E.a.

Finnie, R. (1999c). *Earnings differences by field of study amongst recent Canadian university graduates: An econometric analysis.* Human Resources Development Canada (Applied Research Branch) Research Paper R-99-13E.b.

Finnie, R. (1999d). *A dynamic analysis of the school-to-work transition of postsecondary graduates in Canada in the 1980s and 1990s.* Human Resources Development Canada (Applied Research Branch) Working Paper R-99-14E.

Finnie, R. (2000a). From school to work: The evolution of early labour market outcomes of Canadian postsecondary graduates. *Canadian Public Policy, 26*(2) June, 197–224.

Finnie, R. (2000b). Earnings dynamics in Canada: Correlation coefficients average quintile movements, and a mean quintile index. *The Review of Income and Wealth,* forthcoming.

Finnie, R. (2000c). Earnings mobility in Canada, 1982–92: Evidence from the longitudinal administrative database (LAD). *Journal of Income Distribution,* forthcoming.

Finnie, R., & Wannell, T. (1999). The gender earnings gap amongst Canadian bachelors level university graduates: A cross-cohort, longitudinal analysis. In R. Chaykowski & L. Powell (Eds.), *Women and work* (pp. 1–50). Kingston, ON: McGill-Queen's University Press.

Finnie, R., & Wannell, T. (2000). The evolution of the gender earnings gap amongst Canadian university graduates. *Applied Economics,* forthcoming.

Krahn, H. (1996). *School-work transitions: Changing patterns and research needs.* Discussion paper prepared for the Applied Research Branch of Human Resources Development Canada.

Lavoie, M., & Finnie, R. (1999). Is it worth doing a science or technology degree in Canada? Empirical evidence and policy implications. *Canadian Public Policy, 25*(1), 101–21

Mehmet, O. (1977). Economic returns on undergraduate fields of study in Canadian universities: 1961 to 1972. *Industrial Relations/Relations Industrielles, 32*(3), 321–39.

Morissette, R., & Bérubé, C. (1996). *Longitudinal aspects of earnings inequality in Canada.* Analytical Studies Branch, Statistics Canada, Research Paper No. 94.

Morissette, R., Myles, J., & Picot. G. (1995). Earnings polarization in Canada, 1969–1991. In K.G. Banting & C.M. Beach (Eds.), *Labour market polarization and social policy reform,* (pp. 1–20). Kingston, ON: Queen's University.

OECD. (1996). Growing into work: Youth and the labour market over the 1980s and 1990s. *Employment outlook* (109–159). Paris: Organization for Economic Cooperation and Development.

Picot, G. (1997). *What is happening to earnings inequality in the 1990s?* Forthcoming working paper, Structural Analysis Branch, Statistics Canada.

Riddell, C. (1995). Human capital formation in Canada: Recent developments and policy responses. In K.G. Banting & C.M. Beach (Eds.), *Labour market polarization and social policy reform,* (pp. 125–172). Kingston, ON: Queen's University.

Vaillancourt, F. (1995). The private and total returns to education in Canada. *Canadian Journal of Economics, 28*(3), 532–553.

Zyblock, M. (1996). *Individual earnings inequality and polarization: An exploration into sub-population trends in Canada, 1981 to 1993.* Human Resources Development Canada (Applied Research Branch) Working Paper W-96-8E.

Appendix

Variables Used in the Analysis[12]

Overall evaluation of the education programme: Based on the question: "Given your experience, would you have taken the same field of study or specialization?" The tables report the mean scores of an index constructed from the responses to this question, with higher values indicating greater satisfaction with the choice and essentially representing the percentage of graduates who said they would have chosen the same programme again. The measure could not be constructed from the 1984 data, but should otherwise be quite comparable across all periods.

New diploma: The (cumulative) percentage of graduates who obtained one or more additional diplomas (at higher or lower levels) between graduation in the base year (1982, 1986 or 1990) and the interview dates.

Labour force status (unemployed): Essentially a standard measure, although there is one small departure which results in a slight upward bias (i.e., full-time students are considered as unemployed if they meet the usual conditions of being without a job and looking for work, which is not usually the case).

Part-time employment: Less than thirty hours per week (standard definition)

Temporary job: Based on a direct question to this effect which is almost perfectly consistent across surveys.

Self-employment: Based on a direct question. As noted above, "other" workers (non-wage/salary workers, not self-employed) are deleted from most of the analysis (i.e., job outcomes).

The job-education skill match: Represents the mean scores of a discrete index running between 0 and 100 created by the author from the categorical information available in the raw NGS data derived from the question "Do you use any of the skills acquired through the education programme in your job?," with higher values indicating closer job-education skill matches. More specifically, values of 0 ("not at all"), 33 1/3 ("very little"), 66 2/3 ("to some extent"), or 100 ("to a great extent") were assigned.

Educational pre-requisites of the current job: Represents the level of education required for the job as compared to the diploma obtained at graduation, based on comparing the responses to the question: "When you were hired...what were the minimum educational qualifications required?" to the degree received in 1990.

Job satisfaction — earnings, overall: Based on the questions: "Considering the duties and responsibilities of your job, how satisfied are you with the money you make?" and "Considering all aspects of your job, how satisfied are you with it?" The tables report the mean scores of indices constructed from the responses to this question, with higher values indicating greater job satisfaction. The response options were "very satisfied" (a score of 1), "satisfied" (.67), "dissatisfied" (.33), or "very dissatisfied" (0).

Earnings: Based on the question: "Working your usual number of hours, approximately what would be your annual earnings before taxes and deductions at that job?" thus representing the rate of pay as measured on an annual basis, rather than the amount necessarily earned. All values are expressed in constant 1995 dollars, rounded to the nearest thousand, and capped at the $99,000 upper limit which characterises the 1984 data (the lowest bound in the six databases), or $143,035 in constant 1995 dollars.