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Comments on Chant and Gibson, Finnie, Vaillancourt and Bourdeau-Primeau, and Rathje and Emery

Jeffrey Smith

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I have the happy task of commenting on four fine bits of empirical economics related to higher education in Canada. My discussion is divided into three parts. First, I discuss the three papers on the general theme of returns to higher education, either overall or to particular courses of study at the undergraduate level — namely, those of Finnie, Rathje and Emery, and Vaillancourt and Bourdeau-Primeau. In the next section, I discuss Chant and Gibson's novel study of research productivity at Canadian universities. Finally, I draw some links from these papers back to the themes raised in David Laidler's introduction to this volume, and suggest some profitable avenues for future research on higher education in Canada.

Returns to University Education and to Particular Fields of Study

The three essays on the returns to higher education in general and to various fields of study present evidence that higher education is a "good buy" both for society and for the individuals who undertake it. In this context, a good buy means that the discounted present value of education's labor market payoff exceeds the discounted value of its social or individual cost, respectively. Two of the papers also present evidence that certain fields of study — mainly those that include a strong technical component or prepare students directly for particular well-defined careers — yield better labor

market outcomes than others. The findings outlined in these three papers generally comport with those in the existing literature for both Canada and the United States for earlier cohorts. These papers also extend the existing literature in various directions with, for example, Rathje and Emery paying closer attention to the details of the cost and tuition data than has been the norm. Finnie's somewhat startling (for economist readers, in any case) analysis of students' satisfaction with their chosen fields of study also represents a new finding.

Selection Bias

The findings in these essays all spring from relatively straightforward statistical analyses. What is tricky is determining what they mean, both in scientific and policy terms. The first important consideration in regard to all three essays is that students choose their fields of study. Imagine for a moment a counterfactual world in which students arrived at university and, after partying their way through orientation week, got assigned at random to a particular field of study. In this imaginary world, the field-of-study effects estimated in these essays would represent true causal effects — they would indicate the effect of studying in a given field on any randomly selected student.

Now consider instead our actual world. In the world that generated the data used in these essays, students select themselves into particular fields of study based on their goals, interests, and aptitudes, subject in some cases to entrance requirements or capacity constraints. In this world of nonrandom selection, the field effects measured in these essays combine the causal effects of the fields of study with differences across fields in factors that would affect the labor outcomes of students regardless of what they chose to study. These factors include ability, motivation, quality of primary and high school education, parental background, family environment, and so on. Casual empiricism suggests, for example, that some of the high returns reported for technical fields such as computer science and engineering actually represent returns to ability, specifically mathematical ability, that would likely also have a high return in other areas. That is to say, if, for example, you took all the com-

puter science students and switched them with all of the economics students, the returns to economics as measured in these essays would increase, while the returns to computer science would fall.

The simplest way to disentangle the effects of nonrandom self-selection into fields of study is to collect data on as many of these factors as possible and then include them in the regression equation as conditioning variables. In this way, you get the effects of various fields of study on later earnings, "holding constant" the observable characteristics of the students. Unfortunately, no existing Canadian data sets provide information on labor market outcomes, field of study in university, and the various factors likely to affect both of these areas. Constructing such a data set, or adding the necessary questions to an ongoing data set such as the Survey of Labour and Income Dynamics, would greatly improve the evidence available on which to base higher education policy in Canada.

In the absence of better data, we can still reason indirectly. Students care a lot about their labor market outcomes following graduation. They also have at least some knowledge of the type of evidence regarding returns to different fields of study presented here by Vaillancourt and Bourdeau-Primeau, and by Finnie. Given this fact, if the differences among fields of study in later earnings represent causal effects and are not just an artifact of the non-random selection of students, we would expect a migration of students into the fields with higher labor market payoffs. Yet, in stark contrast to this prediction, Finnie reports in his paper an astounding stability in the fraction of students selecting the various fields of study over the three cohorts (spanning eight years) that he considers. I read Finnie's findings on stability in the distribution of fields of study as indicating that all, or almost all, of the differences that he and Vaillancourt and Bourdeau-Primeau estimate do not represent the causal effects of particular fields of study. Rather, they indicate a substantial nonrandom sorting of more able, better-prepared, or more motivated students into particular fields.

Capacity constraints represent one potential alternative explanation for the higher estimated returns to fields such as computer science. At some schools, the number of slots in these fields is limited. Such limits have two effects. First, to the extent that migration into Canada is not costless, so that immigrants do not represent

perfect substitutes, and to the extent that students from other fields are not perfect substitutes either, capacity constraints raise the labor market return received by students in the constrained majors by artificially reducing their supply in the labor market.

This effect holds even if the limited slots are allocated by lottery, so that no additional selection is induced. But of course, most programs with capacity constraints do not allocate slots by lottery but rather by some measure of ability and effort, such as performance in various screening courses. This is the second effect of limiting the number of slots, and it creates an obvious bias in the estimated returns to the field of study by deliberately inducing the type of nonrandom sorting already discussed. What we lack in regard to this explanation, however, is evidence. A very useful endeavor for a graduate student would be to collect data on the capacity constraints and slot allocation rules in place in universities across Canada. These data, when compared to the estimated returns by discipline, would allow an evaluation of the relative importance of this factor in explaining the observed differences.

Individual Heterogeneity and the Question of Interest

Heterogeneity is the second important factor to keep in mind in interpreting the findings of the three papers on returns to post-secondary education and to fields of study within university programs. It seems quite likely that the effects of going to a university at all, as well as the effects of particular majors within university, will differ among individuals. One person might flourish in a university environment while another might find the experience stultifying and baffling. One person might discover an important new material while studying chemical engineering, while another might discover only that you should not spill acid on your lap.

To the extent that individuals have some idea about how much they would benefit from making different choices about university attendance and field of study, we would expect them to sort themselves accordingly. Thus, the set of persons we observe attending university should, on average, benefit more from it than would the

set of persons not attending university. The same holds true among fields of study: we would expect that the students currently majoring in, say, economics believe they will benefit more from it than they would from another choice of field.

Thinking about heterogeneity in this way has important implications for how we interpret the estimates presented in the three essays under discussion. In particular, we must take care to formulate the question of interest exactly. One potentially interesting question concerns the effects of going to university, or of choosing a particular field of study, on those presently observed to make these choices. For example, we might ask what the return is to studying engineering for those who presently do so. A different question, one that in a world of heterogeneous returns would have a different answer, consists of the effect of studying engineering on those who would be induced to do so in response to particular policy changes. Simple economics suggests that students induced to choose engineering at the margin by a policy change will benefit less from it, on average, than those who chose it prior to the policy change. Similarly, in the absence of credit constraints, we would expect that students on the margin between attending university and not will reap lower rewards, on average, from doing so than students who would attend even if the price were much higher. To make things even more complicated, the same students need not be the marginal ones for all policy reforms. For example, the marginal student who would be induced to attend university by a reduction in tuition may differ from the marginal student induced to attend by the introduction of an income-contingent loan program. Identifying the correct margins for particular policy reforms, and estimating the effects at those margins, remains an important topic for future research. The interested reader should consult Card (1999) and Heckman and Vytlačil (1998) for more technical presentations of these ideas.

Compensating Differences and Mediating Variables

One of the ways in which economics helps our thinking is by providing useful base states against which to compare the actual world.

Simple economics would suggest that, given reasonably good information and in the absence of capacity constraints, the marginal university student should be indifferent to the choices of attending and not, and the marginal student in each field of study should be indifferent to the choice between that field and his or her next best alternative. Yet the estimated rates of return to a university education in general and to particular fields of study presented in these three papers seem to contradict this simple economic model; university has a large positive private return and some fields of study yield much higher labor market earnings than others.

Why does reality fail to match the simple model? The differences between marginal and average returns play a key role, as has already been discussed. Another important factor, however, consists of the nonmonetary returns to both university educations and to fields of study. The simple economic model does not imply that marginal individuals would have the same monetary return to the alternatives they face, but rather that they expect to receive the same utility from them.

This point about what exactly should be equalized at the margin has two aspects. First, casual observation suggests that different fields of study imply different mixes of consumption and investment while in school. If on a Friday night we surveyed both the students in the university library and those at the local dance club, we would find differences in the two distributions of fields of study. In addition to differences in the time and effort required to complete particular degrees, some fields of study involve activities that most people enjoy, such as reading novels, while others involve activities that most people do not enjoy, such as solving differential equations. We would expect these differences among fields during university to be compensated for in the labor market after university.

Second, different fields of study typically lead to different jobs, and those different types of jobs vary in their nonmonetary compensation. Some jobs involve lots of travel, flexible hours, and interesting colleagues. Other jobs involve being outdoors. Still others involve high levels of stress. Indeed, there is a whole literature in labor economics, ably surveyed by Rosen (1986), on the subject of compensating differences — the extent to which persons in jobs with less desirable characteristics receive a wage premium to com-

pensate them. Studies that look only at monetary compensation overstate the differences between fields to the extent that such compensating differences play an important role in labor market outcomes.

A related issue, which has particular relevance to returns to education for women, is differences across education levels and among fields of study in employment and unemployment rates. A standard finding of studies in virtually every developed country is that unemployment rates fall — and employment rates rise — with the level of schooling. Thus, part of the difference in earnings between high school graduates and university graduates arises from the fact that the latter group will spend, on average, more of its time working and less of it being unemployed or out of the labor force. Studies that leave out the “zeros” — that is, studies that omit persons with zero earnings, as do all three studies in this book — miss part of this component of the effect of university completion. They do not miss all of it, because some of those who work less as high school graduates than they would have as university graduates still have positive earnings. Studies that use questions based on annualized earnings, such as Finnie’s, miss more of this employment effect than studies that rely on actual earnings as their dependent variable.

Increased employment is not an unambiguous good, of course, particularly for the individual decisionmaker. More work means less leisure. Such tradeoffs complicate individual cost-benefit calculations related to university attendance and field of study. These employment effects are likely to be particularly important for women, who exhibit much more flexibility in their labor supply than do men in the years immediately following university completion. These differential employment effects may help to account for the somewhat surprising differences in returns to different fields of study between men and women. It would be an interesting research exercise to decompose the effects for both men and women into effects on employment and effects on earnings conditional on employment.

General Equilibrium Effects

Large policy changes have large effects — effects that work through the entire economy in different ways. In the current context, the

most important of these so-called general equilibrium effects consist of changes in relative skill prices in response to policies that change the mix of skills produced by the educational system. For example, consider a move from the current regime of heavily subsidized tuition to a regime combining higher tuition, more reflective of the costs of providing a university education, with an expanded government student loan program. Such a reform would raise the private cost of attending university and should thereby reduce the number of students who do so. This in turn would diminish the supply of university-educated labor, which would have the countervailing effect of raising its market price.

In this example, a failure to consider this price increase would lead to an overestimate of the negative effect of the tuition increase on university enrollment. In their study of a US program to subsidize university tuition (the policy debate in the United States is moving in the opposite direction from that in Canada in this area), Heckman, Lochner, and Taber (1998) find that taking account of changes in skill prices reduces by 90 percent the estimated impact of a subsidy on enrollment. The lesson here is that general equilibrium effects can be important, and should play a role in analyses of large-scale policies.

Some Smaller Issues

I now consider a number of smaller issues — small not necessarily in their substance but in the sense that I have only a bit to say about each one. The first concerns the inclusion or exclusion of those who go on to a graduate degree from the sample used to estimate the returns to an undergraduate degree. Finnie excludes them in his paper, but I am not sure that I would have. Consider the following imaginary scenario.

Suppose that the only reason anyone studied political science was a desire to go to law school. Once they obtained their bachelor's degree, we might then imagine, all political science graduates would immediately apply to law school. Those that get into law school go on to become lawyers (a discipline with, perhaps, externalities of a different sign from those of many others) and those that did not get

in would do something else. In this hypothetical but not completely unrealistic world, excluding persons obtaining a graduate degree would substantially understate the returns to political science, which, in my scenario, consist mainly of the returns to, perhaps, later becoming a lawyer. To return to a more general view, part of the causal effect of certain majors is a heightened probability of going on to graduate school; this effect is something both individuals and society should consider in their calculations.

The second smaller issue consists only of a reminder that none of these three studies has much in the way of longitudinal data. The two studies that use census data rely on a so-called synthetic cohort assumption to estimate the life-cycle returns to both university completion and to specific fields of study. Under this assumption, the outcomes of older persons today proxy for the outcomes that younger people today will experience when they get older. In a world of rapid change, where different cohorts have different skill mixes (and are of different sizes), this assumption may be problematic. Finnie projects earnings profiles beyond the five-year follow-up provided by his data by assuming that the age-earnings profile has a specific functional form. The functional form he adopts is not an unreasonable one, but it would be interesting to know (another topic for future research) the sensitivity of the estimates to the specific functional form he assumes.

Finally, I have a couple of remarks about taxes. First, in the presence of a nonlinear tax schedule such as the one in place in Canada, the expected value of taxes paid does not equal the number that you get by applying the tax schedule to expected income, as is done in all three studies. Second, as is well known but often ignored in cost-benefit exercises of this sort, it costs society more than a dollar to raise a dollar in tax revenue. One source of extra costs is the overhead associated with administering the tax system and with "voluntary" compliance on the part of the long-suffering Canadian taxpayer. A more important source is the set of behavioral distortions induced by the tax system, distortions that reduce the size of the pie for everyone. Estimates of these deadweight costs, or "excess burden" to use the public finance jargon, vary widely, but none of them is zero, and they are large enough in some cases to affect the social cost-benefit calculations in these papers.

Policy Implications

How do the issues raised so far affect the advisability of the various policy proposals raised in the introduction and discussed in some of the chapters?

Consider first a policy, suggested by the findings in Finnie and in Vaillancourt and Bourdeau-Primeau, of increasing the number of students undertaking technical fields of study, such as engineering. In the case of capacity-constrained disciplines this could simply mean loosening the constraints. In other cases it could mean differentially low tuition or perhaps some sort of bonus on degree completion. The arguments above about nonrandom selection into fields of study, individual heterogeneity, and general equilibrium effects all suggest that the returns realized by the new, marginal graduates who would be drawn to these fields would be lower than the estimates in this volume suggest, perhaps substantially lower. There is, as usual, no simple spell to cast in order to make all things wonderful. This does not mean that reducing capacity constraints where they exist is not a good idea; the evidence is consistent with fairly high marginal returns in some disciplines. But the reasoning here does suggest a cautious approach to expensive subsidy programs.

Now consider the policy suggested in the introduction of replacing subsidized tuition with a tuition level more reflective of the costs of providing the education, combined with a more extensive student loan program. The reasoning above about the heterogeneous effects of university suggests that such a reform would reduce the total number of university students, as at the margin some students who previously found it privately worthwhile to attend no longer will. This would (through a compositional effect) increase the average return among those still attending. Whether this is a good or a bad idea in efficiency terms depends on the extent of the externalities associated with university education; keep in mind that those externalities may well be lower for students on the margin between attending and not attending.

Next, consider the very popular recent proposal of a system of higher tuitions combined with income-contingent student loans (loans in which the amount students have to pay back depends in part on how much they make after graduation). Such a reform

would have several effects. First, it would increase the relative attractiveness of disciplines that have a high consumption value, leading, one would predict, to more crowded campus pubs and emptier libraries. Second, it would increase the relative attractiveness of majors that lead to jobs with relatively high nonmonetary compensation. This is because the income contingency in the loan payments would increase the tax rate on monetary compensation but not on nonmonetary compensation. For the same reason, it should lead employers who hire university graduates to alter their compensation packages to include a higher relative level of nonmonetary compensation. Thus, we would predict lower paychecks and more corporate "retreats" in Hawaii and Whistler. Third, because the program would provide a sort of *de facto* income insurance for university graduates, it would increase the relative attractiveness of occupations with high variances in earnings. The predicted result of this factor is more athletes and artists relative to other, less variable, occupations. Finally, and perhaps most important, income-contingent loans would raise the already very high marginal income tax rate facing most university-educated workers. This would lead them to work less and enjoy more leisure. Taking all these predictions into account, I confess that I find it tough to see the point to this particular reform.

Finally, consider the related reform proposal of discipline-specific tuitions, as suggested by Rathje and Emery. The effects of this policy would depend crucially on the details of implementation. Basing tuitions on estimated earnings differences that fail to adjust for nonrandom sorting could lead to all sorts of fascinating distortions. To the extent that, for example, the higher earnings of engineers mainly reflect a sorting by ability, higher tuition for this discipline would chase people out of engineering, as the more able could now make more, net of tuition, doing other things. The less able did not find engineering worthwhile before, so they certainly would not with a higher tuition. Such a system would also require periodic updating in response to general equilibrium effects, as the supply changes in response to the initiation of the system would act to change the earnings effects associated with different fields of study, which would then require further changes in the tuition levels, and so on. Technology shocks affecting the relative demands

for different skills would also lead to a need for updating tuition levels.

Setting tuition levels based on program costs raises another set of issues. In this regard, it is worth noting (and studying further) the fact that private universities in the United States, which can set their tuitions however they like, in fact set more or less standard tuitions for undergraduate education in any field, and then price discriminate like mad based on family income and assets. This behavior suggests that there may be good reasons for not differentiating tuition too finely by discipline — such as the administrative costs of keeping track of the tuition level for students who wander through four or five majors before settling on the one they will ultimately finish. Students would also have an incentive to exploit such a system by switching at the last possible moment from a low-tuition field to a high-tuition field, so that much policing of who took what courses when would be required.

The Research Output of Canadian Universities

Chant and Gibson take their paper in a different direction from the other three discussed here. Rather than the labor market returns to a university education, they look at the research output of Canadian universities, an exceedingly important topic. This paper lays a fine foundation and provides an interesting (and intuitively plausible) finding: that Canadian universities seem to be holding their own in terms of the volume of publications but not of their impact.

Plenty remains for future work: refining the output measures; expanding the comparisons across disciplines in an attempt to explain differences in performance across time and in the cross section; and delving further inside the black box of particular disciplines that may provide especially useful insight.

In regard to the first of these research areas — refining output measures — the most obvious refinement would be to weight both publications and citations by journal quality. At least in some disciplines, such as economics, relatively standard rankings of journal quality should be available. The arduous part of the task, obviously, would be combining these rankings with the publication and

citation data. I suspect that the same basic picture will emerge, but the question is important enough that getting all the details down deserves researcher time and attention.

In regard to the second direction for future research, it is notable that the authors find some fairly wide swings over time in the rankings for particular disciplines. It would be nice to try to link those swings to observable characteristics of the discipline — in particular, to whether or not it operates in an international labor market. If the labor market for a discipline is confined largely to Canadians, then it can better retain its quality in the face of rising salaries in the United States, the United Kingdom, and elsewhere. Other field characteristics worth examining would include the location of the top doctoral programs in the world. Presumably, fields in which one or more of the top doctoral programs is found in Canada will have an easier time retaining quality faculty in the face of labor market competition.

In regard to the final suggested research direction I mentioned, a look at particular disciplines, I offer the somewhat self-serving suggestion that a detailed examination of the case of economics would provide some useful lessons. The economics profession has a truly international labor market. As a result, many economists at Canadian universities are not Canadian by birth, and many of the best-known Canadian economists work at US universities. As is well known within the profession, in recent years the low exchange rate for the Canadian dollar, combined with provincial budget problems, has led to a lot of departures for warmer and more remunerative climes. Studying this field in detail to learn “what went wrong” could provide guidance in reducing the impact of similar changes on fields that may be earlier on in the process.

Concluding Remarks

I now return to some of the main themes raised by David Laidler in his fine introduction to this volume, and then offer up a short list of topics related to higher education in Canada that deserve further research attention. It goes without saying that evidence-based policy-making requires evidence. This volume provides a wealth of evidence on several important questions, but much work remains to be done

on these questions to provide the knowledge base required for making coherent and effective higher education policy.

As Laidler notes, the two primary economic justifications for government intervention in higher education markets are externalities and credit constraints. We know very little about externalities, but we could learn more through some clever research on the topic. While it is handy for those of us who make our living in the higher education sector to point to the shimmering hope of externalities to justify our funding, the taxpayer would be better served with some hard empirical estimates.

A lively literature already exists, however, on the subject of credit constraints. Most of it focuses on the United States, but the institutions and participation levels are similar enough that it can probably be generalized to Canada. Two notable recent contributions are Cameron and Heckman (1998) and Stinebrickner and Stinebrickner (2001). Both suggest that, given the current institutional setup and funding levels in the United States, credit constraints are less important than is commonly thought. There does not appear to be a large pool of smart kids being kept away from university by funding issues, nor does it appear that credit constraints alone account for higher rates of dropping out among students from low-income families. This evidence does not necessarily indicate that current student funding programs should be eliminated, but it suggests little need for expansion beyond the levels currently provided in the United States and Canada.

A third broad issue, one that has received relatively little attention in either the United States or Canada, is the rationale for having government operate universities. Consider a system like that outlined in the introduction, in which schools set their own tuition in a competitive higher educational marketplace, and students shop for the school that best matches their needs in the context of a system of government-guaranteed student loans. In such a regime, one could find economic justifications for government to subsidize research, particularly basic research, and to provide student loans and perhaps grants. But no obvious economic justification exists, in either this hypothetical regime or the existing one, for having government actually operate universities. Both theoretical research on why and how we would expect public and private uni-

versities to behave differently, and empirical research comparing public and private universities in the United States or using historical data from the period prior to the socialization of Canadian universities, would have great value.

I now offer some additional policy-related topics that would repay further research attention. First, and perhaps most important, one of the main characteristics that differentiate Canadian from US universities is that the faculty at many Canadian universities, even some fairly good ones, is unionized. Several questions arise immediately. Why has this occurred in Canada and not in the United States? Is it because of differences in labor laws? Or some difference in the way in which public universities operate in the two countries? Is it the lack of private sector competition in Canada? What are the likely effects of unionization in Canada over the long term on research output and quality, and on instructional quality? One hears many anecdotes and horror stories, but systematic evidence is largely lacking.

Second, Canadian higher education has a number of other distinctive features not present in the US system. One is the strong separation between honors and general degrees, with, at least in Ontario, an extra year spent obtaining the honors degree. These honors programs are expensive in terms of faculty time but provide a higher quality undergraduate education to the cream of the undergraduate population. In economics, at least, such degrees appear to carry a labor market premium. Is that premium sufficient to justify the extra cost?

Finally, three quick topics for consideration within the context of the current government-operated university system. First, what value, if any, would there be to spending the money it would require to have a true "Harvard of Canada" — that is, a Canadian university of the same research stature as one of the elite private or public universities in the United States. Second, and not unrelated, what is the effect of university quality — as measured by, for example, the variables employed in the annual *Maclean's* rankings — on labor market outcomes? An as yet unpublished paper by Betts, Ferrall, and Finnie (2001) examines this question, and finds some labor market effects of quality-related university characteristics for male Canadian graduates. Further research, particularly of a kind

that was allowed to "name names" by indicating the relative labor market performance of specific universities, would be helpful in thinking about the optimal array of qualities to provide within the public system. Third, and also related, we now know something about the extent of peer effects in university education from the US literature on the effects of peer quality measures on labor market outcomes (see, for example, Datcher Loury and Garman 1995). What do these findings imply for the centralized student allocation mechanism presently used in Ontario? Could changes in the assignment rules increase overall educational attainment?

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Paul Davenport is President of the University of Western Ontario and Professor of Economics there. He taught economics at McGill University (1973-89), and was President of the University of Alberta from 1989 to 1994. He served as Chair of the Association of Canadian Universities and Colleges of Canada (1997-99) and Chair of