Adjustments in Markets for Skilled Workers in Canada: A Synthesis of Key Findings and Policy Implications
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April 2008

This document presents Skills Research Initiative (SRI) research and summarizes its findings and implications as discussed at SRI workshops. The report represents the views of the researchers and workshop participants and as such does not necessarily reflect the policies and opinions of Industry Canada, Human Resources and Social Development Canada or the Government of Canada.
Executive Summary

Canada is committed to building a more innovative, more productive knowledge-based economy. A key part of this commitment is to ensure that the talent and skills required are available. The Skills Research Initiative (SRI) is a medium-term policy research program undertaken in response to concerns that the development of Canada’s knowledge-based economy and innovative capacity may be hampered by persistent shortages of skilled labour.

Economics provides a simple model of skill shortages and of how they are resolved. When demand for some type of skilled labour increases, the supply may not increase immediately. As a result, wages for that type of skilled labour tend to increase. This provides an incentive for workers to acquire these skills and for workers who already have these skills to return to this type of work. The resulting increase in supply eventually leads to a new equilibrium between supply and demand. The increase in vacancies and in relative wages play a key role in this process, providing the incentive for individuals and institutions to increase supply.

How can the number of workers (or potential workers) with particular sets of skills increase? There are three ways:

- Labour market entry from the domestic education system of workers with these skills
- Training of workers already in the workforce in these skills
- Temporary or permanent immigration of workers with these skills.

The research summarized in this synthesis report takes up two of these sources of increased supply of skills: entry from the educational system; and training of workers already in the workforce. The third, temporary or permanent immigration was discussed in a previous synthesis report and a June 2006 SRI policy workshop on “International Mobility of Highly Skilled Workers”. In the simple economic model of skill shortages sketched above, skill shortages are self-regulating, although the model has little to say about how much time is required for adjustment.

Why might a need for policy intervention arise nonetheless? First, there may be institutional barriers that prevent supply adjustment or make supply adjust less rapidly than it would in the absence of these barriers. Second, there may be market imperfections that impede adjustment. The SRI research discussed here examines a series of questions related to how policy might seek to make adjustments in markets for skilled labour more rapid and less costly.
What are the research results and their implications for policy?

Post-secondary Education

- Students respond to labour market signals in their enrolment decisions and field of study choices.
- Post-secondary institutions may respond to increased demand for enrolments through increased selectivity, rather than by expanding supply to meet increased demand.
- Partial reforms in post-secondary education in other countries have not led to differentiation in tuition between universities or across fields of study.

If, over the next decades, university enrolments do not increase to meet rising demand, a significant increase in university-high school wage differentials is a probable result. This may signal the presence of scarcity rents for post-secondary graduates. In the absence of market mechanisms to ensure that supply meets demand, policy-makers will need to pay close attention to labour market indicators of the adequacy of the supply of post-secondary graduates, in particular, wage differentials.

A more market-driven system of post-secondary education might provide a more efficient supply response to increased demand. Countries that have attempted to move in this direction have found it difficult to create a market-driven system through partial measures. A move to a more market-driven system of post-secondary education would require a well-planned set of thoroughgoing reforms.

Employer-supported Training

- Canada-U.S. differences in employer-supported training are due in large part to differences in educational attainment and the industrial distribution of employment.
- SRI research supports previous findings of a strong link between education before labour market entry and training once in the labour market. This link may be due in large part to the fact that more educated workers are more likely to be employed.
- Policies that compress wages for skilled workers may decrease their training.
- Policies such as minimum wages that compress wages for less-skilled workers may provide incentives for employers to pay for their training, but also have negative effects on the employment of low-skilled workers, reducing their opportunities for training.
- Regulatory and legislative policies may affect the composition of training between formal and informal training, in addition to imposing certain types of training, for example, in health and safety.
- New technology adoption is an important reason for employers to train.
- There have been significant reforms in apprenticeship systems in a number of countries. Canadian apprentices are older than typical post-secondary graduates and continue to be predominantly male. In Canada, apprenticeship is not typically a school-to-work transition. Completion rates are low and appear to be trending downwards.
Many of the policy actions that would increase levels of training would do so as a “side effect” of actions that are likely to be undertaken for other reasons, for example, policies to increase the education level of labour force entrants, policies to reduce the progressivity of personal income taxation or policies to substitute earned income credits for minimum wages.

Apprenticeship is a type of employer-supported training that receives considerable policy attention. If apprenticeship (or more broadly, training that alternates between classroom time and work experience) is to become a viable alternative form of post-secondary education, consideration should be given to integrating it into community colleges with work experience provided through co-op type programs.

Adjustment and Labour Market Information

Formulating policies to facilitate labour market adjustment requires an understanding of how labour markets adjust in practice. SRI research examined labour market adjustment processes and the role of labour market information (LMI), since providing LMI is often cited as a way that governments can aid in adjustment.

- SRI research found reasonably rapid adjustment in the two markets for skilled labour examined—the Canadian market for university-educated natural scientists and engineers and metropolitan area markets for skilled construction workers. Because these skills require long periods of training, adjustment requires a number of years.
- A number of potential firm-level barriers to adjustment and labour market imperfections can be identified, but it is difficult to assess their costs and the costs of correcting them. Broad labour market policies that constitute barriers to adjustment, such as lack of mutual recognition of professional credentials, are likely to have much greater costs.
- Internal adjustment in firms is an important source of labour market adjustment and is heavily influenced by policy. For example, firms’ ability to adjust by rehiring their own retirees is limited by regulations governing private pension plans.
- Different countries have a wide variety of approaches to providing LMI. There is apparently very little rigorous evaluation of the outcomes of various LMI systems.
- An SRI laboratory study indicates that a targeted LMI intervention may be an effective, low-cost way of influencing the educational choices of youth. Perhaps more significantly, this study shows how different approaches to LMI can be evaluated before undertaking the program.
- Labour market information can play a valuable role in adjustment, but it needs to be accurate, targeted, and evaluated for effectiveness.

While SRI research indicates that markets for skilled workers in Canada adjust fairly quickly, the periods required for adjustment are a matter of years. The adjustment mechanisms discussed here operate too slowly to satisfy short-term demands for skilled workers in a large number of occupations. One alternative for meeting short-term skill requirements is temporary immigration, such as occurred during the information technology boom.
Policy to address barriers to adjustment should begin by dealing with broad labour market policy areas constituting impediments and disincentives to internal labour mobility, such as lack of mutual credentials recognition.

Proposed approaches to the provision of labour market information should be evaluated as to their effectiveness, preferably before costly LMI initiatives are undertaken.

**Key Messages for Policy**

SRI research provides support for the view that labour markets for skilled workers tend to adjust to skill shortages; and that adjustment occurs rapidly, relative to the time required to train skilled workers. The research provides little support for the idea that Canada’s mechanisms for supplying skilled labour in occupations or regions are unable to adjust to shifts in demand, so that the Canadian economy is faced with persistent occupational skill shortages on a grand scale.

As stated in the first paragraph, the focus of SRI research was on the supply of skills. Evidence developed by SRI research indicates, however, that at the highest levels of skills required in an innovative, knowledge-based economy (post-graduate degrees) the problem in Canada is a lack of demand for these skills. This lack of demand is closely related to the poor record of Canadian industry in investing in innovative activities.

On the supply side, there is a valid role for policy in seeking to improve supply-side labour market adjustment mechanisms, in large part by identifying and removing barriers to adjustment. Measures that would further improve internal labour mobility and remove disincentives to mobility would be a useful starting point. The source of skills that needs to be most closely monitored is the post-secondary education system, since demand for post-secondary graduates at the first-degree level may increase, and post-secondary institutions do not have sufficient market incentives to respond by increasing supply.
1. **Introduction**

Canada is committed to building a more innovative, more productive knowledge-based economy. A key part of this commitment is to ensure that the talents and skills required are available. The Skills Research Initiative (SRI, see box) is a medium-term policy research program undertaken in response to concerns that the development of Canada’s knowledge-based economy and innovative capacity may be hampered by persistent shortages of skilled labour.

**Skills Research Initiative (SRI)**

The Skills Research Initiative was established in 2003 by a Memorandum of Understanding between Industry Canada, Human Resources Development Canada and the Social Sciences and Humanities Research Council. The SRI sought to:

- Foster policy-relevant research on skills, organized around four themes:
  - Labour market and skills implications of population aging in Canada;
  - International mobility of highly skilled workers;
  - Employer-supported training in Canada;
  - Adjustments in markets for skilled workers in Canada.
- Encourage dialogue between researchers, policy makers, and practitioners through conferences and publications;
- Support the dissemination and application to policy of research on skills, particularly within government, in the academic community and among other stakeholders.

Three policy workshops were held in the National Capital Region in 2006: Labour Market and Skills Implications of Population Aging, International Mobility of Highly Skilled Workers, and Adjustments in Markets for Skilled Workers (which included the theme of Employer-supported Training). Following the workshops, final versions of the synthesis report for each workshop and an SRI overview report were prepared. The synthesis reports present the research results of the theme, and discuss their policy implications. The overview synthesizes the findings of all the themes and presents the broad policy implications including an overall diagnostic.
Economics provides a simple model of skill shortages and of how they are resolved. When demand for some type of skilled labour increases, the supply may not increase immediately. As a result, wages for that type of skilled labour tend to increase. This provides an incentive for workers to acquire these skills and for workers who already have these skills to return to this type of work. The resulting increase in supply eventually leads to a new equilibrium between supply and demand. The increase in vacancies and in relative wages plays a key role in this process, providing the incentive for individuals and institutions to increase supply.

A recent survey by the Canadian Business and Labour Centre (CBLC, 2006) suggests that this simple economic model fits well with what private-sector employers mean by “skill shortages”. In this survey, private-sector employers described as the three principal problems resulting from skill shortages their decreased ability to retain their own skilled workers, their decreased ability to hire skilled workers from competitors and a lack of qualified graduates. The first two reasons express employers’ concerns about the increased competition for skilled workers that results when demand increases, but supply responds slowly, creating upwards pressure on wages. The third reason expresses concerns about the adequacy of the supply response.

How can the number of workers (or potential workers) with particular sets of skills increase? There are three ways: labour market entry from the domestic education system of workers with these skills; training of workers already in the workforce in these skills; and temporary or permanent immigration of workers with these skills. The research summarized in this synthesis report takes up two of these sources of increased supply of skills: entry from the educational system; and training of workers already in the workforce. The third, temporary or permanent immigration, was discussed in a previous synthesis report and a June 2006 Skills Research Initiative policy workshop, where it was set in the broader context of “International Mobility of Highly Skilled Workers”.

In the simple economic model of skill shortages sketched above, increased demand creates wage pressures that lead to increased supply and eventually to a new long-term equilibrium between supply and demand. Although the model has little to say about how much time is required for adjustment, skill shortages are self-regulating. Why might a need for policy intervention arise nonetheless?

First, there may be institutional barriers that prevent supply adjustment or make supply adjust less rapidly than it would in the absence of these barriers. Second, there may be market imperfections that impede adjustment. The SRI research discussed here examines a series of questions related to how policy might seek to make adjustments in markets for skilled labour more rapid and less costly. These research issues were developed at two roundtables at the beginning of the SRI research process. The subjects discussed at the roundtable on “Adjustments in Markets for Skilled Workers” included the role of post-secondary education in labour market adjustments and adjustment mechanisms and labour market information. The other roundtable discussed research issues in the area of “Employer-supported Training”.

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The paper is organized as follows. Section 2 discusses the role of post-secondary education in labour market adjustment. Section 3 examines the provision of employer-supported training in Canada, and identifies factors that might prevent employers from investing in their employees’ skills. The mechanism of labour market adjustment and the role of labour market information are discussed in Section 4. The last section concludes with the policy implications of the SRI research in this theme.

2. Adjustment in the Post-secondary Education System

The domestic educational system will continue to be the largest source of new labour force entrants (although demographic aging will mean that entry cohorts will be smaller in proportion to the existing labour force). The speed of adjustment in markets for skilled labour will depend on how quickly the education system responds as the volume or type of skills required evolves. In light of the importance of the post-secondary education (PSE) system as a source of skilled labour supply, the SRI devoted a considerable part of its research effort to a better understanding of the response of PSE to labour market signals of skill shortages and of how this response might be improved.

The model of adjustment to skill shortages sketched above operates through market mechanisms. Although the post-secondary education system is the principal source of new supply of skilled labour, Canada’s post-secondary institutions have few market-driven incentives to set their enrolment levels overall and by level and field of study in response to labour market conditions.

Post-secondary Education in Canada

Canada’s PSE system has been shaped in very large part through government policies; and the resulting system has some unique characteristics. Canada currently has broad participation in PSE, with a very high percentage of youth enrolled in some form of PSE. As a result, among Organisation for Economic Co-operation and Development (OECD) countries Canada has the highest percentage (44%) of the working-age population with some form of post-secondary credential (OECD, 2005, Table A1.3a)

One unique feature of the Canadian PSE system is the great emphasis placed on the community colleges and collèges d’enseignement général et professionnel (CEGEPs). Among OECD countries, Canada has by far the highest percentage of the working-age population with a college credential (22%). In contrast (and perhaps as a consequence) Canada is well behind the United States in the percentage of the working-age population with university degrees (22% versus 29%) and lags several other OECD countries in this respect. (OECD, 2005, Table A1.3a)

Canada lags still further behind in advanced degrees, with one of the lowest doctoral graduation rates among advanced economies2 (OECD, 2002). Canada’s lag in advanced

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2 In 2000, Ph.D. graduations in Canada are 0.8% of the relevant age group, versus 1.3% in the United States (OECD, 2002, Table A2.1).
degrees occurs despite a very heavy concentration of Canadian research and development (R&D) spending in the country’s post-secondary institutions. Canada has the highest level of R&D spending in the higher education sector (as a share of Gross Domestic Product (GDP)) in the G-7, yet one of the lowest levels of business sector R&D spending (as a share of GDP) of the advanced economies (OECD, 2004).³

Canadian governments provide direct support to post-secondary students through loans to cover direct expenses and living costs during study. Access to bursaries is more limited. Considerable support is also provided through the tax system by a series of tax credits. A recent paper by Collins and Davies (2005) includes a discussion of the effects of these tax credits. According to the authors, the effective subsidy rate to first-degree university education rose slightly (19% to 21%) from 1998 to 2003, despite increases in student fees. The effective tax rate on post-secondary education fell significantly over the same period (14% to 10%), due to decreased progressivity of the tax system. Consequently, net support to individuals’ investment in their human capital rose.

Canadian governments have implemented reforms to how they fund post-secondary education and how they support students in their post-secondary studies. Further reforms are being considered. Several countries have moved towards increased freedom for universities to set fee levels or income-contingent repayment systems for student loan repayment or both. The Rae (2005) report recently advocated moving in these directions in the Ontario post-secondary education system.⁴

The predominantly non-market character of post-secondary education is not unique to Canada. There is no advanced economy with a large market sector in post-secondary education.⁵ Nonetheless, it is useful to consider how the supply of and demand for different courses of study would be determined in a more market-driven PSE system.

An issues paper prepared for the SRI theme “Adjustments in Markets for Skilled Workers in Canada” (Montmarquette and Boisclair, SRI-2004) sketched how a market-driven post-secondary system might function. Students would purchase post-secondary studies from a post-secondary institution. The price students would be willing to pay in various fields of study would depend on market returns in these fields and on the students’ competencies and interests. Students could borrow to pay for their studies with repayment on an income-contingent basis. Post-secondary institutions would compete for students in various fields of study on the basis of price and of quality of instruction. The price for a course of study in a given field of study at a given quality level would depend on the cost of providing the course of study at this quality level. In this model of “student as customer”, students’ responses to

³ Higher education research and development spending was 0.65% of GDP in 2000, 48% higher than the United States. Business expenditure on research and development in Canada as a percentage of GDP was 40% below that of the United States and sixth out of seven in the G-7. (OECD, 2004)
⁴ Rae also advocates establishment of bursaries for students from low-income families.
⁵ The “private” universities in the United States are in fact non-profit institutions that receive a very large part of their research funding from government. The non-existence of a significant private sector in post-secondary education (aside from vocational institutions) might be due to the subsidization of public sector post-secondary institutions (and to the availability of endowment funds to “private” universities).
changing labour market conditions would affect the course mix by changing the structure of demand for post-secondary studies.

In recent years, federal funding for post-secondary education has moved away from providing funds to post-secondary institutions towards support for post-secondary students. A model of “student as customer” would support moving in this direction. The crucial assumptions of this model are that students respond to labour market signals in making their enrolment decisions and that post-secondary institutions will respond to student demand for increased enrolments. Evidence related to these assumptions is discussed below.

Determinants of Enrolment Levels in PSE

Beginning with Richard Freeman’s (1976) study of *The Overeducated American*, a considerable body of research has been published on the relation between the relative supply of university-educated and high-school-educated workers and the wage differentials between these groups. Freeman provides evidence of a decline in the earnings differential in the United States during the 1970s due to rapid increase in the relative supply of university-educated workers.

A study by Nicole Fortin and Thomas Lemieux (SRI-2006) reviews much of this literature. The paper examines the determinants of educational attainment for successive age cohorts and the results for university-high school wage differentials in Canada. Their estimates show that the size of the 18-24 year old cohort was an important determinant of university enrolment rates in Canada between 1980 and 2000, as was the level of provincial funding to universities per person age 18-24 year old. They note that the percentage with university education of successive baby-boom birth cohorts did not rise significantly; and they attribute this to limitations on the supply of university “seats”. They carry out projections that indicate that unless enrolment rates grow more rapidly than their historic trend, university-high school wage differentials will increase significantly in the future, in particular, for men.

Fortin’s and Lemieux’s results call into question the extent to which Canadian post-secondary institutions respond to increased demand for post-secondary education. If, as seems likely, post-secondary education continues to be funded in large part from provincial budgets, the supply response to increased demand for post-secondary education is likely to depend critically on provincial budgetary decisions. These decisions will be made in the face of competing budget priorities such as health expenditures. In the absence of a market mechanism for determining the appropriate level of post-secondary enrolments (such as that described by Montmarquette and Boisclair, SRI-2004), rising wage differentials between post-secondary graduates and high school graduates may not lead to increased supply of “seats” in post-secondary institutions.

Fortin and Lemieux also examine factors that affect demand for university seats. They cite meta-analyses of U.S. studies that find a strong impact of tuition levels on enrolment levels. They find a similar impact using their Canadian data, but this effect is not statistically significant.

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6 Fortin’s and Lemieux’s paper was presented at the SRI Workshop on “Labour Market and Skills Implications of Population Aging” in January 2006, Ottawa.
significant when a quadratic time trend term is introduced. They find no statistically significant impact of provincial-level university-high school wage differentials on provincial enrolment levels, but note that this may be because of “confounding factors” in the provincial-level data.

Several other SRI research papers examine whether students’ enrolment decisions or field of study choices respond to market returns. They also shed light on two related issues: how rapidly the response occurs and (indirectly) whether post-secondary institutions have responded to increased student demand in fields of study by increasing enrolment in these fields.

Christian Belzil and Jorgen Hansen (SRI-2006b) use data from the School-Leavers Survey and its Follow-Up to estimate a model of grade progression and of field of study choice for Canadians who were 18-20 years old in 1990. They conclude that educational attainment responds significantly to increases in expected earnings, with the largest impact for studies beyond high school. They find smaller effects of parental education than in earlier Canadian research, especially for the post-secondary level.

Field of Study Choices

Belzil and Hansen also examine the determinants of choice of post-secondary field of study. They report no parental education effect on choice of field of study, but significant effects of expected future earnings, with the strongest effects being those for commerce and the weakest being those for humanities.

Brahim Boudarbat and Claude Montmarquette (SRI-2006) examine university undergraduates’ choices of fields of study using data from three rounds of National Graduate Surveys (NGS) of 1986, 1990 and 1995 graduates. Their choice models are estimated for 1990 and 1995 graduates; in both cases they use the labour market experience of the preceding cohort to construct their model of expected earnings in each field of study. Like Belzil and Hansen, they find that field of study choice responds to differences in expected earnings; the effect is somewhat stronger for men than for women. Boudarbat and Montmarquette also show a significant impact of attitudinal variables on field of study choice. Because of the strength of these attitudinal effects, large variations in earnings across fields of study – relative to those currently observed – would appear to be needed to substantially change the field of study choices made by students.

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7 More precisely, they find an elasticity of enrolment rates with respect to tuitions of –0.18 in their reduced form estimates and show that this is comparable to recent U.S. estimates.

8 They report that Fortin had previously found similar results for the U.S. states. Their model assumes that students use a provincial- or state-level rate of return in making enrolment decisions, but since graduates are free to move after their graduation, a national-level rate of return, which would not vary across provinces (states), might be more appropriate.

9 The largest parental effect they find is of father’s education on progression at grade levels of high school or lower.
Sumon Majumdar and Katsumi Shimotsu (SRI-2006) estimate a model of the response of natural science and engineering enrolments to conditions in the labour market for natural scientists and engineers. The relative supply of new natural scientists and engineers tracks their relative earnings well between 1976 and 1988 and again between 1994 and 1999, but the two series move in opposite directions between 1988 and 1994. Using the estimated dynamics of their system, Majumdar and Shimotsu are able to simulate the effects of a permanent and a one-year change in R&D expenditures (as a percentage of GDP) on new labour market entries (graduations) in natural science and engineering. Under two polar sets of assumptions about how the expectations of students are formed – rational and static expectations – a permanent increase in R&D expenditures leads to a permanent increase in graduations in natural science and engineering. Under the static expectations model, 80% of the adjustment occurs within six years; under the rational expectations model, 80% of adjustment occurs within ten years. A one-time increase in R&D expenditures leads to a short-term increase in the supply of natural scientists and engineers, but the effect fades out quickly.¹⁰

The overall picture that emerges from this research is that the enrolment choices of post-secondary students are sensitive to expected labour market conditions. Since the responses of post-secondary students as to field of study are observed through enrolments or graduations, it seems likely that the post-secondary system has accommodated students’ responses to labour market signals as to field of study to some degree. Whether adjustment at the level of fields of study would have been more rapid if post-secondary institutions had greater incentives to respond to changes in students’ field of study preferences remains an open question.

Reforms to Post-secondary Education – Lessons from an International Comparison

By the end of 2006, Australia, New Zealand and the United Kingdom will all have implemented reforms which allow greater autonomy to universities in setting student fees and which provide for student loans with income-contingent repayments. To what extent are these reforms a movement towards the market-driven PSE system outlined by Montmarquette and Boisclair (SRI-2004)? What have been the results of these reforms? What lessons are there for Canada in the experience of these countries with PSE reforms?

These questions are addressed in a research paper by Saul Schwartz (SRI-2006) that reviews the experience of PSE reforms in these three countries. Schwartz begins by recalling the distinction made by Nicholas Barr between an “Anglo-American” model of university education in which students pay significant tuition fees and a high percentage of youth receive a university education and a “Scandinavian model” in which there are no tuition fees, students are often provided with stipends, but only a small percentage of youth receive a university education. In the Scandinavian model there is little differentiation between universities; in the Anglo-American model there can be considerable differentiation.

¹⁰ Majumdar’s and Shimotsu’s (M-S) study in large part replicates the methodology of Rosen’s and Ryoo’s (R-R) (2004) study of the U.S. market for engineers. Many of M-S’ coefficient estimates are similar to R-R, but the adjustment dynamics differ.
Schwartz states as his underlying assumptions that the contemporary economy requires mass post-secondary education and that mass post-secondary education requires that a significant part of the costs be borne by students (or their families). He notes that all three of the countries he examines followed the Scandinavian model before the 1990s and had low rates of participation in post-secondary education. When they moved to mass higher education, they introduced significant tuition fees to aid in financing this change.

Schwartz argues that there is a significant role for market forces in determining the choices of post-secondary students, that it follows that post-secondary institutions must offer a variety of educational options to accommodate student choices, and that with diversity of educational options the question of differential fees is necessarily posed. The provision of financial aid is a key role for government, in Schwartz’s view, because of the inability of students to borrow against their future earnings in a private loan market.

Schwartz provides a history of reforms in PSE financing and in student financial support in Australia, New Zealand and the United Kingdom as each of these countries moved towards a system of mass PSE. He notes, however, that despite these reforms, fees in these countries do not yet actually vary across universities as envisaged in a model of student choice (such as that outlined in Montmarquette and Boisclair, SRI-2004). There are three levels of fees in Australia, but they are common across universities. In the United Kingdom, fees are almost uniformly at the maximum level of £3,000, despite universities’ ability to set them at any level up to this maximum. In New Zealand, where universities have been free to set their fees since 1992, the fee structure varies much more by field of study than by university. The most recent reform in Australia holds out the prospect of significant variation in fees, but it remains to be seen if this will occur.

Schwartz reviews a number of studies of the impact of post-secondary reforms in Australia and the U.K. on post-secondary participation by students from low-income backgrounds. There does not appear to be strong evidence in either country that these reforms have lead to decreased participation in post-secondary education. He does not review other aspects of the effects of these reforms on outcomes such as enrolment levels.

Schwartz sees the following lessons for reform in Canada in the experiences of Australia, New Zealand and the United Kingdom. First, it is politically difficult to move towards a more market-oriented system of post-secondary education. Second, it has proved difficult to charge market interest rates in income-contingent loan schemes, perhaps because doing so means that real loan balances can increase during periods of low income.

Consequently, Australia and the United Kingdom index balances to inflation, but charge no real interest. This is very expensive – for the United Kingdom, Nicholas Barr estimates that it

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11 One reason for the lack of clear evidence is that it is very difficult to distinguish the effects of these reforms from the effects of other factors influencing post-secondary participation.

12 Balances can increase if repayments in a period are less than the interest charged. On the other hand, since income-contingent loan plans often have provisions for forgiving unpaid balances after a number of years. In this case, the ultimate effect would be that graduates with persistent low earnings will have low lifetime repayments.
means that only half the real value of the loans is recovered. Australia appears to have found a way around this difficulty by allowing up-front tuition payments of a lower amount, thus effectively charging interest for those who defer payment.\textsuperscript{13}

Schwartz shows that it is politically difficult to make reforms aimed at moving post-secondary education towards a more market-driven system, with students as purchasers. Partial reform may not be sufficient to assure diversity. On the other hand, movement towards increased access to post-secondary education in a country appears to go hand-in-hand with students (or their families) bearing a greater proportion of the costs. Rising private costs of post-secondary education may increase interest in reforms that provide greater PSE diversity or tie loan repayments to earnings. Schwartz reports no conclusive evidence on the effects of these reforms on actual outcomes, for example, effects on the participation of students from lower-income backgrounds in post-secondary education.

Federal government assistance to PSE has increasingly taken the form of providing monies to students and their families, rather than to universities. Moving further in this direction would increase the power of “students as customers” and might lead to further diversification in post-secondary education.\textsuperscript{14} On the other hand, Schwartz’s study indicates that small-scale reforms may not do much to increase price and quality competition among post-secondary institutions.

3. Employer-supported training and adjustment

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Canada has been identified in several studies as lagging in the provision of employer-supported training. SRI research has examined the provision of employer-supported training in Canada and has sought to identify factors that might prevent employers from investing in their employees’ skills.
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As noted in the Introduction, training of persons already in the workforce can be a significant source of new supply of skills that are in high demand. Demographic aging will mean that the supply of persons entering the workforce from the education system will decrease, relative to the size of the workforce. As a result, new skills acquired by persons already in the workforce may be an increasingly important source of new skills.

International comparisons show that there is relatively less employer-supported, job-related training in Canada than in many other advanced economies. The research discussed in this section investigates possible reasons for Canada’s lower training rates.

\textsuperscript{13} Schwartz does not report any significant administrative difficulties in implementing income-contingent loan repayment systems in the countries he studies, but notes that the joint federal-provincial responsibility for student loans in Canada complicates matters as regards introducing a system of this type.

\textsuperscript{14} Note that there is already considerable diversity in quality among Canadian universities (as evaluated by potential students) which is not reflected in differences in tuition. For example, Drewes and Michael (2006) have used individual-level data from the Ontario universities’ applications clearing-house to show that students with poorer academic results do not apply to selective programs in better universities, where their chances of admission are low.
The economic analysis of training developed by Gary Becker (1964) and Jacob Mincer (1962) distinguishes between skills which are valuable to more than one employer (general human capital) and skills which are specific to a single employer (specific human capital). In their models, individuals receive all of the productivity gains due to general skills acquired through training and consequently must pay the costs of training. In the case of “on-the-job” training, employees “pay” their employers the cost of training by accepting lower wages during training than they would otherwise have earned.

Recent research on employer-supported training has analyzed cases in which employers have incentives to invest in general skills of their employees. Two frequently cited theoretical cases in which employers would make such investments are that they have information on the quality of their workers which is not available to other potential employers (asymmetric information) or that the wage structure is “compressed” so that low productivity workers receive more than their marginal productivity and high productivity workers receive less. In the first case, workers under-invest in their general skills because potential employers are not able to evaluate these skills easily; in the second case, workers under-invest in their general skills because wage compression prevents them earning the full returns of the investment.

Previous research on training has also established a certain number of stylized facts about training. These include

- Older workers are less likely to train.
- Better educated workers are more likely to train.
- Firm size matters for training, with the smallest firms least likely to train.
- Organizational and technological changes are associated with greater training activities.

**Determinants of Training**

As noted above, Canada has lower rates of employer-supported training than many other advanced economies. Reports based on the International Adult Literacy Skills (IALS) Survey of 1994 to 1998 led to calls for greater training efforts in Canada, since that survey showed

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15 Within general human capital, further distinctions are drawn between skills specific to an occupation, to an industry, and so on. Peter Kuhn (2005) reviews how economists classify and measure skills.

16 If investment in general skills is subsidized, as is the case for general skills acquired through education, the individual does not bear all of the costs of investing in the skill. Also, if there are positive externalities associated with general skills (as is often argued for education), the individual does not realize all the returns to general skills. Finally, the term “on-the-job” training is somewhat misleading as it can include classroom training during work hours, outside work hours but supported or paid for by the employer and so on.

17 Chapter 3 of OECD (1999) provides support for the first two statements from four international data sets on training including the 1994 IALS. Kapsalis (1997) provides support for the first three statements in a comparison of seven countries (including Canada) using the 1994 IALS. Lin and Tremblay (SRI-2003) provide support for all four statements for Canada using data from the 1999 Workplace and Employees Survey. See also Chaykowski and Slotsve (SRI-2003) on firm size and training and on the sizeable literature on organizational practices and training.
that Canadians were less likely than Americans to participate in job-related training.\textsuperscript{18} In such analysis, it is common to call for “country-wide solutions” to observed country-wide differences because countries are perceived as homogeneous units.

Nicole Fortin and Daniel Parent (SRI-2006), however, use the IALS to show that training participation rates differ more within Canada and the United States than between these countries. They find that Canadians and Americans have similar training participation rates, once one accounts for ethnic background\textsuperscript{19}, literacy skills, personal characteristics and some employer characteristics such as establishment size and industry. In Canada, English Canadians are much more likely to participate in job-related training than French Canadians, though again the difference largely disappears when the authors attribute English-Canadian levels of educational attainment and other explanatory variables to French Canadians.

Fortin and Parent examine which policy interventions are more likely to close the gap in training rates observed across groups. They note that employers will pay for training only when employees are unable to capture the benefits from training, which they attribute to monopsony power.\textsuperscript{20} Consequently, employers should be able to capture much of the return to training for which they pay. On the other hand, the link between higher educational levels and increased training is well established (although the reasons for this link are not clear, see below). This leads Fortin and Parent to conclude that increasing the educational level of the workforce is the policy intervention that is most likely to succeed in increasing levels of training. (OECD, 1999, Chapter 3 reaches much the same conclusion for similar reasons).

As noted above, better-educated workers are more likely to train than less-educated workers. In the absence of suitable Canadian data, Christian Belzil and Jorgen Hansen (SRI-2006b) use the U.S. National Longitudinal Survey of Youth to follow a group of white males from their mid-teens to age 30, to understand better how their education and training decisions interact. They find that the more educated are much more likely to work, and somewhat more likely to take on-the-job training while working. Similarly, the probability of taking training increases with the number of years of work experience, while years spent outside the labour market sizeably reduce the probability of working, with or without simultaneous training\textsuperscript{21}.

\textsuperscript{18} Table 2.2 in Lin and Tremblay (SRI-2003) shows that Canada finds itself near the middle of the list among countries surveyed in the IALS when ranked by job-related employer-supported training participation rate or training intensity (measured in hours).

\textsuperscript{19} Fortin and Parent find that French Canadians are less likely to train than English Canadians and American blacks less likely to train than American whites. In fact, English Canadians were as likely as French Canadians to train as white Americans. They argue that recent catch-up by French Canadians may be due to rising educational attainment among French-Canadian women.

\textsuperscript{20} “Pay for” is used here in the sense of the Mincer-Becker human capital model of training, in which employees may “pay for” training by accepting a reduced wage during the period of training. The employer “pays for” training to the extent that the costs of training borne by the employer cannot be recaptured through reduced wages.

\textsuperscript{21} Belzil and Hansen also use linked employer-employee data for 2001 from the Workplace and Employee Survey (WES) to examine factors related to training. Among employee characteristics, they find that age is negatively associated and education positively associated with training (but warn that the effect of education may be due to unobserved employee characteristics which affect both the propensity to train and the education level of the individual). They also find that the presence of dependent children decreases the probability of training, that workers who use computers and information technologies are more likely to be trained and that
To summarize Belzil and Hansen’s results concerning the link between education and training: there is a weak, positive correlation between schooling and post-schooling training. This correlation is in part due to a weak, positive *causal* link between schooling and on-the-job training and in part to the fact that the more educated are more likely to be employed (usually a precondition of employer-supported training). There is a weak negative correlation between tastes for schooling and training which is too small to offset the causal link.

Belzil and Hansen’s results suggest that the positive relation between education and on-the-job training may occur in part because the better educated are more likely to be employed. Michael Baker (SRI-2005) makes a similar point. This can be seen as supporting Fortin’s and Parent’s argument that the best long-term policy for increasing training may be to increase educational attainment prior to workforce entry.

As noted above, recent research on training identifies wage compression as one reason that employers may provide training in general skills to their employees. Serge Coulombe and Jean-François Tremblay (SRI-2006) examine the relationship between earnings dispersion in 14 OECD countries and the probability of taking job-related training in each country, controlling for a literacy skill measure (used as a proxy for human capital). They pair training and literacy skills average measures computed with the IALS of 1994-1998 with aggregate data drawn from a variety of other sources. Their statistical analysis uses countries as observations. They measure wage compression among low-skill workers by the median to 10\(^{th}\)-percentile of earnings ratio and measure wage compression among high-skill workers by the 90\(^{th}\)-percentile to median of earnings ratio. The first ratio is lower when there is wage compression between the least skilled and those with an average skills level; the second ratio is lower when there is wage compression between highly skilled workers and those with average skills.

They find that there tends to be *more* training overall when the earning difference between low- and average-skill workers is *compressed*; and, to the contrary, *less* training overall, when the wages of the highly skilled are compressed relative to average-skill workers. They also find that the proportion of workers who get training goes up with the country’s average literacy level, and that countries with older workforces have less job-related training. The unionization rate and the unemployment rate are found to be non-significant, once one controls for wage compression.

Coulombe and Tremblay interpret their results as indicating that the more wages are compressed at the bottom, the more training of the low-skilled is paid for by employers, because this wage compression means that when the low-skilled worker is trained, the resulting increase in productivity is greater than the worker’s pay gain. The more the wages of high-skilled workers are compressed, the less training is paid for by high-skilled workers, as their earnings gains are smaller than the productivity gains resulting from training.

immigrants are less likely to receive paid training. As concerns establishment characteristics, they find there are significant differences in training rates between industries and that larger firms are more likely to train. They make the usual hypothesis that workers are paid according to their marginal productivity and thus equate relative pay level with relative skills level within a country.
Coulombe and Tremblay’s findings raise the possibility that a higher minimum wage might have two types of effects on training of low-skilled youth. On the one hand, by increasing wage compression it might increase training by employers of their low-skilled employees. On the other hand, as Baker (SRI-2005) notes, in Canada minimum wages have been shown to have negative employment effects for youth. Thus by decreasing employment of low-skilled youth, minimum wages may decrease their on-the-job training opportunities. (Baker finds little evidence of a direct effect of the minimum wage on training levels). Coulombe and Tremblay’s findings also indicate that measures that decrease the returns to training for highly skilled individuals (such as highly progressive income taxes) may lead to decreased amounts of training.

All of the studies of determinants of training discussed above are based on surveys of individuals and have little to say about the effects of employer-supported training on the firm. In contrast, research carried out by Benoît Dostie and Marie-Pierre Pelletier (SRI-2005) uses a longitudinal, linked employer-employee data set (WES) to examine the impact of formal and informal training on firm productivity. They find that introduction of new technology and more use of information technology is associated with more training, both formal and informal. They find a greater use of formal training relative in Quebec than in all other provinces (except Saskatchewan), but find that more informal training is offered by firms in Ontario, Saskatchewan, Alberta and British Columbia than in Quebec. They attribute this difference to Quebec legislation that favors formal training. A higher turnover rate is associated with more training, with a greater impact on informal training. They explain this finding by a need for orientation training for new employees, which is often informal.

Dostie and Pelletier report results of four different methods of estimating the impact of training on firms’ productivity. In most of their estimates, the effect of training on productivity is not statistically significant. In their instrumental variables estimates, the effect of formal training on productivity is not statistically significant, but the effect of informal training is statistically significant and negative. In their final set of estimates, in which they control for productivity shocks, the effects of both types of training and productivity are positive and statistically significant, with a much greater effect of formal training than informal training.

Dostie and Pelletier’s results suggest that informal training is often provided to new employees and that the division of training between formal and informal training can be influenced by legislation. They experienced difficulty in identifying effects of training on productivity, but their results may indicate that formal training is associated with greater productivity gains than informal training.

Institutional Aspects of Employer-supported Training

Chaykowski and Slotsve (2005) gather an impressive volume of evidence on the impact that the unions have on training incidence and duration. They find that the effect of union coverage on training incidence varies according to whether it is classroom or on-the-job.

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23 These results are marginal effects in a multivariate framework. Quebec legislation taxes payrolls for a training fund, but remits the tax to employers who provide formal training.
training, and by subject matter, and that the effect of unions on training is usually small. Unionized establishments are more likely to offer training, but unionized workers are less likely to take training. As for the technology use, the impact of unionization appears mixed, being associated with a lower probability that workers use computers on one hand, and a higher probability of using computer-assisted devices, on the other. The authors also find that the presence of unions lowers the probability of technological changes, though it increases the probability of observing training aimed at adapting to technological change.

Since there are indications that unionized establishments are less technologically dynamic than others, Chaykowski and Slotsve recommend that further efforts, through sector councils or otherwise, be made to help unions and firms develop strategies aimed at encouraging increased training associated with technological change.

Chaykowski (SRI-2006) explores questions of what constitutes training and why employers train in a comparative case study of two large railway transportation firms. His analysis highlights the determining influence that government health and safety regulations have on the level and nature of training for train operators and maintenance workers. It also shows that union-enforced seniority rules may have some influence on who gets trained, though whether seniority rules have an impact on the overall level of training is harder to assess. In effect, being government-mandated and allocated through union rules, a significant volume of firm-provided training is determined not by employers or employees, but by third parties such as government health and safety agencies. As such, these training decisions are beyond the firm’s control and may fall outside the logic of investment by firms or workers.

Chaykowski’s analysis furthers shows that technological change and the broader market in which railway firms operate have an influence on the type and level of training given to management and white-collar workers. Information and communication technologies have changed when and how training takes place, and they increased production capacity by improving how the rolling stock is used. As well, competition with the trucking industry and further economic integration of the North-American economies are two phenomena that have increased the value of improving the skills and knowledge of management and other white-collar workers. In light of this changing environment, Chaykowski shows that firms choose to improve their workers’ skills and knowledge through a vast array of activities – some akin to brainstorming, other to coaching – that stretch the boundaries of what is usually considered training.

To the well-known measurement challenges raised in the workforce training literature – such as finding ways to measure the returns to workplace training – this paper by Chaykowski adds two others. First, for some firms, much of their training is determined by third parties, in large part government regulators, so that levels of firm-supported training may differ from what the firm would choose in the absence of regulation. The prevalence of training imposed by regulation may give weight to calls for “smart regulation” initiatives, in which regulations requiring training would be periodically re-examined as to their continued relevance. A second measurement issue is that what constitutes training is sometimes difficult to identify.
Apprenticeships

Apprenticeships constitute a different type of workplace-based training from what has been examined so far, in that they are highly institutionalized and depend on sets of rules mostly or entirely defined outside the firm. Questions regarding apprenticeships have a high public profile, with frequent media references to looming shortages in many trades. Data availability does not match the level of policy interest. In their paper, Sharpe and Gibson (SRI-2005) compare apprenticeship systems in Canada with those in other countries and use the limited data available to examine apprenticeship issues and develop policy recommendations. They find that registrations in apprenticeships in Canada increased during the 1990s, broadly in line with other forms of post-secondary education, but that completion rates have fallen markedly. Registration in apprenticeships appears highly cyclical and evidence suggests that Canadian apprentices are somewhat older than in many other countries, with a large majority older than 24 years old. Women still represent a small proportion of all apprentices, and are still found mostly in a limited set of fields, whereas men continue to dominate traditional trades. The relatively low completion rate is widely seen as a symptom of problems with apprenticeships in Canada, as is enrolment’s pro-cyclicality. Many apprentices drop out because of unemployment and the difficulties involved in securing a position with an employer able and willing to provide the training when economic activity slows down or because of job opportunities when the economy is strong.

Sharpe and Gibson describe two public policy perspectives used to analyze apprenticeships. The first considers apprenticeships as a learning path for youths’ school-to-work transition; the second, more skills-development oriented, considers apprenticeship as a method for teaching certain skills. The authors indicate that the second perspective better describes Canadian apprenticeship systems, given their market-oriented institutional structures and the actual age range of Canadian apprentices.

Sharpe and Gibson make six recommendations aimed at improving the apprenticeship system for Canadians, based on their examination of what little data are available in Canada and on the experience in a few other OECD countries. Quite clearly, the broad thrust of this set of recommendations is to move Canada closer to a school-to-work transition approach, and to make it closer to the Northern European model in which apprenticeship is primarily aimed at youth. This would move towards integrating apprenticeship as a post-secondary option, as suggested in the Rae (2005) report, in contrast to the current situation in which apprentices are typically much older than graduates of a first post-secondary program.

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24 Recall however that Chaykowski (SRI-2006) argues that public regulatory bodies will have an impact on training in some industries such as railway transportation.
Formulating policies to facilitate labour market adjustment requires understanding of how labour markets adjust in practice. The SRI research discussed in this section examines a variety of determinants and mechanisms of labour market adjustment. Two of the papers concern the role of labour market information, as it is often claimed that the provision of better labour market information can promote better adjustment.

Adjustment and Barriers to Adjustment

Patrick Coe and Herbert Emery (SRI-2006) examine the labour market adjustment process in eight construction trades in 20 Canadian metropolitan areas. They argue that adjustment occurs through training in the trade and through migration of skilled trades workers. Both of these adjustment mechanisms take time, so that initial “wage shocks” will only be dampened gradually. This allows them to estimate the “half life” of adjustment, that is, how long it takes for half of the adjustment to occur. They find no marked differences in the distributions of half lives across occupations, with the median estimates in the occupations in the range of 2.3 to 3.0 years. Using regression analysis, they find that required apprentice work hours increase the time required for adjustment in the trades, that higher educational requirements to become an apprentice decrease adjustment time, and that increased training hours required during apprenticeship decrease adjustment time. Certification requirements in the trade have no significant effect.

Coe and Emery’s results suggest that even in markets for skilled labour with high levels of formal training and accreditation requirements, labour market adjustment occurs fairly rapidly—typically half of adjustment occurs within three years. Their results suggest that substituting pre-apprenticeship education and training during apprenticeship for required hours of work experience might make adjustment more rapid.

The simple model of labour market adjustment to skills shortages sketched at the beginning of this paper concerns labour markets in which potential employers interact with potential employees. Once hired by a firm, however, workers’ relations with the employer are often constrained by the firm’s human resources policies, which may include elaborate promotional ladders and a well-established hierarchy of compensation. How do firms adjust these internal policies in light of changes in the external labour market?

Morley Gunderson and Rafael Gomez (SRI-2006a) examine issues of adjustment in labour markets internal and external to the firm. They begin by pointing out that most discussions of labour market adjustment concern markets external to the firm, but that the firm’s internal labour market is where crucial decisions concerning adjustment are made and where
workplace strategies and industrial strategies intersect. Gunderson and Gomez enumerate a series of external pressures for adjustment that affect firms’ internal labour market. These include demand-side pressures—globalization, technological change, industrial restructuring and the need to replace retirees; supply-side pressures—changes in desired work arrangements, work-to-retirement transitions, difficulties in integrating immigrants; and institutional pressures and those arising from the regulatory environment—unions, labour legislation.

Gunderson and Gomez note that changes in firms’ human resources practices in response to these pressures have tended to shift labour market risks away from employers towards employees. They cite as examples the increase in various forms of non-standard employment (in which workers bear the risk of varying hours) and the risk of skills obsolescence. They point out four aspects of managing labour market risk: predicting, controlling, diversifying and insuring. Governments can contribute to predicting risk by developing and disseminating better information on labour market risk. They can contribute to controlling risk by providing a stable macro-economic environment. Governments may encourage diversification by promoting education and training in broad, generic skills. Individual workers find it very difficult to insure labour market risks, which argues for government insurance programs such as Employment Insurance (which are mandatory to avoid adverse selection).

These authors also list a series of changes in firms’ human resources practices that may facilitate adjustment. Among these are: changes in job design towards broad-based multi-skill classifications and job rotation; training in support of multi-skilling; employee involvement and representation; more flexible compensation which lessens the risk of adjustment by layoff; and more flexible work-time arrangements and non-standard employment. They note that government programs with capped contributions such as the Canada Pension Plan and Quebec Pension Plan have disincentives to the employer for more flexible work time (since due to the cap the employer’s total contributions may be greater for two workers working half-time than for one worker working full-time). Once the cap has been reached, the employer’s benefit contributions represent a fixed cost, so that employers prefer increased hours of work among existing employees to hiring new workers.

The simple model of labour market adjustment described at the beginning of this report also fails to take into account a number of market imperfections which have been the subject of considerable recent analysis. In a second research paper, Morley Gunderson and Rafael Gomez (SRI-2006b) examine the impact of labour market imperfections and barriers on adjustment. They classify demand-side imperfections as those involving monopsony power, those involving costs of hiring, training and firing new employees (quasi-fixed costs), and the barriers that prevent employers from carrying out better planning for future retirements. They also note that demand-side shocks may interact with legislatively induced labour market rigidities, slowing the adjustment to the shocks.

On the supply side, they note imperfections in the human capital market for education and training including credit constraints, wage compression, market externalities from training, social externalities from schooling, limits to diversification in human capital investment, information problems concerning training (difficult for employees to evaluate the returns,
asymmetric information between employer and other potential employers) and barriers including those associated with life-course transitions, legislative wage fixing constraints, legislative and regulatory barriers to regional and occupational mobility and disincentives to mobility due to government transfer and income security programs.

Gunderson and Gomez classify among imperfections that inhibit matching supply and demand the following: imperfect information and information asymmetries, lags in institutional responses, lack of incentives for educational institutions to respond to students’ field of study preferences and wage rigidities that arise for strategic reasons. They suggest a three-prong approach for policy: identify barriers, remove barriers due to government policy, and facilitate the removal of barriers that arise from the actions of private market participants.

Gunderson and Gomez’s papers identify a large number of areas in which policy actions might serve to facilitate adjustments in markets for skilled workers. It is difficult to set priorities among these areas, in part because the costs of a barrier or an imperfection are often difficult to measure. Their first paper is also a useful reminder that the ability of markets for skilled workers to adapt to economic change depends in large part on firms’ internal human resources policies, which are subject to both market and non-market influences. Both papers emphasize that broad economic and social trends and legislation and regulation are likely to impact labour market adjustment as much or more as the market imperfections on which economic research often concentrates. Thus the best starting point for removing barriers might well be broad policies aimed at removing barriers to internal labour mobility and disincentives to mobility.

Labour Market Information and Adjustment

Provision of labour market information is frequently mentioned as a way that governments can improve labour market adjustment. If this information decreases adjustment costs there is a strong argument for government to pay for its production. Gunderson and Gomez emphasize the difficulty for individuals of diversifying their human capital. Better information can help workers avoid costly mistakes when they invest in their skills. This is especially so when the progress of knowledge means more education is often more specialized education. Two SRI papers examine questions related to labour market information and labour market adjustment.

Andrew Sharpe and Sharon Qiao (SRI-2006) examine government provision of labour market information (LMI) in five countries: Canada, the United Kingdom, Germany, the United States and Australia. They identify two roles for LMI: facilitating job matching and improving human capital investment decisions. They characterize the United Kingdom as a world LMI leader, with LMI widely accessible, of high quality and with a number of creative initiatives, including personal advisers for youth and information through call centre hotlines for adults. They view the German labour market as in a cultural transition from lifelong jobs to “riskier” lives in a more dynamic environment. They note weaknesses for high-skilled workers in the German LMI system and in the enforcement of national standards for LMI.

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25 This argument is based on the difficulty of limiting the use of information once produced (non-excludability) since it can be diffused at near-zero marginal cost once produced.
The U.S. LMI system is characterized by heavy use of information technology and an effective “one-stop” structure. Also, private sector information providers have been able to provide in-depth research on topics related to LMI. The quality of this information varies between providers. Australia makes use of the private sector to produce LMI under contract to the public sector. Strengths of the Australian system include substantial efforts to offer students LMI in school and the increased focus on local LMI, which requires close coordination among various levels of government. As in the United States, there is variation in the quality of the information produced by private sector providers. Canada is characterized as having an excellent LMI system, which has a highly diversified set of information providers and sources. Weaknesses include the lack of institutional requirements to provide LMI in schools.

Sharpe and Qiao note the effectiveness of “one-stop” centres as opposed to fragmented delivery systems. They also note that many individuals do not fully accept formal LMI and prefer information gathered through personal networks and direct contacts with employers. They conclude by suggesting strategies for improving the LMI system in Canada based on tailoring LMI to the needs of users, improving access to LMI and developing quality assurance mechanisms.

The report discusses various issues concerning the effectiveness of LMI. The authors cite no studies, however, that evaluate methods of LMI delivery, other than a study by Kuhn and Skuterud (2004) that finds that Internet job searchers do not have lower unemployment durations than those who search by other methods.

Sharpe and Qiao in fact found very little in the way of rigorous, systematic evaluation of the effectiveness and benefits of various forms of LMI. Before making further large investments in LMI systems, governments might well wish to know whether LMI is effective in influencing the decisions of labour market participants, leading to improved labour market adjustment. Questions of what approaches to providing LMI are most effective for various target groups are also of interest.

Research conducted by Cathleen Johnson, Claude Montmarquette and Nathalie Viennot-Briot (SRI-2006) shows how questions of this kind might be addressed before launching costly LMI programs. Johnson, Montmarquette and Viennot-Briot carried out a two-stage experimental study of factors influencing individuals’ interest in post-secondary studies in a laboratory setting.

In the experiment, interest in post-secondary studies was assessed by offering participants various choices between cash payments and certificates that could be redeemed to pay for post-secondary studies. Background information on participants was collected in three ways: their time preference and risk preference were assessed experimentally; their numeracy was assessed by a test; and a background questionnaire provided information on a number of individual characteristics. Among these were measures of each individual’s labour market understanding (LMU) and understanding of the relation between human capital and labour market outcomes (PAE – positive attitude to education). In the first stage of the experiment,
LMU did not significantly affect the choice between cash and a certificate to pay for PSE; but PAE had a positive, statistically significant effect.

For the second stage of the experiment, participants were selected who had a poor understanding of the relation between post-secondary education and labour market outcomes, as measured by scores on LMU, PAE and a third scale. The second-stage participants were randomly divided into a treatment group, who participated in a 90-minute information session on actual outcomes for various fields of study in their local labour market, and a control group who received no further labour market information. A month later, both groups filled out a new questionnaire and were again tested experimentally as to their interest in post-secondary studies.

Both treatment and control groups improved in the LMU scale. In the PAE scale, the treatment group improved significantly, especially among the younger participants (who were shown in the first stage to be most likely to choose the post-secondary option). The control group did not improve significantly on the PAE scale. Analysis of the change in second-stage participants’ educational choices between the two stages showed that the labour market information treatment resulted in a significant increase in the probability of choosing a certificate redeemable for post-secondary studies over the cash alternative.

This study has several important implications for the provision of LMI. It provides evidence that a relatively low-cost method of providing LMI (a ninety minute presentation) can affect the educational decisions of a target group (youth with poor understanding of the relation between education and labour market outcomes). One important implication of the study for practitioners of LMI is that laboratory experimental methods can be used in small-scale tests to evaluate the effectiveness of different approaches to LMI before they are implemented on a large scale at high cost. Another is that the experiment supports the importance of targeting – the educational decisions of youth (18-24 years old) who have the greatest incentives to invest in PSE were affected by the intervention; the decisions of older individuals (over 24 years old) were not.
5. Policy Messages

What useful messages for policy-making can be drawn from the evidence discussed above?

Adjustment

There are strong market forces which tend to eliminate skill shortages and surpluses in markets for highly skilled workers. In particular, youth respond to labour market signals (wage levels and unemployment rates) in deciding whether to acquire post-secondary education and in determining their field of study within post-secondary education.

Economists have tended to argue that these market forces mean that governments should focus on ensuring that appropriate incentive structures are in place, rather than intervene through education and training policies to resolve skill shortages.26 Their arguments are that markets are better than policy-makers at correctly identifying areas of market shortage and that markets adjust more rapidly than policy (given the recognition, decision and implementation lags involved in policy-making) Thus policy responses to skill shortages might lead, for example, to training computer scientists when the dot com bubble had burst.

The prevailing view among economists is that persistent skill shortages are unlikely to occur unless there are institutional impediments to labour market adjustment. Evidence developed by the SRI and by other research supports this view.

Barriers, Imperfections and Internal Labour Markets

Despite the presence of strong market forces leading to adjustments in markets for skilled workers, institutional barriers and labour market imperfections may slow adjustment. Rafael Gomez and Morley Gunderson (2006b) note a series of labour market imperfections and barriers to adjustment where policy interventions might facilitate adjustment. Identifying and removing barriers is a relatively low-cost way of facilitating adjustment, although the size of the resulting benefits is difficult to estimate. They note that broad market policies, such as minimum wage laws, may have much larger effects on adjustment processes than specific barriers. In another paper, Gunderson and Gomez (2006b) examine external influences on adjustment processes within the firm. Their work recalls the importance of internal labour markets to labour market adjustment, and to underscore that government policies can affect intra-firm adjustment processes.

The roles for policy that this suggests are removing barriers to adjustment, eliminating distortionary incentives and providing accurate information on labour market conditions.

26 Many economists would argue that skilled immigrants should be admitted based on labour market conditions. Acute skill shortages may require short-run policy action, such as temporary entry of qualified foreign workers. This was in essence the approach adopted to the shortage of Internet technology (IT) workers in the late 1990s, which proved to be a short-run shortage. There does not seem to be much consideration by economists of the effects of temporary entries. One likely effect is to reduce the incentive for Canadians to train in the shortage occupation by reducing wage pressures. Nonetheless, computer science enrolments in Canada increased considerably during the late 1990s in response to rapidly improving conditions in the IT labour market.
Since Gunderson and Gomez note that broad policies are likely to have the largest effects on adjustment, policy initiatives to further increase internal labour mobility and to remove disincentives to mobility might be the most useful starting point.

Post-secondary Education

Economists’ arguments as to the appropriate role for policy are based on the view that markets adjust rapidly to skills shortages. SRI studies provide evidence for Canada for fairly rapid market adjustment in two specific types of markets—the Canadian market for natural scientists and engineers and local Canadian markets for the building trades. Adjustment in labour markets for highly skilled occupations is nonetheless a multi-year process, since highly skilled occupations often require four or more years of training after high school.

The PSE system is thus a key element in adjustment in many highly skilled occupations, because new entrants to these occupations acquire the requisite skills in colleges and universities. Even if youth seek to respond to changing labour market conditions through their educational choices, they cannot if the PSE system does not accommodate these choices. Nicole Fortin and Thomas Lemieux’s (SRI-2006) study of university enrolments raises the possibility that Canadian universities have rationed admissions, with the result that university education is less prevalent among baby boom cohorts than it might have been. Looking forward, their projections suggest that unless there is above-trend growth in the supply of post-secondary graduates, university-high school wage differentials are likely to increase. Increased wage differentials should lead to increased demand for post-secondary education by youth.

The policy issue is whether and how this demand will be met in the absence of market incentives for post-secondary institutions to increase enrolments in response to increased demand. One possible approach is moving towards a more market-driven system of post-secondary education with the student as customer (such as that described in Montmarquette and Boisclair SRI-2004).

Reforms in several countries have sought to make PSE more “market-driven”. The underlying model is one of students as “customers” and post-secondary institutions as “sellers” of a wide variety of educational choices. Making students “customers” and post-second institutions “sellers” has typically meant allowing post-secondary institutions more discretion in setting tuitions and providing students with loan facilities with income-contingent repayment mechanisms. (The argument for student loans as a way to compensate for inability to borrow against future earnings is widely accepted).

Experience with reforms along these lines in Australia, New Zealand and the United Kingdom (surveyed by Saul Schwartz) indicates that there are important “political economy” obstacles to installing a system of this type. The result has tended to be that the desired price and quality competition among post-secondary institutions has not yet occurred—instead all institutions have fixed their tuitions at the maximum level allowed (perhaps because this maximum is too low to be meaningful).
Since the reforms have not been sufficiently thoroughgoing to induce institutions to compete for students through pricing, they provide no evidence as to whether post-secondary institutions adjust better to labour market signals when they are forced to compete for students. There have also been political difficulties in introducing income-contingent loan (ICL) plans; and there does not seem to be conclusive evidence on the effects of ICLs and the other reforms described on outcomes such as participation rates in post-secondary education.

The research evidence that students respond to labour market conditions sheds useful light on why, as noted above, Canada trails other OECD countries in producing advanced degrees, in particular, doctorates. Returns to obtaining an advanced degree are low in Canada. For example, real earnings for new engineering Ph.D.s have stagnated in Canada and grown rapidly in the United States.27

This and other, similar evidence suggests that low demand for workers with graduate degrees is the reason that Canada produces relatively few graduates with advanced degrees, in particular, in science and technology fields. The under-performance of the Canadian private sector in research and development and in innovative activities would appear to be the fundamental source of low demand for workers with advanced degrees.

In this respect, it is interesting to note Majumdar and Shimotsu’s result that a permanent increase in R&D expenditures leads to a significant, durable increase in natural science and engineering graduates by increasing demand, thus leading to upwards pressure on wages and increased supply in a new equilibrium.

Training

While education and training are often presented as alternative ways of supplying skills, the research discussed above points up the importance of education as a determinant of training. In particular, Fortin and Parent find that once educational level is taken into account, much of the gap in employer-supported training between the United States and Canada disappears. It is not clear to what extent the education-training link is due to more stable employment of more educated persons with better literacy skills and to what extent it is due to a greater ability of these persons to absorb training.

SRI research on training also suggests that training for high-skilled workers is paid for by these workers, whether or not it is formally employer-supported. Policies that compress earnings differentials at the upper end of the earnings distribution may provide disincentives to seeking training for the highly skilled. Policies that compress the earnings distribution at its lower end (such as minimum wage policies) may lead to employers to pay for training for employed, low-skill workers. Nonetheless, the overall training of low-skilled workers may decrease as a result of these policies, due to decreased employment of the low skilled and the relationship between being employed and getting at least some training.

27NGS data show that earnings of new Canadian Ph.D. graduates in engineering fell between 1984 and 2002 in real terms, relative to all Ph.D.s and relative to all B.As. More recently, from 1992 to 2002 earnings of recent Canadian Ph.D. engineering graduates grew 1.1% a year on average, while from 1995-2001 earnings of recent U.S. Ph.D. engineering graduates grew 2.3% a year.
Research also shows that legislative and regulatory requirements may play an important role in determining levels of training, as well as the division of training between formal and informal training. Unions also play a role in determining training levels as does the introduction on new technologies and information technology. The effects of training on firm productivity are difficult to measure, but the results seem to indicate a greater effect for formal training than for informal training.

The overall picture that emerges is that training (other than that imposed by regulatory requirements) should be viewed as a complement to education as a source of skills, not as a substitute. High-skilled workers are likely to bear the cost of their training and to prefer to make their own training choices.

The policy actions that seem most likely to increase training would do so as a “side effect” of policy actions that might be undertaken for other reasons. For example, increasing the educational level of the population is likely to increase training, but would probably be undertaken for its direct effects on the skill level of the workforce. Decreasing the progressivity of the income tax would decrease compression of wages for the highly skilled, increasing their incentives to train. Substituting earned income tax credits for minimum wages would avoid the employment-reducing effects of the minimum wage, possibly resulting in increased training of low-wage earners. Certification of skills would make it easier for potential employers to evaluate a worker’s skills, increasing workers’ incentives to invest in their own skills.

Apprenticeships are a form of firm-based training (alternating with classroom training) that has attracted considerable policy attention of late. Apprentices in Canada are older than most post-secondary graduates. Although Canadian post-secondary institutions now have more female than male graduates, there continue to be few female apprentices, aside from those in hairdressing and cooking. Apprenticeship completion rates are low and seem to show a long-term downward trend. Research (van Walraven, SRI-2005) shows that almost all of the public funding of employer-supported training in Canada goes to apprenticeships.

It seems reasonable to ask whether a complete re-examination of the current apprenticeship system is warranted, in light of reforms to apprenticeship in other countries and the unsatisfactory outcomes of the current system. In particular, given that Canada has a very highly developed system of community colleges, should we move towards replacing apprenticeships by community college programs combined with work terms?

Labour Market Information

The provision of LMI is often cited as a way in which governments can facilitate labour market adjustment. There are strong arguments for this view. Given the size of the human capital investment required for high-skilled occupations, it would seem that good information on actual and prospective labour market conditions might lead to fewer costly mistakes. (This of course ignores the difficulties of producing accurate and timely information). The argument for public provision of this information is the traditional “public good” argument. Once produced, it is very difficult to exclude potential users from access to the information,
As a consequence, private markets will produce too little LMI relative to the amount that is socially desirable.

Sharpe and Qiao’s review of LMI mechanisms in a series of countries shows that there is a wide variety of approaches to LMI, with good reasons to support use of one or the other of these approaches. Unfortunately there does not appear to have been much in the way of serious evaluation of the impacts of alternative LMI designs on labour market and social outcomes. As a consequence, we do not know whether the provision of LMI leads to better labour market decisions by its users, whether there are benefits of LMI in facilitating adjustment in labour markets, or whether these benefits outweigh the costs of providing LMI.

Johnson, Montmarquette and Viennot-Briot’s report of an LMI laboratory experiment provides some useful lessons, given the lack of evidence on the effectiveness and benefits of LMI. Their results seem to indicate that a LMI intervention can lead to increased levels of human capital investment among youth who had a low level of labour market understanding and negative views about education. The other lessons their study indicates are perhaps more important: that a relatively inexpensive laboratory experiment can provide information on the effectiveness of an LMI program before it is undertaken; that before-and-after studies confined to persons who received LMI provide very little information on the effectiveness of LMI28, and that LMI aimed at providing information on returns to human capital investment is effective with youth, but not with “prime age” individuals.

Their study thus suggests a method for determining what labour market information is likely to be useful, and to whom, before costly and possibly ineffective LMI programs are undertaken.

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28 Both the group that received LMI and the control group had increased labour market knowledge when retested. The striking difference between the two groups was in changes in positive attitudes towards education.
6. Conclusion

The research discussed in this paper identifies many areas in which policy might facilitate adjustment in markets for skilled workers in Canada, thus easing skill shortages. Three sources of skilled labour were identified in the Introduction – entry from the domestic post-secondary educational system, training of persons already in the workforce, and permanent and temporary immigration. The last of these was discussed at an earlier SRI policy workshop and a number of possible areas for policy action were identified.

As noted above, many of the policy actions that would increase levels of training would do so as a “side effect” of actions that are likely to be undertaken for other reasons. Apprenticeship is a type of employer-supported training that receives considerable policy attention. If apprenticeship (or more broadly, training that alternates between classroom time and work experience) is to become an alternative form of post-secondary education, perhaps it should be integrated into community colleges with work experience provided through co-op type programs.

For post-secondary education, evidence was presented to show that students respond to labour market signals in their enrolment decisions and field of study choices. Research evidence, however, also indicates that post-secondary institutions may meet increased demand for enrolments through increased selectivity, rather than by expanding supply to meet demand. An increase in university-high school wage differentials is a probable result. In the absence of market mechanisms to ensure that supply meets demand for post-secondary education, policy-makers will need to pay close attention to labour market indicators of the adequacy of the supply of post-secondary graduates, in particular, wage differentials.

Skill shortages refer to shortages in specific occupations, rather than in the overall level of skilled workers. SRI research provides little support for the view that Canada’s mechanisms for supplying skilled labour are unable to adjust to demand for various types of skilled labour, so that the Canadian economy is faced with “looming skill shortages” on a grand scale. For skilled labour, adjustment mechanisms take considerable time to operate, if only because of the long periods required to produce skilled workers. With the unemployment rate at a long-time low, employers are experiencing short-term skill shortages typical of a tight labour market. The adjustment mechanisms discussed here operate too slowly to satisfy short-term demands for skilled workers in a large number of occupations.

One alternative for meeting short-term skill requirements is temporary immigration, such as occurred during the IT boom. One possible cost of temporary immigration is to decrease the return for Canadians who train in occupations in high demand by decreasing the wage premium for these occupations.

LMI is often pointed to as an important tool for governments to use to assist labour market adjustment. SRI research shows there are many approaches to providing LMI in different countries, each with possible drawbacks and advantages, but there is very little rigorous evaluation of these programs. One of the SRI studies of LMI provides a possible model for
evaluating LMI approaches before they are undertaken and provides some evidence of the effectiveness of LMI.

At the highest levels of skills required in an innovative, knowledge-based economy (post-graduate degrees) the problem in Canada seems to be a lack of demand for these skills. This lack of demand is closely related to the poor record of Canadian industry in investing in innovative activities.

On the supply side, there is a valid role for policy in seeking to improve supply-side labour market adjustment mechanisms, in large part by identifying and removing barriers to adjustment. Measures that would further improve internal labour mobility and remove disincentives to mobility might be a useful starting point in this process. The source of skills that needs to be most closely monitored is the post-secondary education system, since demand for post-secondary graduates at the first-degree level may increase, and post-secondary institutions do not have market incentives to respond by increasing supply.
References

SRI Working Papers


**Other References**


