

Is There a Skill Gap in Canada?

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Le nombre grandissant de travailleurs du savoir au sein de l'économie canadienne, combiné à un nombre de plus en plus élevé d'employeurs qui signalent des difficultés à trouver de la main-d'œuvre qualifiée, soulèvent des questions quant au niveau du stock des compétences disponibles au Canada. L'objectif de ce rapport est double. Dans un premier temps, il s'agit de préciser les questions auxquelles nous sommes confrontés. Dans un deuxième temps, nous cherchons à répondre à ces questions en examinant les données empiriques disponibles.

Premièrement, à partir principalement d'une analyse de statistiques descriptives, nous concluons que rien ne porte à croire que, de façon générale, le Canada est aux prises avec une pénurie de main-d'œuvre qualifiée ou que la main-d'œuvre canadienne ne peut pas satisfaire aux exigences de l'économie.

Deuxièmement, l'étude de données microéconomiques révèle une fréquence accrue de pénuries précises de main-d'œuvre dans certains secteurs et pour diverses professions au cours des dernières années. Toutefois, il ne semble pas que ces pénuries constituent un phénomène plus répandu aujourd'hui que dans le passé à des stades semblables du cycle économique. Nous concluons donc que, s'il y a une pénurie grandissante de main-d'œuvre (qualifiée et peu qualifiée), il n'y a pas de pénurie généralisée de main-d'œuvre qualifiée.

Troisièmement, il ressort de l'examen des données disponibles que le Canada se compare avantageusement à plusieurs de ses principaux compétiteurs sur les marchés mondiaux, tant sur le plan des investissements en capital humain que sur celui du stock des compétences. Finalement, nous examinons aussi les niveaux de compétence minimums nécessaires pour réussir sur le marché du travail canadien. À cet égard, les faits indiquent que les jeunes d'aujourd'hui doivent, à tout le moins, terminer leurs études secondaires pour espérer obtenir et conserver les emplois jugés les moins exigeants sur le plan des compétences.

The increased employment of knowledge workers in the Canadian economy, combined with the growing number of employers reporting difficulties recruiting qualified employees, raises questions concerning the supply of skills in Canada. The goal of this paper is two fold. We will first identify the issues confronting us, and then seek to resolve them by examining the available empirical data.

First, by drawing principally on an analysis of descriptive statistics, we conclude that there is no reason to believe that, globally, Canada is suffering from a broad-based shortage of skilled labour or that its workforce cannot fulfil the economy's needs.

Second, examination of microeconomic data reveals an increased frequency of specific labour shortages in certain sectors and occupations in recent years. Nonetheless, it does not appear that these shortages are more common today than they were in the past at similar stages of the business cycle. We conclude that, while there may be a growing labour shortage (skilled and low-skilled), there is no aggregate shortage of skilled labour.

Third, available data indicate that Canada compares favourably with many of its principal competitors in world markets, both in terms of investments in human capital and in the stock of skills. Finally, we investigate the minimum skill level necessary for success on the Canadian labour market. We conclude that, at the very least, young people today need a high school diploma to qualify for even the lowest skill jobs.

INTRODUCTION

The increased employment of knowledge workers in the Canadian economy, combined with the growing number of employers reporting difficulties recruiting qualified employees, raises questions concerning the supply of skills in Canada (Lavoie and Roy 1998). Does the Canadian population provide a pool of skilled labour adequate to the needs of the economy? Is the Canadian labour supply comparable to that of other modern economies? Are we investing enough in the acquisition of skills?

These questions are obviously important to the entire population. A major and prolonged shortage of skilled labour may affect our ability to improve, or even maintain, our standard of living. In the short and medium term, disparities between labour supply and demand may also create adjustment difficulties for workers below a certain skill threshold, adding to the unemployment rate. The goal of this paper is twofold. We will first identify the issues confronting us, and then seek to resolve them by examining the available empirical data.

In the first of the following five sections we present some basic concepts. We limit this treatment to a brief exposé, referring the reader to a recent publication by the Applied Research Branch for greater detail (Roy, Henson and Lavoie 1996). In the third section we apply an aggregate analysis to examine whether the available data justify concluding that Canada is suffering from a broad-based shortage of skilled labour. Drawing principally on an analysis of descriptive statistics, we conclude that there is no reason to believe that, globally, Canada's workforce cannot fulfil the economy's needs. In the fourth section we use a microeconomic approach to assess whether the presence and frequency of shortages in specific markets suggest the existence of an aggregate scarcity of qualified labour. Examination of microeconomic data reveals an increased frequency of specific labour shortages (skilled and low-skilled labour) in certain sectors and occupations in recent years. Nonetheless, it does

not appear that these shortages are more common today than they were in the past at similar stages of the business cycle. We conclude that while there may be a growing labour shortage (skilled and low-skilled labour), there is no aggregate shortage of skilled labour. The increased incidence of shortages results from a cyclical improvement in overall labour-market conditions.

In the final section we compare the average skill level of Canadian workers with that of their counterparts in other industrialized countries. Examination of the available data indicates that Canada compares favourably with many of its principal competitors in world markets, both in terms of investments in human capital and the stock of skills. In this section we also investigate the minimum skill level necessary for success on the Canadian labour market. Our information on this matter indicates that, at the very least, young people today need a high-school diploma to qualify for even the lowest skill jobs. We conclude with some final remarks and proposals for broad actions to ensure better functioning of the labour market.

SOME DEFINITIONS

References to the notion of a "skill gap" are often vague and ambiguous, tending to cloud the issues under discussion. We shall simply assign a broad meaning to the concept, using it to designate the existence of a discrepancy between the availability of qualified labour and some benchmark or reference value. The extent of the shortage will thus depend upon the choice of benchmark. We could, for example, use the level of skill usually required by employers. Then we would have a skill gap if the qualifications demanded by employers exceed the supply, given the structure of wages and labour-market conditions.

Other benchmarks may have a more normative quality, in the sense of representing hypothetical or desirable reference points. For example, we could

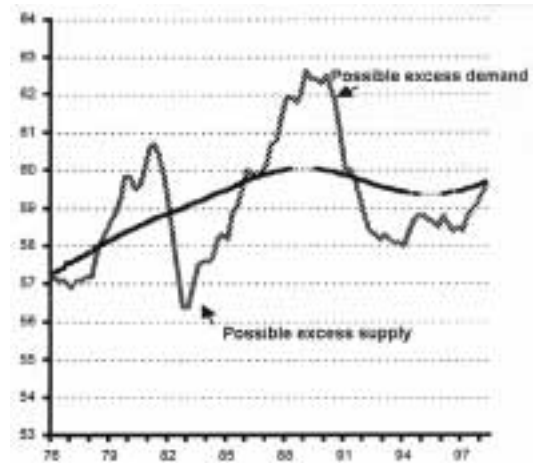
decide that Canada ought to be a leader in biotechnology, and should consequently have a relatively greater number of jobs in microbiology than its principal competitors on the world stage. As long as this goal remains unfulfilled, we would have a “skill gap” under this definition. Another important example of a normative benchmark arises when we compare a population’s stock of skills to that which would be optimal in a strict economic sense, in which case a skill shortage exists if the social return to an investment in human capital exceeds its opportunity cost.

In this study, we are primarily interested in the question of whether Canada is subject to a generalized shortage of skilled labour, not limited to any particular fields. As we shall see, there are always specific shortages, even during economic slowdowns, and this is not necessarily a cause for concern. Conversely, if we establish the existence of an aggregate generalized shortage of skilled labour, the question arises as to whether current institutions and incentives are adequate to ensure efficient adjustment. In the case of a large-scale technological upheaval, for example, we can imagine that changes in the skill set required for new production processes may be sufficiently drastic and widespread to impact on a large proportion of the working population, possibly creating a generalized shortage of skilled labour.

It is also important not to confuse a shortage of *skilled* labour with a labour shortage. One of the limiting factors in the growth of any economy is the available amount of labour at any point in time. It is well known that economies are subject to cycles characterized by under- and overutilization of available human resources. During boom periods, as at the end of the 1980s, labour shortages are more prevalent at nearly all skill levels. These cyclical shortages, principally attributable to macroeconomic phenomena, are difficult to avoid. In particular, they cannot be averted by increasing investment in training.

This situation is illustrated in Figure 1, where we show an estimate of the cyclical fluctuations of the labour employment rate for Canada.¹

FIGURE 1
Employment Rate in Canada*
(trend versus actual, in %)



Note: *The trend is an H-P filter.

Source: Applied Research Branch, HRDC.

AGGREGATE ANALYSIS

A recent study revealed that between 1971 and 1996 employment in occupations in which the primary task is the production of ideas, which are characterized by a high proportion of skilled workers, registered by far the fastest annual rate of growth: 7.6 percent and 4.1 percent respectively for managers and knowledge workers (Lavoie and Roy 1998). These rates are particularly high when compared with the overall growth rate of total employment, which was 2.1 percent per year during the same period. The corresponding rate for workers whose primary function is the production or handling of goods was only 0.6 percent.²

This rapid growth in the employment of knowledge workers does not, however, tell us much about the status of the skilled-worker labour market. It could be that over this period demand grew more rapidly than supply, or vice versa. We may form an idea of the progression of needs from census data on the evolution of employment. Associating this data with education levels normally required for each job (based on the National Occupational Classification System) makes it possible to convert the number of jobs per occupation into jobs per number of years of schooling.

This index of labour requirements can be compared with an index of labour supply by level of education, as is shown in Figure 2. From 1971 to 1991, the number of jobs requiring a university diploma increased by 40 percent.³ Over the same

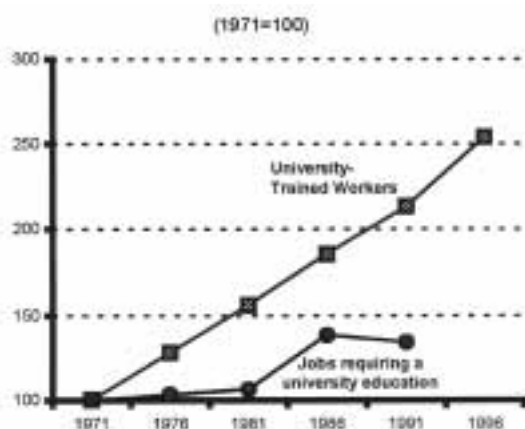
period the number of university graduates on the Canadian labour market increased by 140 percent. These figures reveal that the increase in the supply of university education has far outstripped the growth in the economy's need for these qualifications. Consequently, far from being in deficit, Canada may actually be in a surplus situation in terms of university graduates.

It is, however, possible that the methodology underlying the data presented in Figure 2 underestimate the level of skills required by today's jobs, since the national occupation classification system that we used assumes that skills requirements within occupations do not change over time. In this case, our assessment of needs may fall short. It may also be the case that the data on the number of university diplomas awarded overstate the actual level of competence possessed by graduates, in which case we need to lower our estimate of the number of highly skilled individuals effectively available on the job market. If both of these assumptions prove true, we may be substantially off the mark with our conclusions regarding the skill surplus indicated in Figure 2.

We observe from a recent review of the literature and some sectorial studies performed by Human Resources Development Canada (HRDC)⁴ that skill requirements have increased over time for several occupations (upskilling). There are also examples of jobs having been deskilled. It is difficult to be categorical, but it appears that overall there has been a slight increase in skill requirements within occupations.

In this context it is of some interest to note that, according to the participants in the National Graduates Survey, today's university graduates are at least as satisfied with their work-training match as were earlier cohorts (Figure 3). If recent graduates were compelled to accept jobs for which they are overqualified, we would expect to see a deterioration in the match. Thus, we are inclined to believe that the effective growth of demand for university graduates is greater than is suggested by Figure 2.

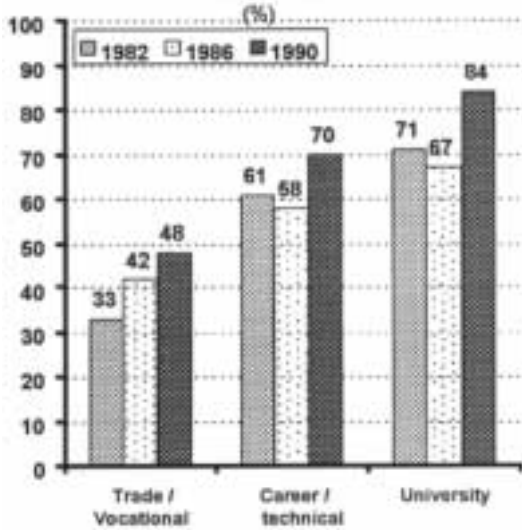
FIGURE 2
Demand and Supply of University-Trained Workers



Note: Jobs requiring a university education are those defined as requiring 17 or more years of education in the Canadian Classification and Dictionary of Occupations.

Source: Applied Research Branch, HRDC using census data for 1971, 1981, 1986, 1991 and 1996.

FIGURE 3
Proportion of Graduates whose Job Directly Matches their Training, by Level, 1982, 1986 and 1990



Note: For graduates two years after their studies.
Source: National Graduates Survey.

Since skills are in part acquired, level of education can provide some indication of individuals' skill levels. However, we need to recognize that education varies in quality and that individuals have different aptitudes. For a given level of education, the skill level of individuals will vary. For example, the 1994 International Adult Literacy Survey indicated that 11 percent of university graduates had difficulty reading and interpreting texts. This variation in literacy skills within similarly educated groups may explain why some workers end up in jobs requiring less education than they possess.⁵

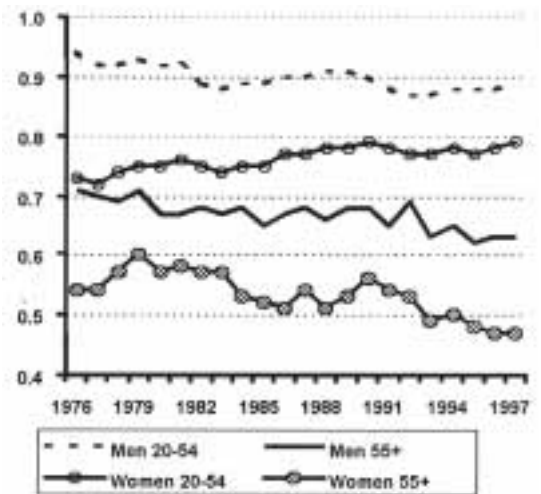
To some extent, the use of educational data could result in an overestimation of skill levels if the link between education and skills deteriorated over time. Using a cohort approach, Boothby reports no evidence of a deterioration in the link between education and skills over the 1981 to 1991 period.

Despite these caveats about these indicators, we can safely assert that any true gap between skilled-labour supply and demand in a competitive labour market as in Canada would reveal itself in the trends of certain synthetic economic variables, such as wages, unemployment rates, and employment rates (Roy, Henson and Lavoie 1996). In particular, in the case of an economy-wide shortage of skilled labour, we should observe a relative rise in the wage premium paid to qualified workers.

If relative wages were inflexible — so that relative quantities must adjust — we would expect the burden of a shift in labour demand toward skilled labour to fall mostly on poorly qualified labour.

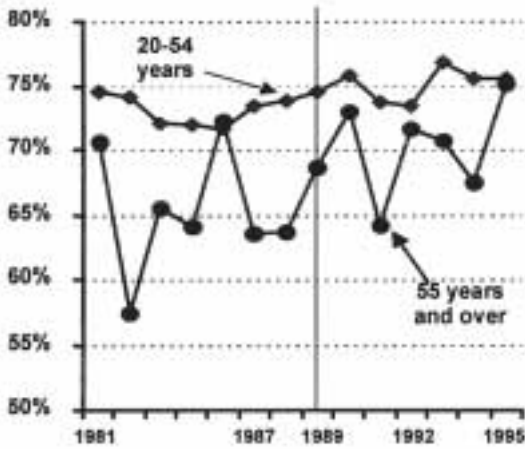
Figure 4 reveals that there is no evidence of a major shift in the employment rates ratio of individuals without a postsecondary degree, diploma or certificate (PSD) compared with those with one (see Boothby and Gingras 1998). For the 20 to 54 age

FIGURE 4
Employment Rate Ratio: Individuals without to those with a Postsecondary Degree



Source: Special Tabulations from the Labour Force Survey.

FIGURE 5
Weekly Earnings Ratio: Workers without to those with a Postsecondary Diploma, Canada, 1981-1995



Note: High-skilled workers are those with a postsecondary degree, diploma or certificate. Low-skilled workers consist of persons without a postsecondary qualification. Data are limited to non-students 20-64 years old who were in the labour force for the entire year. Source: Survey of Consumer Finances (SCF).

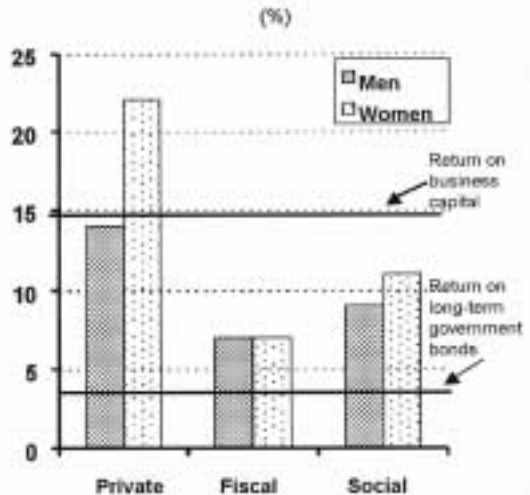
group, this ratio is slightly higher for women, slightly lower for men, and unchanged for both sexes combined. Consequently, the ratio of the aggregate employment rates for members of this age group do not indicate any worsening in labour market conditions for workers without a PSD.

For the 55-plus age group, it can be demonstrated that the slight deterioration in the employment ratio for those without a PSD is primarily attributable to an age-composition effect. In this group, the average age of workers without a PSD is considerably higher than workers having one, and since the probability of being retired increases with age, we expect a deterioration of the employment rate of workers without a PSD. This phenomenon is not, however, related to the level of expertise.

As to the wage premium paid to workers with a PSD, our results are confirmed by the Survey of Consumer Finances (Figure 5). The ratio of average weekly earnings of workers without to those with a PSD seems to have increased little since the beginning of the 1980s, contradicting the hypothesis of a shortfall in workers with a PSD in Canada.

Examining the social returns to investment in education may help us determine whether we, as a society, are spending too little, enough, or too much on skill development. Recent evaluations of the social rate of return to university education in Canada put the value at around 10 percent (Figure 6). This rate of return may appear high, but it should be judged by comparison to other types of investments with similar risk. Public investment in highway and street infrastructures or in health-care facilities, for example, may prove more profitable alternatives. In

FIGURE 6
Private and Social Rates of Return to Education at the University Level in Canada, 1995



Source: Returns to education from *Education at a Glance OECD Indicators 1998*. Returns on business capital from *OECD Economic Outlook*, December 1998.

TABLE 1
Earnings Premiums for University-Educated Workers in Canada

<i>Ratio of Earnings: University Degree/Postsecondary¹</i>					
	1971	1979	1985	1991	1996
<i>Men</i>					
Age 30-39	1.49	1.26	1.34	1.36	1.31
All ages	1.58	1.37	1.42	1.48	1.44
<i>Women</i>					
Age 30-39	1.63	1.47	1.39	1.62	1.56
All ages	1.50	1.42	1.43	1.53	1.54
<i>Ratio of Earnings: University/High School²</i>					
<i>Men</i>					
Age 30-39	1.78	1.39	1.49	1.63	1.49
All ages	1.87	1.54	1.59	1.72	1.62
<i>Women</i>					
Age 30-39	1.64	1.66	1.74	1.91	1.72
All ages	2.01	1.65	1.76	1.79	1.74

Notes: ¹Some postsecondary or postsecondary certificate or diploma.

²Some or completed high school.

Source: Survey of Consumer Finances (SCF).

any case, a rate of 10 percent is clearly lower than the return to corporate capital.

Furthermore, it has been shown that the social rate of return tends to diminish as the level of education increases. According to estimates for Canada, the social rate of return is relatively high for high-school education and lower, even negative, for graduate studies (Vaillancourt 1985). Private returns are decidedly higher, especially for women (21 percent), creating a powerful incentive to pursue a university education. We can gain an overview of the evolution of the return to education over time by examining the mark-ups, or premiums, paid by the markets for different levels of education.

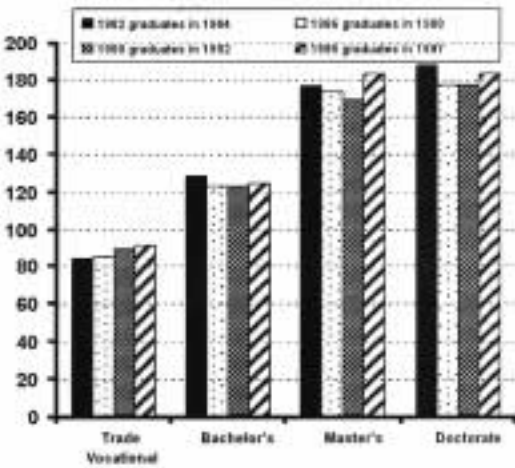
As we see in Table 1, the wage premium paid to university graduates fell during the 1970s and has remained relatively stable over the last ten years. This suggests that the return to education and skills, though high, not only has not increased, but has actually decreased in Canada over the course of the last 25 years, contrary to what one would expect in the case of a generalized shortage of qualified labour.⁶ It is possible that wage premiums paid by the markets adjust very slowly, because experienced workers are, to varying degrees, sheltered from market pressures. Table 1 reveals that, overall, we observe the same phenomena for the 30–39 age group as for the set of all workers. We can also examine the performance of recent graduates with various levels of education.

In a situation of an aggregate shortfall of qualified labour, we would expect the median earnings of recent graduates from postsecondary programs to benefit the most educated. This is not the case. According to the National Graduates Survey, and as illustrated in Figure 7, the distribution of graduates' earnings by degree earned (two years after receipt of the diploma) has not changed significantly since the beginning of the 1980s. The evolution of the employment rate (the placement rate) of new graduates has not changed either. These results are essentially the same five years after graduation.

A marked deterioration of the equilibrium between labour supply and demand owing to a skill shortage could, at least in the short term, create bottlenecks and increase the non-accelerating inflation rate of unemployment (NAIRU). We would further expect a worsening of the economy-wide unemployment-vacancy relationship. Empirical research into these two areas does not support the position that the market for skilled labour has been in disequilibrium in Canada in recent years (Archambault and Fortin 1997).

The claim that Canada is in the throes of a generalized shortage of skilled labour is not borne out by the data.

FIGURE 7
 Median Earnings of Graduates Working Full Time
 (college graduates = 100)



Note: College graduates refers to community college and CEGEP graduates.

Source: National Graduates Survey.

MICROECONOMIC ANALYSIS

The previous analysis indicates that there is no generalized shortage of skilled labour. In this section we shall attempt to reconcile that conclusion with employers' claims that they cannot meet their skilled-labour requirements. First, however, we shall review why and how specific labour shortages arise, and evaluate their true significance.⁷

Supply and demand in various professional sectors of the labour market are in constant fluctuation, which may be purely random or occur in a more foreseeable and regular manner. This phenomenon is typical of modern economies. These movements have a variety of causes, including technological progress, shifts in consumers' tastes, institutional changes, the evolution of commodity prices, and demographic variation. The

composition of the quantities of labour demanded by firms and supplied by households needs to change in tandem with these disturbances.

These adjustments can occur instantaneously. Whether in terms of wages or the influx of labour from related occupations or industries, these changes are costly and time consuming.⁸ During this adjustment process some employers' expectations will not be met and they will report a shortage of workers, while other sectors will be in the midst of layoffs and labour surpluses. It follows that at any point in time we will find shortages in some sectors and surpluses in others.

Two principal approaches are used in empirical studies to identify specific labour shortages. On the one hand, there are studies that rely on the analysis and interpretation of trends in certain economic variables; this is similar to the approach we used in the previous section. On the other hand, there is an approach that consists of compiling comments from employers on the relative difficulties they are experiencing filling specific jobs. In these surveys or interviews a labour shortage is deemed to exist if employers express enough problems recruiting for any particular occupation. Table 2 presents an example where the two methods are used to describe the market conditions for computer programmers and systems analysts in Canada.

Clearly, this is not the place to survey the literature on specific labour shortages; we simply introduce some of the main sources of information.⁹ The Canadian Occupational Projection System (COPS)¹⁰ with its national network of partners constitutes a good source of information on the evolution of the national and provincial labour markets, broken down by profession. Its diagnostic of the current and future state of the labour market for professionals is based on economic indicators and consultations with private sector associates. Table 3 provides several examples of occupations moving toward shortage or surplus taken from the Human Resources Development Canada publication *Job Futures 2000*.

TABLE 2

Examples of Market-Specific Adjustments: The Market for Computer Programmers and Systems Analysts

In order to illustrate the appearance of shortages as a normal aspect of market adjustments, consider the specific case of computer programmers and systems analysts. The sharp drop in computer prices over the last 20 years, combined with a widespread diffusion of computer technologies and the exponential growth of the Internet, has resulted in a sharp increase in the demand for programmer-analysts. The supply of programmer-analysts has also increased dramatically — employment in this profession doubled between 1987 and 1997, constituting a growth rate approximately seven times that of the general labour market. This pace of growth alone could suffice to create recruitment problems, but it is compounded by needs associated with the year-2000 problem and the very good overall performance of the industrialized economies in recent years. The dynamism of this sector is indisputable.

The supply of programmer-analysts is also limited in the short term by the time required to train new workers. Thus, we observe an influx of skilled labour from other sectors or countries. We have, in fact, noticed a net transfer of experienced professionals from other industries in recent years. At the same time, while the overall contribution to these professions of the flow of migrants into Canada from the rest of the world remains positive, it amounts to only a small proportion of total employment and is only a fraction of the number of new entrants emerging from the education system.

According to a Statistics Canada survey of educational institutions, enrolment in computer science programs (at all levels of university education) rose by 21% between 1986 and 1996. The corresponding percentage growth for computer engineers was about 30%, while overall university attendance increased 17% during the same period. Registration in computer programs in community colleges surged 49% in the same interval. While we do not have official statistics, it seems likely that enrolments in private institutions offering similar courses will have experienced a comparable growth rate recently.

Inspection of employment and wage indices for programmer-analysts reveals a slight tightening of the market in recent years. This dovetails with the results of surveys of employers, who complain of recruitment difficulties. According to the Census of Canada, between 1991 and 1996 computer programmers' wages increased by 20%, those of systems analysts by 14%, and those of professionals in the natural and applied sciences by 12%. The Occupational Compensation Survey by the Bureau of Labor Statistics indicates that in the Boston area the wages of systems analysts rose by 18% between 1992 and 1996, while those of lawyers and accountants remained unchanged.

According to the National Graduates Survey in recent years the median wage paid to university graduates from computer science programs five years after graduation has increased relative to those of graduates in other disciplines. The full-time employment rate of recent graduates in computer science increased by 14 to 17 percentage points above the mean for all fields of study between 1984 and 1997. According to the Labour Force Survey, recent data on the unemployment rate of systems analysts, 2.7% in 1997, indicates a reasonably tight market.

We should also mention HRDC's sectorial studies.¹¹ They have frequently identified shortages of skilled labour, focusing on qualitative measures, and have concluded that available training was inadequate. Generally, their reports recommend more training for these sectors.

Results from surveys of employers often suggest that the evidence of skill shortages have reached dra-

matic proportions in Canada. For example, the Canadian Federation of Independent Business conducted a survey on the hiring practices of its small and medium-sized members in 1996. Approximately 45 percent of the firms questioned declared having "difficulties finding qualified labour to meet their employment needs." A 1995 survey of employers in Quebec dealing with the characteristics of their demand for labour provides another example.

TABLE 3
Examples of Occupations Expected to Move Toward a Shortage Situation

Moving Toward a Shortage

- Physical Science Professionals (Physicists, Chemists)
- Librarians, Archivists, Conservators and Curators
- Plumbers, Pipefitters and Gas Fitters
- Heavy Equipment Operators

Moving Toward a Surplus

- Retail Salespersons
- Childcare and Home Support Occupations
- Machine Operators in the Textile Sector
- Agriculture and Horticulture Workers

Source: HRDC, *Job Futures* (2000 Edition).

No less than 75 percent of the firms in the sample indicated experiencing hiring difficulties attributable to lack of qualified workers.

However, it is difficult to interpret this type of result from one-time, non-repeated surveys; we cannot determine whether the situation is deteriorating or improving. Furthermore, employers' answers to the types of questions asked in these surveys do not necessarily reflect serious difficulties. For example, in the aforementioned Quebec survey, fewer than 10 percent of the firms having complained of shortages of qualified labour considered the situation sufficiently serious to justify raising wages, increasing overtime of current staff, or limiting production. Moreover, a study of occupations supposedly in shortage revealed that less than 20 percent of them involved skilled labour. As to the survey of the Canadian Federation of Independent Business, 75 percent of employers who declared experiencing difficulties filling positions complained that workers' wage demands were too high, or that government income-support programs were a source of competition.

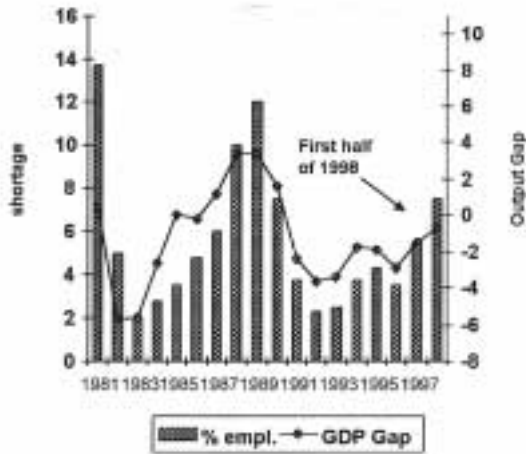
Research has shown that it is very difficult to obtain reliable and detailed information about labour shortages — suitable for grouping across firms

to generate results significant at the level of the market — by questioning employers (Roy, Henson and Lavoie 1996, s.3). One of the principal problems with the employer-based method, especially when it relies exclusively on questionnaires, is that the information gathered may reflect internal hiring problems specific to the firm and not an actual shortage on the labour market. Another problem is the fact that employees are never sufficiently qualified according to their bosses. It is not surprising, then, that we obtain positive responses when we question the latter about shortages of skilled labour. Moreover, since employers take little or no account of the reactions of their competitors or of the impact of their decisions on the markets, they tend to overestimate their needs during periods of sales growth.

Few surveys have attempted to track employers' hiring experiences over time, and those that have are very qualitative in nature and very aggregated.¹² Two surveys of employers are frequently mentioned. One of them, the Business Conditions Survey from Statistics Canada, provides the number of manufacturing firms having declared that shortages of skilled labour are the cause of production difficulties (Figure 8). As we see in Figure 8, the proportion of employers in the manufacturing sector that declare hiring difficulties due to shortages of skilled labour is very cyclical. During the first quarter of 1998 this proportion was about 7.5 percent, which is comparable to past values from times when the economy was functioning at today's level of output. Indeed, when the economy is operating at the same level, relative to capacity, as today (e.g., in 1987 and 1990-91), the proportion of employers in the manufacturing sector indicating shortages is very similar. The results of this survey hold no surprises; at this stage of the business cycle we expect a growing number of employers to declare shortages of qualified labour. Thus, the survey does not evince a structural increase of shortages affecting the Canadian manufacturing sector.¹³

Research and Development (R&D) activities are considered by many economists to be crucial to

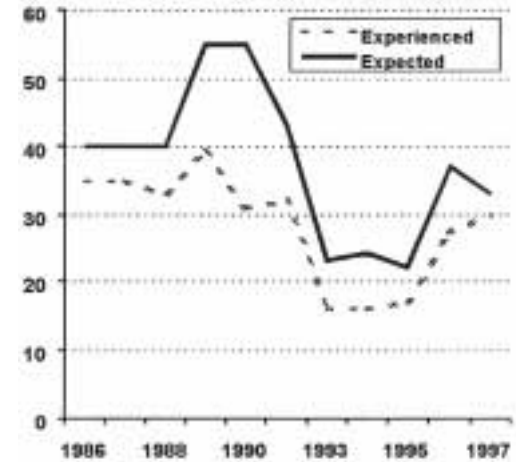
FIGURE 8
Manufacturing Skill Shortages and Output Gap
(percentage of employers experiencing difficulties hiring skilled labour)



Note: The output gap is from the OECD, defined as real GDP minus potential GDP.

Source: Business Conditions Survey, Statistics Canada and the OECD *Economic Outlook*, June 1998.

FIGURE 9
Shortages of R&D Employees
(percentage of employers surveyed)



Note: Defined as the inability to fill a position over a period of six months.

Source: *R&D Outlook (1986-1997)* and *Innovation Outlook 1998*, Conference Board of Canada.

economic growth, and a permanent shortage of that type of labour could affect our long-term prospects. According to a survey of R&D-performing firms conducted by the Conference Board of Canada, the proportion of firms experiencing or anticipating a shortfall of qualified R&D staff is currently about 30 percent. This proportion has grown in recent years. Nonetheless, as we see in Figure 9, not only is this percentage no higher, it is in fact a little lower than what we would expect based on historical relationships between the general level of economic activity and this index.

In concluding this section we reaffirm our finding from the previous section, that there is no reason

to believe that Canada is experiencing an aggregate shortfall of skilled labour. Surveys of employers show increasing hiring difficulties, but these are primarily attributable to the improved cyclical performance of the Canadian economy of the last two years.

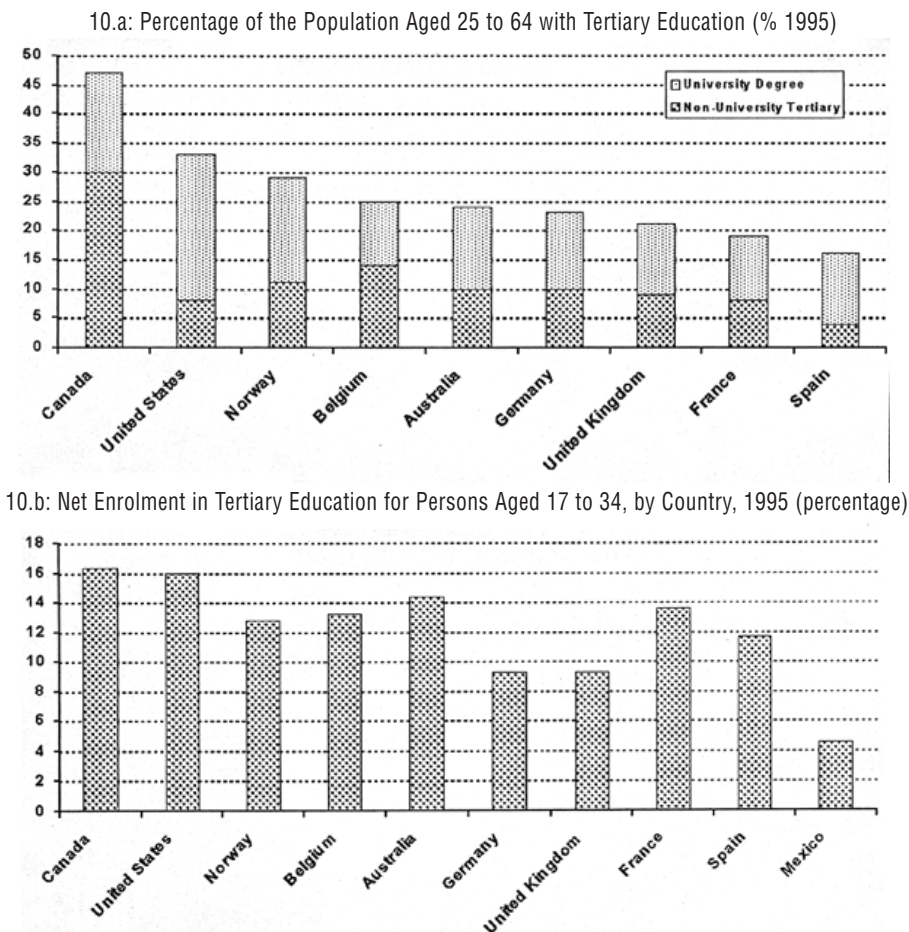
OTHER NOTIONS OF SHORTAGE

Two other notions of shortage are examined in this section. First, many analysts maintain that the accumulation of human capital is an important contributor to a country's economic growth, and thus to the welfare of its population. Of course, it is not

our intention to attempt to resolve the thorny issue of identifying the determinants of growth, but rather to simply compare the stock and flow of investments in human capital in Canada with those of other industrialized countries to determine whether there is a shortfall.¹⁴ Second, we seek to determine whether there exists a skill threshold beneath which workers are not even qualified for unskilled jobs, and we shall briefly examine the conditions necessary for Canadians to meet these minimal requirements.

As we see in Figure 10.a, Canada counts among the countries having the highest stock of human capital in terms of educational level. According to a recent OECD document (1998), in 1994 Canada led the industrialized nations in terms of the proportion of the population 25 to 64 having a tertiary education. In Canada, 47 percent of the population had a postsecondary education, while the corresponding number for the second-place United States was 33 percent. Figure 10.b reveals that Canada is also

FIGURE 10
Human Capital in Industrialized Countries



Source: OECD (1998).

among the countries investing the most in university education.

In terms of the ability to read at the document scale, a direct measure of competence, Canada again leads the pack. Indeed, according to the International Adult Literacy Survey, the average level of literacy of Canadians places it among the top countries. Canada rates fourth in a field of 13, ahead of the United States and the United Kingdom, among others. Job-related training accounts for a substantial share of all-adult education and training activities. According to the OECD (1998), in 1994-95 the rate of participation in workplace training programs by Canadians was above average. However, the average duration of training in Canada, measured as the number of hours per employed person, is a little below average than in the other countries, but comparable to that in the United States.

On the basis of these observations we conclude that the stock of skills of the Canadian labour force and the level of investments in human capital compare favourably to their counterparts in the other industrialized countries. Consequently, Canada does not appear to be suffering any shortage vis-à-vis its competitors.¹⁵

In economies in which the average level of human capital trends upward, and in which production activities are becoming increasingly complex, it is possible that some share of the least-skilled segment of the labour force will have difficulty finding work and will eventually quit the job market. Several studies have found that older workers with less than eight years of education have seen their situation deteriorate substantially in recent years (Riddell and Sweetman 1997). In fact, this phenomenon is not restricted to older workers. The situation of the least educated (from zero to eight years of schooling) on the job market is worsening for most age groups in Canada (Figure 11). The group comprising the oldest is more vulnerable than the others because it contains the highest proportion of poorly educated.

FIGURE 11
Participation Rates by Educational Attainment for Males Aged 20-54 (percent)



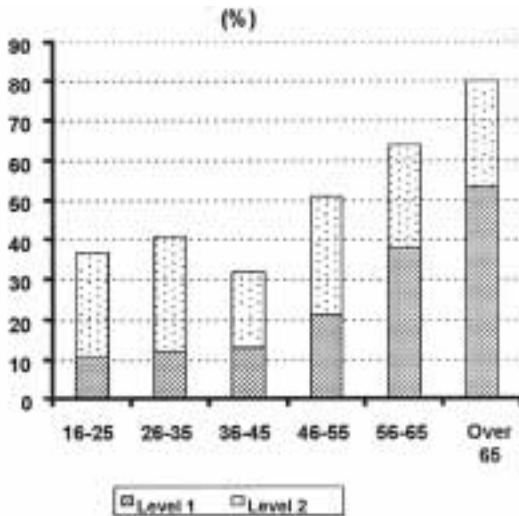
Source: Special Tabulations from Labour Force Survey (LFS).

This age-related bias in the distribution of skills is also apparent when we look at levels of literacy (Figure 12).

The phenomenon of the least-qualified workers being shut out of the labour market suggests that a minimal level of competence is required to land a rewarding job in Canada.¹⁶ According to HRDC's Essential Skills Project, on a scale of one to five, the level of literacy required to hold one of the lowest-skill jobs is about three. As Figure 13 indicates, nearly 75 percent of young Canadians between 16 and 25 possessing a high school diploma are ranked at three or better.

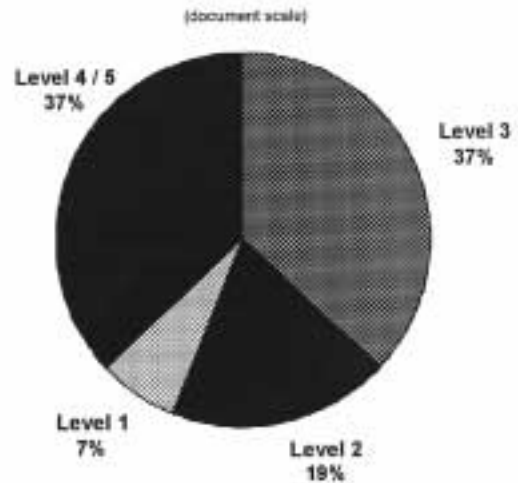
Youths classified in the first or second levels, about 25 percent of the population of young people having completed their high school education, are

FIGURE 12
Percentage of the Population with Low-Level Literacy Skills in Canada



Source: International Adult Literacy Survey, 1996.

FIGURE 13
Distribution of Literacy for Youths Aged 16 to 25 with High School Diplomas



Source: International Adult Literacy Survey, 1996.

faced with a reduced choice of jobs and lower earnings. The Canadian job market thus offers little to youths who do not have a high school diploma.

CONCLUSIONS

In conclusion, analysis of the empirical data strongly suggests that there is no broad-based shortage of skilled labour in Canada. Furthermore, it is relatively easy to reconcile this conclusion with the fact that, over the last few years, growing numbers of employers have complained of increasing hiring difficulties attributable to a labour shortage. We have, in fact, demonstrated that these recruitment difficulties are a normal cyclical phenomenon and are attributable to a tightening of the labour market, not a sudden, aggregate shortage of skilled labour.

It is not normal for an economy to have no occupational or geographic labour markets in which employers experience hiring difficulties. In general, relative supply and demand conditions will always be changing in a dynamic economy and this will generate shortages in some areas and surpluses in others. The existence of labour shortages is as inevitable as the existence of unemployment in modern economies. This phenomenon is not intrinsically indicative of any malfunction in the labour market or in the education and training systems.

As in the case of government intervention aimed at easing the transition for unemployed workers, policymakers arbitrate the markets in various ways and facilitate the citizenry's acquisition of skills. For example, governments finance training programs and subsidize education. The incentives to educate

and train in Canada seem high enough since, as we have shown, Canada registers a rate of investment in education and training greater than that of most other industrialized countries. Consequently, Canada's current stock of human capital also compares favourably to other nations.

This is not to say that there is no room for improvement, or that everything is working smoothly. We have shown, for example, that the Canadian labour market is increasingly demanding in terms of minimal skill requirements. To function adequately in today's labour market, a high school diploma is strongly recommended. In this context we believe it essential that all possible efforts be made to encourage young Canadians to finish high school, and that assistance to the least-educated continue to help them learn to read and maintain their literacy skills.

It is essential that those Canadian institutions with a connection to the labour market remain alert and responsive to the needs of the economy and the population. Changes in the composition of the Canadian labour force of the last 30 years, as well as those in the nature and forms of work, together with Canadian's strong position in terms of skills and standard of living, suggest that Canada's institutional framework has adapted well during this period. In our opinion, and judging from the recent Canadian experience, there is good reason to believe that our institutions will be able to continue adjusting to meet the new challenges looming on the horizon.

These adjustments will not occur instantaneously. In some cases the intervention of political authorities may be required. Issues of information on the labour market, the regulation of an increasingly dynamic private training system, the adaptation of public educational institutions, and the migration of labour are at the heart of these adjustments, and will require government decisions. It will nonetheless be important to guard against intervening without first understanding the mechanisms in place and clearly articulating the reasons why the proposed actions do, or do not, promote the necessary adjustments.

NOTES

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¹The cyclical phases illustrated in Figure 1 are similar to those identified using more sophisticated methodologies. See, for example, OECD *Economic Outlook*, December 1999.

²We should bear in mind that, despite the rapid growth in employment for knowledge workers, their share constituted a mere 8.5 percent of total employment in 1996.

³We believe that variations from 1981 to 1991 are mainly due to shifts in the occupational structure of employment, although measurement problems cannot be excluded.

⁴From 44 human resource sector studies produced between 1991 and 1997 by the Strategic Human Resources Analysis Division of the Human Resources Partnerships Directorate of Human Resources Development Canada.

⁵It has been shown in Canada and in the United States that workers with a university degree in jobs that only require a high school education are less literate than the university graduate average. Their lower wages reflect their lower skills, which are required by their jobs. For more details, see Boothby (1999).

⁶Preliminary results from ongoing work in the Applied Research Branch indicate that the return to education has not, in fact, increased during the 1990s.

⁷This section draws heavily on Roy, Henson and Lavoie (1996).

⁸These shifts usually occur in uncertainty. Decisions such as whether or not to hire, and at what wage, or whether to quit a job and take another entail a high level of risk for individuals and firms. It follows that market adjustments occur in small steps as information on the true situation of the market becomes available.

⁹On this point, compare Section 4 in Roy, Henson and Lavoie (1996).

¹⁰COPS is a collection of models and a federal/provincial/territorial network for the analysis and projections of occupational skills. In recent years, the demand for analysis and projections from COPS has increased considerably. Information similar to that provided by the national edition of the publication *Job Futures* is available at the provincial, and for some provinces, the sub-provincial level.

¹¹See note 2.

¹²The Canadian Job Vacancy Survey, conducted between 1970 and 1978, presents quarterly data in considerable detail about the number of job openings that were difficult to fill. While several countries have attempted it, no industrialized country today is conducting this type of very detailed survey (Newton and Henson 1996).

¹³The recurring and varied nature of specific skill shortages is also illustrated by an analysis of newspaper articles. ARB staff performed a press review of print media for the last two years and for the years 1979 and 1980, considered as two periods at comparable stages of the business cycle. We found the same number of employers indicating a lack of qualified workers, and a diversity of shortages was manifest in both periods.

¹⁴The link between economic growth and capital accumulation is not obvious. Particularly, accumulation of human capital is not sufficient to guarantee growth.

¹⁵We ignore the issues of composition, structure, and valuation of this stock of human capital and the impact these may have on economic growth. For example, it is well known that Canada employs a smaller proportion of workers in R&D than the United States or Japan. If R&D is a key factor of growth, and if we establish target proportions, then we could conclude that Canada is short of R&D workers. Our analysis of the experience of recent graduates from science and technology programs on the market would suggest, however, and this must be emphasized, that the shortage is more on the demand than on the supply side.

¹⁶Employment can always be increased, but perhaps only by reducing minimum wages and the generosity of

income-support programs, or by supplementing the wages of low-income workers.

REFERENCES

- Archambault, R. and M. Fortin. 1997. *The Beveridge Curve and Unemployment Fluctuations in Canada*. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Boothby, D. 1999. "Literacy Skills, the Knowledge Content of Occupations and Occupational Mismatch," Working Paper No. W-99-3E. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Boothby, D. and Y. Gingras. 1998. *Labour Market Conditions of Low-Skilled Workers in Canada. Quarterly Macroeconomic & Labour Market Review*. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Lavoie, M. and R. Roy. 1998. *Employment in the Knowledge-Based Economy: A Growth Accounting Exercise for Canada*, Research Paper No. R-98-8E. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Newton, C. and H. Henson. 1996. *Tools for Identifying Skill Shortages: A Cross Country Comparison*, No. T-96-3E. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Organization for Economic Cooperation and Development (OECD). 1998. *Human Capital Investment*. Paris: OECD.
- Pryor, F. and D. Schaffer. 1997. "Wages and the University Educated: A Paradox Resolved," *Monthly Labor Review*, July. Washington, DC: Bureau of Labor Statistics, US Department of Labor.
- Riddell, W.C. and A. Sweetman. 1997. "Human Capital Formation in Periods of Rapid Change," Paper presented at the conference "Adapting Public Policy to a Labour Market in Transition," Montreal.
- Roy, R., H. Henson and C. Lavoie. 1996. *A Primer on Skill Shortages in Canada*, Research Paper No. R-96-8E. Ottawa: Applied Research Branch, Strategic Policy, Human Resources Development Canada.
- Vaillancourt, F. 1985. "Private and Public Monetary Returns to Schooling in Canada," Working Paper No. 35. Ottawa: Economic Council of Canada.