Skills Research Initiative
Initiative de recherche sur les compétences

International Mobility of Skilled Labour:
Analytical and Empirical Issues, and Research Priorities

Surendra Gera (Industry Canada)
Samuel A. Laryea (Human Resources and Skills Development Canada)
Thitima Songsakul (Industry Canada)

Human Resources Development Canada/Développement des ressources humaines du Canada
Industry Canada/Industrie Canada
Social Sciences and Humanities Research Council/Conseil de recherches en sciences humaines du Canada

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Abstract

The international mobility of skilled labour has become a key component of the global knowledge-based economy. Rising levels of foreign direct investment (FDI), international trade, research and development (R&D), technological advances and increased demand for skilled workers seem to have all contributed to an increase in the international mobility of skilled labour. Internationally mobile individuals are often found participating in industries that are largely knowledge-based and global in scope. As a result, it has become increasingly important that the economic policy discussion surrounding the international mobility of skilled labour must take into consideration the wide variety of ways the migration of skilled labour affects the economy. Numerous drivers, policy and non-policy induced, are at work. Attention must now turn towards the links between these movements and the institutions regulating them; the performance in the trade of goods and services; FDI; human capital formation and multinational enterprises location; and income convergence among countries. This paper provides an overview of the literature on four key issues surrounding the international mobility of skilled workers, while identifying potential directions for future research. First, global trends of recent international skilled migratory flows – magnitude and their composition in terms of underlying skills/education of migrants with a focus on Canada-US migratory flows. Second, fundamental (non-policy) drivers of the increased skilled migratory flows, especially among advanced countries. Third, economic costs and benefits associated with cross-country movement of skilled labour and the main factors conditioning these costs and benefits. Fourth, how policy has adjusted or should adjust to increased skilled labour mobility in the global economy?

Résumé

La mobilité des travailleurs qualifiés dans le monde est devenue un volet clé de l'économie mondiale du savoir. L'accroissement des investissements étrangers directs (IED), le commerce international, la recherche-développement (R-D), les progrès technologiques et la demande accrue de travailleurs qualifiés semblent avoir tous contribué à l'intensification de la mobilité des travailleurs qualifiés dans le monde. Les personnes qui sont disposées à aller travailler à l'étranger font souvent partie d'industries d'envergure internationale, fortement axées sur le savoir. Il est donc de plus en plus important que le débat entourant les questions de politique économique et de mobilité des travailleurs qualifiés tienne compte des multiples répercussions sur l'économie de la migration des travailleurs qualifiés. De nombreux facteurs, d'ordre politique et autre, sont à l'œuvre. Il faut maintenant passer à l'examen des liens entre ces mouvements et les institutions qui les réglementent; des résultats aux chapitres du commerce des biens et des services; de l'IED; de la formation du capital humain et de l'emplacement des multinationales; de la convergence des revenus entre les pays. Ce document donne un aperçu de la documentation qui existe sur quatre grandes questions entourant la mobilité des travailleurs qualifiés dans le monde, et il présente certaines orientations que pourraient prendre les futurs travaux de recherche. Premièrement, les

tendances mondiales des récents flux migratoires de main-d'oeuvre qualifiée – l'ampleur du phénomène et sa composition en ce qui touche la scolarité et les compétences sous-jacentes des migrants –, en particulier les flux migratoires entre le Canada et les États-Unis. Deuxièmement, les facteurs fondamentaux (autres que politique) à l'origine de l'accroissement des flux migratoires de travailleurs qualifiés, surtout dans les pays avancés. Troisièmement, les coûts et avantages économiques liés aux mouvements de main-d'œuvre qualifiée d'un pays à l'autre et les principaux facteurs qui déterminent ces coûts et avantages. Quatrièmement, la façon dont les politiques s'adaptent ou devraient s'adapter à l'accroissement de la mobilité des travailleurs qualifiés dans l'économie mondiale.

> "Today, the border between Canadian and U.S. labour markets is somewhat more open than it was at the end of the Second World War. But, in comparison with the markets for products and capital, it is still *the* least open. This is because of immigration policies and a multitude of different provincial, state, or federal licensing laws in the two countries. To achieve the full benefits of a single market, significant freeing up of laws and regulations that impede labour mobility would be needed."
>
> (Remarks by David Dodge, Governor of the Bank of Canada,
> to the Couchiching Institute on Public Affairs,
> August 7, 2003, p.3)

Introduction

There is a wide recognition that today's economy is being fundamentally transformed via globalization, economic integration, new technologies and a shift to more knowledge-intensive activities. An important aspect of this global knowledge-based economy (KBE) is the emergence of a new trend where segments of the skilled labour force are becoming increasingly mobile. Key features of this new trend include a growing focus of temporary migration as opposed to permanent migration, and an increase in the share of skilled professionals moving across industrialized countries.

Some argue that the greater international mobility of skilled workers may well be the by-product of globalization.[1] As the argument goes, the new trend, which became more noticeable in the 1990's, is driven by the information technology revolution and the general economic integration of product markets (e.g. the increased globalization of corporations). The increased scarcity of skilled workers being reflected worldwide by the higher premium paid for the highly skilled and better educated workers. These globally mobile skilled individuals generally comprise those who participate in high-tech industries, manage multinational enterprises (MNEs), and occupy scientific and technical professions. These individuals participate in industries that are largely knowledge-based and global in scope.

Business is becoming increasingly international in its outlook and activities. Doing business in a global world has implications for the mobility of skilled workers. Exports of products, technology transfers and R&D investment across operations worldwide require the movements of key skilled personnel. Seeking ways to draw upon scarce specialized resources, firms are shopping for skilled workers across continents. Individuals' attitude to mobility are changing as they become better qualified and increasingly seek opportunities to work internationally to improve their incomes and to work in premier global organizations. More people, particularly those in the younger age groups, regard international mobility to be an important part of their skills and career development.[2]

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[1] See, for example, Harris (2003) and European Economic Advisory Group Report (2003), henceforth referred to as EEAG (2003).

[2] PriceWaterhouseCoopers (2002). Henceforth, in the rest of the paper, this study is referred to as PWC (2002).

National policy makers increasingly view nations as competing to attract internationally mobile workers in order to improve their innovation performance through R&D investments, the adoption of advanced technologies and the application of knowledge-intensive processes throughout the economy. Head and Reis (2003) note that until recently, the most sought after internationally mobile resource (IMR) has been foreign direct investment (FDI), particularly new manufacturing facilities of MNEs. The desired set of IMRs has now widened to include a variety of activities of MNEs such as R&D and access to highly skilled professionals. The authors argue that the location decisions of FDI, R&D and skilled professionals are jointly determined: success at attracting one resource draws more of each.

Indeed, evidence suggests that the international mobility of skilled workers increased during the 1990s. Data show an increase in migration flows during this period, particularly among temporarily migrating skilled professionals, from Asia to the US, Canada, Australia, and the UK Part of the rise in the international mobility of these individuals is related to deliberate policies by national governments of OECD countries. Strong demand for information technology (IT) and other skilled workers in OECD countries has been a key driver of reforms toward migration rules easing the movements of skilled workers. The mobility of skilled workers is also on the rise among OECD countries but appears dominated by personnel with specialty occupations such as IT specialists, advanced students, researchers and managers. While data is limited on the intra-EU migration flows of skilled EU nationals, there is some evidence that skilled mobility between the EU and other OECD countries is on the rise (OECD, 2001; PWC, 2002). For example, data show that countries such as France, the UK and Germany are becoming a more significant source of temporary skilled migrants to the US under the H1B temporary visa program. The US also attracts a growing share of foreign students enrolled in OECD countries.

The emigration of skilled professionals from Canada to the US has often received particular attention from Canadian policymakers, in part because of a periodic concern about a "brain drain". Finnie (2001) estimates that 178,000 people left Canada for the US between 1991 and 1996, 30 per cent higher than from 1986-91; permanent emigration increasing by 15 per cent and temporary emigration doubling. The most striking change is the increase in the number of Canadians entering the US under TN visa in the late 1990s, reaching an average of 73,000 entries per year during the 1998-2002 period. While weak business conditions in Canada relative to the US and special factors in sectors such as health services have played a role in the outflows of Canadians, the increase also reflects the growing economic integration of the North American economies under the FTA and the NAFTA (Globerman, 1999). The globalization of firms has also helped fuel the temporary flows to the US; intra-company transferees in the mid-1990s accounted for 5-10 per cent of the total flows of Canadian skilled workers to the US (OECD, 2002).

What are the costs and benefits of international mobility of skilled workers for a nation such as Canada? To a large extent the answer to this question will depend on the

underlying assumptions that are made on the role of skilled labour in the economy and on the forces driving these labour movements.

In the most basic migration model labour is assumed fairly homogeneous and economic issues of cross-country labour mobility, such as the immigration from low-income to high-income countries, are essentially equivalent to offsetting changes in population size (scale effects) with, in most cases, little or no effects on the standards of living of the countries involved in steady state.[3] More sophisticated discussions of the economic aspects of migration include a distinction between low-skilled and high-skilled migrants so that human capital flows and stocks are taken into account. Traditional tools of labour economists are used to compute the static costs and benefits associated with the migration of that capital. In such models the effects of migration flows on standards of living of participating countries could be significant.[4] Overall though, the migration of skilled workers is largely viewed as a zero-sum game among countries. The benefits of the receiving country being, by and large, equal to the costs born by the sending country. Even in models where there are dynamic externalities associated with human capital, the magnitude of the cost-benefit calculations changes, but the migration of skilled workers is still largely viewed as a zero-sum game for participating countries.

A competing perspective on cross-country labour movements - "brain exchange or brain circulation" or "globalization of high skilled labour market" or "labour market integration" - holds that movements of skilled labour across countries must be studied in the context of globalization. This perspective argues that segments of the international mobility of high-skilled individuals are linked to technology transfers, FDI, location of MNEs, and two-way flows of knowledge, ideas and technology among trading countries. The highly talented workers are essentially becoming more globally mobile as goods, services and capital have become more globally mobile over time. This development may suggest more a pattern of "brain circulation" than a permanent draining of skills from one place to another. Under this brain circulation perspective, the international mobility of skilled workers can generate global benefits by improving knowledge flows and satisfying the demand for high-skilled workers where that demand is the strongest. Contrary to the typical "brain drain" perspective, this view suggests that greater skilled-labour mobility may well lead to better long-term economic outcomes among the countries participating in that labour exchange (Wildasin, 2003; Harris, 2003 and 2004a; Harris and Schmitt, 2003).

What does all this mean for policy research? The argument made here is that the economic policy discussion surrounding the international mobility of skilled labour must take into account the wide variety of ways the migration of labour affects the economy. In particular, it is suggested that policy discussion on the migration of labour must not be satisfied looking exclusively at the more traditional social and humanitarian considerations underpinning immigration policies. It must also go much beyond the possible contribution of short-term migrations in alleviating short-term recruitment difficulties of workers by employers or even the most obvious transfer of human capital

[3] Such models abstract from issues related to the aging of populations.
[4] See, for example, DeVoretz and Laryea (1998).

implied by these flows. The recent trends in high-skilled labour movements show that segments of national labour markets are increasingly becoming globally mobile. Numerous drivers, policy and non-policy induced, are at work. Attention must now turn towards the links between these movements, and the institutions regulating them, and the performance in the trade of goods and services; foreign direct investment; human capital formation and MNE location; and income convergence among countries. Addressing these and related key knowledge gaps is required to develop appropriate policy approaches on the migration of labour.

This paper provides an overview of the literature on key issues surrounding the international mobility of skilled workers, while identifying potential directions for future research. The paper focuses on four key issues in each of the subsequent section:

- How mobile is skilled work force internationally? Global trends of recent international skilled migratory flows – magnitude, direction, and the nature (temporary versus permanent) of recent aggregate flows and their composition in terms of underlying skills/education, and age structure of migrants.

- Fundamental (non-policy) drivers of international mobility of high skilled workers with a focus on Canada-US migratory flows.

- Costs and benefits associated with cross-country movement of skilled labour and the main factors conditioning these costs and benefits.

- What are the implications of increased skilled labour mobility for business and policy? How can the future challenges for public policy in North America be addressed? How policy has adjusted or should adjust to increased skilled labour mobility in the global economy? The discussion focuses on whether Canadian trade, immigration, labour market, and science and technology policies and regulations facilitate or hinder the cross-country movements of skilled labour.

Finally, the summary and conclusions are presented in the last section.

1. How mobile is skilled work force internationally?

Getting a firm grip on the magnitude, direction and the composition of the international flows of skilled workers is imperative to inform and fashion appropriate policy responses. The increasing globalization and the importance of knowledge-intensive activities is changing skill needs across all industries, and business is placing higher premiums to access internationally mobile talents. A recent European report points out that skilled labour mobility is becoming increasingly important to business as they are expanding their production and marketing activities globally (PWC, 2002). Additionally, a number of recent empirical and theoretical contributions provide support for the linkages between doing business in a more integrated world and requirements for a more mobile skilled labour force.[5]

Our aim in this section is to illustrate using data how international mobility of skilled workers has evolved over recent years. First, we define and identify different forms of skilled labour mobility that we consider in our discussion. Second, we document trends of recent international skilled migratory flows – magnitude, direction, and the nature (temporary versus permanent) of recent aggregate flows and their composition in terms of underlying skills/education. We examine these trends at three different levels: global patterns of skilled labour mobility; patterns of labour mobility in the European Union (EU); and the movement of skilled workers between Canada and the US.

1.1 Defining skilled labour mobility

In this paper, skilled workers are defined as those individuals who are engaged in knowledge-intensive professions such as physicians, nurses, science and technology (S&T) workers, engineers, information technology (IT) specialists, graduate and post-doctoral students, scholars and researchers, and administrators and managers.[6]

International labour mobility is multi-dimensional. The PWC report (2002) for the European Community argues that it can take many different forms depending upon whether it is motivated by an employer or an individual and whether it is temporary (i.e., lasts for a few months) or permanent (lasts for several years). [7] In the subsequent discussion, we document the following forms of skilled labour mobility:

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[5] See, for example, Harris and Schmitt (2003) and Globerman (2001).

[6] This definition is broader than the definition suggested in "Canberra Manual" (prepared by OECD's Group of National Experts in Science and Technology Indicators). The Canberra manual defines skilled human resources in science and technology (HRST) as personnel with a tertiary education level in science and technology study or currently employed in a S&T occupation. See OECD (2001).

[7] PWC (2002) report identifies eight key types of worker mobility from the business perspective in the EU. Some notable new forms of recent worker mobility include the cross-border commuter, whereby an employee commutes from their home to a place of work in another country (on a weekly or bi-weekly basis); the rotational assignee in which an employee commutes from their home country to work in another country for a few months without changing their home; a virtual assignee who assumes business responsibilities which span several countries and works as part of a team located in several countries but does not need to relocate: a virtual assignment often involves extensive business travel to work with colleagues and supported by ICTs; and teleworking whereby an employee, supported by ICTs, works from any location, especially his or her home.

- the 'traditional' permanent migration – skilled individuals move on a permanent basis from one country to another;
- temporary skilled migration – such as admissions to the US based on H-1B visa, and TN visa;
- intra-company transferees generally associated with MNEs; and
- temporary visiting foreign scholars and researchers.

1.2 Trends in the international mobility of the high-skilled workers

The readily available data on the international mobility of highly skilled workers is rather limited. Most of the data measures only inflows to the advanced OECD countries and as such provides only incomplete story of international mobility of skilled labour.

The data shows that skilled migration, especially from Asia to major OECD countries, rose substantially during the 1990s (OECD, 2002). Furthermore, the increase in skilled migration among OECD countries was characterized by temporary inflows as opposed to permanent inflows (Guellec and Cervantes, 2001). The data shows that the US, Japan and Canada have been major recipients of temporary flows of skilled workers (Table 1.1).

International mobility of skilled workers is also on the rise amongst OECD countries. A strong demand by US technology-intensive firms in service-related occupations such as architecture, engineering, surveying and computer-related occupations and the demand by universities for academic faculty and researchers led to increased temporary inflows of skilled workers into the US. The main source of temporary skilled migrants have been India, China and advanced OECD countries such as the UK, Canada, France, Mexico, Germany and Japan. In particular, the admissions on H1B visa increased sharply from 144,458 in 1997 to 370,490 in 2002, at a growth rate of 23 per cent per annum (Table 1.2).[8]

[8] The number of H1B temporary workers admissions and the number of H1B petitions (i.e., visa) approved measure different populations. None of these two gives a perfect measurement in terms of the number of people entering the US. Petitions approved authorize temporary employment for specialty workers, whether they are in the US or overseas. H1B petitions can be approved for workers changing non-immigrant status without leaving the U.S. Roughly half of petitions approved were for initial employment. In addition, the number of approved petitions exceeds the number of individual H1B workers due to multiple petitions submitted on behalf of a single worker. While admission data represent number of entries of H1B workers arriving from abroad, and thus, always exceed the number of individuals. (See more details on data overview from US – Yearbook of Immigration Statistics, 2002) To reflect the *flow* and *mobility* of these workers, the number of admissions is used here.

Table 1.1 Inflows of 'permanent' and 'temporary' skilled workers: selected OECD countries

		Permanent ('000)	Temporary ('000)
Canada [a]	1998	81.2	38.0
	2001	137.1	49.9
US [b]	1998	63.5	754.2
	2001	165.8	1148.0
Germany [c]	2000	n.a.	8.6
UK [c]	2000	n.a.	39.1
France [c]	1999	n.a.	5.3
Japan [c]	1996	n.a.	191.0
	1999	n.a.	238.7
Australia [d]	1996	27.5	n.a.
	2000	35.3	43.2

Notes: a) Permanent flow to Canada shows number of skilled immigrants admitted under skilled focus program, principals and dependents. Temporary workers are movers with managerial, professional, and technical skilled levels. Source: CIC (Facts and Figures, various years)

b) Permanent flows to the US are immigrants with employment preferences including professionals, executives, skilled workers and their dependents (1st, 2nd, and skilled workers in the 3rd employment preferences). Temporary inflow is in terms of admissions, not persons, under the following visa arrangements: NAFTA-TN, H1B, Exchange visitors (J1), and intra-company transferees (L1). Source: US-CIS (Statistical Yearbook, various years)

c) All immigrant workers to European countries mentioned above and Japan are recruited on a temporary basis. Intra-company transferees are not included. Data relate to specific programs dedicated to highly skilled workers except for France and the UK for which highly skilled are those engaged in managing and professional occupations. Source: STI-OECD (2002).

d) Australia data on permanent flow are from OECD (2002), Ch.17. Permanent flow reflects the number of skill migration program visas granted. Temporary workers are those admitted under temporary business visa, and temporary resident visas granted for medical practitioners, academics, and business executives.

Table 1.2 Admissions to the US under H-1B visa, selected countries, 1997– 2002

Country	1997	2001	2002
India	29239	104543	81091
UK	18221	32456	32056
Canada	4192	16454	19866
France	6076	15597	16105
Mexico	5273	14423	15867
China	4377	17192	15838
Germany	6117	13968	13714
Japan	7401	13049	13287
Total (world)	144458	384191	370490

Source: US-Citizenship and Immigration Services

Notes: 1) H-1B class refers to temporary workers with speciality occupations based on professional education, skills, and/or equivalent experience, for example, engineers, computer-related analysts and programmers, physicians, professors, accountants, managers.

2) Countries listed above are the top 8 countries according to the 2002 ranking. Admission data are classified by country of citizenship.

Guellec and Cervantes (2001) make two interesting observations. First, while the temporary migration and high skilled workers into the US has increased in the latter part of 1990s, the permanent migration of engineers and computer scientists to the US has decreased substantially since 1992. Second, at the same time there is a surge in inflows of skilled migrants in occupations such as physicians, nurses, and health-related technicians.

Although the US is the major beneficiary and destination of global skilled migrants, Canada is also a major recipient of skilled workers from rest of the world. The migration of skilled workers into Canada occurs primarily through three distinct but related channels – permanent immigrants admitted under the skilled-focused program, temporary foreign workers with work permit visas, and foreign students at higher education levels.

First, the economic principal applicants constitute the bulk of the international skilled workers to Canada (permanent migrants), because they are selected on the basis of their labour market attributes through the points system. They include skilled workers and business immigrants.[9] In 2001, 250,346 immigrants were admitted to Canada. Out of this number, 61% were in the economic class, 27% in the family class and 11% were in the refugee class.[10] The majority of immigrants to Canada in the last decade came mainly from Asia.[11]

The second source of skilled workers into Canada includes temporary foreign workers on work permits. Temporary inflows of skilled labour include workers with professional, executive, and technical skill levels. On average, 48,000 skilled workers were admitted into Canada during 2000-02, out of which 70% are highly skilled such as executives and professionals. The main source countries are the NAFTA partners (30% from the US and 10% from Mexico) and the UK (7%).

Thirdly, student migration constitutes a significant part of international mobility.[12] As one of the main players in globalization of education services, Canada receives substantial number of foreign students. Their number has risen substantially in recent years, more than doubling between 1995 and 2001. In 2000, there were 29,239 foreign students admitted to Canadian universities and colleges; the number rose to 36,198 by 2002 (CIC, various years). The number of foreign students per 1000 students enrolled in Canada is 27.9, considerably lower than the OECD weighted mean (37.1). The respective

[9] These also include individuals nominated by the provinces and fast tracked through the system to meet urgent labour market shortages within that province.

[10] In recent years, while the total number of immigrants admitted under both the refugee and family classes have been declining, those admitted under the economic class has been increasing. (Facts and Figures, CIC, various years). Over the1998 and 2000 period, the majority of immigrants into Canada are highly educated and in their prime working age. For principal applicants, 83% have a bachelor's degree or above (27% with master and/or doctoral degrees). The remarkable increase in education attainment of permanent immigrants to Canada reflects a response to structural shift in demand for higher skills and changes in selection criteria.

[11] For example, in the previous five consecutive years, China has been the leading source country of immigrants to Canada, accounting for over 40,000 new immigrants in 2001, or 16% of the year's total. During the same year, the second, third and fourth largest source countries were India, Pakistan and the Philippines.

[12] Tremblay (2001) argues that student migration to higher education can be a precursor of subsequent migration of qualified workers particularly in the field of science and technology.

numbers are, 32.4 in the US, 73 in France, and 125.9 in Australia, and 12.4 in Italy. (OECD 2001, Ch.2)

There is also growing evidence of outflows of skilled workers from the OECD countries to the developing countries in Asia (see, for example, OECD, 2002). This may reflect an increased importance of trade links with Asian economies but also signals substantial return migration. Using 2001 Hong Kong census data, DeVoretz et al. (2002) show that about 34,000 people who had been in Canada at the time of the 1996 census had returned to Hong Kong by 2001. Those who returned were generally younger and more educated. For example, 50 percent had post secondary degrees, versus 26 percent who stayed in Canada.

We use four additional indicators to gauge the extent of international mobility of skilled workers in the OECD area.

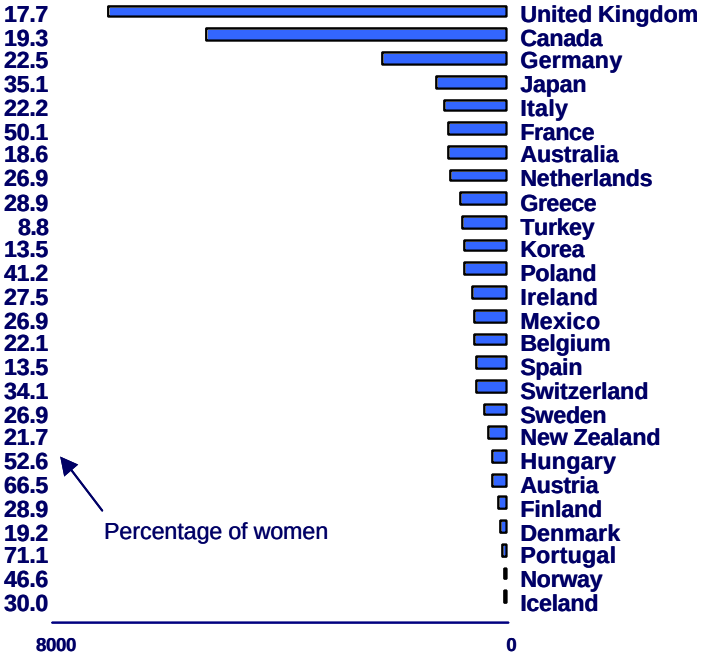
The first relates to scientists and engineers in the US with a doctorate qualification who are not US citizens. Chart 1.1 shows the number of non-US OECD citizens with science and engineering (S&E) doctorate in the US. The data shows that the largest number of foreign-born scientists and engineers come from the UK and Canada; relatively few are from Germany and Japan (OECD, STI Scorecard 2003). The report points out that if non-OECD countries are taken into account, there are three times as many foreign-born scientists from China and twice as many from India as from the UK. The corresponding shares of foreign-born women scientists vary greatly across countries.[13]

The second indicator relates to the stock of foreign-born human resources in science and technology (HRST), illustrated in Chart 1.2. The relative share of foreign-born HRST varies considerably in the European OECD countries. It is highest in Luxembourg and Austria, while Belgium and the UK also employ relatively high shares. The relative shares are small in Italy, Finland, Greece, Ireland and Spain. The share of women in non-national HRST employment varies from around 35 to 50 percent in these countries.

The third indicator looks at the international mobility of PhD student as an indicator of internationalization of both higher education sector and the research system (OECD, STI Scoreboard 2003). The available data for the OECD countries shows that the US has the highest number of foreign PhD students among the OECD countries (about 79,000), followed by the UK with some 25,000. European students represent 19 percent of foreign PhD students enrolled in Canadian universities. These shares reach 50 percent in Austria and 77 per cent in Switzerland (Chart 1.3).

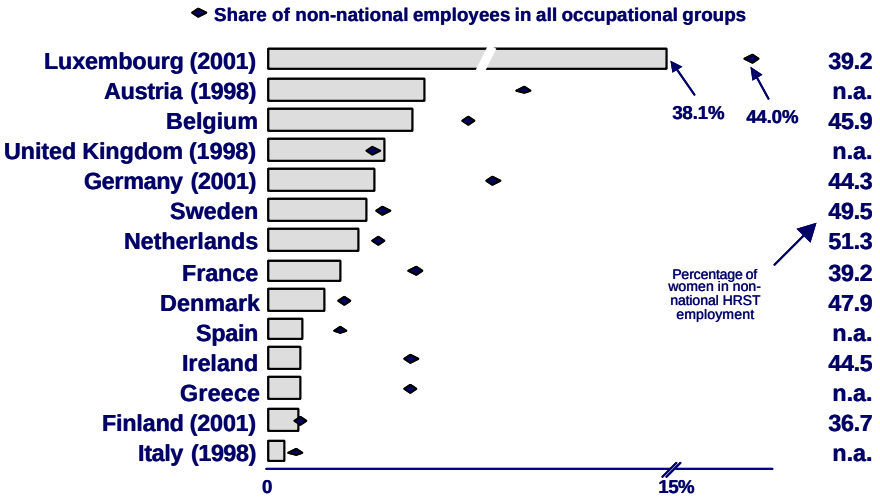
[13] The OECD, STI Scoreboard 2003 notes two important points. First, internationally comparable data on international flows of scientists and researchers are extremely scares; and second, the available date only covers inflows and thus provides only part of the picture of international mobility.

Chart 1.1 Non-US OECD citizens with S&E doctorates in the US, 1999



Source: OECD, based on data from National Science Foundation/SRS, SESTAT database, May 2003.

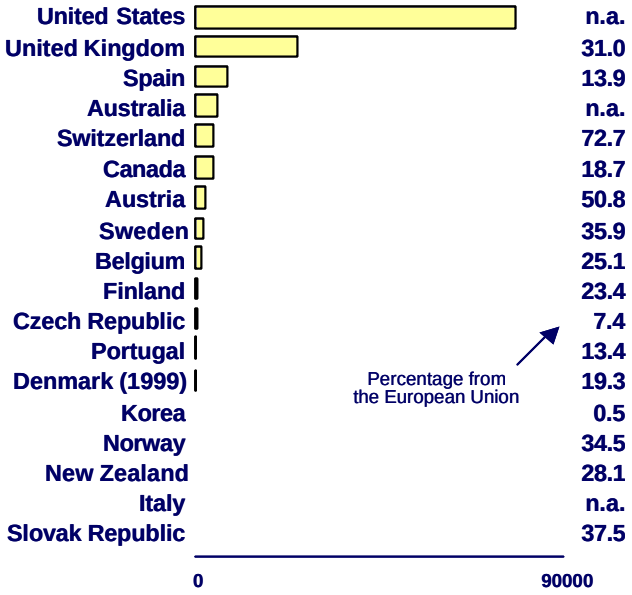
Chart 1.2 Relative share of non-national HRST employment in the selected OECD countries , 2002



1. Human resources in science and technology defined according to occupational goups. HRST includes only ISCO-88 major groups 2 and 3 (professional and associated professionals).

Source: OECD, based on data from the Eurostat Labour Force Survey, May 2003.

Chart 1.3 Distribution of foreign PhD students in OECD countries by host country, 2000



Source: OECD, Education database, May 2003

The fourth indicator shows the movement of intra-company transferees among selected OECD countries. Temporary migration of intra-company transferees increased sharply in the US as compared to other OECD countries (Table 1.3). These movements are usually for short periods, but may be for several months or recur at frequent intervals. Intra-company transferees in the US (L-1 visas) virtually tripled in magnitude between 1995 and 2002. It increased from 112,100 in 1995 to 313,699 in 2002.

Table 1.3 Intra-company transferees in selected OECD countries, 1995-1999

Thousands

	1995	1996	1997	1998	1999
Canada[a]	na	na	2.1	2.8	2.9
France	0.8	0.8	1.0	1.1	1.8
Japan	3.1	2.8	3.4	3.5	3.8
Netherlands	na	1.6	2.3	2.7	2.5
United Kingdom	14.1	13.0	18.0	22.0	15.0
United States (visa L-1)	112.1	140.5	na	203.3	234.4

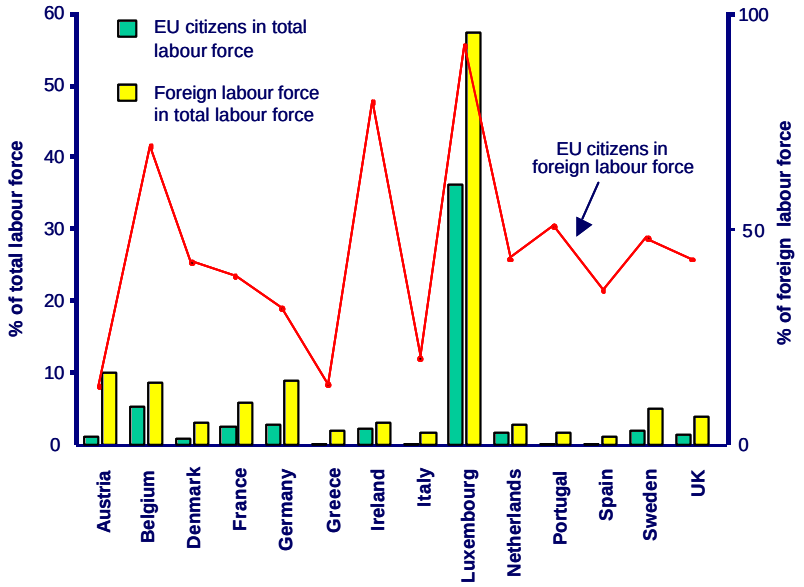
a) Including Mexican and American intra-company transferees entering under NAFTA.
Source: OECD-DSTI/STP(2002)34

1.3 Recent patterns of labour mobility within the EU

The data that measures the flows of workers between EU countries on a consistent basis is not available. The available data rather focuses on the share of foreign-born work force. A recent report by PWC (2002) notes that historically, the level of labour mobility in the EU has been low compared to that of the US; and the rate of migration has changed little during the 1990s. Based on the estimates by the European Commission, the PWC report (2002) notes that the annual mobility of EU nationals within the EU is less than 0.4 percent of the resident population (some 1.5 million people) whereas in the US it is about six times greater.

Chart 1.4 shows the share of foreign-born workers in the labour force. The relative shares are higher in Luxembourg, Austria and Germany and lower in Spain and Italy. The chart also shows that mobile EU citizens (from other Member States) are more important in Luxembourg, Belgium and Ireland and least important in Greece and Italy.

Chart 1.4 Size and Composition of foreign labour force in the EU, 1998

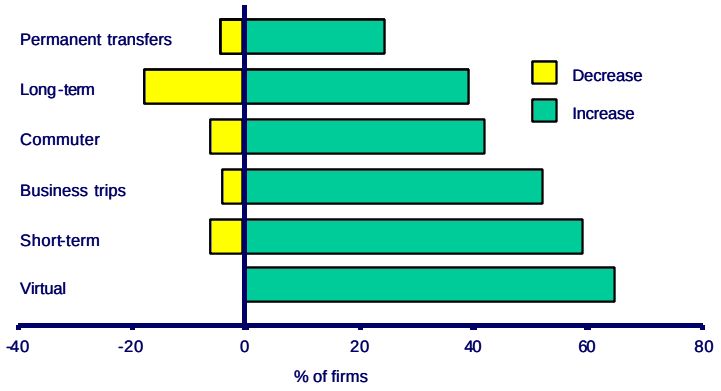


Source: PricewatershouseCoopers (2002) based on OECD data and OECD Employment Outlook (2001)

The report argues that the way in which these data are collected excludes workers on short-term assignments. Their survey of business firms' expatriate staff suggests that there has been an overall increase in mobility of workers within organizations, and, more importantly, the relative importance of virtual and short-term assignments has increased most significantly (Chart 1.5).[14]

[14] The PWC report (2002) defines a virtual assignee "who assumes business responsibilities which span several countries and works as part of a team located in several countries but does not need to relocate: a virtual assignment often involves extensive business travel to work with colleagues (rather than to develop new client or supplier relationships) and is supported by wide use of ICTs".

Chart 1.5 Changes in international assignment type over the last two years



Source: PricewaterhouseCoopers, IAS Survey 1999/2000

1.4 Canada-US patterns of skilled labour mobility

The issue of measuring the migration of skilled labour in the North American context will continue to be important in the near future. An improved understanding of the magnitude, direction and the composition of the migratory flows between Canada and the US is essential to estimate the longer-term cross-border mobility trends of skilled workers.

In terms of inflows from the US to Canada, on average, about 5,400 permanent migrants entered every year into Canada over the 1997 – 2002 period (Table 1.4). However, the inflows of skilled permanent (principal) migrants were quite insignificant - less than a thousand people per year. In comparison, the total temporary inflows from the US have been quite significant over this period – on average, about 23,000 people per year. Temporary inflows of skilled workers from the US, on average, are around 20,000 people per year. This comprises both NAFTA-TN workers and the non-NAFTA workers in managerial, professional and technical skills categories.[15]

[15] The number somewhat understates the amount of skilled workers due to the fact that almost 10% of temporary workers from the US did not declare their skill levels.

Table 1.4 Inflows of skilled workers from the US to Canada, 1997-2002

Year	Temporary Inflows [a]					Permanent Inflows [b]	
	From all countries		From the US			From the US	
	Total	Skilled	Total	NAFTA Skilled	non-NAFTA Skilled	Total	Skilled (principal)
1997	75452	na	23453	8194	11971	5043	764
1998	79788	na	23760	9073	11322	4773	680
1999	85932	na	23751	7921	12368	5528	712
2000	94893	52446	26407	8752	13819	5815	692
2001	95555	49945	23227	8080	11959	5902	658
2002	87910	41488	19700	6923	9766	5288	556
Average	86588	47960	23383	8157	11868	5392	677

a) Numbers of foreign workers are in terms of persons. Skilled workers from all countries are temporary workers with managerial, professional and technical skill levels (i.e., Levels O, A, and B). Temporary inflows form the US are workers with American citizen. Skilled workers from the US are NAFTA-TN workers and non-NAFTA workers in skill categories O, A, and B (source: CIC unpublished data).

b) Total numbers include all skilled levels. Skilled permanent immigrants are principal applicants admitted under skilled focus program. Source: CIC, various years

The outflow of skilled professionals from Canada to the US has always been of great interest to Canadian policy makers, particularly because of periodic concerns over brain drain. Data quality is one of the main problems in estimating outflows from Canada. In recent years, a number of efforts have been made to improve these estimates. Statistics Canada has employed three different data sources to provide estimates of the magnitude of the total outflows of workers from Canada. These include personal income tax data, the Canadian Census Reverse Record Check (RRC) and the US Current Population.

Using sample data from the Canadian census (RRC), Zhao et al. (2000) estimate that half of all permanent emigrants and a third of all temporary emigrants chose to move to the US during the period 1986-91 and 1991-96.[16] Similarly, Finnie (2001) estimates that 178,000 people left Canada for the US between 1991 and 1996, 30 percent higher compared to the 1986-91 period; permanent emigration increasing by 15% and temporary emigration doubling. Furthermore, Finnie (2001) and Zhao et al. (2000) estimate that the annual emigration to the US in the 1990s was in the 22,000 -35,000 range, or approximately 0.1 percent of the Canadian population.[17] Helliwell (1999), using the US Current Population Survey (CPS) for the years up to 1998, concludes that there is little evidence of a surge in the *net* outflow of Canadians during the 1990s. In fact, both Finnie and Helliwell conclude that there is little evidence of a substantial outflow of Canadian workers to the US through most of the 1990s.

[16] Similar trends in the outflow of skilled migrants to the US can also be observed for countries such as Germany, the United Kingdom and France (See Guellec and Cervantes, 2001).

[17] Interestingly enough, while the share of migration to the US has remained approximately constant between 1986-91 and 1991-96, temporary emigration to other countries has risen just as fast as that to the US in the 1990s. Canadian emigration flows (both temporary and permanent) have shifted from Europe towards Asia in the past decade.

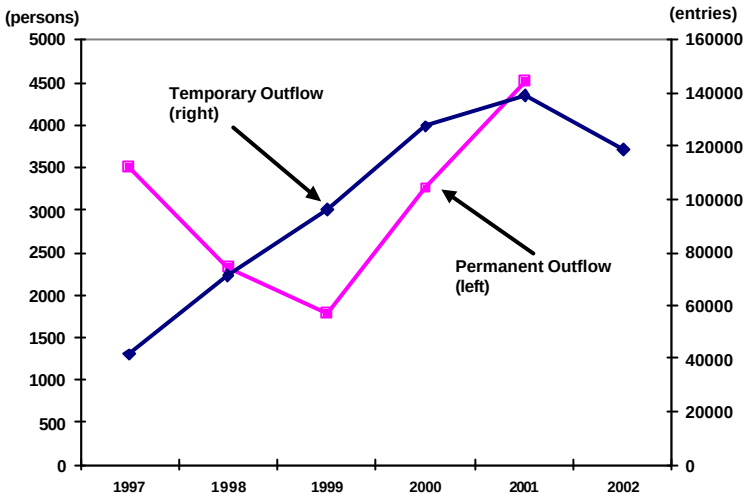
However, recent numbers reported by McHale (2002) do not support the joint Finnie-Helliwell contention that the Canada-US outflows were small. McHale extends Helliwell's CPS estimates to include data for the 1999 to 2002 period. McHale's key findings are: (1) by 2002, the stock of Canadians resident in the US approached 935,000 which represented approximately 400,000 or 80 percent increase in 5 years (1997-2002); (2) the *net* annual outflow to the US appears to be around 50,000 per year; and (3) more importantly, between 1997 and 2002, 116,000 more university trained Canadians aged 25–64 moved to the US which represented an average outflow of 23,000 annually during the period.

We also look at the outflow data that comes from the US Citizenship and Immigration Services (US-CIS). Chart 1.6 below shows the quantitative importance of the permanent and temporary emigration of skilled Canadians to the US during the period of 1997-2002. The number of Canadians granted permanent residency in the US has been small despite sharp increases in 2000 and 2001. In contrast, the temporary outflow of skilled Canadians is relatively large and has been sharply on the rise during 1997-2002, with a striking rate of 26.6% per annum.

The trend illustrated in Chart 1.6 appears consistent with CPS data reported by McHale.[18] A significant part of the recent increase in emigration is accounted for temporary migrants (i.e. intra-company transfers, NAFTA-TN visa holders, H-1B visa holders and exchange visitors). Chart 1.7 shows temporary flows of Canadians to the US under these temporary visa arrangements. An important change is the increase in the number of Canadians entering the US using the TN visa in the late 1990s. Between 1998-2002, the average number of TN visa admissions to the US was around 73,000. The temporary outflow of skilled workers did decrease in 2002, however, this could be a result of an overall decline in the migratory flows to the US during this year due to the external shock of September 11 event.[19] Intra-company transferees have also been rising rapidly. The other major group of professionals entering south is under H1B program – a nonimmigrant visa issued to foreign professionals in occupations such as computer system analysts and programmers, physicians, professors, engineers, and accountants. The annual flow is smaller in magnitude (about 11,000 annually) than the flow under NAFTA-TN but grew fastest at the rate of 38% per annum during the same period.

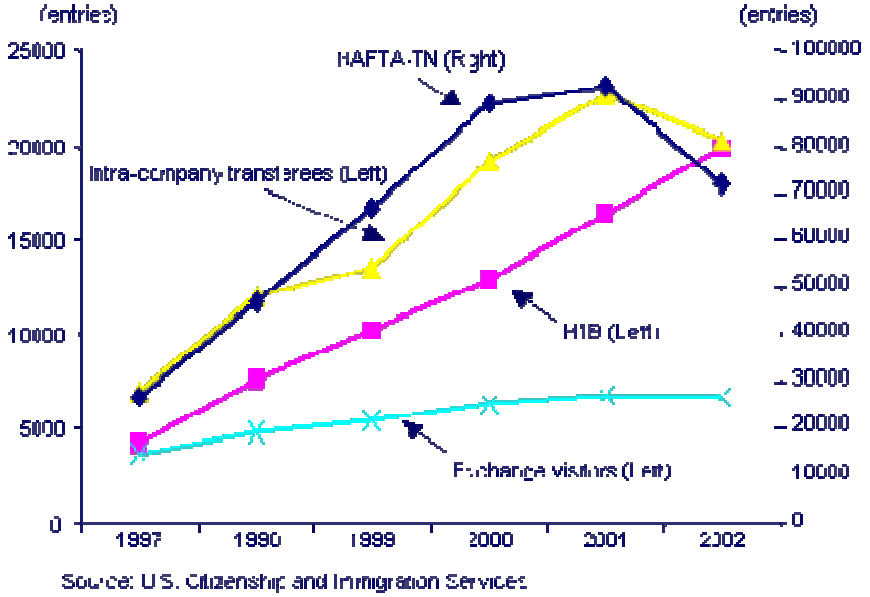
[18] McHale's study is drawn from stock data while US-CIS data reports annual flows. The unit of temporary flows is in terms of entries, therefore, it is difficult to compare the figures from US-CIS and McHale's numbers literally. Nevertheless, both sources indicate that there has been a surge of outflows of Canadians to the US in recent years.
[19] The impact of the shock is clearly acknowledged in the 2002 Yearbook of Immigration Statistics.

Chart 1.6 Outflows of skilled workers from Canada to the US



Note: Permanent outflows to the US are Canadian-born emigrants with professional and executive skills, principals (exclude dependents). Temporary flows are in terms of admissions (entries) of Canadian citizen working in the US under the following visa arrangements: NAFTA-TN, H1B, intra-company transferees (L1), and exchange visitors (J1).
Source: US- Citizenship and Immigration Services, various years.

Chart 1.7 Entries of Canadian citizen to the US on temporary basis



The evidence presented above shows that out-migration of skilled Canadians to the US increased in the 1990s and sharply so since 1997. Clearly, there appears to be an upward trend, and a steep one.

The composition of the outflows from Canada to the US

First we look at the composition of such migrants in terms of skill levels. Table 1.5 shows that Canadian emigrants to the US have always had above-average education levels relative to those who stayed home (Card, 2003). Card's analysis shows that currently Canadians men living in the US are 2.7 times more likely to hold a university degree than men in Canada. Even more striking is that about 8% of Canadian immigrants in the US have an advanced degree (MA, Ph.D., law and medical degree), compared to just over 1% of Canadian men. The data suggests a possible sharp increase in the quality of outmigrants in the 1980s and1990s. Similar conclusions hold for women.[20]

Table 1.5 Outflows of skilled labour: percentage Canadians with a university degree

	Canadians in US.		Canadians in Canada	
	Women	Men	Women	Men
1940	3.3	5.8	2.0(est.)	3.0
1970	7.6	15.0	---	---
1980	12.7	24.9	7.5	11.8
1990	22.7	33.3	---	---
2000	36.7	44.3	15.2	16.0
2000*	5.0	8.1	0.5	1.1

* percent with advanced degree
Source: Card (2003)

Frank and Belair (1999) report that a survey of 1995 Canadian university graduates found that 1.5 percent of the respondents were residing in the US by 1997, which is fairly consistent with the proportion of Canadians living there. The figure for PhD graduates in the same survey was even much higher – 12 percent of them were living in the US by 1998.[21]

Secondly, in terms of income, the estimates from Zhao et al. (2000) and Finnie (2001) show that Canadian tax filers who moved to other countries, including the US, are more likely to be high-income earners. To illustrate, almost 1% of 1995 tax filers who earned $150,000 or more ceased to reside in Canada in 1996. The fractions are smaller for the lower income earners.

[20] The data shows the distribution of measured educational levels among emigrants and misses a potentially important dimension of skill that is unmeasured ability. The loss of human capital would be underestimated if, at any given education level, those who migrate from Canada have a higher ability than others. Card (2003) notes that the issue of unobserved skill differences is complex, and ultimately difficult to resolve.

[21] Helliwell (2001) makes some interesting observations on inflows and outflows of PhDs from Canada. He argues that the high numbers of exiting PhDs reflect most of all the global reach of the recruiting for PhD programs.

Lastly, the evidence on occupational profile shows that in 1996-97, permanent outflows to the US tend to be concentrated in certain knowledge-intensive professions (Table 1.6). Emigrants in professions such as physicians, nurses, natural scientists and engineers had higher-than-average emigration rates. In particular, for physicians and nurses, the number of permanent emigrants to the US exceeded the number of such immigrants to Canada from all countries (OECD, 2003). The higher emigration rates of these medical professionals were probably related to the health spending cutbacks enacted by most provinces in those years. Barrett (2001) argues that for physicians, the outflow seems to have abated toward the end of the decade.

Table 1.6 Emigration to the United States and total immigration, for selected professions

Annual averages, in percent of 1996 labour force by occupation

	Emigration to the United States[1]			Immigration (total)[1]		
	1986-89	1990-95	1996-97	1986-89	1990-95	1996-97
Physicians	0.25	0.45	0.78	0.69	0.70	0.51
Nurses	0.13	0.31	0.33	0.34	0.39	0.16
Teachers – post-secondary	0.13	0.17	0.13	0.38	0.49	0.35
Teachers – except post-secondary	0.06	0.07	0.06	0.25	0.32	0.23
Computer scientists	0.06	0.08	0.07	0.55	1.53	4.11
Engineers	0.27	0.31	0.27	1.01	2.11	5.21
Natural Scientists	0.22	0.30	0.39	1.28	2.32	6.49
Managers	0.09	0.13	0.12	0.44	0.56	0.70
All other occupations[2]	0.06	0.05	0.03	1.23	0.92	0.72
All occupations	0.07	0.08	0.06	1.06	0.86	0.80

1. Permanent migration
2. Includes cases where occupation was not identified.

Source: OECD Economic Surveys: Canada (2003)

1.5 Issues for discussion

- What is the evidence on the mobility of skilled workers? How large are these flows? Are skilled workers, much like capital and FDI, becoming more mobile globally than in the past? In advanced countries, are movements becoming more multi-directional than in the past or do they tend to be one-way flows? How can we characterize the changes in migrations flows through time? For example, are recent flows more temporary than in the past?

- What are the characteristics of skilled movers? What types of skilled workers are becoming more mobile? What is the evidence within specific occupational groups or industrial sectors?

- Are the patterns of skilled migration across countries much different than within integrated labour markets such as in the US and Canada? What is the experience of the European Union? What is the historical perspective of skilled migration in these more or less integrated labour markets?

- International market for highly skilled workers is becoming highly competitive. How well Canada does in attracting skilled workers (permanent and temporary)?

2. Fundamental drivers of international mobility of skilled workers in the global knowledge economy

The traditional migration literature in the labour economics tradition treats international migration as driven by "push" and "pull" factors. "Push" factors are the supply side factors affecting the incentives and willingness to migrate; and "pull" are demand side factors that affect the demand for migrants in the receiving country. On the supply side, higher relative incomes in the host country is a key factor influencing migration decisions while the demand side factors include the use of less expensive migrant workers and skill shortages in specific sectors of the host country. In the most basic migration model, labour is assumed fairly homogeneous and the net out-migration of skilled educated workers is treated as a "brain drain" in which there is a transfer of skilled workers from one country to another leading to benefits for the country gaining these talents (brain gain) and costs for the sending country (brain drain). The migration of skilled workers is largely viewed as a zero-sum game for participating countries.

In the new global economy perspective, international mobility of skilled labour is considered as "Brain Exchange" or "Brain Circulation" where the increased mobility contributes to increased two-way flows of knowledge, ideas and technology (OECD, 2002a; Harris 2003). This perspective suggests that a number of important factors have contributed to the recent rise in the international mobility of skilled workers. These are: technological change, in particular the developments in ICTs, globalization of production and integration of markets through trade in goods and services and FDI, location of MNEs, access to leading clusters of research and innovation, opportunities for high-technology entrepreneurship, technology transfer and the internationalization of the R&D activities of national firms. Guellec and Cervantes (2002) argue that these factors are important for migratory flows of skilled workers among advanced countries, although they also play a role in the case of flows from developing countries. Furthermore, factors such as differences in labour market conditions, skills premium, job opportunities and career prospects, and attractiveness of the education and research systems continue to be the key drivers of the mobility of skilled individuals in the new global economy (OECD, 2002). Table 2.1 below, based on the OECD (1998), provides a summary of the key factors that drive the mobility of different occupational groups in the new global economy.

Table 2.1 Factors explaining mobility of different occupational groups

Occupations	Major Factors
Managers and executives	Takeovers and mergers FDI Process
Engineers and technicians	Economic opportunity in host country Immigration policies R&D activities Personal factors
Academics and scientists	Networking, R&D activities International mobility within academic institutions
Entrepreneurs	Economic opportunity Immigration and taxation policies Capital markets and availability of venture capital
Students at higher education	Job market R&D (postdoctoral research) Financial supports Immigration policies

Source: Harris (2003) based on OECD

Interestingly, a study on European mobility patterns suggests that individual's attitude to mobility are changing in the new economy as they become better qualified. They are more interested to live and work in another country, particularly those in the younger age groups (PWC, 2002).

We organize our discussion of the key drivers of the mobility of skilled workers under five main headings: technological change, globalization through trade and FDI, research and innovation, increased income and employment opportunities, and changing individual preferences. In order to assess the likely importance of these inter-related factors for the mobility of skilled labour what key analytical issues would need to be addressed? To answer these questions, we turn our attention to both theoretical and empirical work in the area.

2.1 Technological Change

Technical change is considered as one of the most fundamental sources of productivity and economic growth in the new global economy (OECD, 2000). Developments in ICT are clearly the most important source of technological change in the 1990s. Most observers agree that the pace of technological change has accelerated and nations that develop and adopt the latest technological innovations can achieve competitive advantages and, eventually improve their productivity performance.[22] Evidence from a number of OECD countries shows that technological change, both "disembodied and "embodied" in capital equipment, especially in ICT have been a key factor in recent growth in total factor productivity (TFP). The evidence from the US, for example, shows that over the 1990-2001 period, investment in IT and transformation of

[22] See Hanel and Niosi (1998) for a comprehensive survey of the relationship between technology and economic growth.

business activities in response to IT investment accounted for 50 percent or more of the rise in labour productivity growth (Stiroh, 2002).[23]

How does technological change affect the international mobility of skilled labour? This is a complex question and also an area of uncertainty. It is important to note that the different potential roles of internationally mobile skilled workers will be affected in different ways by technology.

First, technological change may shift demand towards high skilled workers relative to the less skilled and raise returns to skill. Higher returns to skills, in turn, act as a significant pull factor in attracting globally mobile high skilled workers. Much of the recent empirical evidence confirms that the technological change associated with new computer technologies has been skill-biased (SBTC); it has caused a rise in demand towards highly skilled workers relative to the less skilled (see, for example, Katz and Murphy, 1992; Card and Lemieux, 2001; Boudarbat, Lemieux and Riddell, 2003).[24] OECD (2002) argues that in recent years, increased demand for skilled workers, driven by the rapid expansion of technology-based activities, has played a major role in the rise of cross-country labour mobility for some countries. The observed higher returns to education in a number of countries over the last two decades or so, including the US and the UK, also seem to be a major pull factor in stimulating cross-country mobility of skilled workers.

Second, technology, especially ICT, may reduce the demand for internationally mobile workers. The argument goes that the ICT may transform the business activities and open up the new possibilities that are cost-effective and does not involve interaction between worker and jobs. For example, the need for virtual labour mobility and telemobility may increase in importance and act as a substitute for physical labour mobility in many areas. Examples include software engineering, data entry, translation services and distance teaching. According to Harris and Schmitt (2003), call centers in various Canadian cities that serve the entire NAFTA market provide, in essence, a form of mobile labour service. Inexpensive high-bandwidth communications ma ke it feasible for large workforces located and effectively managed anywhere, giving rise to the vision of a continental e-labour market. The need for skilled labour mobility to facilitate skill transfer could decline if technology is used to deliver new forms of learning, such as, e-learning. Two common examples include university professors who deliver lectures via distant learning technology and doctors located in one city perform surgery in another.

A survey of businesses in the EU countries argues that although the use of new technology will allow greater flexibility for employers and workers, it will not reduce the need for mobile workers. Moving forward, a great majority of businesses believe that

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[23] Enabling technolgies with broad applications throughout the economy offer considerable benefits over the longer term. What Richard Lipsey has called General Purpose Technolgies, "Fifth-wave" technologies include ICTs, bio, nano and environmental/energy technologies.

[24] In contrast, Haskel and Slaughter (2002) have shown that for ten OECD countries over the period 1970s and 1980s, sector bias, and not skill bias, was a more important determinant of changes in relative wages. Other studies such as Card and DiNardo (2002) fail to support the SBTC hypothesis for the US.

ICT developments enhance worker mobility. Innovations such as video conferencing facilitate 'virtual' meetings across countries. Yet personal contact remains the optimum way to develop business relationship. Only 18 percent of the all businesses think that advances in technology will mean less need to have mobile workers (PWC, 2002).

2.2. Globalization through trade and FDI

The last few decades have seen a stunning integration of the global economy through trade, FDI and technology. Rapid advances in ICTs accompanied by the sharp drop in transportation and communication costs, and increasing competition for markets, capital and skilled workers have accelerated the pace of globalization of business throughout the world.

The 1990s witnessed a significant increase in global trade. Canada actively participated in this process. Canada's international trade as a share of GDP increased dramatically in the 1990s. It now represents nearly 90 percent of Canada's GDP. Global FDI flows have grown at a pace that exceeds even the growth in trade. In the 1990s, the nature of FDI has changed markedly, with mergers and acquisitions (M&A) now accounting for more than 85 per cent of total FDI (Kang and Johansson, 2001). Over the 1991-99 period, M&A grew more than tenfold mainly in response to the rising importance of economies of scale and technology.

ICTs have been instrumental in making the production of goods and services global. The world's economies are increasingly becoming inter-linked and co-dependent. Mann (2003) notes that looking back, global integration of IT production accounts for about 10 to 20 percent of the dramatic decline in IT hardware prices. These price declines supported additional investment in IT and transformation of businesses which together contributed to higher productivity and GDP growth in the US.[25]

Interestingly enough, it is suggested that the rising global integration of world markets has brought with it increased mobility of skilled labour. The EEAG report (2002) suggests that rising mobility of skilled workers is a natural outcome of the increased globalization process. The PWC report (2002) argues that going forward, developments in technology will accelerate globalization as more and more businesses will be looking to operate on an international basis. This can only lead to increased demand for internationally mobile skilled workers.

<u>International trade and skilled labour mobility</u>

In the new global economy, trade continues to expand rapidly. High-technology industries have experienced the greatest increase in trade during the 1990s, much of which is intra-industry trade and reflects the specialization of production across the globe

[25] Mann (2003) notes that productivity growth might have been 2.5 percent instead of 2.8 percent for the 1995-2002 period and that annual real GDP growth might have been 0.3 percentage points lower if global integration of IT production had not occurred

to take advantage of local knowledge and comparative advantages. In several services industries such as in business services, retailing and banking, trade is also increasing at the international level.

According to theory, trade may be either a substitute or complement to international mobility of labour. In the standard neo-classical trade model (the Heckscher-Ohlin model), free trade leads to relative and absolute factor price equalization that, by itself, reduces economic incentives for international migration. Therefore, trade and international migration are substitutes (Mundell, 1957). Globerman (1999) argues that, according to this model, free trade between Canada and the US should lower the outflow of skilled professionals from Canada. Of course, the neoclassical trade model is an extreme case because of the stringent assumptions underlying this model. These include: perfect competition, homogeneous product, full employment and complete markets, identical production technologies, the use of same factors of production, constant returns to scale technologies, and instantaneous adjustment to policy changes.

Harris and Schmitt (2003) in their review of recent developments in the trade theory note that when these assumptions are relaxed, on theoretical grounds, pressures to migrate can easily increase with freer trade. Introducing factor specificity, imperfect competition and increasing returns to scale can yield results opposite to the standard H-O model, implying that trade and international labour mobility are complements.[26] Consider, for example, the case of increasing returns to scale at the sector level. Let us assume that the technology used in the labour-intensive sector exhibits increasing returns to scale. The expansion of production in the US through trade liberalization could encourage inflow of migrants to meet the demand in a growing and more productive industry. A general conclusion of this literature is that when trade is based on economies of scale, migration and trade are complements (Markusen, 1983; Markusen and Melvin, 1981).

The empirical evidence on the relationship between trade and the migration of skilled workers is not very strong. Harris and Schmitt (2003) note that the current levels of migration between Canada and the US are quite low in relation to other periods in history. There are some limited forms of labour mobility within the NAFTA countries covering certain types of professionals under the TN visa program.[27] The apparent one way flow of skilled professionals such as physicians, nurses, natural scientists and engineers from Canada to the US raised considerable alarm as to the possibility of a serious brain drain.[28] There is some empirical evidence to suggest a positive relationship between trade and migration of workers. Gould (1994) found a positive and significant

[26] Models with technological differences across countries can also reverse the standard result. Other relaxations of the Heckscher-Ohlin setting that can reverse the standard result include adjustment lags, migration costs, risk, and migration networks. For a discussion of these issues, see, for example, Harris and Schmitt (2003), Mercenier and Schmitt (2002), Wildasin (2003), Faini et al. (1999), and Venables (1999).

[27] Globerman (1999) concludes that trade liberalisation has had little impact on permanent immigration. However, temporary migration of Canadian professionals to the US has increased somewhat since the FTA. He also suggests that the number of US professional workers emigrating temporarily to Canada has also increased consistently since 1989, although at a substantially slower rate than comparable migration of Canadian TC/TN visa holders.

[28] For a discussion of this issue at length, see Finnie (2001) and the references therein.

relationship between trade and immigration in the US and similarly Head and Reis (1998) and Head, Reis and Wagner (1998) find it for Canada. Wildasin (2003) argues that large gross internal flows of labour in the US and Canada despite free trade is evidence that trade and migration are not substitutes. He suggests that this could also be true in the international context.

The available evidence from the EU suggests that since its creation significant progress have been made towards intra-EU trade in goods; around 60 percent of Member States' trade in goods with the rest of the EU. However, the movement of workers between Member States has been limited. Although there is some evidence to suggest that there has been an overall increase in mobility of workers within organizations, and the relative importance of virtual and short-term assignments has increased most significantly (PWC, 2002).

Foreign Direct Investment and international mobility of skilled workers

In theory, FDI may either substitute or complement international mobility. FDI and skilled mobility may be substitutes if MNEs relocate facilities abroad to access low-cost labour instead of creating jobs locally that might be filled by foreign workers. Evidence from Israel and India illustrates that FDI may also be driven by access to skilled labour, including R&D staff (Guellec and Cervantes, 2002). Head and Reis (2003) argue that the location decisions of FDI, R&D and skilled workers are jointly determined: success at attracting one resource draws more of each.

In contrast, FDI and international mobility of skilled workers may be complements as MNEs stress the potential need for factor movements, especially the relocation of managers and technical experts, to expedite production rationalization and increased trade following trade liberalization. This theory suggests that freer trade between Canada and the US, to the extent that it encourages increased intra-industry trade and investment, may increase economic incentives for bilateral migration. Trade liberalization may therefore induce more migration of specialized workers, insofar as FDI requires them (Globerman, 1999).

The data shows that intra-company transferees have increased in the OECD countries over the late 1990s (Table 1.3 in the previous section). This may represent both the increased importance of takeovers, mergers and FDI in the economy, and the shift toward short-term assignment of skilled professionals such as managers and executives (see Chart 1.5). Clearly, we need more empirical research to show a relationship between the location of FDI and MNEs, and the international mobility of skilled labour.

The new global economy is witnessing two additional trends: First, the trade and investment in services is rising steadily; and, Second, growth in international outsourcing. In the discussion to follow, we turn our attention to these two issues and examine their implications for the increased mobility of skilled labour.

International Trade and FDI in Services

In the new global economy, there is a trend increase in trade, employment and investment in services.[29] However, barriers to trade and investment in services continue to be an important obstacle to further globalization of the service sector. One concern is with the issue of how trade liberalization in services would affect the international mobility of skilled labour?[30] Technological change is dramatically changing the landscape of the global financial system. The growth in services trade raises the prospect of a global e-labour markets for some types of labour services. Examples include software engineering, data entry, translation services and distance teaching. We discussed the implications of this issue for the international mobility of skilled workers in section 2.1 above. The issue is particularly important in the context of North America and other advanced OECD countries (Harris and Schmitt, 2003).

The globalization of trade in educational services is increasing. This is occurring in two different ways: first, OECD countries are increasingly seeking to attract foreign students at the master's, PhD and the post-doctoral levels, particularly in the field of science and technology (S&T), and facilitating their access to the labour market. Host countries can capture much benefits of student migration. In the US, stay rates of foreign PhD students is extremely high – in excess of 50% for Europeans for example (Harris, 2003); and second, cross-border collaboration of higher education and research institutions is rapidly growing. This may act either as a substitute or as a complement to international mobility of students, much as FDI accompanies or substitutes for the migration of skilled workers (OECD, 2002).

Outsourcing in a global economy and the international mobility of skilled labour

"The rising integration of world markets has brought with it a disintegration of the production process" (Feenstra, 1998). Cheaper access to information induced by technological change has facilitated the integration and coordination of internationally diverse production processes. Firms are outsourcing either domestically or abroad, a range of manufacturing or service activities, from product design to assembly, from R&D to marketing, distribution and after-sales service (Grossman and Helpman, 2001). They argue that outsourcing of inputs and business services is one of the rapidly growing components of international trade. As an example of foreign outsourcing, Feenstra (1998), citing Tempest (1996), describes the production process of a Barbie doll. Mattel obtains the raw material for the doll (plastic and hair) in Taiwan and Japan, conducts

[29] A number of explanations have been put forward for the growth in service trade and investment. These include: technological change, changes in trade policy, changes in domestic policy ("deregulation") and demand and supply effects, such as increases in the demand for services due to increases in real income or the average education level. It is important to identify the importance of these factors in explaining services trade and investment trends (Copeland, 2003). For a review of global integration of financial service industry, see Neave (2003), a paper prepared for Industry Canada under the Services Research project.

[30] By invoking relevant sections of Modes 3 and 4 of GATS, Whalley (2003) recognizes that changes in factor mobility restrictions could be a *sine qua non* to attain significant trade liberalization in services. And with segmented factor markets, especially labour markets, larger effects could be realized if services liberalization becomes an indirect conduit for liberalizing domestic factor markets. This latter point is also consistent with relaxed immigration controls, a viewpoint articulated by some countries within the OECD.

assembly in Indonesia and Malaysia, buys the molds in the US, the doll clothing in China, and the paints used in decorating the dolls in the US.

Although outsourcing in manufacturing has been occurring for a long time, a relatively new development is the outsourcing of increased variety of services made possible by the new application of the ICTs. For example, call centres have moved to India and elsewhere. Routine back office accounting work, such as handling accounts receivable also shifting abroad and becoming centralized for global corporations.[31] Does it mean that there will be greater demand for local hires of mobile workers and use of virtual teams and lower international mobility? In a recent article, Mann (2003) argues that an international value chain should increasingly produce not only IT hardware but also software and services. This will, just like hardware, lead to a decline in the prices of software and services and make the overall IT packages affordable for more businesses and other end users. This will promote deeper integration and wider diffusion of IT to new sectors and businesses in the US economy and lead to a greater demand in the US for IT-proficient workers. This suggests that the demand for internationally mobile skilled workers will increase in the US. However, evidence on this issue is rather non-existent and more research is required.

2.3 Research and Innovation

OECD (2002) suggests that research and innovation in advanced countries is a key factor for the international mobility of science and technology (S&T) professionals. This is especially true for S&T professionals in developing countries but also in advanced OECD countries where environment for excellence in scientific research and innovation exists. Human capital is a key factor in innovation and S&T personnel are increasingly required by an economy more based on research and innovation (OECD, 2000).[32]

The nature of innovation is changing in the new global economy. It is becoming much more intense and market driven, more closely linked to scientific progress and more widely spread throughout the economy (OECD, 2000).[33] ICT has played an important role in facilitating innovation. It has helped speeding up the innovation process and reducing cycle times, it has led to faster diffusion of codified knowledge and has made science more efficient and closely linked to business. The OECD growth project and other studies have found a strong link between innovation and growth. Cameron (1998) surveys the empirical evidence on the link between innovation and economic growth in the light of new growth theory and notes two major conclusions. First,

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[31] A series of articles have recently appeared in the US newspapers debating the outflow of US jobs to the countries such as India and China. See, for example, Schumer and Roberts "Second Thoughts on Free Trade", The New York Times, 6 January, 2004; and Reisman, "A reply to Schumer and Roberts", The New York Times, January 9, 2004; Murphy, "Free Trade and Factor Mobility", The New York Times, January 11, 2004.

[32] Firm-level empirical evidence shows that skilled labour is complementary with a cluster of factors including ITC and new products and services (Bresnahan, Brynjolfsson and Hitt, 2002).

[33] Technological innovation has accelerated among the OECD economies since the mid-1980s as measured by the surge in patenting activity, particularly in the US. Of the overall growth in patents granted by the US Patent office over 1992-99 period, ICT accounted for 31% and biotechnology for 14%.

innovation makes a significant contribution to output and TFP growth. Evidence shows that typically a 1% increase in the stock of R&D leads to a rise in output of 0.05-0.1%.[34] Studies also find a strong and significant link between R&D and productivity growth, with the private rate of return to R&D investment being estimated as 10-20% and because of knowledge spillovers social rate of return is found to be much higher, 20-50%. Second, there are significant knowledge and technology spillovers between firms, industries and countries. The evidence shows that for small open economies (SOEs) such as Canada, knowledge and technology spillovers from abroad have a larger impact on productivity than spillovers from domestic R&D.[35]

Although stronger evidence is needed, a host of research and innovation factors seem to be contributing to the mobility of S&T personnel in the 1990s (Guellec and Cervantes, 2002).

First, both the higher level and growth of R&D spending are key to creating increased employment opportunities for S&T graduates in advanced OECD economies. The overall investment in innovation capacity (measured by R&D expenditures) is much higher in the US and is rising rapidly in the OECD economies, notable countries include Sweden, Finland, Canada and Australia. The services sector in the new global economy is becoming increasingly innovative and contributing to increased demand for skilled workers such as ICT professionals. In Canada, for example, business expenditures on R&D has been growing faster in services than in goods-producing industries. In 2002, the share of research originating in services was about 35 percent, compared to 18 percent in the 1980s. The share in the US is about 20% and the OECD average is at 15%.

Second, the number of strategic alliances in regard to R&D and technical collaboration between firms has increased, particularly in areas such as ICT and biotechnology.[36] A major factor behind this development is the fact that in the new global economy innovation is both risky and costly, and, at many times, requires expertise that exists outside of the firm. To overcome these obstacles, firms form collaborative relationships, from informal sharing of information to more structured strategic alliances within the country to international alliances, with their suppliers, customers, consulting firms and even competitors. Collaboration and networking are now fundamental to the corporate strategies of firms. Innovation surveys confirm the importance of these channels to acquire knowledge and technology. Other channels include interaction with scientific institutions, integration of other firms through mergers and acquisitions; outsourcing; and mobility of high skilled workers.

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[34] Nicholson (2003), based on regression analysis of 21 OECD countries over 1971-98, finds that 0.1 percentage point change in business R&D as a percentage of GDP leads to an impact effect of greater than 1.2 percent on level of GDP per capital in steady state. Griffith, et al. (1998) show that R&D may play a different role in small and large economies. In large economies, R&D mainly accelerates of rate of innovation; in small economies, it facilitates technology transfer from abroad.

[35] Evidence for Canada also shows that the impact on productivity growth of investment in ICT and of international spillovers linked to import of IT goods is large (Gera et al. 1999).

[36] A number of studies on the biotechnology industry show that company's commerical success is closely linked to their connections with the scientific community (Darby, et al. 1999).

Third, OECD (2000) argues that start-up firms play an important role in the innovation process, as they are important sources of new ideas and innovations. The availability and forms of financing, such as venture capital, are of critical importance to innovative and entrepreneurial activity. Stephan and Levin (1999) find that the foreign born account for 25 per cent of the founders of start-up enterprises in the US biotechnology sector. Clearly, the climate for innovation plays an important role for the entrepreneur-minded S&T personnel to move abroad for business start-ups and self-employment.[37]

Fourth, industry clusters – the phenomena of same-industry firms locating in geographical proximity – tend to generate agglomeration economies i.e. positive spillovers between firms in the same industry (Porter, 1998). In the literature, entrepreneurship, linkages to a major and growing market, and the availability of skilled labour are identified as three key ingredients in the formation of a cluster (Bresnahan et. al., 2001). The reward to talent is higher in these locations and they attract more skilled workers. And, both native-born and skilled workers from abroad move to these locations in order to benefit from employment opportunities. MNEs cluster in particular locations due to common causes (i.e., proximity to demand, low-cost inputs etc.) and perhaps to access agglomeration economies flowing across firms.[38] This provides incentive for skilled labour to migrate.

OECD (2002) argues that the presence of high technology clusters, innovative industry and centres of excellence for scientific research are important magnets for attracting skilled labour. Based on the evidence from OECD surveys, Guellec and Cervantes (2002) note that much international migration of scientists and engineers is in fact highly localized around knowledge-intensive clusters (e.g. Silicon Valley), scientific research areas (e.g. biosciences) and R&D-intensive companies (e.g. Lucent Technologies). In an empirical study of biotechnology industry, Darby and Zucker (1999) find that a close relationship exists between the geographic location of the emergence of new biotechnology enterprises and the location of star scientists.

Fifth, the internationalization of R&D and innovative activities is an important component of the new global economy. The limited evidence on the allocation of R&D activities of MNEs shows that firms conduct R&D in countries where they produce. While there may be special purposes for a MNE firm to locate some of its research facilities abroad, a key explanation is to adapt their products to local conditions (Head and Reis, 2003; Fors, 1998; and Niosi, 1999).

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[37] A study by Saxenian (2000) shows that nearly a third of Silicon Valley's 1990 workforce was composed of immigrants, two-thirds of them from Asia, primarily China or India. Chinese and Indian engineers started 29% of Silicon Valley's technology companies over the 1995-98 period, up from 13% in the 1980-84 period.

[38] A key benefit of agglomeration, arising through external economies of scale, is that clusters promote technological transfers and knowledge spillovers as closer geographical proximity improves communication (Globerman, 2001). Evidence suggests that technologically-intensive industries tend to be more localized than other industries and that spillovers and information flow locally more easily than at a distance (Jaff et al. 1993; Audretsch and Feldman, 1996). An important implication is that personal contacts through conferences, trade fairs, seminars, or sales meetings, are a significant transmission mechanism.

Guellec and van Pottelsberghe (2001) present three new patent-based indicators of internationalization of technology reflecting international co-operation in research and the location of research facilities of MNEs. They find that the cross-border ownership of patents - share of joint patent applications by researchers residing in two different countries – has increased considerably in the 1990s. The evidence also shows that US patents have a larger, and more rapidly growing proportion of foreign co-inventors than those of Europe or Japan. The authors suggest that people generating these inventions and the ownership of these inventions have greater incentives for migrating abroad.

Sixth, temporary migration is often motivated by the quality of higher education and research, especially at the PhD level. The US experience illustrates that financial support for academic research activities is a major pull factor. OECD (2001), based on the evidence from National Science Foundation (1998), reports that more than 75 percent of the 10,000 foreign doctoral recipients at US universities in 1996 reported their university as the primary source of support for their graduate training. According to Statistics Canada, Survey of Earned Doctorates (2003), 17 percent of Ph.D. graduates from Canadian universities indicated that they have had definite plans to work or continue their studies (e.g., postdoctoral) in the US.[39]

1.4 Increased income and employment opportunities

Differences in labour market conditions, income and employment opportunities and career prospects have always been a major driver of international mobility of high skilled workers. And, this was very much true during the 1990s. In the US, for example, higher levels of productivity combined with the unprecedented period of economic expansion through the 1990s resulted in higher wages and salaries, notably at the higher skill levels and attracted skilled professionals from all over the world. Borjas (1994) argues that higher relative wages for skills tend to bias the composition of emigrants towards the highly skilled – a phenomenon characterized as "self-selection" bias.

In the case of Canada and the US, for example, a number of labour market factors may have contributed to the increased outflow of skilled Canadians to the US in the 1990s (OECD, 2003).

First, increased demand for skilled workers in the US resulted in higher wages and salaries, notably at the higher skill levels where the Canada-US wage gap is the greatest.[40] This led to emigration of highly skilled professionals in certain knowledge-

[39] A demonstration project for the Survey of Earned Doctorates was conducted by Statistics Canada from November 2002 to June 2003 with the cooperation and support of the University of Toronto and l'Université de Montréal (including HEC Montréal and École Polytechnique).

[40] In a study of wage structures over 1981-96 period in Canada and the US, Card (2003) concludes that the combination of declining average wages in Canada relative to the US, widening wage inequality in the US, and constant wage inequality in Canada imply that the economic incentives for emigration have increased for all Canadians, but especially for younger, highly educated Canadians. A recent study for Canada finds that the wage differential between more-educated and less-educated workers has increased substantially 1995 and 2000 (Boudarbat, Lemieux and Riddell, 2003).

intensive professions such as physicians, nurses, natural scientists and engineers to the US.

Second, higher returns to skills in the US than in Canada may also contribute to increased flows of high skilled from Canada to the US (Card, 2003). A study by Psacharopoulos and Patrinos (2002) also confirms that the average return to an extra year of education (in percent) is lower in Canada (8.9%) than in the US (10%). These numbers show the proportional impact on pre-tax wages of an extra year of education on average.[41] The phenomenon of higher return to skills combined to that of higher productivity in the US may have contributed to the outflow of skilled Canadians to the US.

Third, given the relatively larger size of the US labour market compared to the Canadian market, it offers a greater variety of outlets for job opportunities, particularly for those with specialized skills. According to the Survey of 1995 graduates who moved to the US, work-related factors that attracted them to the US include the greater availability of jobs in a particular field (44%), higher salaries (39%), chance to gain or develop skills (21%), better career advancement opportunities (16%) and lower taxes (8%).[42]

2.5 Changing individual preferences

A recent survey of Europeans of working age shows that as individuals' skills and qualifications increase they are keen to seek opportunities outside their home countries. This seems to be particularly true for those in younger age groups, where mobility is sometimes considered to be an important part of their personal development (PWC, 2002). The survey results vary between different groups of the population. For example, a much higher proportion of younger people would like to move than those in older age groups; single people are more inclined to move than married or living together; senior managers/directors are more inclined than those in other occupational groups; those on low incomes are slightly less keen to move; and a slightly higher proportion of men would like to move than women.

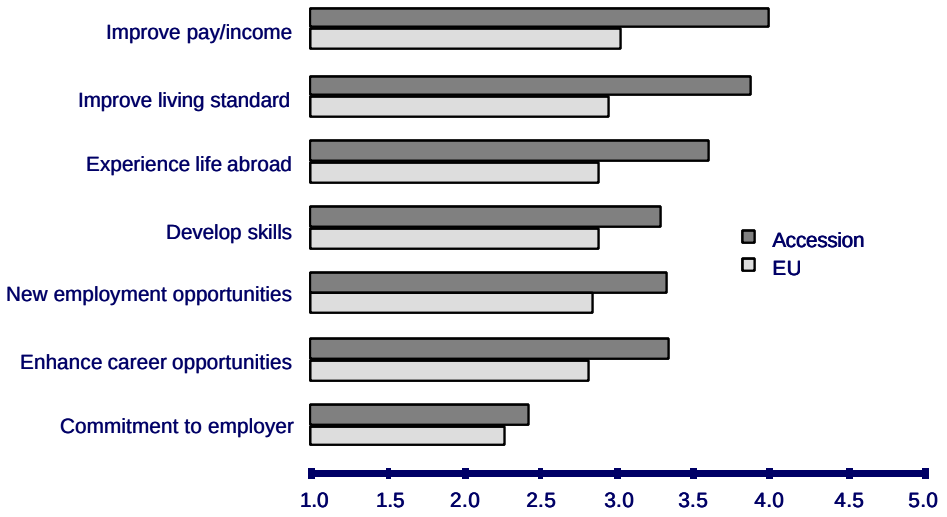
What motivates individuals to be internationally mobile? The survey results show, as Chart 2.1 illustrates, the two strongest motivators are to improve their pay and income

[41] In a recent paper, Collins and Davis (2003) argue that if education costs were more highly subsidized and returns to education more more heavily taxed in Canada, Canadian effective tax rates (ETRs) would not differ greatly from those in the US. However, there would be strong tax incentive to emigrate. The authors argue that policy initiatives aimed at reducing human capital ETRs in Canada will only have a payoff on the emigration front if they are directed at taxing returns less, rather than subsidizing costs more.

[42] Fourth, personal income tax rates are lower in the US than in Canada, particularly for high-income earners. Canadian emigrants in the higher income brackets do not perceive the higher public spending in Canada on health care, tertiary education and other social services as fully compensating the higher tax rates in Canada. A study by Wagner (2000) documents the influence of tax rates on the migration decisions of Canadians to the United States. The findings show that lower US taxes are a significant pull factor attracting Canadians to the US. He estimated that if Canadian and US taxes were identical, migration of university educated workers to the US would have decreased by 41 percent.

and to enhance their standard of living. Experiencing life abroad and development of skills are also significant motivators. Interestingly, the commitment to employer is of least importance as a motivator.

Chart 2.1 What motivates individuals to be internationally mobile?*



* Using a scale of 1 to 5 (where 1 means 'would not motivate at all' and 5 means 'would be major motivation') respondents were asked to what extent each of the factors would motivate them to live and work in another country.

Source: MORI survey for PricewaterhouseCoopers

2.6 Issues for discussion

- What are the underlying fundamental factors driving international mobility of skilled labour? How have they changed through time? How do these factors vary across different groups of skilled workers or by sector of activity?
- To what extent changes in the incidence of mobility do reflect adjustments in firms' requirements for labour mobility in the global economy or, instead, suggest changes in the structure of incentives or motivations for skilled individuals?
- Is increased economic integration through trade and FDI a factor driving the mobility of skilled labour? What are the mechanisms that would make mobility of skilled workers complementary to trade, FDI, R&D, technology and, more generally, innovation activities? Has greater service market integration lead to higher mobility of skilled workers?

3. Costs and Benefits of International Mobility of Skilled Labour

The mobility of skilled labour, at internal and international levels, has been a matter of concern to policy makers. While there is less debate on the benefits and costs of internal mobility of skilled workers at the national level, the international movement tends to create substantial concern to public and policy makers alike. This is largely due to the "brain drain" – a dominating public view. Concerns remain in the sending countries that a large scale and permanent loss of skilled workers will increase the gap in growth performance between rich countries and limit the ability to "catch up" in developing countries. (OECD, 2001a) The factor migration literature generally suggests small efficiency gains and strong distributional effects – the migrating factor and host country gain and immobile factors in the source country lose.[43] Subsequent research on the mobility of skilled workers has moved beyond the traditional brain drain perspective and argued that cross-border movement will not lead to a zero-sum outcome, although the distribution of costs and benefits may remain uneven.[44] Some countries may incur cost in the short run and possibly in the long run.

The new global economy perspective on labour mobility (i.e., the "Brain Circulation" view described in the previous section) emphasizes complementarity between increasingly mobile human capital and globalization of business activities such as MNE location, R&D and technology clusters, outsourcing, and increased trade in goods and services. According to this perspective, cross-border movement of skilled workers can generate benefits on a global basis by improving international flow of goods, services, and, more importantly, knowledge. Additional global benefits are possible through the formation of international research/technology networks and better jobs-skills matches.

In this section, a key objective is to enhance our understanding of the economic costs and benefits associated with international mobility of skilled workers beyond the brain drain literature.[45]

3.1 Aggregate welfare gains to skilled labour mobility

The literature on mobility of skilled workers suggests many channels through which potential welfare gains can be realized. The gains are made possible through increased specialization, human capital acquisition, knowledge spillovers, and risk redistribution.

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[43] Harris (2004) argues that results may be biased due to relatively small factor movements in recent history expressed relative to total labour force.

[44] While redistribution of gains between provinces/states is feasible within a country, the equalization issue is more difficult to deal with in the international context.

[45] For a comprehensive treatment of the issues, see a companion paper prepared for the February 27 Roundtable by Richard G. Harris.

Increased specialization

Wildasin (2003) suggests that international mobility of skilled workers will improve aggregate welfare of integrated economies in the same way as internal mobility of workers contributes to welfare gain in the domestic economy. To the extent that skill specialization is complementary to specialization in goods and services markets, a free mobility of labour gives way to overall efficiency gains. He argues that benefits of free mobility are derived via more efficient allocation of existing stock of specialized human capital as it flows from low productive regions to high productive regions in search of higher returns or improved job match.[46] Wildasin concludes that gross migration in general is efficiency enhancing[47], although the distribution of efficiency gains across regions remains uncertain. For example, a one-way flow between two regions can lead to an aggregate net gain, however, the gain to one region may incur at the expense of the other region. Conversely, it is possible that both regions can mutually gain from free mobility of workers if there is an exchange of specialized workers encompassing different skill sets. A brain circulation, thus, leads to higher growth rates through increased specialization and productivity.

The mobility of skilled workers enhances efficiency in knowledge production as it reduces R&D duplication and facilitates innovation. Furthermore, participation in global knowledge industries enables global knowledge workers to acquire access to international science and technology networks through which knowledge is shared and transferred. This bodes well both for the source and host countries.

The impact of an increased mobility of skilled workers on product specialization and trade could result in a sending country being left with less skill-intensive production, as reflected in an illustrative static general equilibrium model by Mercernier and Schmitt (2003). However, the outcome may be different if dynamic considerations of product specialization over time are introduced in the model. While not focusing on movement of workers per se, Mann (2003) illustrates that the mobility of the 'work' of skilled labour is playing an important role in changing specialization of production. She uses the example of the globalization of IT services, to show the shift of production from industrialized countries to developing countries[48] and argues that such industrial restructuring is the source of productivity growth across all countries.

Human capital acquisition

The economic impact of the mobility of skilled workers on human capital accumulation is contrary to the traditional brain drain view. In the new perspective, the

[46] Empirical evidence showing the efficiency-enhancing effect of labour mobility can be found in Hamilton and Whalley (1984), and Topel (1986).
[47] Return migration is another factor contributing to gross flows. OECD (2002) argues that skilled migration between advanced OECD countries is often temporary and the source country will benefit upon their return with their new technological competencies, valuable management experience, entrepreneurial skills and access to global networks.
[48] As developing countries increase their share of production of standardized IT products (for instance, semiconductor chips), the advanced economies move on to higher-value products (e.g. microprocessors) and find ways to use their technologies in more productive ways. The idea is along the line with product-cycle model in trade literature.

out-migration of skilled workers, in both temporary and permanent forms can increase human capital accumulation in the source country. Mobility of skilled workers increases international competition for scarce human capital, resulting in increased incentive to invest in human capital. In the sending country, returns to human capital rise. This generates incentives for higher rate of human capital acquisition (Wildasin, 2003; Harris and Schmitt, 2003; and Commander, Kangasniemi and Winters, 2002).[49] Findings from Beine, Docquier and Rapoport (2001) provide empirical support for "beneficial brain drain" growth effect for developing countries.[50]

Wildasin (2003) describes another mechanism where mobility tends to increase human capital investment. By enlarging the market size, where labour services can be sold, the risk of income-loss is minimized and the expected return of personal education investments increases. When workers are freely mobile, the risk of income-loss over their life cycle decreases allowing greater option value of employment opportunity. This positively influences individuals to acquire more human capital.[51] In this model, the impact of free mobility of skilled workers on human capital accumulation is positive for all countries.

Knowledge spillovers

Increased mobility of skilled workers facilitates knowledge creation and enhances cross-border knowledge spillovers. Such spillovers benefit both sending and receiving countries in the form of higher innovation, productivity and growth across industries. Brain circulation suggests small country benefits from two-way flow of knowledge workers. A number of recent studies show that spillovers associated with R&D expenditures are substantial. Coe and Helpman (1995) find that international R&D spillovers are of great importance, especially in small open economies (SOEs)[52]. The study shows that Canada is a recipient of large spillover effects from US, and more interestingly, global R&D plays an increasingly significant role than domestic R&D for productivity growth in Canada.[53] Similarly, Gera, Gu and Lee (1999) demonstrate that R&D spillovers in Canada are primarily international in scope. They also find that international R&D spillovers, particularly from the IT sector, contribute significantly to labour productivity growth across Canadian industries.

Despite the common consent on the economic benefits of knowledge spillovers, the mechanisms transmitting knowledge spillovers remain relatively unexplored and unknown (Audretsch and Feldman, 2003). The study notes that existing empirical evidence supports that university research laboratories are a key channel that transmits

[49] More benefit is added up when taken into account the positive external effect of human capital accumulation.
[50] Similar argument on beneficial brain drain due to human capital accumulation is also found in several studies which assume that there is some uncertainty about the ability to move abroad. See a survey by Commander, et.al. (2003).
[51] Even if an individual has no incentive to acquire more human capital, risk reduction is still beneficial due to expansion of opportunity set, thus larger option value.
[52] Eaton and Kortum (1999) show that even for large countries international diffusion of technology is a key factor in productivity growth.
[53] A number of studies by Bernstein find similar evidence for Canada (see, for example, Bernstein, 1994). A recent study by Keller (2001) also shows that spillover effects account for 97 percent of the total effect of technology on productivity growth.

innovation-generating knowledge to private enterprises. More recently, a body of research has identified entrepreneurship as another important transmission mechanism.

Risk redistribution

Mobility of labour is a channel in which risk bearing can be spread optimally across factors of production (Wildasin 2003). Greater mobility of skilled labour shifts the distribution of income-loss risk across factors of production, in particular from mobile workers to owners of immobile resources. There is a potential gain from optimal risk sharing by allowing income-loss risk to spread from risk-averse workers to relatively less risk-averse (immobile) resource owners. The gains due to risk re-distribution exist in theory, but empirical evidence remains to be investigated.

The literature on labour market integration suggests mutual gains from trade through increased division of labour and other possible beneficial effects such as faster rates of income and productivity convergence between nations or regions (see, for example, Harris, 2004b). Using a CGE model, Iregui (2003) estimates substantial worldwide efficiency gains – 13 to 59 percent of world GDP –from the elimination of global restrictions on labour mobility of both unskilled and skilled workers. However, when only skilled workers move freely the worldwide gains are smaller ranging from 3 percent to 11 percent of world GDP since skilled labour represents a small fraction of the labour force in developing regions.

3.2 Potential costs incurred by the sending economy

In the traditional brain drain perspective, the economic costs and benefits of mobility are in terms of changes in population size (scale effects).[54] As such, the migration of skilled workers is largely viewed as a zero-sum game among countries. When dynamic consideration and heterogeneity of labour are introduced, the costs may change due to the externalities generated over time. Harris (2003) argues that the costs for the country losing human capital arise from two distinct effects: (i) loss in human capital spillovers; and (ii) loss in human capital recipient capacity (which, to some extent, is necessary in absorbing international knowledge diffusion). In addition, there are associated costs to the sending country in terms of innovation gaps and divergence of income levels and productivity.

Loss in human capital spillovers

The idea is based on the notion of increasing returns to scale embodied in the form of "external effect of human capital" (Lucas, 1988). An implication of Lucas model is that a one-time transfer of human capital between countries could have a long-term effect of raising the income gap. The out migration of highly skilled people can reduce the growth potential, if the observed amounts of human capital transfer are significant

[54] The usual estimate of population-scale effect is based on human capital trade balance (head-counting).

enough to impact the average level of human capital in the sending economy. This effect may also generate an increased cost of human capital on those who do not migrate. Large outflows of skilled individuals could lead to lower returns to public investment in education, including fiscal externality in education (EEAG report, 2003). However, the loss of human capital spillovers due to mobility, as Harris (2004a) argues, is not large in Canada. His argument is based on the following two observations. First, the outflows of skilled Canadians to the US are of limited order of magnitude. Moreover, the evidence indicates that most of the change in the human capital levels in Canada versus the US over time is largely due to changes in the output of education sectors and educational attainment as opposed to migration.[55] Second, there is no consensus on the size of the human capital spillovers. Harris argues that they are extremely small.[56]

Reduced knowledge absorptive capacity

The effect refers to the loss in an economy's capacity to absorb international knowledge diffusion.[57] Skilled human capital is a key determinant of the capacity to successfully transfer technological knowledge from abroad. While skilled migration enhances global knowledge creation and spillovers, it may also lower the capacity to capture spillovers in the sending country.

According to Harris (2003), interaction between experts plays an integral role in the transfer of international knowledge in specialized scientific and commercial fields. To the extent, the best and the brightest – the so-called "superstars" are migrating, there may be a larger cost to the sending country.[58] For example, in the case of Canada - US, the capacity for innovation in Canada could be reduced and the rate at which international knowledge diffuses to Canada is limited.

Innovation gap

The EEAG report for the European Union (2003) highlights that an outflow of skilled professionals may encourage specialization of economic activity away from high-skill intensive sectors. A sending country could be left to specialize in medium-technology goods and suffer from an "innovation gap". The outflow of skilled workers leads to lower rents from innovation in the sending country and negatively impacts entrepreneurship, business formation and the long-term growth potential of an economy.

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[55] Harris (2003) cites Murphy, Riddle and Romer (1996) who point out that Canada had a higher rate of growth of skilled workers during much of the last two decades which led to a convergence in the human capital intensity of the two economies rather than a divergence.

[56] See, for example, Harris (2003). However, a survey of empirical works by Davies (2003) suggests the sizable effect of education externalities (including non-market externalities) that is large enough to justify the use of education subsidy to some extent. However, even based on Davies' study, current education subsidy could be large enough to compensate for the gap between social and private returns (in other words, these externalities are already taken into account).

[57] The literature concerning "absorptive capacity" or the firm's ability to utilize knowledge spillovers is small, but growing (Agrawal, 2002). Other factors identified as determinants of firm's absorptive capacity include connectedness (to other knowledge diffusing institutions and people), and investment in R&D.

[58] The superstars constitute exceptional individuals in specific areas. These include sportsmen, executive individuals, team leaders, innovators, and high-technology entrepreneurs. For more discussion on this issue, see Rosen (1982), and Shapiro and Varian (1999).

The adverse impacts could be much larger if the movers are from the "superstar" pool. The report argues that business formation in scientific and high-tech areas may be increasingly harmed by the outflow of top scientists. In support of its argument, the report cites a study by Zucker et. al (1994) which examines the geographical impact of "star scientists" on the birth rates of biotechnology enterprises. The findings show that controlling for measures of overall intellectual capital, the number of star scientists has a strong positive impact on business formation in the local economy.

Mercernier and Schmitt (2003) argue that that free mobility of skilled workers affects production specialization of trading partners and their pattern of trade. Through an illustrative static general equilibrium model, they show that an altered specialization could translate in a transfer of high-tech production between regions[59] that may adversely affect overall innovation rate in the country losing skilled workers. Clearly, more empirical work is needed in this area.

Convergence/Divergence of income levels, productivity, and regional development[60]

In a recent study, Harris and Schmitt (2003) address the question: what is the potential impact of increased labour mobility on the pattern of regional economic activity in a more integrated North American market? The authors suggest that there is no definitive answer. The new theories of trade and geography predict that in some circumstances, an increased mobility will lead to regional divergence in economic activity and income levels (Krugman, 1991).[61] Although, extended work on growth theory suggests the contrary – an increased mobility can lead to convergence in income levels and productivity (see Razin and Yuen, 1997a,b; Harris 2004a).[62]

Empirical evidence showing contribution of mobility of skilled workers to income convergence within economic unions is mixed. Harris and Schmitt (2003) note that early evidence from the US states and EU countries suggests that actual outcomes are different than those predicted by the new economic geographic models. The experience from the US states, where labour mobility is high, shows that income levels have converged but the pattern of industrial development is relatively uneven. In contrast, the evidence from

[59] Their simulation result also shows that the wage inequality between skilled and unskilled workers increases due to trade and globalization. This, in turns, creates incentives for skilled workers to migrate to take advantage of earning differentials.

[60] In a companion paper for the roundtable, Harris (2004b) deals with these issues at length.

[61] In the new economic models of firm localization, firms are attracted by factors derived from operating in close geographical proximity to each other; they are specialized suppliers of inputs, large pool of specialized workers, and knowledge spillovers. This happens largely because of the increasing returns to scale and circular causation effects. The theory predicts that, given low transportation costs, the size advantage of agglomeration leads to higher income growth and productivity as the 'core' region attracting more industries, leaving the rest on the 'periphery'. Factor mobility, thus, reinforces the core-periphery type outcome and provides further incentives for skilled workers to move to the industrialized core.

[62] Razin and Yuen (1997a,b) argue that capital mobility alone can induce convergence in growth rate but *not* in income level. To achieve income level convergence, the mobility of human capital is the key. As skilled workers move from low (real) wage to high wage country, rise in wages in the source country leads to higher rate of human capital accumulation. Higher levels of human capital and knowledge spillovers drive economic growth rates. The process persists until the steady state is reached where real wage per worker and level of human capital are equalized across regions and income and productivity level convergence is achieved. Using data from the US states and EU countries, they find some evidence supporting the income level convergence effects.

the EU, where labour mobility is considered low, suggests that income levels across countries vary but industrial patterns are more balanced.

In a recent study, Cousineau and Vaillancourt (2000) found that across Canadian regions, the overall internal migration rate decreased during the 1972 and 1994 period and that the internal migration cannot explain the actual convergence of regional per capita income.[63] The study notes that internal labour mobility still plays an important role in geographic allocation and reallocation of labour force in Canada. A more recent study by Coulombe (2003) shows that inter-provincial migration in Canada is high and it has had a substantial impact on the redistribution of human capital across provinces during the 1972-1996 period. The author also notes that interprovincial migration increases provincial differences in standard of living across regions. However, it remains unclear whether the divergence or convergence hypothesis is more relevant in explaining a more recent change in per capita income and the development of industrial structure within a North American context.

3.3 Issues for Discussion

There is a little empirical evidence on the costs and benefits associated with cross-country movement of skilled labour and the main factors conditioning them. As discussed above, there are reasons to believe that increased skilled labour mobility may be important for improving income, productivity levels and the standard of living of Canadians. The program of research under this block will propose to examine a number of mechanisms or channels through which increased skilled labour mobility may contribute to convergence or at least set in motion the process of convergence. Whilst omitting numerous questions of theoretical interest, below is an outline of research direction that would provide valuable inputs to the policy-making process in Canada.

- Is cross-country skilled labour mobility important for national/domestic economic performance? What are the channels?
- To what extent does increased international labour mobility encourage specialization, productivity, change the risks and returns to skill acquisition, and affect innovation volumes and firms location decisions? Under which conditions cross-border flows of skilled professionals could have a large effect on domestic economic performance?
- What are the analogies and differences between the assessment of the costs and benefits of skilled labour mobility within common labour market areas (e.g., the provinces of Canada) and those related to cross-country labour mobility? How important labour mobility has been for economic convergence or divergence within common labour market areas?

[63] Their empirical result suggests that technological-catch-up, not labour mobility, is the main contributor to achieving regional income convergence. Other significant factor includes federal government transfers.

4. International Mobility of Skilled Workers: Policy Issues

The discussion in Section 2 of the paper highlighted the key fundamental (e.g., non-policy driven) drivers of the international mobility of high skilled workers in the new global economy. These include, technological change, globalization through trade, FDI and technology, research and innovation, increased income and employment opportunities, and the changing individual preferences to be internationally mobile. In this section, we assess whether Canadian policy has kept pace with emerging developments in the new global economy. To this end, we ask the question: how policy has adjusted or should adjust to increased skilled labour mobility in the new global economy? Our discussion focuses on a selective set of Canadian policies such as immigration, trade, domestic labour market, and science and technology policies, although other policies such as tax and fiscal policy, and education policies have an equally important role to play. In a companion paper, Harris (2004b) discusses a broader set of Canadian policies as they relate to the international mobility of knowledge workers.

4.1 Immigration Policy[64]

At present, Canadian immigration policy affects three different routes of skilled migration; temporary foreign workers, permanent immigrants, and foreign students enrolled in post-secondary institutions.

First, Canadian policies toward temporary (non-immigrant) workers have been implemented mainly with the goal of meeting short-term needs of domestic labour market rather than facilitating the movement of workers across border. As a result, the inflows of temporary foreign workers to Canada are relatively modest compared to other OECD countries like the US, Australia, and New Zealand.[65] A significant institutional barrier can be traced to the legislative framework requiring that an individual who intends to work on a temporary basis in Canada must obtain a work authorization, which involves a very long process.[66] Only certain categories of workers (including those entering under NAFTA visas and other special arrangements) are exempted from this requirement.[67]

There have been changes in the 2002 legislation to speed up the authorization process and, more importantly, to facilitate entry of temporary workers to Canada. For example, the new Immigration and Refugee Protection Act (IRPA) extended the after-

[64] For a detailed overview of these policies, see Beach, Green and Reitz, 2003.
[65] See OECD (2003) and the discussion of inflows in Part 1.
[66] In order to obtain the work permit, the employer must give details of the job offer to HRDC, including a description of the duties, duration of employment, wages and working conditions, a statement of essential qualifications, and registrations or licenses that the applicant needs. An HRDC officer must confirm that the wages and working conditions associated with the job offer are standard for that type of employment, the job cannot easily be filled by a qualified and available Canadian or land immigrant, and that allowing a foreign national to fill the position is unlikely to have a negative effect on the Canadian economy and labour force.
[67] These include some commercial speakers, seminar leaders and guest speakers; some performing artists, students, athletes, sports officials, journalists and providers of emergency services; business visitors; and diplomats, consular officers and other representatives or officials of other countries.

sales servicing provisions under NAFTA to similar type of workers from all other countries. Moreover, under IRPA, certain skilled temporary workers can be granted permanent resident status from within Canada as a skilled worker immigrant rather than having to leave Canada to complete the immigration process.

Second, regarding permanent immigrants, many OECD countries have developed policies to encourage immigration of the highly skilled (McHale, 2002). For Canada, skill has been the key component considered in Canada's immigration selection policies since the early1990s. This contributes to an increase in skill-assessed immigrants.[68] Also the composition of immigrants has changed partly as a result of change in selection policies.[69] The dramatic change in source-country composition from European immigrants to those from developing countries, especially Asian countries is observed as a result of the change in admission policy that replace race-based selection with skill selection rules in mid 1960s. The new cohorts of immigrants have higher education than those landed earlier. The occupations declared by immigrants at entry (although not necessarily the same as the actual occupations taken after entry) have also shifted towards jobs with greater skill requirement. However, the average language skills of immigrants do not improve much over time, partly due to the change in source-country composition. (OECD, 2003)

Lastly, foreign students constitute an important source of skilled workers to Canada and other OECD countries. Their importance to the Canadian economy is two-fold; being potential skilled workers and enhancing Canada's educational sector.[70] Currently, foreign students can be allowed to work under certain conditions, and their spouses can obtain temporary work permits. Post-secondary foreign students are allowed to work on campus where they study without work permits. After graduation, they can apply to work in their fields of study for up to a year. Mobility of foreign students can be enhanced by more transparent procedures for equivalence of degrees or simplified conditions for obtaining student residence permits. Argument towards elimination of differential fees is also raised.[71] Though, little is known about costs and benefits to Canadians in eliminating (or reducing) these differential fees.[72]

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[68] During 1998-2002, more than 60% of total immigrants are admitted under "skilled workers" class. The average annual growth rate of immigrated skilled workers is around 10%, which is higher than the overall growth rate of immigration.

[69] Other factors influencing the composition of immigrants are discussed in non-policy drivers – Part 2 of this paper.

[70] According to the Expert Panel on Skills (2000) argues that foreign students, who are already familiar with Canada's economic and social culture, offer an attractive source of skills to Canadian employers. Similarly, CIC (2001) argues that foreign students "enhance Canada's educational sector, bring new ideas to institutions of higher learning, and generate a cultural richness on Canadian campuses and in Canadian schools and institutions. While in Canada, foreign students add to Canada's reputation as a global centre of excellence for higher education, research and training. Later, when they return to their home countries, these students may help build strategic international alliances, enhancing Canada's position in the global market place."

[71] Tuition fees for international students in most schools are substantially higher than those applied to domestic students. This, arguably, makes post-secondary education inaccessible to some potential foreign students.

[72] European countries have long used programs such as ERASMUS *Higher Education Programme Exchange* to encourage student mobility. In Nordic countries, NORDPLUS encourages exchanges among Scandinavian countries. More than 50 percent of Swedish students have taken part in one of these programs. A high degree of international mobility among Swedish students is due in part to the internationalization of its system of higher education (OECD: DSTI/IND (2003) 15).

4.2 Domestic labour market practices: Institutional impediments concerning skill recognition of foreign credentials and labour laws

Reducing institutional barriers to movement of skilled workers involves government actions, not only on an improvement of authorization process but also policies that can assist these workers to integrate into Canadian labour market successfully. The latter is related to two key institutional problems; these are (1) inadequate recognition of foreign credentials, and (2) multiplicity of jurisdictions regarding labour laws. These problems are not specific only to immigrants; they equally barricade prospective movers on temporary basis.

Inadequate foreign credential recognition

According to OECD (2003), there is some anecdotal evidence showing that the barriers in credential recognition are greater in Canada than in the U.S. This is partly due to relatively more strict regulations on professions and trades, and also more conservative attitude of Canadian employers towards foreign work experience. The problem of inadequate recognition of foreign credentials in Canada is partly reflected by the fact that the returns to education are lower for foreign-educated immigrants than for the Canadian-born (OCED, 2003). Similarly, foreign work experience, especially from developing countries, yields little returns in Canadian labour market. Organizations which regulate or license trades and professions may not recognize or be able to properly evaluate their credentials; there are similar issues to consider in non-regulated occupations. The result is that foreign skilled workers tend to be unemployed or underemployed in the Canadian labour market, this impacts subsequent flows of skilled migrants, whether temporary or permanent.

This inadequacy of foreign credential recognition is rooted in the imperfect transferability of the credentials and the asymmetric information about their actual worth.[73] The lack of adequate recognition generates social welfare loss to the economy. In addition, globalization trends make the transferability of occupational and educational credentials increasingly important. In this aspect, improvement in the institutional and regulatory framework surrounding foreign credentials is necessary.

Recognizing that barriers to mobility of skilled workers could generate welfare loss to the economy, the federal and provincial governments have responded to the credential recognition problem. To reduce imperfect portability and information uncertainty of foreign credentials, Canadian Information Centre for International Credentials (CICIC) was established in 1990. CICIC works as a national clearing-house and provides referral services to support recognition and transferability of educational and occupational qualifications between Canada and other countries. It also serves as a

[73] The low valuation of foreign education and work experience is also connected with the non-policy factors such as deterioration of the observable and unobservable "quality" of immigrants including language skills, and structural changes in skill requirement associated with labour demand in Canadian market that adversely and disproportionately affect immigrants. Another argument includes the outright discrimination, although there is very little evidence found. See OECD (2003), Chapter III.

link for Canadian academic and professional bodies to international organizations and to information centres around the world.[74] At provincial level, programs are set up to support credential evaluation services for certain professions.[75] In addition, some self-regulated professional organizations, such as the Medical Council of Canada and the Canadian Council of Professional Engineers, offer the evaluation of foreign credentials related to their specialties.

Multiplicity of jurisdictions regarding labour laws

The second key institutional barrier to skilled-labour mobility – the problem of multiplicity of jurisdictions regarding labour laws – affects both Canadian-born as much as foreign workers but can be more obstructive for the latter due to their lack of familiarity with the system (OCED, 2003). In Canada, diversity of provincial standards exists in such key areas as labour markets, financial markets, and the markets for some services. In 1995 an intergovernmental agreement -- the Agreement on Internal Trade (AIT) was established. It focuses on reducing trade barriers between provinces and territories and harmonizing inter-provincial standards. Under labour mobility chapter, restrictions on internal labour mobility were officially removed since July 2001. For example, all local residency requirements have been eliminated and the mutual recognition agreement on professional certification now covers 97 percent of regulated professional workers (OECD, 2003). Clearly, there is a recognition that the harmonization of regulatory standards in the labour market is the key step in moving towards freer movement of workers both domestically and beyond.

In his speech delivered to the Couchiching Institute on Public Affairs on the economic integration of North America, the Governor of the Bank of Canada stresses that resolving the domestic multiplicity of jurisdiction is the first step towards capturing the full benefit of deeper economic integration within NAFTA. Canada has a non-trivial problem in this regard. In Canada, for example, there are different criteria for professional certification of trade's people, different provincial securities regulations and different rules related to transportation. It is very important that we harmonize regulatory standards between provinces in Canada.[76]

Coordination and further implementation of these measures remain a challenge to governments, self-regulated bodies, as well as employers and employees. More research is needed on assessment and evaluation of these policy changes, such as the new immigration act, and how it impacts international mobility of skilled workers.[77]

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[74] See http://www.cicic.ca

[75] Ontario, Quebec, Alberta, Manitoba, and British Columbia

[76] Remarks by David Dodge, Governor of the Bank of Canada, to the Couchiching Institute on Public Affairs, August 7, 2003 (www.bankofcanada.ca/en/speeeches/2003/sp03-11.htm)

[77] In a comparative perspective, the EU countries also face similar barriers to labour mobility. A recent report on European survey of businesses has identified the key policy-related factors that business sees as hindering the free movement of workers in Europe. These include the lack of integrated EU-wide employment legislation, differences in tax and benefit systems, pensions, foreign credential recognition; and immigration procedures (PWC, 2002).

4.3 Trade policy and deeper economic integration in North America

Both the CUSFTA and NAFTA have brought major benefits to Canada. The performance of merchandise trade has been very good, while overall growth in service trade has improved a little, though particular service industries did benefit. FDI between the US and Mexico got a clear boost from NAFTA; a gain of 288 percent in two-way FDI stock between 1993 and 2001. In contrast, two-way FDI stock between Canada and the US increased by 135 percent between 1989 and 2001. The financial integration has also improved between Canada–US and US–Mexico through cross-border mergers and new corporate subsidiaries (Hufbauer and Schott, 2004).

However, to achieve the full benefits of economic integration, some further work remains to be done. This includes, elimination of all non-tariff barriers (such as countervailing and anti-dumping duties); broadening NAFTA coverage to include agricultural products; reducing the cost to industry of complying with a number of special rules, such as rules of origin; and closer integration of regulatory regimes in North America. The key issue for Canada, Dodge (2003) argues, is to reduce "border risk", that is, guarantee Canadian producers and service providers access to US markets without hassle and expense at the border as *borders still do matter.* He recommends a number of steps that could help in this respect: a common tariff – that is, a customs union and common border practices for imports from, and exports to, overseas markets; harmonization of trade and commercial policies and regulation; an end to the application of trade remedies within North America; and a uniform policy with respect to federal and state/provincial subsidies.

More importantly, from the US point of view, border security is an important element of deeper economic integration; security integration and economic integration are clearly linked.

Dodge (2003) argues that to realize real welfare gains from the NAFTA, further integration of labour markets must take place. Greater harmonization of policies and adoption of common licensing standards in North America are key to reducing barriers to cross-border mobility. However, this is a complex issue as it has serious implications for existing policies in areas such as the provision of health care and the regulation of public health and drugs, and immigration policy.

On the international trade front, policies affecting trade in services will certainly influence the movement of skilled labour internationally. An approach towards liberalization of the service supply modes under GATS[78] will reduce barriers to labour mobility. Cattaneo and Neilson (OECD, 2002) indicate that there exists economic gain from liberalization to all trading partners but the economic impact may vary between nations. They also suggest that studies on the economic impact remain inconclusive and more empirical works are in dire need.

[78] In particular for service providers or Mode 4, which is still under negotiation between WTO members.

4.4 Science and Technology (S&T) policies

To a large extent, Canadian government policies towards science and technologies has embraced the notion that the creation, diffusion and use of knowledge has been and will continue to be one of the main factors underpinning our long-term productivity performance. Canada has a significant "innovation gap' (Government of Canada, *Achieving Excellence*, 2002*)*. Canada's overall level of innovation capacity is near the bottom in the G-7. Over the past few years, Canada has been reinvesting in S&T and focusing on a number of new initiatives including reforming the organization and governance of universities and public research, support for private-sector R&D and innovation, promoting collaboration and networking among private and public sector organizations, promoting industry-science relations, and sponsoring programs to foster international collaboration in science. Some new infrastructure for research and innovation measures include the creation of the Canadian Foundation for Innovation, Canada's Networks of Centres of Excellence, Research Chairs and enhanced funding for the Granting Councils. Consistent with these efforts, the government has recently embarked on its Innovation Strategy. In 2002, the Government of Canada released Achieving Excellence and Knowledge Matters – the foundation pieces for its innovation strategy. [79]

Science and Innovation polices matter for the international mobility of skilled workers. The new infrastructure measures for research and innovation have fostered return migration of top Canadian talents. Some examples of anecdotal evidence are: (1) more than 150 scientists have come back to Canada from universities and institutes in the US, Europe and Australia in the last three years; (2) Canadian Research Chairs have attracted about 840 scientists and social scientists, including about 160 recruited from other countries.[80] Chinese Taipei and Ireland have also succeeded in attracting return migrants and fostering "brain circulation" in S&T professions.[81]

Obviously, a country's innovation performance is highly endogenous. It depends on a myriad of factors only a subset of which are subject to direct policy influence – e.g., support for R&D or higher education, flexible labour market policies, appropriate intellectual property regimes, etc. Clearly, these policies encourage international mobility of HRST. OECD (2003) argues that research employment is increasingly becoming more dynamic and involves greater collaboration between universities and private sector firms in the new global economy. Consequently, mobility of S&T personnel is becoming more important to matching supply and demand and diffusing knowledge. To foster mobility of researchers both at the national and international level, it is critical to reduce regulatory barriers and create incentives. Many OECD countries are taking a number of initiatives

[79] The government's strategy (www.innovationstrategy.gc.ca) is focused on four inter-related priorities: (1) Create and use knowledge strategically to benefit Canadians: promote the creation, adoption and commercialization of knowledge; (2) Increase the supply of highly qualified people: ensure the supply of people who create and use knowledge; (3) Work toward a better innovation environment of trust and confidence, where public interest is protected and marketplace policies provide incentives to innovate; (4) Strengthen communities: support innovation at the local level so our communities continue to be magnets for investment and opportunity.
[80] See, for example, Globe article by Anne McIlroy, Science Reporter, March 26, 2003.
[81] OECD/STP/(2002)34

for fostering the mobility of researchers. Examples include, regulations on dual employment or restrictions on participation in entrepreneurial activities are being removed; creating incentives for mobility between public research and business; competition for research funds; human resource management policies in business and public research institutions that reward mobility in career advancement.[82]

More importantly, there is clear need to coordinate science and innovation policies with migration policies to enhance the attractiveness of Canada as a destination for attracting S&T professionals.

4.5 Issues for Discussion

- To what extent changes in the patterns of movement of skilled labour have been supported by adjustments in policies and regulations towards mobility? Do recent movements in skilled labour mainly policy driven? Are barriers to mobility falling?
- Who contributes more to the measured human capital in Canada - skilled immigrants? Canadian-born? Is the strategy of attracting skilled immigrants a cost- effective way to increase human capital in the country (compared to a general policy option such as improving the post-secondary education)?
- What is the best way to attract skilled workers? Have Canadian immigration policies facilitated or hindered this process in the knowledge-based economy?
- What are significant regulatory and other barriers to some partial integration of Canadian and US labour markets?

[82] See, for example, OECD--DSTI/STP(2003)30, Oct. 14, 2003.

5. Summary and Conclusion

The main objective of the Government of Canada's Innovation Agenda, outlined in two of its key innovation documents – *Achieving Excellence* and *Knowledge Matters* - is to increase our capacity to innovate and to make Canada one of the most innovative nations in the world. In the knowledge-based economies of today, highly qualified workers are indispensable to an innovative economy. Reaching the goal of a more innovative Canadian economy requires that the skilled labour force is of sufficient quantity and quality to support the expansion of innovative activities by firms. Satisfying this key condition for the labour force poses challenges as highly skilled workers have become increasingly mobile and the market for some segments of highly skilled workers has become more global. Many industrialized countries compete strategically in attracting these workers. Therefore, in adjusting to new skill requirements, Canada must consider its performance in attracting skilled workers from the rest of the world and in retaining domestic talents.

Consequently, it has become increasingly important to understand key issues surrounding the international mobility of skilled workers in order to adopt the right policy approaches towards it. Attention must now turn towards improving our understanding of the issues such as what are implications of this new trend for the Canadian economy. Would facilitating cross-border mobility bring economic benefits to Canada?

This paper focuses on four key issues and identifies potential directions for future research. First, it examines the global trends in the international migratory flows of skilled labour and where Canada stands relative to other industrialized countries. Second, it discusses the fundamental (non-policy) drivers of the increased skilled migratory flows, especially among advanced countries. Third, it reviews the literature on the economic costs and benefits associated with cross-country movement of skilled labour and the main factors conditioning these costs and benefits. Finally, it assesses how policy in areas such as trade, immigration, labour market, and science and technology has adjusted or should adjust to increased skilled labour mobility in the global economy?

Our findings show that international mobility of high skilled workers has increased significantly in the last decade, particularly among temporarily migrating skilled professionals. Two observations are particularly notable: First, the mobility of skilled workers has increased among industrialized countries; and Second, there is some evidence on return migration from OECD countries to newly industrialized countries of Asia. In the North American context, the temporary outflow of skilled Canadians to the US under TN visa increased significantly in the 1990s, particularly during the 1997-2002 period. Labour market integration in the EU countries does not seem to have led to an increase in flows of workers between regions. Although, there is some evidence of an overall increase in mobility of workers within organizations; the relative importance of virtual and short-term assignments has increased significantly among the EU countries.

Measuring the scale of the international movement of highly skilled individuals remains a challenge. We need to have a better understanding of the pattern and direction of flows, and the characteristics of movers. We need answers to questions such as are skilled workers becoming more mobile globally than in the past? Are movements becoming more multi-dimensional (brain circulation) than in the past or do they tend to be one-way flows (brain drain)?

A recent European report points out that skilled labour mobility is becoming increasingly important to business as they are expanding their production and marketing activities globally (PWC, 2002). Our findings seem to be broadly consistent with this view. Our analysis suggests that mobility of skilled workers has increased in parallel to an increasing importance of technological change, globalization of production and integration of markets through international trade and FDI, location of MNEs, strategic alliances and networks with high-technology global firms and clusters of research and innovation, opportunities for high-technology entrepreneurship and the internationalization of R&D activities of national firms. Our findings also seem to suggest that increased income and employment opportunities, and career prospects and attractiveness of the education and research system coupled with the changing preferences of highly qualified personnel towards working abroad are also key drivers of international mobility of skilled workers in the new global economy.

Overall, there remain significant knowledge gaps and more research on the fundamental drivers of international mobility of skilled labour is clearly warranted. For example, we need to better understand the mechanisms that would make mobility of skilled workers complementary to trade, FDI, R&D, technology and, more generally, innovation activities.

A review of the literature on welfare economics of labour mobility suggests that there are many channels through which potential benefits of cross-border mobility of skilled workers can be realized by the participating economies. These are increased specialization of production, increased human capital acquisition, enhanced knowledge creation and cross-border spillovers, and risk redistribution. However, the distribution of benefits is likely uneven. And, some sending countries may incur cost in the short run and possibly in the long run. The potential costs may include loss in human capital spillovers, reduced knowledge absorptive capacity, and an increased innovation gap.

There is not much literature on the impact of labour mobility on economic convergence/divergence among integrated labour markets. Evidence from the EU countries and US states provides some support to the income levels and productivity convergence effects. In Canada where inter-provincial mobility is large, the evidence does not provide credence to the view that internal migration leads to the actual convergence of regional per capita income. More empirical evidence is clearly needed on the costs and benefits associated with cross-country movement of skilled labour and the main factors conditioning them. Further investigation on mechanisms or channels through which increased skilled labour mobility may contribute to convergence is also warranted.

Finally, we address the question: how policy has adjusted or should adjust to increased skilled labour mobility in the new global economy? The discussion examines a selective set of policies such as immigration, domestic labour market practices, trade and science and technology policies as they relate to the international mobility of skilled workers. A brief review of the Canadian immigration policy suggests that there have been a number of recent changes implemented and several proposals made on how to respond to current labour market needs and integration of immigrants to Canada. A critical question is what is the best way to attract and retain globally mobile skilled workers. How might Canadian immigration policy contribute to the mobility of skilled workers in ways which help realize greater efficiency gains in the domestic economy?

Our review of the domestic labour market policies suggest that both the federal and provincial governments have responded to the foreign credential recognition problem to facilitate the integration of immigrants into Canadian labour market. There is also a recognition that the harmonization of regulatory standards in the labour market is the key step in improving the mobility of labour both domestically and beyond. However, Canada has a non-trivial problem in this regard as there still remain different criteria for certification of trade's people, different provincial securities regulations and different rule related to transportation between provinces in Canada.

More importantly, as Dodge (2003) argues, if we were to think of a common North American labour market, greater harmonization of policies and adoption of common licensing standards in North America would be needed. However, this is a much more complex issue as it has serious implications for existing policies in areas such as the provision of health care and the regulation of public health and drugs, and immigration policy. Clearly we need to know more about the significant regulatory and other barriers to some partial/complete integration of Canadian and US labour markets. In the areas of trade and S&T policies, we need to understand better the impacts of these policies and deeper integration in North America on mobility of skilled workers in and out of Canada.

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