

Who wins and who loses in the contest for talent? Some descriptive evidence from OECD countries

- International Macroeconomic Governance
- Globalisation and financial stability
- The Integration of Markets for Trade in Goods and Services
- **Migration and the Mobility of Labour**

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High skilled migration into OECD countries has increased during the last decades. About 20 million immigrants with tertiary education resided in the OECD at the beginning of this millennium, representing about 11 per cent of the total highly skilled population living there. Using recently developed data sets on the skill composition of immigrants, this paper analyses the patterns of high skilled migration in OECD countries. While according to conventional wisdom rich countries tend to benefit from a ‘brain gain’ and poor countries tend to suffer from a ‘brain drain’, the findings presented here indicate that only few English-speaking destinations in the OECD which have adopted skill-selective immigration policies have actually benefitted from a brain gain. Most other OECD countries have either a balanced record of high skilled migration or are net senders of tertiary educated individuals. This is particularly true for the United Kingdom and most of the continental European countries. The available data indicates that these patterns are even more pronounced at the top of the skill distribution, i.e. among Phd-holders and among individuals in top occupations. About 50 per cent of the immigrants with a tertiary education degree in the OECD stem from other OECD countries, although this share tends to decline over time. Emerging economies from South- and South-East Asia and Eastern Europe become more and more important sources of high skilled immigration in the OECD. At the same time, the global pool of talent tends to increase. Relative to the increasing pool of talent, the current figures of high skilled migration look rather moderate. An important factor hindering high-skilled labour mobility is the limited transferability of human capital. The available evidence indeed suggests that considerable wage differences between natives and immigrants exist even at the top of the skill distribution if we control for covariates such as the area of study and occupational choice.



The PEGGED Collaborative Project is supported by the European Commission's Seventh Research Framework Programme, Contract no. 217559.
Project funded under the Socio-economic Sciences and Humanities theme.

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High skilled migration into OECD countries has increased during the last decades. About 20 million immigrants with tertiary education resided in the OECD at the beginning of this millennium, representing about 11 per cent of the total highly skilled population living there. Using recently developed data sets on the skill composition of immigrants, this paper analyses the patterns of high skilled migration in OECD countries. While according to conventional wisdom rich countries tend to benefit from a 'brain gain' and poor countries tend to suffer from a 'brain drain', the findings presented here indicate that only few English-speaking destinations in the OECD which have adopted skill-selective immigration policies have actually benefitted from a brain gain. Most other OECD countries have either a balanced record of high skilled migration or are net senders of tertiary educated individuals. This is particularly true for the United Kingdom and most of the continental European countries. The available data indicates that these patterns are even more pronounced at the top of the skill distribution, i.e. among Phd-holders and among individuals in top occupations. About 50 per cent of the immigrants with a tertiary education degree in the OECD stem from other OECD countries, although this share tends to decline over time. Emerging economies from South- and South-East Asia and Eastern Europe become more and more important sources of high skilled immigration in the OECD. At the same time, the global pool of talent tends to increase. Relative to the increasing pool of talent, the current figures of high skilled migration look rather moderate. An important factor hindering high-skilled labour mobility is the limited transferability of human capital. The available evidence indeed suggests that considerable wage differences between natives and immigrants exist even at the top of the skill distribution if we control for covariates such as the area of study and occupational choice.

Keywords: International migration, brain gain, brain drain, education, labour markets.

JEL code: F22.

Introduction¹

High skilled migration into OECD countries has increased during the last decades. About 20 million immigrants with tertiary education resided in the OECD at the beginning of this millennium, representing about 11 per cent of the total highly skilled population living there. Although highly skilled workers are more internationally mobile than less skilled ones, skilled migration is still a small phenomenon compared to other facets of globalisation. Besides its general low level, there are good reasons to believe that the contest for talent will intensify during the next few decades. Skill biased technological change and, perhaps to a lesser extent, the growing specialisation of developed countries in human capital-intensive activities will raise the demand for highly skilled labour. Highly qualified migrants can bring valuable skills which are in short supply and new entrepreneurial spirit. Ageing and the resulting pressures on the welfare states may also involve an increasing demand for highly skilled immigrants which create a net gain for public finances in destination countries (e.g. Boeri, Hanson and McCormick 2002; Boeri 2009; Bonin, Raffelhüschen and Walliser, 2002). Large and persisting earnings differentials and declining transport and communication costs are likely to result in growing migration flows between rich and poor countries, even if the current financial crisis may lead to a short-term reduction.

Thus, OECD governments are becoming more and more aware of the potential gains of adopting skill-selective immigration policies and more and more countries are redesigning their immigration systems to make them more skill-selective. The recent introduction in the United Kingdom of a point based system is just an example, and the recently adopted EU “Blue Card” is another. Still, in many destinations countries domestic pressure groups have been so far very successful in limiting the inflow of foreign skilled workers (Facchini, Mayda and Mishra, 2008). This entails that, while a “Battle for Brains” is currently beginning, it is far from having shown its full effects. Consequently, the incidence of highly-skilled migration is heterogeneous across high income countries. In fact English-speaking destinations, and especially those which have pursued an active skill-selective immigration policy, receive many more foreign highly skilled workers than all other OECD destinations. In addition, most OECD countries are even net senders of highly skilled workers.

The objective of this paper is to provide an overview on the patterns of high skilled migration in the OECD. Using recently collected data on the number of immigrants with tertiary education in the OECD, we describe the main trends in the immigration of highly skilled individuals from the receiving country perspective. In particular, we look at the balance of highly skilled migration within the OECD and between the OECD countries and other countries of the world.

Recent progress in the collection of data on the educational attainment of migrants facilitates the analysis of highly skilled immigration in receiving countries. Building upon the work of Carrington and Detragiache (1998), Docquier and Marfouk (2006), Beine, Docquier and Rapoport (2007), Dumont and Lemaitre (2005) and Defoort (2009) have constructed comprehensive data sets from population censuses on the educational level of immigrants in the OECD by country of origin, which enables this paper to outline the skill structure of the foreign-born population in the developed world. These data sets can be linked to the skill composition of the native population in the destination and sending countries, which in turn allows us to characterize the skill selectivity of migration both with respect

¹ This paper is part of the study “Understanding Highly Skilled Migration in Developed Countries: The Upcoming Battle for Brains” co-authored by Simone Bertoli, Giovanni Facchini, Anna Maria Mayda and Giovanni Peri. Paola Monti, Valentina Jung, Alexander Raatz, Markus Wilhelm and Michael Zibrowius provided excellent research assistance. Financial support by the “PEGGED project” funded by the European Commission and by the fondazione Rodolfo De Benedetti is gratefully acknowledged.

to the population in the receiving and in the sending countries (Section 1). Moreover, we can analyse the development of the pool of highly skilled workers in both developed and less developed countries, which forms the battle field of the contest for talent (Section 2).

Although the data sets described above enable us to draw a comprehensive picture on the mobility of highly skilled individuals, they suffer from a series of shortcomings, which limit in various ways the scope of the descriptive analysis carried out here. One important drawback is represented by the fact that the definition of highly skilled worker refers to tertiary educational attainment only, which represents a rather broad category ranging from individuals with practical and technical education degrees (e.g. nurses) to PhD holders. To have a more detailed picture, the data collected by Docquier and Marfouk (2006) and others is supplemented here with information on individuals with PhD degrees and completed university degrees in a selected number of countries from the population censuses. Moreover, this paper also analyses how many migrants are represented in top management and professional occupations in receiving countries in order to shed some light on the question of whether the battle for talent affects the recruitment of elites in the private and public sector (Section 3).

The admission of foreign students has become an increasingly important gateway for highly skilled immigration. A substantial part of the college graduates immigrating to Australia, Canada, the US and the UK move there for attending graduate study programs. Many countries have eased the access of foreign students to their university systems, and enhanced opportunities for working in host countries after the completion of the degree. In the EU, the Bologna process – among other measures – was specifically designed to encourage the cross-border mobility of students. This paper therefore also examines whether and to which extent the international mobility of students has increased at different levels of tertiary education (Section 4).

Not all the human capital of highly skilled immigrants acquired in the sending or receiving countries can be transferred into the host country labour markets. Analysing the phenomenon of the downgrading of skills and of the assimilation of high-skilled foreigners is beyond the scope of this descriptive study. Instead some data from the United States and Canada on the wage levels of immigrants and natives at the top of the skill distribution is provided here as a first indicator (Section 5). Finally, Section 6 concludes.

1 Highly skilled immigrants in the OECD

1.1 Sources and limitations of the data

The analysis in this section is based on the data set compiled by Beine, Docquier and Rapoport (2007), which is an updated version of the Docquier and Marfouk's (2006) data set. Since the data set is based on decennial censuses, the latest information available refers to the year 2001 for most countries. This data set distinguishes the immigrant population aged 25 and above by its educational attainment (tertiary, secondary, primary or less) and by country of origin, which makes it possible to approximate both the stock of highly skilled labour which has been attained from abroad in the receiving, and the stock of highly skilled labour which has moved abroad in the sending countries. The host country information is derived from national censuses, which usually take place every ten years. The source country information has been taken from the Barro and Lee (2000; 2010) data set which, however, does not cover all source countries. In case of missing countries, the skill distribution has been extrapolated from neighbouring countries with the closest human development index. The Beine, Docquier and Rapoport (2007) data set refers to the 1990 and 2000 censuses. To complement this cross-sectional information we use in addition a data set compiled by Defoort (2009), which provides for six destinations in the OECD information from 1975 to 2000 in five

year intervals, which enables us to describe the development of highly skilled immigration in the major destinations among OECD member states.

Although these data sets are an important step forward in providing comprehensive information on the skill structure of immigrants residing in the OECD, a number of caveats apply: First of all, the available information does not enable us to distinguish between education that has been acquired in the home or in the host country. Beine, Docquier and Rapoport (2007) try to circumvent this problem by providing information on the age of entry, which shows that recent arrivals have similar or higher education levels compared to those who have resided already for longer periods in the host country. Nevertheless, an accurate measure for the human capital acquired through immigration cannot be derived from macro data – this can only be taken from individual survey data (see Rosenzweig, 2005, for a discussion). Second, the distinction between tertiary, secondary and primary education levels is rather rough. In particular, the category tertiary education includes individuals with practical and technical education degrees; university degrees as well as those at the top of the skill distribution (see UNESCO, 1997, for a description of the ISCED classification which we adopt here). Moreover, since educational systems differ largely across countries, the information is not entirely comparable. We therefore provide in the later sections of this chapter detailed information on the top of the skill distribution. Third, human capital acquired in other countries may be not entirely transferable. The issue of the so-called ‘skill-downgrading’ will therefore be discussed at the end of this chapter. Fourth, and finally, these data refer to the stock of foreign residents and thus provide no information on return and circular migration, which is however particularly important in the case of highly skilled immigration. Again, this information can only be derived from micro data sets which follow migrants in host and home countries over time. However, it is worthwhile to note that the stock data used here covers both permanent and temporary migrants, albeit we are not able to distinguish these types of migration here.

1.2 The stock of highly skilled immigrants

Based on this data set, the stock of highly skilled immigrants in the OECD can be estimated at about 20 million individuals in 2000/2001, where we define highly skilled by tertiary educational attainment (i.e. academic or professional diploma beyond high school degrees). More than 50 per cent of those reside in the United States, another 22 per cent in Australia, Canada and New Zealand, i.e. the traditional immigration countries which pursue highly selective immigration policies. About 24 per cent reside in the EU and other Western European countries, most of those in the United Kingdom (6 per cent), Germany (5 per cent) and France (3 per cent). The Southern European countries attract only moderate shares (Spain: 1.4 per cent, Italy: 0.7 per cent). Altogether, the English speaking countries attract about 80 per cent of immigrants with tertiary educational attainment in the OECD (Table 1).

Table 1 **Immigrants with tertiary education in OECD countries, 2001**

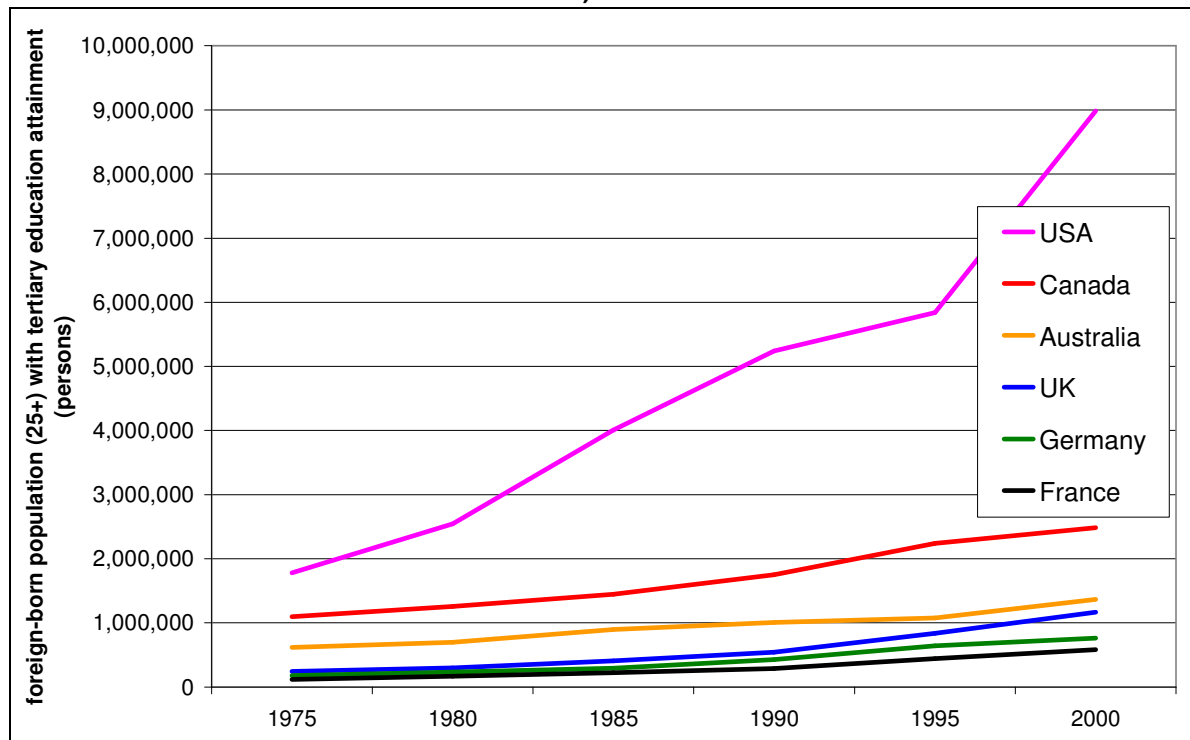
	stock of high-skilled immigrants ¹				(self-)selection indicators	
	persons	in per cent of			share of high-skilled in immigrant population relative to share of high-skilled in	
		all OECD-30 high-skilled immigrants	host country high-skilled population	host country immigrant population	host population ²	home population ³
Australia	1,638,052	8.02	43.76	40.27	1.35	4.47
Austria	103,211	0.51	11.77	12.65	0.84	0.96
Belgium	99,770	0.49	7.05	18.34	0.93	1.90
Canada	2,724,095	13.34	24.83	58.77	1.11	8.24
Czech Republic	46,988	0.23	na	11.45	na	0.85
Denmark	39,635	0.19	4.91	17.29	0.80	1.77
Finland	21,511	0.11	2.59	23.77	1.02	1.99
France	608,985	2.98	8.18	16.42	0.89	2.62
Germany	1,020,755	5.00	9.67	21.77	1.24	2.35
Greece	64,784	0.32	6.17	15.00	1.10	1.11
Hungary	12,545	0.06	1.50	11.61	0.97	0.36
Iceland	6,560	0.03	24.46	31.06	2.00	2.76
Ireland	115,721	0.57	25.59	41.15	2.12	3.00
Italy	142,418	0.70	2.27	15.44	1.05	1.65
Japan	267,370	1.31	1.21	28.05	1.17	3.87
Korea	45,971	0.23	0.88	38.13	1.48	4.49
Luxembourg	21,772	0.11	na	21.72	na	1.60
Mexico	81,954	0.40	1.56	44.87	3.97	2.62
Netherlands	393,891	1.93	16.16	21.97	1.00	2.55
Norway	63,904	0.31	8.46	28.69	1.16	3.07
New Zealand	217,854	1.07	21.36	40.89	0.98	4.33
Poland	103,496	0.51	3.80	13.96	1.26	1.10
Portugal	27,488	0.13	3.08	18.56	1.47	4.37
Slovakia	5,913	0.03	na	15.17	na	0.90
Spain	294,040	1.44	6.38	18.54	1.14	1.53
Sweden	195,869	0.96	13.66	25.69	1.11	2.53
Switzerland	280,075	1.37	33.98	18.60	1.16	1.52
Turkey	148,689	0.73	5.18	21.49	2.53	1.38
United Kingdom	1,233,421	6.04	15.93	34.95	1.83	7.08
United States	10,400,000	50.91	11.27	42.62	0.85	5.74
OECD-30	20,426,737	100.00	10.45	35.06	1.31	3.37

1) Share of high skilled individuals, i.e. individuals with attained tertiary education (ISCED 5A, 5B, 6) in 25+ aged population.-- 2) Ratio of share of high skilled individuals in immigrant population to the share of high skilled individuals in host country population.-- 3) Ratio of the share of high skilled individuals in immigrant population to the share high skilled individuals in home country population weighted by the number of migrants from the respective home country.

Sources: Data sources Beine et al. (2007), Defoort (2009); own calculations of shares and indicators.

Not surprisingly, the share of immigrants in the population with tertiary educational attainment is extremely high in those countries which pursue a highly skill-selective immigration policy: The share of foreign-born individuals in the population with tertiary education amounts to 43 per cent in Australia, 24 per cent in Canada and 21 per cent in New Zealand. However, there are also some other destinations for which immigrants represent a large proportion of the skilled population: Switzerland (35 per cent), Iceland (25 per cent) and Ireland (25 per cent). In the US, the share is at about 11 per cent, and this is due - at least partly - to the high share of individuals with tertiary educational attainment among the native population there and to the large inflows of illegal immigrants from Mexico. In Europe, the share of immigrants in the highly skilled population is - beyond Iceland, Ireland, and Switzerland - relatively large in the UK (16 per cent), Sweden (14 per cent) and Austria (12 per cent), while skilled immigration is much less important in Italy and the other Southern European countries.

Figure 1 **Foreign-born population with tertiary education attainment in selected destination countries, 1975-2000**



Sources: Data source Defoort (2009); own calculations.

The data set compiled by Defoort (2009) allows analysing the long-term trends in highly skilled migration for selected OECD countries. Note that these countries cover more than 85 per cent of the highly skilled immigrant population in the OECD.² As Figure 1 shows, the stock of highly skilled immigrants has increased by a factor of 5 in the US, from 1.8 million in 1975 to 9 million in 2000, while in the other traditional immigration countries (Canada, Australia) the increase has been only relatively moderate, as the stock of highly skilled immigrants has grown there only by a factor of 2. The European destinations played only a negligible role in the 1970s, but the stock of highly skilled has grown by a factor of 5 there until the 2000s.

1.3 Are immigrants favourably selected with respect to observable skills?

As a first hint to the skill bias in the immigrant population we have computed the share of highly skilled individuals among the immigrant population (see the fourth column of Table 1). Again, this share is extremely high in destinations which pursue selective immigration policy (Australia, New Zealand, and Canada) or at least some skill-selective immigration policies (US, Ireland and UK). Some of the relatively poor destination countries in the OECD (Mexico, Korea) also achieve relatively high shares of highly skilled individuals in the immigrant population, while those shares are rather low in the Southern European countries (Italy, Spain, Greece, and Portugal).

We present below two indicators to describe the skill selectivity of the immigrant workforce in some further detail. The first indicator, I_1 , divides the share of highly skilled individuals in the immigrant population by the share of the highly skilled in the native population:

$$I_1 = \frac{s_m^h}{s_n^h},$$

² Note that the Defoort (2009) data set is due to different data sources and methodologies not entirely comparable to the Beine, Docquier and Rapoport (2007) data set employed in Table 1.

where s_m^h is the share of highly skilled individuals in the immigrant population aged 25 and above in the host country, and s_n^h is the share of highly skilled individuals in the native population in the same age group. This first indicator gives us information on whether immigrants are positively selected on observable skills with respect to the host country population.

The second indicator, I_2 , divides the share of the highly skilled in the immigrant population by the share of the highly skilled in the sending country population and weights these shares by the share of a sending country in the immigrant population of a certain destination:

$$I_2 = \sum_{i=1}^{i=N} m_i \frac{s_{m,i}^h}{s_{n,i}^h},$$

where $s_{m,i}^h$ is the share of highly skilled individuals in the immigrant population aged 25 and above from sending country i , $s_{n,i}^h$ the share of highly skilled individuals in the same age group in sending country i and m_i the share of immigrants from sending country i in the total immigrant population of the host country. Finally, $i = 1, 2 \dots N$ denotes the sending country index. Thus, the second indicator measures the skill bias of the immigrant population relative to the source country population. In both cases, an index above 1 indicates that the immigrant population is positively selected relative to the host country or the source country population, while an index below 1 indicates a negative selection bias.

We find that the share of the highly skilled among the immigrant population is higher than that of the native population of the OECD in the aggregate and much higher than that of the native population in the sending countries, as the last two columns of Table 1 show. However, aggregates may hide interesting differences across countries. We observe a positive selection bias relative to the destination country population in some but not all countries which pursue a highly selective immigration policy (Australia, Canada), in countries which have relatively recently attracted large numbers of immigrants (Ireland, Iceland, the UK) and in some countries where the share of the highly skilled is relatively low in the native population (e.g. Germany). A negative selection bias relative to the destination country's population is found instead in some continental European countries (Austria, Belgium, France), and, interestingly enough, in the US. In the latter case this can be traced back inter alia to the high share of highly skilled individuals in the native population.

The last column of Table 1 shows a strong skill selection of immigrants in the OECD relative to the home country population. On average, the share of highly skilled individuals in the immigrant population of the OECD exceeds that in the source country population by a factor of 3.4. The selection bias is particularly high in Canada (8.2), the UK (7.1), the US (5.7) and Australia (4.5), while it is low in some continental European countries such as Austria, Belgium, and Germany.

Interestingly enough, the skill composition of the immigrant population in the OECD is extremely balanced by gender. Among the 20.4 million immigrants with tertiary educational attainment, almost 50 per cent are females. This holds also true for most destination countries in the OECD. Substantially larger shares of males in the highly skilled immigration population can be observed in Germany, France, Austria, Belgium and Mexico, i.e. destinations which receive a high share of immigrants from sending countries with strong gender discrimination in higher education. In contrast, Italy, Spain, the Netherlands and Japan receive larger shares of females, which can be attributed, inter alia, to the fact that females are better represented in the educated population of the source countries there.

Table 2 **Source countries of highly skilled immigrants in the OECD by income level, 2001**

	stock of high-skilled immigrants ¹				
	all home countries	home country group share by income level ²			
		high	upper middle	lower middle	low
	<i>persons</i>	<i>in per cent</i>			
Australia	1,638,052	53.85	17.57	20.87	7.72
Austria	103,211	46.14	37.40	15.40	1.06
Belgium	99,770	71.72	8.58	14.23	5.46
Canada	2,724,095	45.17	20.01	26.66	8.16
Czech Republic	46,988	63.92	18.78	14.23	3.07
Denmark	39,635	52.98	16.14	23.92	6.96
Finland	21,511	37.48	46.37	11.29	4.87
France	608,985	39.65	14.73	32.39	13.23
Germany	1,020,755	38.72	37.05	18.10	6.14
Greece	64,784	26.88	19.07	51.78	2.26
Hungary	12,545	64.78	35.22	0.00	0.00
Iceland	6,560	68.95	12.37	10.19	8.49
Ireland	115,721	80.81	7.27	6.98	4.94
Italy	142,418	38.19	21.56	34.20	6.06
Japan	267,370	49.67	9.80	37.39	3.14
Korea	45,971	45.63	8.39	35.08	10.90
Luxembourg	21,772	86.93	6.44	4.81	1.82
Mexico	81,954	63.75	26.44	9.24	0.58
Netherlands	393,891	46.82	17.16	32.01	4.00
Norway	63,904	61.07	12.04	18.71	8.18
New Zealand	217,854	64.54	14.33	18.03	3.10
Poland	103,496	14.02	42.44	42.70	0.84
Portugal	27,488	45.36	25.80	22.27	6.57
Slovakia	5,913	7.14	77.41	12.68	2.78
Spain	294,040	39.02	34.17	24.96	1.85
Sweden	195,869	43.48	25.73	25.89	4.91
Switzerland	280,075	68.51	17.42	11.00	3.08
Turkey	148,689	36.94	50.68	10.84	1.54
United Kingdom	1,233,421	46.21	14.06	19.30	20.43
United States	10,400,000	28.67	30.29	31.11	9.93
OECD-30	20,426,737	37.72	25.69	27.40	9.20

1) Share of high skilled individuals, i.e. individuals with attained tertiary education (ISCED 5A, 5B, 6) in 25+ aged population.-- 2) Income levels of home countries are classified by using the income classification of the World Development Indicators.

Sources: Data sources Beine et al. (2007), own calculations.

1.4 Where do highly skilled immigrants come from?

Almost two-fifths of the highly skilled immigrants in the OECD come from other high income countries. Table 2 groups the source countries by the income level of the source countries, and Table 3 by regional groups of source countries, using the classifications of the *World Development Indicators* by World Bank (2008).

According to this classification, only 9 per cent of the highly skilled immigrant population in the OECD is born in low income countries, 27 per cent in lower-middle income countries such as China and

India, 26 per cent in higher-middle income countries such as Mexico, Northern Africa and Russia, and 38 per cent from high income countries in the OECD and other high income countries such as the oil-producing countries in the Middle East (Table 3.2).

Table 3 **Source countries of highly skilled immigrants in the OECD by region, 2001**

	stock of high-skilled immigrants ¹							
	home country group share by region ²							
	high income ³	Latin America, Carrebean	Eastern Europe, Central Asia	East Asia, Pacific	South Asia	Middle East, North Africa	Subsaharan Africa	Unknown
	<i>in per cent of all high skilled immigrants</i>							
Australia	51.95	2.17	7.00	17.11	8.39	4.41	4.68	4.30
Austria	45.32	1.22	37.13	2.62	1.30	9.45	0.85	2.11
Belgium	71.75	2.51	5.76	2.76	1.40	8.87	6.91	0.04
Canada	45.22	8.97	11.45	14.99	9.48	5.81	4.09	0.00
Czech Republic	63.28	0.58	28.49	2.93	0.54	2.18	0.89	1.11
Denmark	52.74	2.74	16.54	4.59	4.12	14.74	3.81	0.70
Finland	35.89	1.53	44.22	3.19	1.64	5.30	3.67	4.57
France	39.66	3.77	7.77	5.48	2.66	28.70	11.95	0.02
Germany	39.70	3.36	30.70	4.42	4.22	15.46	2.13	0.00
Greece	26.89	0.76	61.32	1.26	0.88	6.88	1.94	0.07
Hungary	32.48	0.00	17.66	0.00	0.00	0.00	0.00	49.85
Iceland	68.93	2.20	22.47	2.00	1.33	1.17	1.88	0.03
Ireland	77.95	0.41	4.18	3.84	3.18	1.16	5.75	3.54
Italy	38.27	10.51	23.41	6.28	3.66	12.38	5.38	0.11
Japan	49.39	11.56	0.45	33.60	3.58	0.43	0.43	0.57
Korea	39.97	0.00	0.00	38.51	9.12	0.00	0.00	12.40
Luxembourg	86.69	1.57	4.95	1.42	0.38	2.70	1.98	0.31
Mexico	63.38	30.45	2.72	1.08	0.44	1.14	0.21	0.58
Netherlands	47.25	10.04	7.94	22.60	2.10	6.85	3.22	0.01
Norway	61.10	3.36	10.66	6.72	5.98	7.28	4.85	0.05
New Zealand	63.76	0.62	2.63	12.07	11.26	1.57	6.80	1.29
Poland	13.51	0.00	80.86	0.93	0.00	1.03	0.00	3.67
Portugal	45.37	19.45	18.52	0.91	0.93	1.06	13.77	0.00
Slovakia	5.74	0.63	69.53	1.71	0.63	1.41	0.64	19.71
Spain	38.22	39.65	6.36	1.54	0.65	9.68	1.85	2.05
Sweden	42.61	5.30	23.37	3.33	2.51	17.64	3.08	2.16
Switzerland	64.98	4.34	12.26	2.73	1.77	5.72	2.56	5.63
Turkey	36.56	0.00	55.95	0.28	0.42	4.46	0.00	2.33
United Kingdom	46.22	4.80	3.06	4.44	17.29	4.95	19.23	0.00
United States	28.56	27.20	7.70	19.32	8.85	4.49	3.29	0.60
OECD-30	37.49	17.11	10.27	15.21	8.17	6.19	4.62	0.94

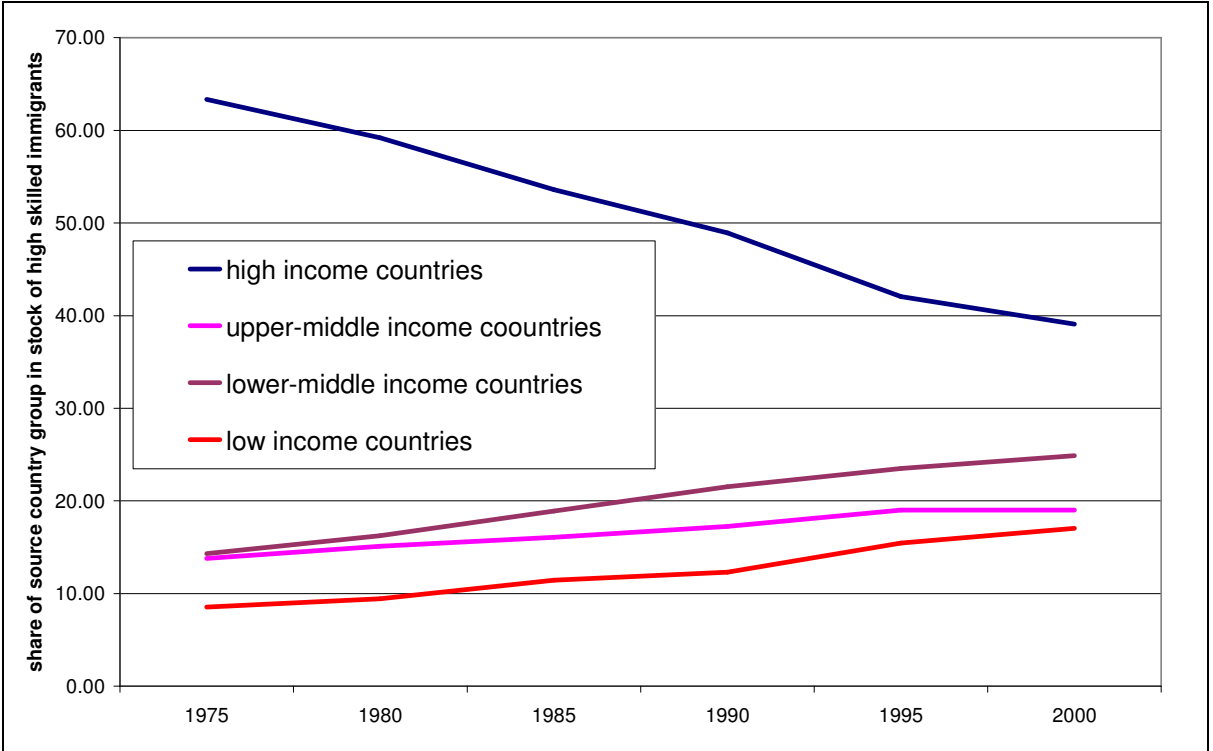
1) Share of high skilled individuals, i.e. individuals with attained tertiary education (ISCED 5A, 5B, 6) in 25+ aged population.-- 2) Regions of home countries are classified by using the definitions of the World Development Indicators (WDI).-- 3) High income regions comprise high income OECD and other high income countries, e.g. Gulf countries.

Sources: Beine et al. (2007); own calculations.

Beyond the high income countries, the largest sending region for highly skilled immigrants is Latin America and the Caribbean (17 per cent), followed by East Asia and the Pacific (15 per cent) and Eastern Europe (10 per cent). In contrast, the share of Sub-Saharan Africa is, at 4.6 per cent of all highly skilled immigrants in the OECD, negligible (Table 3).

The importance of high income countries as a source of highly skilled immigrants has been substantially declining in the six main receiving countries of the OECD over the past four decades: While two-thirds of the highly skilled immigrants in Australia, Canada, France, Germany, the US and the UK were born in high income countries in 1975, this share had declined to less than 40 per cent by 2000. At the same time, the share of the low income countries has increased from 9 to 17 per cent, and that of the middle income countries from 28 per cent to 44 per cent (see Figure 2.2). In particular, the stock of highly skilled immigrants from lower-middle income countries in South and East Asia has surged during the last decade.

Figure 2 **Share of source countries in highly skilled immigrant stock by income level, 1975-2000**



Sources: Data source Defoort (2009), own calculations.

1.5 The competition for talent across OECD countries: who wins, who loses?

The OECD countries are at the same time important destinations for and origins of highly skilled migrants. Table 4 reports estimates of both the highly skilled immigrant population which each country receives from other OECD countries, and the highly skilled emigrant population from this country which lives in another OECD country. Interestingly enough, only seven OECD countries are net recipients of highly skilled individuals in the OECD: the US (+3.4 million), Australia (+708,000), Canada (+643,000), Switzerland (+97,000), Belgium (+60,000), Sweden (+20,000) and Luxembourg (+8,000). Thus, not only the relatively poorer OECD member states like Mexico and Turkey, but also most Western European countries are net senders of highly skilled labour to other OECD countries, particularly to the United States. In some cases the net losses are sizeable, like the United Kingdom (-970,000), Korea (-594,000), Germany (-370,000) and Italy (-340,000). Interestingly enough, New Zealand, a country which pursues a highly skill-selective immigration policy, and usually perceived as

one of the winners of the *Battle for Brains*, sends also to other OECD countries more highly skilled individuals than it receives from them.

Table 4 **Immigrant and emigrant population with tertiary education in OECD countries, 2001**

	stock of high-skilled immigrants			<i>memo item:</i> stock of other high-skilled immigrants in country
	from OECD-30 in country	from country in OECD-30	difference	
Australia	826,301	117,865	708,436	811,751
Austria	64,537	130,146	-65,609	38,674
Belgium	73,914	13,738	60,176	25,856
Canada	1,166,275	523,461	642,814	1,557,820
Czech Republic	6,345	70,449	-64,104	40,643
Denmark	23,612	67,889	-44,277	16,023
Finland	8,300	72,594	-64,294	13,211
France	240,867	310,751	-69,884	368,118
Germany	566,185	936,520	-370,335	454,570
Greece	15,575	161,667	-146,092	49,209
Hungary	2,950	123,289	-120,339	9,595
Iceland	4,270	7,125	-2,855	2,290
Ireland	90,668	228,141	-137,473	25,053
Italy	57,515	395,229	-337,714	84,903
Japan	132,097	278,268	-146,171	135,273
Korea	18,375	612,937	-594,562	27,596
Luxembourg	13,987	6,419	7,568	7,785
Mexico	51,235	949,330	-898,095	30,719
Netherlands	170,422	254,730	-84,308	223,469
Norway	41,265	44,067	-2,802	22,639
New Zealand	135,201	174,870	-39,669	82,653
Poland	14,957	454,557	-439,600	88,539
Portugal	12,197	145,765	-133,568	15,291
Slovakia	3,436	24,097	-20,661	2,477
Spain	111,450	154,650	-43,200	182,590
Sweden	100,706	80,553	20,153	95,163
Switzerland	189,274	92,554	96,720	90,801
Turkey	53,683	174,687	-121,004	95,006
United Kingdom	511,030	1,478,474	-967,444	722,391
United States	3,804,292	426,099	3,378,193	6,595,708
OECD-30	8,510,921	8,510,921	0	11,915,816

1) Share of high skilled individuals, i.e. individuals with attained tertiary education (ISCED 5A, 5B, 6) in 25+ aged population.--

Sources: Data source Beine et al. (2007); own calculations.

Nevertheless, these losses can be compensated by the immigration of highly skilled individuals from other origin countries. Indeed, according to our data about 11.9 million highly skilled individuals from non-OECD countries resided in the OECD in 2001. However, 9 million of these reside in Australia, Canada and the US, i.e. in those countries which are the main net recipients of highly skilled migrants in the OECD anyway. Consequently, even if we consider the high-skilled immigrant population from

non-OECD countries, 17 out of 30 OECD countries send more highly skilled individuals to other OECD countries than they receive from OECD and non-OECD countries (Table 4).³

To sum up, the global contest for talent is not won by the OECD or the high income countries as such. The real winners are the United States and some other English-speaking countries which pursue highly selective immigration policies, such as Australia and Canada. The United Kingdom, some continental European countries and Korea are instead the main losers. Moreover, relatively poor countries in the OECD at the periphery such as Mexico and Poland are important net senders of highly skilled migrants.

2 How large is the global pool of highly skilled labour?

A talent contest can unfold only if the pool of highly skilled labour is supply-constrained. To analyse this issue, once again we define individuals as highly skilled if they have attained a tertiary education level. As Table 3.5 shows, the world-wide supply of individuals with tertiary education amounts to 338 million. 191 millions or 56 per cent of those reside in high income countries, 17 per cent in upper-middle income countries, 24 per cent in lower-middle income countries and 3.5 per cent in low income countries (Table 3.5).

Table 5 **Total population and immigrants with tertiary education by country groups, 2001**

	pool of high skilled 25+ population			high-skilled immigrants in OECD-30	
	thousand persons	in per cent of global stock of high-skilled population	home population	thousand persons	in per cent of home country stock of high-skilled population
<i>by income groups</i>					
high income countries ¹	190,728	56.41	29.09	7,706	4.04
upper middle income countries	55,889	16.53	11.56	5,200	9.30
lower middle income countries	79,761	23.59	4.90	5,475	6.86
low income countries	11,729	3.47	2.82	1,862	15.88
total	338,107	100.00	10.62	20,435	6.04
<i>by region</i>					
high income countries ¹	190,728	56.41	29.09	7,706	4.04
Latin America and Carrebean	29,978	8.87	12.05	3,485	11.63
Eastern Europe and Central Asia	28,174	8.33	11.37	2,092	7.43
East Asia and Pacific	42,174	12.47	4.23	3,096	7.34
South Asia	28,073	8.30	4.31	1,663	5.92
Middle East and Northern Africa	11,793	3.49	8.41	1,260	10.69
Subsaharan Africa	7,187	2.13	2.96	941	13.09
total	338,107	100.00	10.62	20,435	6.04

1) High income countries comprise the high-income OECD countries and other high income countries according to the WDI classification.

Sources: Data sources Beine et al. (2007); Defoort (2009); Barro/Lee (2000); own calculations.

This pool has been increasing over time. The global number of individuals with tertiary education has grown from 93 millions in 1975 to 319 millions in 2000, or by a factor of 3.4 in 25 years. During the same period of time, the world population grew from 4 to 6 billion people, i.e. by a factor of 1.5.⁴ In the high income countries, the labour supply of the highly skilled has grown at a factor of 2.9 less

³ Unfortunately, we cannot calculate the difference in the stock of highly skilled immigrants from abroad and of highly skilled natives residing in other countries properly since data on highly skilled migrants from OECD countries residing in non-OECD countries are unavailable.

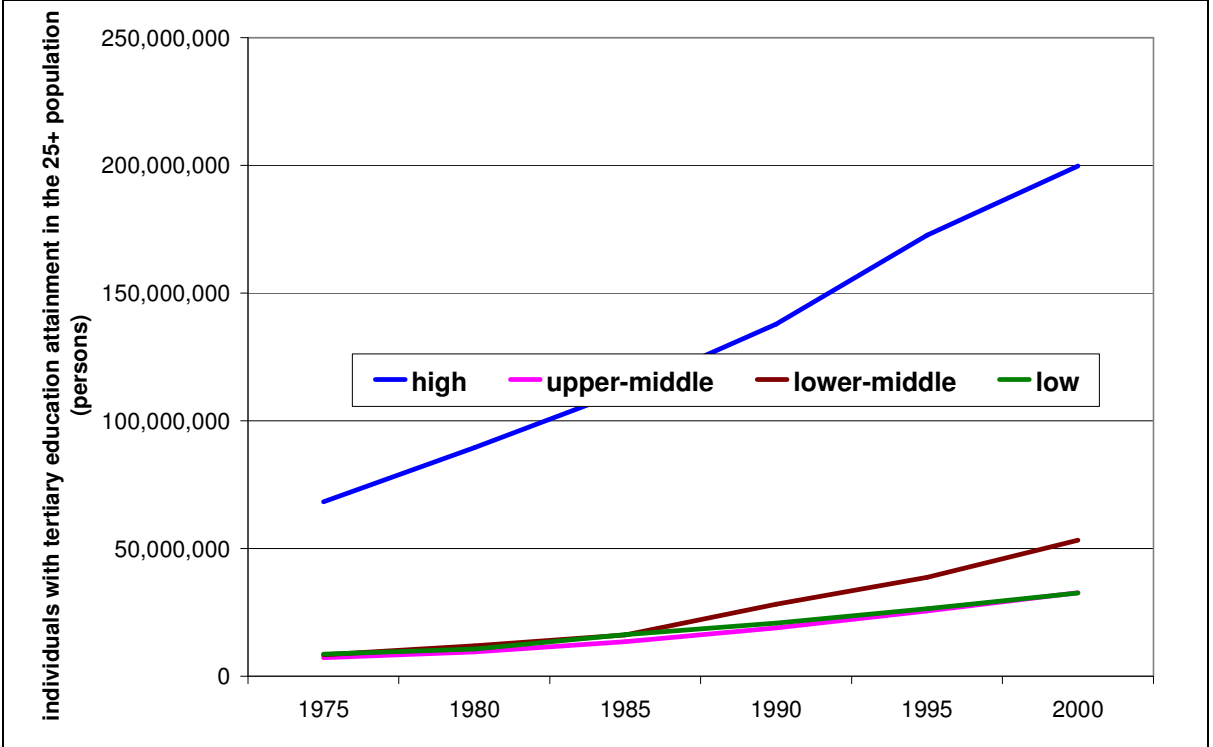
⁴ Own calculations based on Defoort (2009) and Barro/Lee (2000). Small differences to the figures by Beine et al. (2007) occur due to differences in the methodological approach.

than proportional during this time span. In contrast, it has grown in the lower-middle income countries by a factor of 6.3, in the upper middle income countries by a factor of 4.5 and the low income countries by a factor of 3.8. The growth of the highly skilled labour supply has accelerated especially in the lower-middle income countries during the last decade - making this country group the second largest source of highly skilled labour in the world. It is thus reasonable to expect that the role of the lower-middle income countries in South and East Asia as suppliers of highly skilled labour will further increase during the next decades.

Of course, only a minority of the highly skilled population is willing to migrate or has the legal, economic and social opportunities to do so. In 2001, about 6 per cent of the individuals with tertiary education belonged to the immigrant population. The share is particularly high among the low income countries (16 per cent) and the upper middle income countries (9 per cent), while it is rather low among the high income countries (4 per cent) and the lower middle income countries (7 per cent) (Table 5).

These rather moderate emigration shares refer, however, to aggregates, which conceal differences across countries: In fact, in some upper- and lower-middle income countries the share of emigrants exceeds 30 per cent of the highly skilled population, which suggests that the pool of highly skilled labour is largely exploited there.

Figure 3 **25+ population with tertiary educational attainment, countries classified by income, 1975 - 2000**



Sources: Data sources Barro/Lee (2000); Defoort (2009), own calculations.

However, at the global level, the rather moderate shares of emigrants among the highly skilled population suggest that the pool of potential immigrants with tertiary education is far from exhausted. This may be traced back to the fact that only a minority of OECD countries (Australia, Canada, and New Zealand) actively recruits highly skilled immigrants at present, while the largest destination, the US, pursues a mixed immigration policy which grants only a limited amount of visas to highly skilled immigrants. For the supply constraint to bind, a major policy shift is required, i.e. the introduction of an active and highly skill-selective immigration policy in both the EU and in the US.

3 Looking at the top of the skill distribution

So far, the analysis focused on the broad category of tertiary education, which covers a wide range of qualifications. This section provides a closer look at the upper end of the skill distribution for the OECD and some selected non-OECD countries wherever the relevant information is available.

3.1 High concentration of immigrants in population with academic degrees

Table 6 displays the number of foreigners holding a PhD degree in Canada, Germany, Spain and the US. Interestingly enough, the share of foreigners is increasing at the upper end of the skill spectrum compared to the group which has attained tertiary education. The share of foreign-born in the total population which has acquired a PhD amounts to 51 per cent in Canada, to 27 per cent in the US, to 10 per cent in Spain and to 5 per cent in Germany. The rather high shares of individuals with a PhD among the foreign-born population which stays for less than 1 year in the host country suggests that a substantial number of these has acquired their PhD abroad, although we have no information in the census on the country where the PhD has been attained. Information from selected European countries (France, Germany, and Switzerland) suggests that about one-third of the foreign-born students are “educational inlanders” (Kuptsch, 2006), i.e. individuals which have obtained their educational degrees in the destination country.

Table 6 Immigrant and native population with a PhD degree, 2001

	Natives		Foreign born			
			all	by year since arrival		
				less than 1	1 to 4	more than 4
<i>persons</i>						
Canada	51,123	52,428	n.a.	12,376	40,052	
Germany	397,429	20,300	714	5,857	13,714	
Spain	143,600	16,600	1,440	4,340	10,780	
USA	1,058,671	390,023	6,963	61,756	321,000	
OECD-4	1,650,823	479,351	9,117	84,329	385,546	
<i>in per cent of 25+ population of respective group</i>						
Canada	0.41	1.47	na	2.67	1.29	
Germany	1.06	0.93	2.66	2.04	0.74	
Spain	0.69	1.16	1.08	1.08	1.20	
USA	0.85	1.69	2.69	2.09	1.62	
<i>in per cent of total 25+ population with PhD degree</i>						
Canada	49.37	50.63	na	11.95	38.68	
Germany	95.14	4.86	0.17	1.40	3.28	
Spain	89.64	10.36	0.90	2.71	6.73	
USA	73.08	26.92	0.48	4.26	22.16	
OECD-4	77.50	22.50	0.43	3.96	18.10	

Data sources: Integrated Public Use Microdata Series - International (IPUMS International), Version 4.0, Minnesota Population Centre, Minneapolis, 2008; Statistics Canada; Federal Statistical Office Germany, National Institute of Statistics Spain, Bureau of Census, USA; own calculations.

While the structure of the foreign-born population with tertiary education in the OECD was balanced by gender, the structure of the foreign-born population with a PhD degree is not. The share of males with PhD degree exceeds that of females by a factor of 2.5 in the foreign-born population, while it exceeds that in the native population by a factor of 2.

Table 7 **Immigrant population with a completed university degree in selected OECD countries, 1970-2005**

	1970 ¹	1980 ²	1990 ³	2000 ⁴	2005
<i>foreign born with completed university degree (persons)</i>					
Canada	160,000	496,000	772,000	1,310,026	na
France	236,720	319,620	599,064	na	na
Netherlands	23,281	na	na	23,281	na
Spain	na	27,227	90,082	164,820	na
UK	na	na	na	325,300	na
USA	717,051	1,636,959	3,172,215	5,868,732	7,699,884
<i>foreign born in per cent of 25+ population with completed university degree</i>					
Canada	39.41	35.87	35.43	42.95	na
France	15.16	16.29	18.05	na	na
Netherlands	8.39	na	na	1.32	na
Spain	na	5.30	5.49	8.48	na
UK	na	na	na	14.48	na
USA	7.31	9.20	12.34	17.68	20.64
<i>individuals with completed university degree in foreign-born 25+ population in per cent</i>					
Canada	8.09	19.72	24.93	34.76	na
France	6.79	8.77	14.17	na	na
Netherlands	6.24	na	na	20.61	na
Spain	na	10.21	19.73	11.43	na
UK	na	na	13.35	na	na
USA	11.92	18.72	22.34	25.42	29.44
<i>individuals with completed university degree in native 25+ population in per cent</i>					
Canada	5.48	14.93	19.12	24.32	na
France	7.46	8.91	13.52	na	na
Netherlands	5.04	na	na	22.76	na
Spain	na	3.00	8.70	9.33	na
UK	na	na	8.88	na	na
USA	11.77	18.07	22.71	26.74	27.90

1) Canada and Netherlands 1971; France 1975.-- 2) Canada and Spain 1981; France 1982.--
3) Canada, Spain and UK 1991.-- 4) Canada, Netherlands, Spain and UK 2001.

Data sources: Integrated Public Use Microdata Series - International (IPUMS International), Version 4.0, Minnesota Population Centre, Minneapolis, 2008; Statistics Canada; Federal Statistical Office Germany; National Institute of Statistics Spain; Bureau of Census, USA; own calculations.

A larger number of OECD countries report data on the number of immigrants who have completed university with a degree.⁵ Again, we see that the concentration of foreign-born is higher at the upper end of the skill-spectrum compared to the tertiary education level. The share of foreigners in the population with a completed university degree reached 43 per cent in Canada, 25 per cent in the US and 8.5 per cent in Spain in the year 2000. These shares have considerably increased over time in all receiving countries. Moreover, the share of foreign born individuals who have obtained a university degree is in most countries similar to that in the native population or even exceeds it, particularly in Canada (see Table 7).

⁵ Note that the category of tertiary education covers also college education and technical and other professional education levels beyond high school.

3.2 How are immigrants represented in top occupations?

The formal level of educational attainment as reported in the previous section can serve only as a hint to the actual human capital of the immigrant population. Educational degrees may be hardly comparable across countries and immigrants may lack complementary skills such as language or cultural knowledge which are needed to transfer the human capital acquired abroad to the labour markets in destination countries. Looking at how immigrants are represented at the top of the occupational distribution provides therefore a good approximation how the human capital acquired by highly skilled immigrants is valued in host countries' labour markets. To this end, we analyse the absolute numbers and shares of immigrants at the ISCO 1 and ISCO 2 occupation level. ISCO 1 covers top management positions in public administration and private business,⁶ ISCO 2 includes instead highly skilled professionals and academics in engineering, natural sciences, social sciences, medicine, law, media, and arts (ILO 2009).⁷

Table 8 **Immigrants with tertiary education in key management and highly skilled professional positions, 2006**

	total stock of immigrants (25+)			share of occupational group in total stock			
	key management occupations ¹	high professional occupations ²	all occupations	immigrants		natives	
				key management occupations ¹	high professional occupations ²	key management occupations ¹	high professional occupations ²
Australia	211,777	396,263	1,997,517	0.11	0.20	0.11	0.17
Austria	32,594	35,667	516,391	0.06	0.07	0.09	0.08
Belgium	54,730	65,298	382,057	0.14	0.17	0.11	0.19
Denmark	1,678	17,919	159,863	0.01	0.11	0.02	0.12
Finland	1,010	8,810	48,000	0.02	0.18	0.03	0.15
France	184,181	267,539	2,071,134	0.09	0.13	0.07	0.11
Greece	22,892	37,176	556,606	0.04	0.07	0.10	0.13
Hungary	10,853	23,472	108,375	0.10	0.22	0.08	0.12
Ireland	31,002	39,048	195,234	0.16	0.20	0.14	0.14
Luxembourg	5,317	11,240	78,825	0.07	0.14	0.06	0.12
Mexico	16,861	26,186	117,974	0.14	0.22	0.02	0.08
Netherlands	61,825	122,644	761,095	0.08	0.16	0.12	0.17
New Zealand	44,580	59,592	338,943	0.13	0.18	0.12	0.13
Norway	8,590	17,692	126,144	0.07	0.14	0.09	0.10
Poland	11,502	24,684	113,892	0.10	0.22	0.06	0.13
Portugal	26,456	57,386	395,816	0.07	0.14	0.07	0.08
Spain	74,203	103,269	1,093,927	0.07	0.09	0.08	0.12
Sweden	13,380	62,170	445,545	0.03	0.14	0.06	0.17
Switzerland	55,680	80,491	930,822	0.06	0.09	0.09	0.11
United Kingdom	379,892	411,481	2,327,892	0.16	0.18	0.14	0.12
USA ³	2,750,000	3,280,000	23,580,000	0.12	0.14	0.12	0.16
OECD-21	3,787,226	4,751,764	36,346,052	0.10	0.13	0.10	0.14

1) Legislators, senior officials and managers (ISCO 1).-- 2) High professional occupations (ISCO 2).

Sources: Data sources OECD (2009); own calculations of shares and indicators.

In order to get a hint whether immigrants are particularly affected by a skill-downgrading, i.e. whether immigrants are employed below their education level, we present in Table 8 the number of immigrants with tertiary education in key management and top professional occupations and the shares of these two groups in the total immigrant and native population with an tertiary education degree. Interestingly enough, at the level of the entire OECD, these shares are strikingly similar: 10 per cent of the immigrants and the natives with a tertiary education degree fill top management

⁶ Leading positions in public administrations, ministers, members of parliament, entrepreneurs, top management positions in private businesses, business consultants, auditors, tax consultants etc. Note that this category covers also entrepreneurial activities.

⁷ Engineers, academics in natural sciences and mathematics, social sciences, medical doctors, university and other teachers, legal persons, journalists, artists.

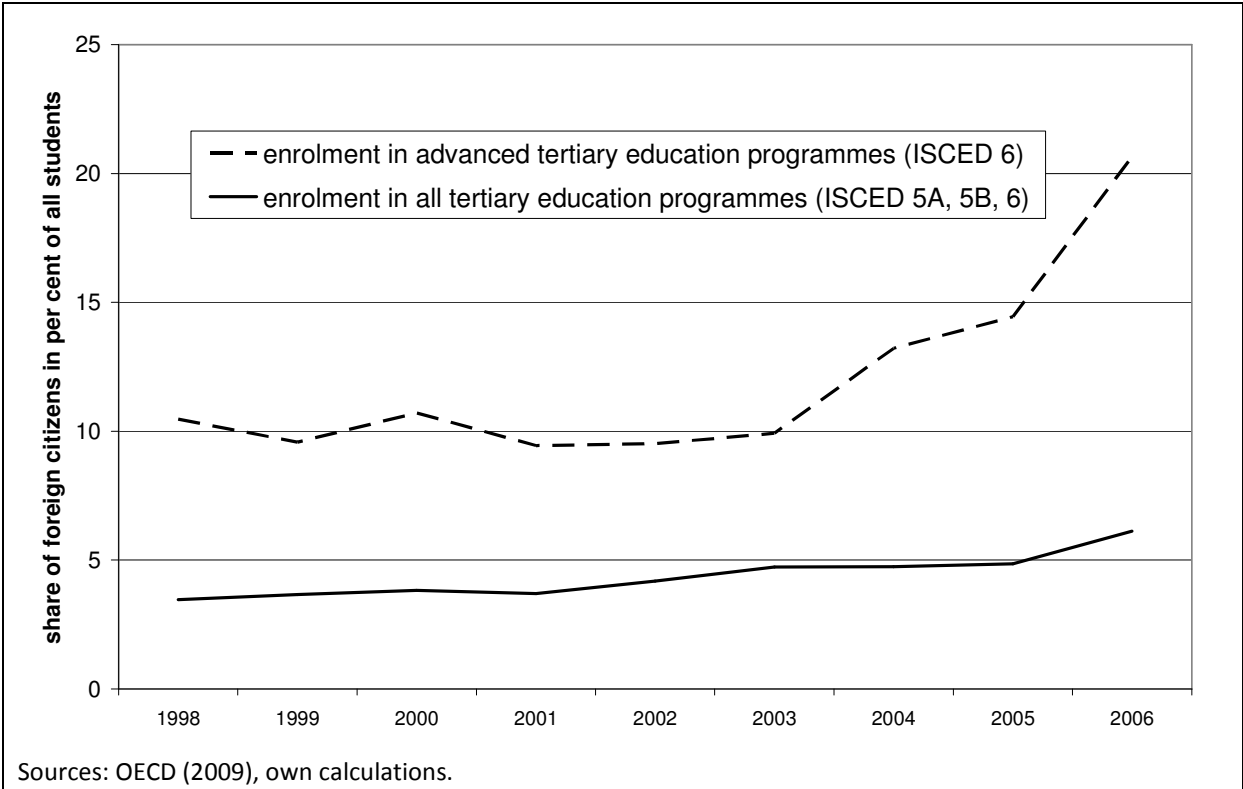
occupations according to the ILO classification, and 13 per cent of the immigrant and 14 per cent of the native population with a tertiary education degree are employed in highly skilled professional occupations (Table 8).

However, these rough data do not control for the field of study and do not distinguish between advanced and less advanced tertiary education degrees, such that the figures have to be taken with a grain of salt. Nevertheless, these figures do not suggest that skill-downgrading affects largely the potential human capital gain of the receiving countries. In Section 2.5 we review the econometric evidence on whether immigrants can transfer their skills into host country labour markets in some detail.

4 The competition for foreign students

Foreign students are an important source of highly skilled immigration. The incentives for moving abroad are high since studies in foreign countries are well rewarded in the labour market even if the students return to their home countries. Receiving countries can benefit from the immigration of foreign students by acquiring human capital which is well adapted to the host country labour market (Kuptsch, 2006). Even if the receiving countries cannot completely recover the costs of the studies by tuition fees, they may benefit later through the productive use of human capital in the labour market. More and more destination countries have therefore facilitated the immigration of foreign students by adjusting their immigration laws and easing access to the labour market for foreigners which have completed their studies in the country.

Figure 4 Participation of foreigners in tertiary education and advanced education programmes in the OECD-27, 1998-2006



Triggered by concerns that Europe may fall back in the contest for talent, the EU has harmonized study programmes under the umbrella of the Bologna process, and it encourages intra-European

flows of students. However, many countries have increased the share of university education costs to be born by students, and many discriminate against foreign students through higher tuition fees (e.g. Australia, Netherlands, Switzerland and the UK). Altogether, these processes have increased incentives for destination countries to attract foreign students, even if they cannot recover the entire costs of their studies in the short-term.

The available data on foreign student flows reflect these trends. Again, information on foreign students has to be interpreted with care, since a substantial number of the foreign students have grown up in the host countries and are therefore “educational inlanders” (Kuptsch 2006).

Nevertheless, the available data suggest that the number of foreign students has increased substantially: In advanced research programmes (ISCED 6), i.e. study programmes which are completed with a publishable thesis or dissertation, the share of foreign students has grown in the eight years from 1998 to 2006 from 11 per cent to 22 per cent, while the enrolment of foreigners in all tertiary education programmes has increased from 4 per cent to 5.4 per cent during the same period of time (Figure 4).

Table 9 **Foreign students by educational programme in the OECD, 2006**

	foreign students (persons)				foreign students in per cent of total students			
	total tertiary education ¹	advanced research programmes ²	theoretically based programmes ³	practical and technical programmes ⁴	total tertiary education ¹	advanced research programmes ²	theoretically based programmes ³	practical and technical programmes ⁴
Australia	217,055	11,988	192,987	12,080	20.87	29.66	22.96	7.60
Austria	39,329	3,520	35,809	na	15.54	20.93	16.86	na
Belgium	40,607	2,321	24,518	13,768	10.30	31.02	13.41	6.75
Canada	148,164	13,302	134,862	na	14.60	38.26	13.76	na
Czech Republic	21,395	1,807	19,267	347	6.34	7.98	6.80	1.09
Denmark	19,123	912	15,264	2,947	8.35	19.20	7.80	10.33
Finland	8,955	1,663	7,292	na	2.90	7.51	2.54	na
France	247,510	24,997	196,794	25,719	11.24	35.80	12.33	4.80
Germany	261,363	na	248,149	13,214	11.42	na	12.70	3.93
Greece	16,558	414	14,171	1,973	2.54	1.84	3.67	0.81
Hungary	14,491	642	13,720	129	3.30	8.06	3.38	0.52
Iceland	715	19	691	5	4.55	12.18	4.55	1.29
Ireland	na	na	na	na	na	na	na	na
Italy	48,766	1,926	45,980	860	2.40	5.03	2.33	6.18
Japan	130,124	12,586	88,176	29,362	3.19	16.78	2.90	3.03
Korea	22,260	2,024	14,697	5,539	0.69	4.66	0.74	0.47
Luxembourg	1,137	na	na	na	42.24	na	na	na
Mexico	na	na	na	na	na	na	na	na
Netherlands	35,374	na	35,374	na	6.10	na	6.18	na
Norway	67,699	2,278	47,935	17,486	28.47	42.78	28.35	27.60
New Zealand	14,297	1,127	12,952	218	6.66	22.33	6.24	11.17
Poland	11,365	942	10,409	14	0.53	2.88	0.50	0.06
Portugal	17,077	1,570	15,257	250	4.65	7.65	4.45	5.91
Slovakia	1,733	77	1,641	15	0.88	0.72	0.89	0.53
Spain	51,013	14,783	27,057	9,173	2.85	19.18	1.84	3.82
Sweden	41,410	4,414	36,077	919	9.80	20.65	9.47	4.51
Switzerland	39,415	7,626	25,917	5,872	19.23	44.25	17.04	16.47
Turkey	19,079	872	17,135	1,072	0.81	2.68	1.05	0.16
United Kingdom	418,353	40,193	318,937	59,223	17.91	42.68	18.44	11.57
United States ⁶	572,509	78,884	396,285	na	3.31	26.34	29.41	na
OECD-27	2,526,876	230,887	1,997,353	200,185	5.42	22.42	8.12	3.75

1) All tertiary education comprises the ISCED 6, ISCED 5A and 5B level.-- 2) ISCED 6 level. Advanced research programme are concluded with a publishable thesis or dissertation, which qualify inter alia for a faculty post or research position in the private sector.-- 3) ISCED 5A level which comprises studies which cover also theoretical qualifications. 4) ISCED 5B level, which comprises education programmes with technical and practical occupational qualifications.-- See UN(2006) for a description of the ISCED classification.-- 6) All tertiary 2005; advanced and theoretical programmes 2001.

Sources: OECD STAT database; own calculations of shares and indicators.

In general, it is important to note that foreign students are heavily concentrated at the upper end of the tertiary education programmes: In 2006, the share of foreign-born individuals in the total enrolment of practical and technical education programmes (ISCED 5B) was only 3.8 per cent, but it reached 8.1 per cent in theoretical programmes (ISCED 5A) and 22.4 per cent in advanced research programmes (ISCED 6). The foreign participation in advanced research programmes and theoretically based programmes is particularly high in Switzerland, the United Kingdom, Norway, and Luxembourg. In the largest destination, the US, the foreign participation in advanced research programmes and theoretically based programs is also well above the OECD averages, at 26 per cent and 29 per cent respectively. Similarly, Kerr and Lincoln (2008) report on basis of census data 24 per cent and 47 per cent of the US workforce in science and engineering with bachelor and doctorate degrees are foreign citizens compared to a 12 per cent immigrant share in the US workforce.

The education of immigrants and natives differs also with respect to their specialization. The OECD educational database provides some information on specialization patterns of enrolled foreign and native students. In our analysis we distinguish between technical and practical and theoretically based programs (ISCED 5) on the one hand, and advanced research programs (ISCED 6) on the other hand. The latter category comprises PhD and equivalent programs.

Table 10 Field of study of foreign and native students (ISCED 5 and ISCED 6), 2006

	science	engineering, manufacturing and construction	health and welfare	social sciences, business & law	science	engineering, manufacturing and construction	health and welfare	social sciences, business & law
<i>share of study field among all immigrant and native students in ISCED-5 programs¹</i>								
Australia	0.12	0.15	0.14	0.26	0.08	0.10	0.16	0.23
Canada	0.13	0.19	0.13	0.32	0.09	0.12	0.16	0.34
Czech Republic	0.05	0.30	0.09	0.19	0.06	0.30	0.09	0.20
Denmark	0.20	0.03	0.06	0.06	0.19	0.02	0.05	0.03
Finland	0.05	0.26	0.15	0.24	0.04	0.22	0.17	0.34
Greece	0.09	0.16	0.13	0.23	0.09	0.15	0.12	0.27
Ireland	0.10	0.09	0.10	0.14	0.10	0.08	0.08	0.14
Mexico	0.05	0.18	0.09	0.30	0.05	0.16	0.07	0.31
New Zealand	0.11	0.20	0.16	0.23	0.07	0.24	0.16	0.21
Norway	0.14	0.06	0.19	0.20	0.07	0.12	0.19	0.23
Slovakia	0.03	0.24	0.09	0.14	0.04	0.27	0.06	0.18
Spain	0.00	0.27	0.12	0.28	0.00	0.30	0.12	0.29
Sweden	0.08	0.16	0.20	0.21	0.05	0.14	0.22	0.21
OECD-13	0.11	0.18	0.13	0.28	0.06	0.18	0.12	0.28
<i>share of study field among all immigrant and native students in ISCED-6 programs²</i>								
Australia	0.36	0.12	0.23	0.06	0.35	0.06	0.26	0.05
Canada	0.35	0.18	0.12	0.17	0.27	0.07	0.13	0.24
Czech Republic	0.21	0.24	0.11	0.15	0.26	0.28	0.11	0.11
Denmark	0.31	0.09	0.00	0.20	0.29	0.10	0.00	0.23
Finland	0.19	0.24	0.19	0.12	0.22	0.19	0.21	0.17
Greece	0.16	0.13	0.20	0.17	0.19	0.15	0.24	0.16
Ireland	0.35	0.06	0.10	0.08	0.40	0.05	0.08	0.07
Mexico	0.11	0.09	0.22	0.20	0.07	0.08	0.37	0.18
New Zealand	0.21	0.08	0.15	0.26	0.17	0.06	0.14	0.31
Norway	0.33	0.07	0.22	0.10	0.20	0.19	0.22	0.12
Slovakia	0.11	0.19	0.14	0.15	0.14	0.18	0.14	0.17
Spain	0.00	0.22	0.27	0.27	0.00	0.30	0.25	0.24
Sweden	0.30	0.16	0.22	0.12	0.24	0.20	0.28	0.12
OECD-13	0.27	0.15	0.17	0.17	0.13	0.16	0.25	0.19

Figures do not add up to 1 since only selected study areas are considered.-- 1) ISCED refers to technical and practical study programs.--
2) ISCED 6 refers to advanced and theoretical study programs.--

Sources: Data sources OECD (2009); own calculations of shares and indicators.

The most striking fact is that foreigners are more than proportionally represented in sciences, and this specialization pattern is even sharper if we consider the participation in advanced research programs: 11 per cent of the foreign students in the OECD which participate in ISCED-5 study programs are enrolled in sciences, compared with 6 per cent among the native students. Moreover,

27 per cent of the foreign students in the OECD which are enrolled in advanced research programs studies sciences, compared with 13 per cent of the native students.

Interestingly enough, in most other programs such as engineering, social sciences, law and business administration the specialization patterns of foreign and native students are very similar. A notable exception are health- and welfare-related studies which comprise also medical doctorates, where we find a higher share among native students (25 per cent) compared to foreign students (17 per cent) in the advanced research programs.

Whether foreign students contribute to the human capital endowments of the receiving countries depends on whether these countries are able to retain them. While many countries such as Germany did even not grant work and residence permits to foreign students after the finalisation of their studies, more and more countries have meanwhile realized that foreign students are an important source for highly skilled labour. A recent survey from Italy however suggests that particularly continental European countries have a problem to retain foreign students due to poor job and career opportunities: 88 per cent of the PhD students who have already decided (47 per cent of the interviewees) what they will do upon completion of the PhD course says that it will leave Italy. Note that 85 per cent of the foreign PhD students receive a grant (mostly from the hosting Italian university), and that the availability of a grant is one of the major driving forces behind the choice of coming to Italy. Hence, Italy pays for their education (and this contributes to attract foreigners), but it is then unable to retain the students, who report a high quality of the educational system, but poor career opportunities. About 75 per cent of these PhD students are enrolled in scientific and engineering faculties i.e. are specialized on fields which promise high economic and social returns (Colussi et al., 2009).

5 How do highly skilled immigrants assimilate into host labour markets?

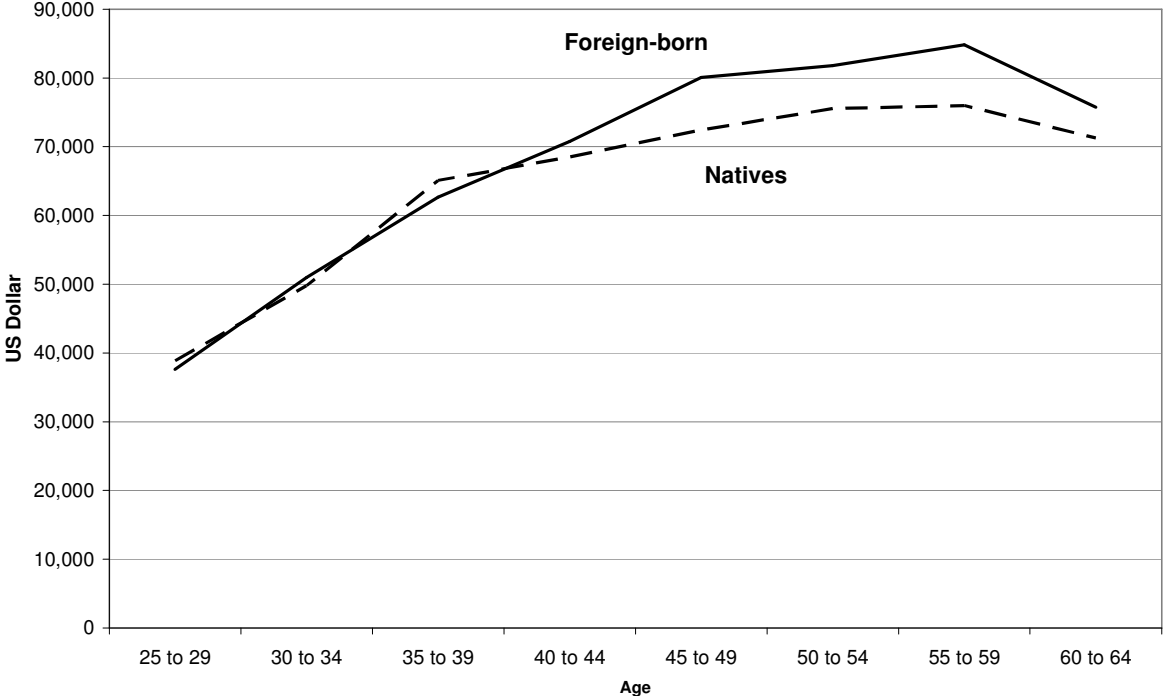
The effects of highly skilled immigration as well as the incentives for highly skilled individuals to migrate depend on whether they are able to transfer their human capital into the labour markets of host countries. There exists a large literature building on Chiswick (1999), Carliner (1980), Borjas (1987) Jasso and Rosenzweig (1985) and others which examines the “assimilation” of immigrants into host country labour markets, i.e. the age-earnings profile of immigrants relative to the native population controlling for the year of entry and cohort effects (see Chiswick and Miller, 2007, Venturini and Villosio, 2008, for recent contributions). While the overwhelming share of these studies focuses on the returns to education in general, some of these studies directly address the labour market performance of highly skilled individuals.

These studies find that (i) highly skilled immigrants have a lower probability than natives of similar education levels to obtain highly skilled jobs (see Mattoo, Neagu and Özden, 2008, for the US, Green, 1999, for Canada, Kler, 2006, for Australia), (ii) have higher unemployment risks (see Chiswick et al., 1997, for the US) and (iii) receive lower wages than natives (see Brekke and Mastekaasa, 2008, for Norway, Clark and Drinkwater, 2008, for the UK, Friedberg, 1996, for Israel, Ker, 2006, for Australia). Clark and Lindley (2009) however find for the UK that highly skilled individuals entering the country through the educational system perform better in terms of both wages and employment opportunities than natives, while immigrants which enter the country through the labour market channel perform worse.

The evidence on whether wages and other labour market outcomes of highly skilled immigrants converge to - or even overtake - those of natives is mixed. Many studies find no evidence for the convergence of wages (e.g. Constant and Massey, 2003), while others find mixed or rather weak evidence for wage convergence (Kler, 2006; Friedberg, 1996). In contrast, the findings of Chiswick

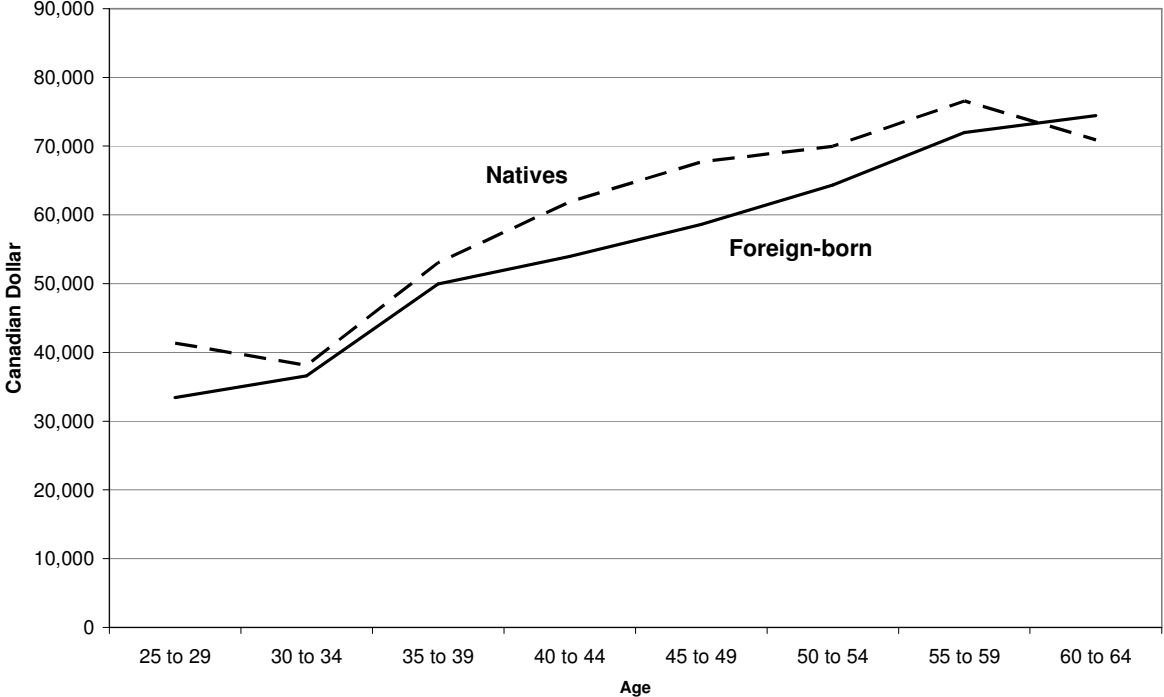
and Miller (2007) indicate that the share of immigrants which obtain a job above their skill level is increasing with the length of staying in the host country, and Chiswick et al. (1997) show that unemployment risks decline with the length of stay.

Figure 5 **Annual wage incomes of PhD graduates in USA, 2000**



Sources: IPUMS international, own calculations.

Figure 3.6 **Annual wage incomes of PhD graduates in Canada, 2001**



Sources: IPUMS international, own calculations.

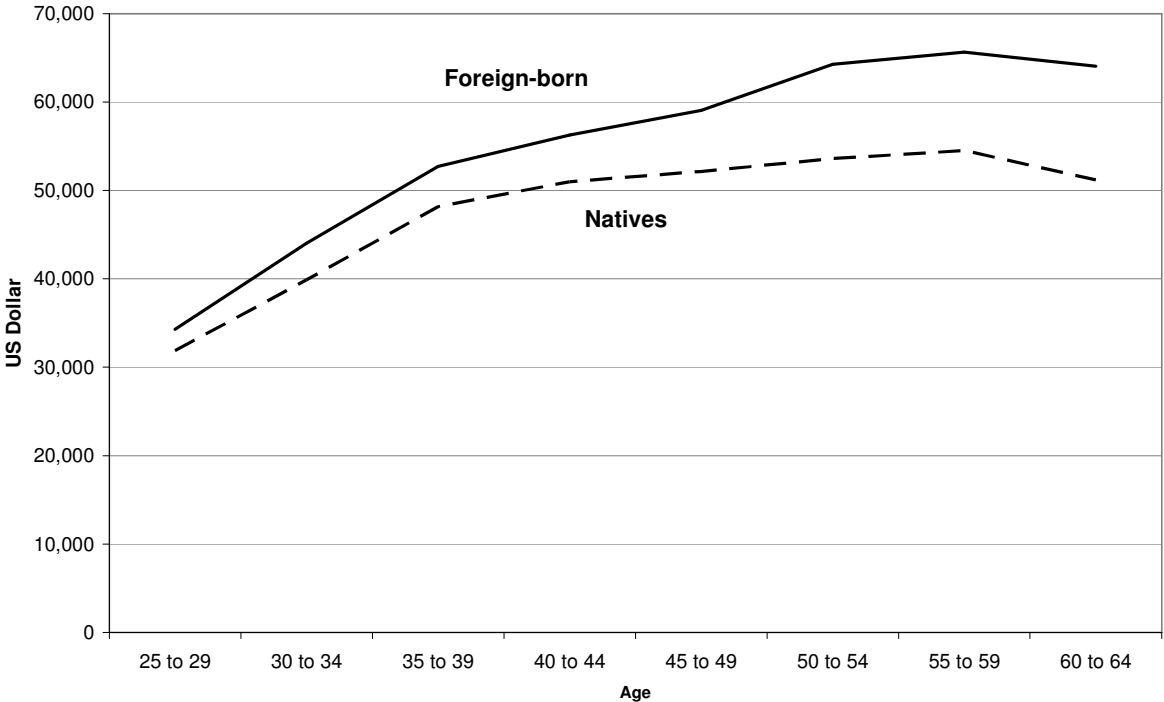
Recently, Hunt (2011) has examined the performance of highly skilled immigrants which have graduated in the US using the 2003 wave of the National Survey of College Graduates. Interestingly enough, immigrants who graduated in the US have significantly higher wages than native graduates, are more likely to start up a firm and been granted a patent, and author more academic papers. Similarly, Hunt and Gauthier-Loiselle (2008) and Kerr and Lincoln (2008) find that a higher number of immigrant college graduates or a higher number of temporary students visas raises patents per capita significantly. However, these effects may disappear once the analysis controls for the field of study and the census region: immigrants are overrepresented in fields with high returns in the labour market, i.e. computer sciences and mathematics, engineering and physical sciences, and in high wage regions. While high-skilled immigrants earn 2.9 per cent more than natives without controls, they earn 8.2 per cent less if all covariates are considered (Hunt, 2011).

An in-depth analysis of the earnings of highly skilled immigrants and other aspects of their labour market performance is beyond the scope of this study. We rather provide here some descriptive data on the wages of full-time employed highly skilled immigrants by age groups for the US and Canada.

Figures 5 and 6 display the age-earnings profile for foreign-born and native PhD graduates in the US and Canada. Interestingly enough, the two countries show different assimilation patterns. In the US, PhD graduates receive similar wages as natives until they achieve the 40-44 age brackets, and higher wages in the age brackets above 44. In contrast, foreign-born individuals in Canada receive in all age brackets lower wages than natives except for the 60 to 64 age group.

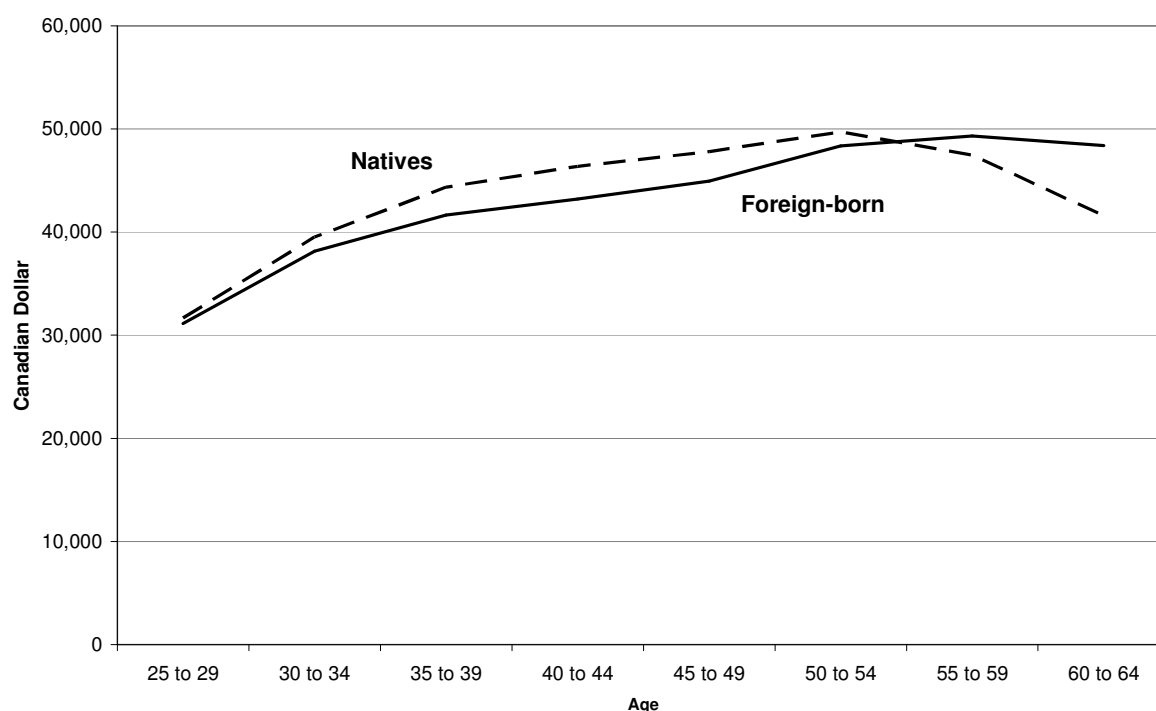
Interestingly enough, a similar analysis for individuals with highly skilled professional occupations shows that foreign-born may outperform natives if we control for occupation: Foreign-born individuals in professional occupations (ISCO 2) receive substantially higher wages than natives in the US in all age brackets (Figure 3.7). In contrast, wage levels of foreign-born individuals in ISCO 2 occupations are in most age brackets below those of natives in Canada (Figure 3.8).

Figure 7 Annual wage incomes of highly skilled professionals (ISCO 2) in USA, 2000



Sources: IPUMS international, own calculations.

Figure 8 **Annual wage incomes of highly skilled professionals (ISCO 2) in Canada, 2001**



Sources: IPUMS international, own calculations.

A similar picture emerges if we carry out the same analysis for the age-earnings profile of foreign-born and natives in ISCO 1 occupations and if we control for gender (not displayed here).

6 Conclusions

The descriptive analysis provided in this chapter suggests that only a minority of the high income countries benefits from net inflow of highly skilled migrants. The available data indicates that the global pool of highly skilled labour consists of about 320 million individuals, and 190 million of them reside in high income countries. The stock of highly skilled immigrants in the OECD can be estimated to be about 20 million, 50 per cent of these coming from high income countries. Interestingly enough, only a minority of OECD countries are winners in the contest for talents, in the sense that they obtain more highly skilled individuals than they send abroad. While the US and countries with a highly skill-selective immigration policy (Australia, Canada) are net winners, Europe is a net sender even if we consider the inflows from non-OECD countries. The picture within Europe is mixed: Particularly rich countries such as Luxembourg, Switzerland and Sweden benefit from a net inflow of highly skilled labour, while most other countries lose.

Data on immigration at the top of the skill distribution are scarce. The available evidence suggests that the concentration of foreign-born individuals among the population with a PhD degree is significantly larger than that among the population with a tertiary education degree. Moreover, foreign students are heavily overrepresented in advanced research programmes (ISCED 6) and theoretically based programmes (ISCED 5A). In these programs, they specialize more than native students on sciences and similar fields, which may explain the fact that increasing the number of foreign college graduates raises the number of patent applications per capita significantly. Again, the US, Canada and Australia benefits more than proportionally from the immigration of individuals at the top of the skill distribution.

The available data suggest that the share of individuals in top professional occupations (ISCO 2) and top management occupations (ISCO 1) among the immigrant population is very similar to that of natives in selected OECD countries. At first glance, this suggests that skill-downgrading does not heavily affect highly skilled immigrants. Our descriptive data indeed indicates that immigrants with a PhD degree and immigrants in ISCO 1 and ISCO 2 occupations have similar or higher earnings than natives with the same educational or occupational level in the US. However, the age-earning profile of immigrants is well below that of natives in all age brackets in Canada. Micro econometric evidence suggests that distinct differences between highly skilled immigrants and natives exist in earnings and other labour market outcomes if we control for covariates such as field of study, other human capital characteristics and regions of residence.

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Annex Tables

Table A.1 Wage income by selected skill groups in
USA and Canada, 2000/01

Age	US		Canada	
	Natives <i>in US-\$</i>	Foreigners	Natives <i>in Canadian \$</i>	Foreigners
	PhD			
25 to 29	38870	37580	41340	33410
30 to 34	49780	50990	38110	36580
35 to 39	65090	62650	53030	49930
40 to 44	68500	70750	61900	53950
45 to 49	72410	80090	67700	58580
50 to 54	75540	81800	69980	64320
55 to 59	75980	84800	76560	71950
60 to 64	71250	75760	70910	74430
	completed university degree			
25 to 29	35200	37630	32090	28730
30 to 34	46670	47930	42760	35680
35 to 39	58300	55570	50310	40000
40 to 44	61530	57580	53520	41650
45 to 49	60260	58620	54020	43780
50 to 54	61210	61230	55450	48100
55 to 59	62250	62510	51080	47940
60 to 64	57720	57240	44350	46430

US figures for 2000, Canadian figures for 2001

Sources: IPUMS international, own calculations.

Table A.2 **Wage income by selected occupations in
USA and Canada, 2000/01**

Age	US		Canada	
	Natives <i>in US-\$</i>	Foreigners	Natives <i>in Canadian \$</i>	Foreigners
ISCO-01				
25 to 29	34670	33870	33840	32840
30 to 34	45790	45050	44260	40480
35 to 39	56040	55610	52320	45310
40 to 44	61290	58800	56500	45780
45 to 49	64090	61860	57420	48210
50 to 54	66560	64430	58910	51770
55 to 59	65750	64490	52770	50650
60 to 64	60350	59020	47880	46800
ISCO-02				
25 to 29	31870	34300	31660	31110
30 to 34	39880	44030	39510	38130
35 to 39	48160	52700	44360	41660
40 to 44	50980	56280	46380	43180
45 to 49	52150	59040	47800	44950
50 to 54	53600	64250	49710	48370
55 to 59	54500	65640	47470	49300
60 to 64	51190	64030	41570	48370

US figures for 2000, Canadian figures for 2001

Sources: IPUMS international, own calculations.