

## **PART 3. FLOWS**

### **Historical Evolution of Qualified Migrations**

Table of Contents	Page
Organisation of the Report	1
Historical Evolution of Qualified Migrations	
1. Introduction: From the Origins to the 19th Century	2
2. From the Early 20th Century to the End of World War II: Enforced Migration	4
3. From 1946 to the 1960s: The British Brain Drain and the Development of the US Research System	6
4. The 1970s and the 1980s: New Migration Flows	8
5. The 1990s: Globalisation and the Brain Drain in Eastern Europe	10
6. The Outlook for the 21st Century	12
7. Bibliography	14

### **Organisation of the Report**

Part 3 - Flows presents a paper *Historical Evolution of Highly Qualified Migrations* written by M. Carolina Brandi of CNR-IRPPS (Rome). The paper focuses on the migration of Europeans following World War II., from enforced migration to the British brain drain and the development of the US research system.

## The Historical Evolution of Highly Qualified Migrations<sup>1</sup>

### 1. Introduction: From the Origins to the 19<sup>th</sup> Century

The ranks of every group of migrants always include a certain number of highly skilled individuals. In certain historical periods, individuals equipped with special talents and knowledge have had a considerable influence on the circulation of knowledge and ideas. In prehistoric times, for example, groups of skilled metalworkers moved from one place to another (c.f. Renfrew, 1979); and, in the first millennium, migrant Phoenician artisans distributed their expertise far and wide. Similarly, itinerant philosophers of classical antiquity disseminated systems of thought; mediaeval scholars spread learning; and the natural philosophers, thinkers and writers of the Renaissance and Reformation, as well as the academics of the Enlightenment in the 18<sup>th</sup> century, helped extend the reach of new ideas. As these migratory flows contributed to the propagation of knowledge, they are of considerable historical importance, but their relevance to the migrations of research scientists and technicians in today's world is limited.

The main difference is that today's qualified migration is as economically relevant to the country of destination as the country of origin. Until the 19<sup>th</sup> century, the movement of qualified workers, whether as individuals or members of a group, and whether their migration was voluntary or forced, did not have an immediate impact on the countries involved. This is not to say that countries were socially and economically more similar than they are today but, rather, that they all shared an essential characteristic, namely: their methods of production were slow to evolve.

Technological innovation and social change before the 19<sup>th</sup> century took a long time to complete, and could even stretch over centuries. So, apart from some exceptional cases, the arrival of migrants with special intellectual or practical knowledge did not have direct repercussions either on the place they had left behind or the place to which they had come. To be sure, innovative techniques did eventually spread over large areas, but very slowly. For instance, the Republic of Venice, for all that it was always keen to maintain the strength of its navy, failed to exploit the potential of the hand telescope even though Galileo, had sojourned in Padua and put the new device at the disposition of the Venetian authorities. It took almost a century before the hand telescope became a common piece of naval equipment used for the long-distance identification of the flags raised by ships at sea. Even then it was not Venice but two other nations (Britain and Spain) that were first to use it to their advantage. Similarly, the spread of firearms and the introduction of efficiency improvements to them was a long drawn-out and discontinuous process straddling centuries, even though firearms were among the first products whose technological content increased over time as people in different parts of the world copied exemplars and added their own improvements. We can fairly say that geographical diffusion was a more important font of innovation than the efforts of the inventors (c.f., Reid, 1984).

In the period spanning the end of the 18<sup>th</sup> and the beginning of the 19<sup>th</sup> centuries, the pace of innovation in the system of production accelerated suddenly. With the advent and success of industrial capitalism and the consequent replacement of human labour by mechanical means, the quantity of technological knowledge incorporated in a given product and in the industrial

---

<sup>1</sup> This paper was written by M. Carolina Brandi, CNR-IRPPS, Rome for the project *The Brain Drain - Emigration Flows for Qualified Scientists*.

process behind its manufacture expanded considerably. At first, the instigators and inventors of new technologies were ingenious businessmen with predominantly practical concerns who lived and worked outside the confines of academia. Such was the case with the businessman who invented the mechanical loom (in 1801) and the steam locomotive (in 1814), (see Geymonat, 1976b).

The first half of the 19<sup>th</sup> century marked a technological watershed. So important did technology become in this period that it moved beyond the province of single business inventors to become a field of study in its own right. Once technology had become an essential part of the mission of science, its practitioners started directing their efforts towards discovering the theoretical bases for observed physical processes with the specific aim of finding solutions to technical problems. Special academic institutes were founded for this purpose and following the example set by the *École Polytechnique* of Paris they set about educating a new generation of scientific experts (Geymonat, 1976b).

The same century experienced massive migratory flows, notably from Europe to the New World. Most of the migrants were peasants seeking land, and came from the poorest and least qualified classes in their country of origin. Those with higher qualifications, especially if their qualifications related to the scientific disciplines, had few difficulties in successfully adapting themselves to the new system of production. In the 19<sup>th</sup> century, technological innovation proceeded at a rapid pace, especially in countries such as England, France, the Netherlands and Germany whose histories had left them with more advanced industrial, scientific and educational systems than others. They were thus able to distribute their goods throughout the world, but it was merchandise rather than knowledge that they were spreading.

The migrant classes of the 19<sup>th</sup> century also included a number of artisan workers with good technical skills and various professionals and intellectuals. Some of these people were destined to become the primary movers of the ensuing industrial and cultural development of the New World.

Martellini (1997) analysed the emigration of an elite group of Italians to Latin America in the second half of the 19<sup>th</sup> century. This particular group was made up of aristocrats, writers and professionals who shared the experience of having abandoned their home country, though their reasons for doing so ranged from financial ruin to personal mishaps and political motives. In common, however, they had a powerful spirit of initiative, excellent professional capabilities and experience; and some of them were destined to achieve great success. Martellini's case histories (1997) illustrate how the migration of this elite class of Italians to South America was also influenced by factors such as the existence of a network of family and friends in the host country, and the common belief that skill and a touch of fortune were what was needed to make it. Indeed, these were the very same factors that attracted most migrants to the New World, including the less academically and culturally accomplished.

Dunae (1983) took as his case histories a group of British university graduates, retired army officers and aristocrats who emigrated to Canada in the fifty years from when the country became an independently governed dominion until the outbreak of the Great War. Here, too, the migrants were educated members of the upper middle classes and aristocracy motivated partly by a thirst for adventure but mostly by material deprivations at home. In the case of these British subjects, the material difficulties in question were often related to the "son in the cadets" phenomenon. These cadets were young men of upper-class stock who were not destined to inherit the family title or estate, but had usually received a good education from

the so-called “public” (i.e. private) schools of Britain and its ancient universities. They were, as a rule, marked out for a career in the liberal professions such as medicine, the law, the army, university or the church. Many members of the British ascendancy, however, had to divide a limited amount of capital between many children, and so some of the siblings, deprived of full economic support, found it difficult to get a foot into the professions. Many of them opted to seek their fortunes in the New World, particularly in Canada that was regarded as more “British” than the US and less hostile than Australia and other colonies. Another section of this elite group of immigrants consisted of retired army officers who had spent long years of service in the British army. These were men with a strong sense of adventure and excellent professional skills in several fields, and were to contribute a great deal to the development of Canada.

Within Europe, most migration consisted of flows of literate and semi-literate peasants towards industrialized nations. Yet here, too, a small but significant minority of migrant workers were skilled artisans rendered redundant by industrial progress and intellectuals who were often political refugees. Dreyfus (1992) draws attention to the important contribution made by the considerable numbers of qualified immigrants, especially Italians, Poles, Spaniards and Belgians, to the building of an enterprise base in France between the end of the 19<sup>th</sup> and the beginning of the 20<sup>th</sup> century.

## **2. From the Early 20<sup>th</sup> Century to the End of World War II: Enforced Migration**

We can reasonably claim that the migration of highly qualified workers began to have a telling effect on local systems of production from the third decade of the 20<sup>th</sup> century. In the years preceding the Great War, and for a few years after it ended, migration continued to follow broadly the same course as in the previous century, though the creation of new industries in host countries by immigrants was already becoming an increasingly important phenomenon. This was especially true of the newly industrializing countries of Latin America that underwent a phase of rapid economic expansion during this period (see, for example, Barbero, 1987).

The repercussions of the intellectual migrations caused by racial and political persecution by Nazi and Fascist regimes from the 1920s to the 1940s in Europe can to some extent still be felt today. In the 12 years of Nazi dictatorship, approximately 300,000 Germans and Austrians found refuge in the US. Unlike the German immigrants who had gone to the US in the 19<sup>th</sup> century, the refugees of the 1930s and 1940s were mainly from middle and upper-middle class backgrounds, and many were intellectuals (Pfanner, 1983). While it is hard to fix a definite date for when this refugee outflow began, we can observe that whereas professionals made up just 3.12% of total immigrants arriving in the US in the period 1926-30, they made up 5.53% in 1931-35; 8.47% in 1936-49; and 10.5% in 1941-45 (Fortney, 1972).

The immigrants included large numbers of academics from different countries working in diverse academic areas, some of whom were the very best in their field. Einstein, Fermi and Freud are three of the most famous cases, but the phenomenon affected many others. Laura Fermi (1971) examined the demographic and social identities of a sample of more than 2,000 illustrious European exiles in the US. She found that 44% were German (two thirds of who were Jews), 3.6% were Italian, and a small percentage was Hungarian. Roughly half came from countries occupied by the Axis powers (Austria, Poland, France, the Netherlands,

Belgium, Denmark and Norway).

The migrant flow was to have enormous consequences both for the countries of origin and the host nation. The former suffered a substantial impoverishment of their national scientific systems, and the latter enjoyed a huge boost to innovative capacity. The outflow had an immediate and adverse military impact on the countries at war and later on their manufacturing capacity. It was to have a significant bearing on the outcome of the war and the subsequent economic evolution of the countries that had been engaged in the conflict. The phenomenon, however, has still only been partly studied.

Hughes (1977) looked at how this transfer from Europe to the US was to influence scientific and philosophical innovation in the host country. Hughes limits himself to making a detailed study of only some aspects of the phenomenon and, particularly, the development of psychoanalysis and the emergence of the so-called “Frankfurt School.” He does not address its more general aspects, nor examine the effect of the return of many exiled scientists to their countries of origin after the war (Francovich, 2000).

Pfanner (1983) focused on German artists, musicians, writers and human scientists who sought asylum in the US after 1933. It is interesting to note that only those who were already renowned when they arrived in the US, figures such as Thomas Mann, Erich Maria Remarque and Bertolt Brecht and a few others, managed to succeed in the new setting. Most of the others were forced to accept manual labour or other low paying jobs requiring few qualifications. While one cause of their failure was the difficult economic conditions of the US in the period immediately preceding the war, the language barrier evidently proved an insurmountable hurdle, especially for the writers who were unable to translate or have translated their works into English. The scarce German-speaking audience in the US and the impossibility of getting published in Europe effectively closed off other professional outlets, and so it is fair to say that the flight of intellectuals from Nazi Germany was not just the first example of large-scale brain drain, but also the first episode of “brain waste.”

Several biographical studies (such as Mafai, 1992) examine the personal histories of very highly qualified individuals and the complex mesh of political and academic factors behind their emigration and later fortunes. These studies help us understand the importance of forced emigration from Europe to the US in the inter-war period. As far as we can see, however, no general study has been made of the level of education of these migrants, aside from the very circumscribed analyses by Fortney (1992) and Pfanner (1983), nor of the reflux of migrants back to their native countries after the war. Similarly, only episodic studies have been made of mass deportations of Dutch and Danish scientists to Germany, as well as the emigration of engineers and technicians from occupied countries. Few studies exist of how German scientists in the immediate aftermath of the defeat of Nazi Germany were forced (initially at least) to transfer to the US, USSR and Britain, and what effect they had on the scientific and productive systems of these countries after the war.

### **3. From 1946 to the 1960s: The British Brain Drain and the Development of the US Research System**

In the years immediately following the Second World War, the US became the undisputed leader of western science and a magnet for top-level European scientists and technicians, many of who were suffering from the effects of post-war economic privation. Apart from the exiles who stayed on in the US at the end of the war, 372,204 professionals, scientists and technicians emigrated to the US in 1946-65, 16.9% of the total number of immigrants for the period. By way of comparison, the proportion of highly qualified immigration to Canada and Australia (two other nations that have always attracted a large number of skilled migrants) in the same period was 11.1% and 8.2%, respectively (Johnson, 1968). The migration of these intellectuals to the US was not only the result of centrifugal pressures in Europe, but also the gravitational pull of US universities that were seeking to expand their natural science faculties as rapidly as possible. Medicine was another discipline that drew in considerable numbers of foreign professionals (from Britain and Canada especially) as the US hospital system, in rapid expansion, soon ran up against the scarcity of medical students in US universities (Fortney, 1972).

During this period, the US Administration actively encouraged the immigration of highly qualified workers. In 1956, the government amended the Immigration and Nationality Act to redistribute the annual immigration quotas assigned to various regions of the world. Thanks to the amendment, quotas not used during a fiscal year could be converted into resident visas for certain privileged professionals present in the US on temporary visas. The privileged categories included all professionals with university degrees and those with at least a first degree in a scientific subject. It is estimated that among Asian immigrants, this privilege accounted for 30% of the total uptake of these residency visas in the period 1965-74 (Agrawal and Huang, 1991). We should also recall that in the same years the US actively pursued policies geared towards encouraging immigration of scientists and professionals from communist countries. Not only were such scientists accorded recognition as political refugees and therefore exempt from the quota system, but they were also beneficiaries of numerous financial programmes to help them join US public organizations and companies or embark on professional careers. In 1959-65, Cuba alone supplied the US with more than 2,700 doctors who were able to avail themselves of several forms of subsidy, notably twelve weeks of English language lessons, professional refresher courses and preparatory instruction for the admission examination for the US medical profession. They also received a grant of \$600 (Moncarz, 1970). Hungarian professionals enjoyed similarly generous treatment after the Soviet repression of 1956 (Fortney, 1972). The migration of qualified workers from Latin America and, especially, Africa in the same period was rather limited; the most likely explanation is the opposition of various members of Congress to allowing in immigrants of any type from these geographical areas (Fortney, 1972).

In any event, even after the effects of the forced migrations of the Second World War had petered out, the US continued to attract qualified professionals, mainly from Western Europe and Canada. Consequently, when the first-ever scientific congress on the brain drain phenomenon was organized by the Centre of European Research and held in Lausanne (Adams and Rieben, 1968), the one theme under discussion was the outflow of European scientists to the US. In the period 1956-61, more than half the scientists moving to the US came from Britain and Germany (28.23% and 22.59%): scientists accounted for 11.1% of Germans and 13.9% of Britons emigrating to the US. The corresponding figure for France

was just 0.5% and for Italy, 0.9%.

Francovich (2001) hypothesizes that the low figures for Italy and France was a consequence of the poor knowledge of English in their scientific communities. While this was almost certainly a factor, it is our belief that other reasons lay behind the relatively small outflow.

In the period we are examining, major changes were taking place in the entire international system of power. The US had definitively taken up the mantle of the leading western power both from a political and an industrial point of view. The very fast pace of scientific advance in the US in the preceding decades had paved the way to a second industrial revolution that was to begin a few years later with the groundbreaking entrance of electronic and information technology into the world of production. These new technologies had been nurtured within the confines of the military and space industries, which expanded rapidly during these years. The US needed to attract more highly qualified personnel than their own top-level institutes could produce, and so Germany and, to a lesser extent, Britain, assumed supporting roles. Germany had been reduced by the war to a condition of misery: its industrial system was in ruins and the country was subject to economic sanctions. Britain had emerged victorious from the war, but this did not save it from entering a period of enormous crisis as it struggled to convert an economy largely geared to military production back to civilian use<sup>2</sup>, and all the while losing its imperial colonies as the new global order took hold.

The production systems of both Germany and England suffered severe contraction after the war, but thanks to their former international ascendancy, the two nations were still endowed with first-class universities that were now turning out more scientists and technicians than their own academic and industrial systems were capable of absorbing. An outpouring of talent from these two countries to the US was therefore inevitable. Conversely, France and Italy had suffered from a shortage of scientific workers in the same period, the former as a result of its intense drive towards modernization and reconstruction, and the latter as a result of a chronic lack of graduate students caused by the extremely restrictive educational apparatus put in place by the Gentile Reform of 1928. We should not overlook the voluntary transfer to Latin America of an uncalculated number of university teachers who were compromised to varying degrees by their association with the defeated Fascist regime and whose emigration contributed to the impoverishment of the Italian academic environment in the years immediately after the war.

In 1953, the Royal Society sounded the alarm at the pernicious effects of the brain drain on the economic prospects of Britain. This warning was taken very seriously by the Government who introduced a series of measures to increase the work opportunities for British scientists at home. Meanwhile, the Germans had come out of their post-war crisis and the country was reasserting itself as a regional economic power whose output was driven by high technology. For these reasons, the outflow of British and German experts to the US fell drastically before the 1960s came to a close.

---

<sup>2</sup> In the aftermath of the war, the system of production in all industries was based on the Fordist system. In this system, only in the military manufacturing where performance was the most important virtue. In civilian manufacturing, however, cost is the chief consideration. For this reason, the conversion to civilian manufacturing usually entails the abandonment of innovative technologies in favour of more conventional ones, and so there is less need for researchers. This situation does not arise in post-Fordist systems of productions in which innovation is in itself a competitive advantage.

#### 4. The 1970s and 1980s: New Migration Flows

The US system of production was demanding many more researchers and technicians than the educational system of the country was able to produce. The 1970s and 1980s were the decades that saw a definite shift to an economic system based on technological innovation driven forward by the arms and space race with the USSR. The flow of mature researchers from Britain and other English-speaking countries to the US was gradually replaced by a flow of academics from less wealthy European nations and, most of all, developing countries.

The death of colonialism in the 1960s led to the emergence of an intellectual class in newly independent countries. The intellectual expansion was largely driven by the increasing number of young students who, owing to the lack of academic institutes in their home countries, went abroad to study. The number of foreign students enrolled in the universities of Australia, Canada, the US, France, West Germany and Great Britain (i.e. the six western nations with the highest number of immigrant scholars in the second half of the 20th century) rose from 57,100 in 1950 to 261,400 in 1970. At first, the immigrants came mainly to the two former colonial powers, France and Britain. For some years, their total intake of foreign students, most of them from former colonies, was almost equal to that of the US. By 1970, however, the US alone was already attracting 144,700 students from abroad, while Britain and France were attracting just over 40,000 between them (UNESCO, 1998). The statistics compiled by Francovich (2000) show that the majority of foreign students in American universities came from newly independent Asian states and Latin America (although Latin American countries had been independent for around a century, they were only now beginning to export qualified workers because their economies, prosperous until the end of the Second World War, had fallen into steep decline).

The young students who went abroad to study soon found themselves under pressure to remain in the host country and abandon their native country. Several factors combined to make the option of remaining in the country where they had completed their studies more attractive than returning (Ardittis, 1989). The students knew that if they went home, their high levels of qualification would be underexploited in underfunded national universities with little chance of growth owing to the scarcity of economic resources. In addition to a lack of adequate infrastructure resources such as laboratories, libraries and equipment, the ex-colonies were also unable to offer any career prospects to returned immigrants. Developed countries, on the other hand, were able to offer far better salaries, immeasurably superior working conditions and, often, the continuance of a socio-cultural model that foreign students had adopted as their own in the course of their studies but were unable to find back home in their countries of origin (Ardittis, 1989).

Emigration from underdeveloped countries was often caused by political instability with major consequences as much for the cultural elite as for the rest of the population. These political upheavals pushed out young students and mature intellectuals alike. An emblematic case is Chile that was stripped of its cultural elite in the wake of the 1973 coup d'état. Similar patterns of emigration also occurred in Brazil in 1964, Argentina in 1974 and many other nations in the southern hemisphere.

This shift in the pattern of qualified immigration is clearly visible in Table 1 that shows the origins, expressed in percentage measurements of the total immigrant population, of qualified workers (professionals, technicians and highly skilled workers) to the US between 1964 and 1970 (Fortney, 1972).

	1964	1965	1966	1967	1968	1969	1970
<b>Region</b>	<b>Percent</b>						
Europe	37.1	37.9	35.2	31.5	30.5	23.9	22.3
Asia	9.7	7.2	18.7	29.7	26.7	41.4	52.9
North America	37.2	40.1	33.9	30.8	33.7	23.5	13.3
South America	13.5	12.4	9.4	5.1	5.9	5.6	3.6
Africa	1.4	1.2	1.5	1.6	2.1	4.5	6.7
Oceania	1.0	1.2	1.3	1.2	1.1	1.1	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Fortney, 1972 based on UNESCO figures.

In 1964, most of the highly qualified immigrants to the US had come from Europe and Canada, but by 1970 most were from Asia.

It is easy to surmise that this outflow of qualified human resources was looked upon by poor countries (and Asian countries particularly) as posing a serious threat to their economic development. Accordingly, the countries concerned raised the issue before the United Nations, and campaigned intensely during the 1970s. As a result of this pressure, the United Nations Conference on Trade and Development (UNCTAD) commissioned a series of studies to analyse the effect of the brain drain, especially as regards Asian countries. Some of the most important of these studies were those produced by Oh (1977), Nasseem (1977), Sicut (1977) and UNCTAD (1977a,b). UNCTAD also produced general reports containing information and political suggestions (see, for example, UNCTAD 1978, Pomp and Oldman, 1977), though none was to have any tangible effect.

Throughout the 1980s, the number of highly qualified immigrants to the US continued to rise, albeit with small variations as different policies were adopted by successive political administrations. The number of residency visas issued in the categories of “Professional, Specialty and Technical” and “Executive, Administrative and Managerial” increased from 64,740 in 1982 to 90,739 in 1989. The total number of visas assigned under these two categories accounted for roughly 10% of all visas issued in the period. It is not clear how many of these immigrants stayed in the US for good. All the same, the statistics clearly show that the US certainly enjoyed the benefits of a major “brain gain”: at the start of the 1990s, more than 430,000 of the science and technical workers in the US (more than 16% of the total) had been born outside the country. Also, more than 100,000 doctorate researchers (almost 30% of the total) in the US were of foreign birth (Cervantes, 1999).

In the same years, a sharp increase also took place in the number of qualified migrants from developing countries moving to industrialized nations other than the US, notably Australia and France. For example, the number of “Administrative and Technical” migrants from sub-Saharan francophone countries who came to France rose from 2,000 in 1975 to 17,000 in 1978 (Fresson, 1980).

Canada, too, remained a preferred destination for qualified immigrants in these years, though it suffered a contemporaneous outflow of scientists and technicians to the US.

The situation in Britain during this period was more complicated. From the mid 1970s to the start of the 1980s, Britain’s economic policies underwent a radical shift as the government of

the day abandoned the Keynesian model and embraced neo-liberalism. The result of this change was a huge increase in labour mobility in all industries and sectors. The effects were felt among highly qualified workers as well as in the universities that had to accept cutbacks in their funding. Consequently, many professionals, researchers and technicians, including non-Britons who had previously immigrated to the United Kingdom, found themselves looking for fresh employment in other countries. On the other hand, the increased mobility also opened up new employment opportunities for qualified Britons who had previously moved abroad, as well as for foreigners in possession of the specialist skills most in demand. This caused a considerable increase in the inflow of qualified personnel to Britain. On the basis of International Passenger Surveys<sup>3</sup> (admittedly, not the most accurate statistical source), it has been calculated that between 1978 and 1990, approximately 60% of the people entering or leaving the United Kingdom consisted of very highly qualified persons (Salt, 1992). In 1989 alone, 70,600 people classed as “professionals” and “managers” left Britain for reasons of work of whom 45,100 were British citizens. In the same year, 75,500 people belonging to the same category entered the country, roughly half of whom were returning expatriates (Salt, 1992). If the figures for that year are representative for the period as a whole, they seem to point to the conclusion that if neo-liberalist economic policies were effective in attracting foreign intellect into the country, they were just as effective in pushing British brains out of the country. Britain seems neither to have enjoyed a net gain nor suffered a net loss.

We must also remember that during the 1970s and 1980s the economic unification of western Europe, begun in the 1950s, was completed (Tapino, 1994). The Treaty of Schengen officially sanctioned the free movement of labour within the European Union and many availed themselves of the opportunity, especially the very highly qualified. Mobility within the Union, which governments strongly encouraged, increased enormously but has never been properly monitored. So we are unable to say whether mobility brought about a uniform redistribution of human resources in science and technology or whether it led to brain gains for some and brain drains for others.

## **5. The 1990s: Globalization and the Brain Drain in Eastern Europe**

The early 1990s saw a series of economic and political changes that had major repercussions on the migration flow of highly qualified people.

The end of the Cold War, the dissolution of the Eastern Bloc, the increasing prevalence of methods of production that depend entirely on scientific and technological innovation, the emergence of a global market in which capital and, to a lesser extent, labour could be transferred freely from one place to another increased the international migration of highly qualified workers searching for better salaries, lifestyles and working conditions. Many major regions such as Europe signed up to agreements guaranteeing the free movement of capital, labour and goods across national borders. At the same time, globalization and the creation of new opportunities in recently industrialized nations contributed to an increase in the number of qualified workers migrating temporarily or permanently from developed to developing countries (see, for example, Rudolph and Hillmann, 1977). We now have a global labour

---

<sup>3</sup> International passenger surveys are based on interviews of a sample number of incoming and outgoing passengers at ports and airports in the United Kingdom. The interviewees are asked to state the reason for their journey. Those in arrival are asked whether they intend to reside in the country for a year or more; those in departure are asked if they intend to remain away for a year or more.

market, and an increasing number of jobs demanding special skills and professional experience can now be bought and sold throughout the entire world (Iredale, 1999).

The most industrialized countries, notably the US, Canada and Australia (Cobb-Clark and Connolly, 1997) but also France, Britain and, to a limited extent, other countries as well are now competing with each other to attract highly qualified technical-scientific or managerial personnel. When choosing a destination, the skilled worker will not only consider the qualities of a given country, but also weigh up the policies and economies of its competitors.

In the early 1990s, the number of residency visas for qualified immigrants issued by the US soared. In 1993, the number peaked at 147,000, but declined thereafter (to 85,200 in 1995). Of those who obtained a residency visa in those years (issued simply on the basis of recommendations from the applicant's employer (Kramer, 1997)), 40% had already been living in the US before applying. Most of the visas went to foreign students who had completed their university studies in the US. The Chinese are the ethnic group that has contributed the largest number of qualified workers to the US since 1989 (Iredale, 1999). The US is still the favourite destination for qualified workers from all parts of the world, even though some of them find it hard to make use of their specialist skills in the US labour market (Iredale, 1997).

Throughout the 1990s, Canada was very successful in drawing in qualified labour, and steadily increased its intake of "skilled immigrants." The number of them who became permanent residents increased from 20,000 in 1983 to more than 100,000 in 1995 (Kramer, 1997). This is an even better showing than the US in the same period. It has been estimated that the stock of highly qualified immigrants in Canada is increasing by 60,000 people per year (Mata, 1994). The largest migrant groups to Canada come from, in order, Hong Kong, France and India. These people are helped by the Canadian immigration system that, when examining applications for residency, awards extra points to professionally skilled workers who have a sound knowledge of English or French.

Australia has a strong pull on skilled immigrants mainly from Asia but, owing to the changing priorities of its governments, has varied its immigration policies greatly in recent decades. Until the early 1980s, Australian immigration legislation was very relaxed, especially as regards arrivals from Europe, and it therefore received a large number of immigrants<sup>4</sup>, though they were not particularly well qualified. Since the 1980s, the rules have been tightened and modified to favour skilled over unskilled workers who are judged on the basis of their expected capacity to contribute to the wealth and development of the country (Cobb-Clark and Connolly, 1997). Of course, the definition of what skills are needed will depend on the economic policy that the government of the day has chosen to follow.

In the period 1990-91 when the Australian Labor Party was in government, the number of skilled immigrants soared to over 48,000, but fell below 20,000 per year in 1996 and 1997 after the Liberals had come to power. The Liberals, however, then changed their approach, and in 1998 the number of residency visas assigned to skilled immigrants began to climb again, though the selection process is strongly skewed in favour of certain categories of workers (Iredale, 1999).

Since the early 1990s when the Eastern Bloc was dissolved, the countries of Eastern Europe, particularly those that until 1991 formed part of the Soviet Union, have been supplying the world with skilled migrants to add to those from other countries with a tradition of

---

<sup>4</sup> Between 1943 and 1983 immigration accounted for 40% of the increase in the population of Australia.

emigration by its scientists and technical workers.

According to a 1993 OECD study, Russia alone lost more than 500,000 scientists between 1989 and 1991, and the outflow shows no sign of slowing down. Other statistics show that the Russian scientific community lost 37% of its workers between 1989 and 1995. Between 1990 and the first half of 1995, 120,000 Russian scientists, engineers, doctors, dentists, artists, journalists and technicians left their country (De Tinguy, 1995).

The enormity of the numbers reflects the size of the human resources in the fields of science and technology that Russia had built up during the communist period. Proportionally, however, the countries of Eastern Europe have been exporting just as many skilled workers as Russia, or even more (see, for example, Grecic, 1995). The cause of the exodus or even more is the cutbacks in scientific and technical projects in these countries, especially in the military and space sectors. To this we must also add: low salaries relative to the cost of living and better working conditions in the host countries to which the workers emigrate (see, for example, Dolgic, 1995; Leidonova, 1995; Tyconov, 1995). At first, the migrants headed for the US that also had a specially tailored US programme to attract highly qualified scientists from former USSR countries (Tyconov, 1995). Later, they started going to other developed countries. The youngest and the most highly qualified are the workers with the highest propensity to emigrate (Dolgic, 1995; Leidonova, 1995).

Although some academics (such as De Tinguy, 1995) would dispute the claim, we seem to be witnessing the largest brain drain of all time. The sheer size of this flow and the general slowdown in the world economy in recent years has created the risk that the skilled migrants from East Europe might end up not finding employment in the host country befitting their qualifications. The risk of extensive brain waste is imminent (see, for example, Bernstein and Shuval, 1995).

## **6. The Outlook for the 21st Century**

In the 1990s, it was thought that the problem of the brain drain phenomenon had been largely solved by the globalization of the economy and the spread of information networks. Yet once again, the issue has turned up as a source of contradiction and difficulty at the heart of the world economy. One reason is that the chronic shortage of science and technology workers in the developed world, especially the US, has continued and, owing to the population decline in industrialized nations, is getting even worse (c.f. Boulier, 1999). Another reason is for reasons yet to be explained, fewer and fewer students in industrialized countries are enrolling in science faculties (see, for example, Le Scienze, 2001).

Many less industrialized nations, especially in Asia and Latin America have, at great cost, established systems of higher education capable of producing very well qualified personnel. For the time being, the economies of these countries are unable to provide their science students with a sufficient number of professionally satisfying posts (Gaillard and Gaillard, 2001), and this has caused a haemorrhage of talent. The prevailing tide has also been swollen by the collapse of the economies of East Europe, which had previously been only marginally affected by the brain drain phenomenon. Suddenly, from the early 1990s on, East European countries found themselves in a situation similar to that of developing nations. The result has been “inverse technology transfer”, an unjust process by which poorer countries pay the cost of training professional workers who then put their services at the disposition of the wealthy

nations (see Boussaid, 1998).

The policies put in place so far by the “exporting” countries to counter the tendency can do little to change the prevailing political and economic order in the world, and have therefore proved ineffective. Countermeasures are contingent on each country’s economic, scientific and technological stage of development, and depend for their success on the existence of an adequate long-term government strategy. Until the southern hemisphere and, nowadays, East Europe, too, are able to create the necessary contingencies and enact the appropriate policies, only scientific and technical cooperation based on genuine agreement and the pursuit of reciprocal interests between developed and developing countries has any chance of stemming the brain drain (Gaillard and Gaillard, 2001).

The current global recession, which is afflicting wealthy as well as poor nations, makes the realization of this level of cooperation most unlikely. We cannot even rule out the possibility that the reverse transfer of technology will begin adversely affecting western European nations. Without intervention by the European Union, the brain drain towards the US will gather pace; indeed, we have strong grounds for believing that this process is already under way (cf. ADI, 2001).

## 7. Bibliography

- Adams W., Rieben H., (eds.) “L’exode des cerveaux”, Lausanne, Centre des Reserches Europeennes”, 1968.
- ADI (Associazione Dottorandi e Dottori di Ricerca Italiani), “Cervelli in fuga”, Avverbi Edizioni, Roma, 2001
- Agrawal V. B., Huang W. C., , “Cross Sectional Analysis of Indirect Professional Immigration to the United States”, *International migration*, 29, 445 1991
- Ardittis S., “Tendences et nouveaux enjeux de l’exode des cerveaux des pays en développement”, *Studi Emigrazione/Migration Studies*, 26, 272, 1989
- Barbero M. I., “Il profilo degli industriali italiani e il loro contributo allo sviluppo economico argentino”, *Affari sociali internazionali*, n. 2, 192, 1987
- Bernstein J.H., Shuval J. T., “Occupational Continuity and Change among Immigrant Physicians from former Soviet Union in Israel“, *International Migrations*, 33, 3-29, 1995
- Boulier, D., “La migration des competences : enjeu de justice et solidarité internationale”, *People on the Move*, XXVII, 69-79, 1999
- Boussaid L., “L’exode des cerveaux et les pays en developement”, *Migration Societé*, 10, 65-71, 1998
- Cobb-Clark D., Connolly M., “A Worldwide Market for Skilled Migrants: Can Australia compete?”, *International Migration Review*, 31, 670, 1997)
- De Tinguy A., “La mobilité des élites: une chance historique pour la Russie” *Studi Emigrazione/Migration Studies*, XXXIII, 98, 1995
- Dunae A., “Gentlemen Immigrants: From the British Public Schools to the Canadian Frontier”, Manchester University Press, 1983
- Dolgik E., *Determinants of Migration Potentials among Russian Physicists*, *Studi Emigrazione*, vol 117, pp 144-158, 1995
- Dreyfus M., “Que sait-on en France des créateurs d’entreprises étranger depuis un siècle?”, *Revue Européenne des Migration Internationales*, 8, 17, 1992
- Fermi L., “Illustrious Immigrants: the Intellectual Migration from Europe, 1930-1941”, University of Chicago Press, 1971
- Fortney J., “Immigrant Professionals : A brief Historical Survey”, *International migration review*, 6, 50 ,1972
- Francovich L. “Le migrazioni intellettuali in Europa e in Italia”, atti del Convegno Internazionale “Migrazioni, Scenari per il XXI secolo”, 1, pp.621-679, Rome, 12-14 luglio 2000
- Fresson, S., 1980, “L’exode des compétences des pays en voie de développement vers la France” *Documents Homme et Migration*, n. 982, 1/1/1980, 31ème année
- Gaillard A. M., Gaillard J., “Fuite des cerveaux: un voyage à sens unique?”, *Sources UNESCO*, N° 132, p. 3-6, mars 2001

- Geymonat L. “Storia del pensiero filosofico e scientifico”, Vol. I, Garzanti, 1976a
- Geymonat L. “Storia del pensiero filosofico e scientifico”, Vol. III, Garzanti, 1976b
- Grecic V., *Migration of Scientist and Professionals from Republic of Serbia*, Studi Emigrazione, vol 117, 1995, pp117-127
- Huges H. L. “Da sponda a sponda. L’emigrazione degli intellettuali europei e lo studio della società contemporanea (1930-1965)”, Bologna, Il Mulino, 1977 (trad. It. of “The Sea Change: The Migration of Social Thought, 1930-1965)
- Iredale R. “Skill transfer: International Migration and Accreditation Issues”, University of Wollongong Press, Wollongong 1997
- Iredale R., “Migration Policies for the Highly Skilled in the Asian-Pacific Region”, International Migration review, 3, pp. 882-906, 1999
- Johnson H. G., “Le point de vue cosmopolite” in W. Adams and H. Rieben (ed.s) “L’exode des cerveaux”, pp. 79-103, Lausanne, Centre des Reserches Europeennes”, 1968.
- Kramer R. “Development of International Migration to the United States: 1995”, The United States Report for the Continuous Reporting Systems on Migrations (SOPEMI) of the Organisation for Economic Co-operation and Development (OECD), Washington, DC, Dept. of Labour, 1996
- Krings, V. (ed.) “La civilisation phénicienne et punique”, Brill, Leiden, 1995
- Ledeniova L., *Attitude to Emigration among University Students in the Former USSR* Studi Emigrazione, vol 117, 1995, pp189-199
- Le Scienze “Cosa succede nelle nostre università?”, Le Scienze, LXVI, no. 389, 18-19, 2001
- Logan I.B. “The Brain Drain of Professional, Technical and Kindred Workers from Developing Countries: Some Lessons from the Africa - US Flows of Professionals (1980 - 1989)” International migration 3-4, pp. 289-312, 1992
- Mafai M. “Il lungo freddo”, Mondadori, Milano, 1992
- Martellini A. “Fare il milione”: La emigracion de élite y el mito de la tierra prometida”, Estudios migratorios latinoamericanos, 12, 467-489, 1997
- Mata F. “The Non-accreditation of Immigrant Professionals in Canada: Social Impact, Barriers and Present Policy” Socio-Cultural Information Division, Strategic Research and Information Policy Branch, Citizenship and Information Canada, Ottawa, 1994
- Moncarz, R., “Professional Adaptation of Cuban Physician in the United States”, International Migration Review, 2, 80, 1970
- Nasseem S., “Case studies on Reverse Transfer of Technology (Brain Drain): A Survey of Problems and Policies in Pakistan, UNCTAD Segretariat, Ginevra, 1977
- NSF Issued Brief, January 1999; cited in : Cervantes M. “Background Report: an Analysis on S&T Labour Markets in OECD Countries”, in OECD, DSTI/TTIP(99)92/Final, 1999
- OECD “Science, Technology and Innovation Polices - Federation of Russia - Background Report”, Directorate for Science, Technology and Industry, Committee for Science, Technology and Innovation Polices, Report prepared by the Russian Centre of

- Science Research and Statistics, 1993
- Oh T., “The Asian Brain Drain: a Factual and Casual Analysis” R. and E. Research Associated, San Francisco, 1977
- Pfanner H. F., “Exile in New York: German and Austrian Writers after 1933”, Wayne State University Press, Detroit, 1983
- Pomp R e Oldman O., “Legal and Administrative Aspects of Compensation, Taxation and Related Measures: Suggestion for an Optimal Policy Mix, UNCTAD Segretariat, Ginevra, 1977
- Reid W., “Weapons through the Ages”, Peerages Books, London, 1984
- Renfrew C., “Before Civilisation” Cambridge University Press, 1979
- Rudolph H, Hillmann F., “The Invisible Hand Needs Visible Heads”, in K. Koser, H. Lutz (eds), “The New Migration in Europe”, pp. 221 London, McMillan, 1997
- Salt J., “Migration Processes among the Highly Skilled in Europe”, International Migration Revue, 26, 484, 1992
- Sicat M., “Case Studies on Reverse Transfer of Technology (Brain Drain): A Survey of Problems and Policies in the Philippines, UNCTAD Secretariat, Geneva, 1977
- Tapinos, G., “Regional Integration”, in “Migration and Development”, OCSE, Paris, 1994.
- Tykonov V., *Migration Potential within Russia’s Military-Industrial Complex Studi Emigrazione*, vol 117, pp128-143, 1995
- UNCTAD, “Case Studies on Reverse Transfer of Technology (Brain Drain): A Survey of Problems and Policies in Sri Lanka, UNCTAD Secretariat, Geneva, 1977a
- UNCTAD, “Case Studies on Reverse Transfer of Technology (Brain Drain): A Survey of Problems and Policies in India, UNCTAD Secretariat, Geneva, 1977b
- UNCTAD, “Development Aspects of Reverse Transfer of Technology ” UNCTAD Secretariat, Geneva, 1978
- UNESCO “Statistical Yearbook”, 1999.