Foreign Business-led Mobility for Upgrading the Flow of Knowledge (New Measure and the Hungarian Experience)

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Abstract

This paper focuses on one part of the inflow of highly-skilled workers, namely on immigrants employed in relevant jobs by foreign (affiliated) companies. The aim of this research was to explore the relationship between foreign direct investment and knowledge-flow through mobility in the age of continuing internationalisation of companies. The internationalisation of economies is clearly changing the size, direction and character of employment-based mobility across countries.

This paper describes a new survey which was developed for this investigation in order to collect information relating to business-driven mobiles who are knowledge-conveyors in terms of brain and skill circulation.

Among the different types of business-led immigrants, managers first arrived in Hungary in the initial phase of transition. Foreign owners came here - or delegated employees - in the initial years of foreign direct investment in order to establish smooth collaboration - or simply to train locals in the jobs and apply tight controls. The importance of seconded CEOs (chief executive officers) should not be underestimated in the process of knowledge-flow, transfer of technology, and in changing the rules and behavioural routines. Managers create an environment for others to employ - or not to employ - their accumulated knowledge and skills and to support "upskilling" and mutual learning. In the later stages of development - more specifically in the late 1990s - other professionals were also imported by business, professionals such as development engineers and

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designers, and so many different types of knowledge assets flow into the country channelled through these occupations.

In the sample, most immigrants (one-third, in fact) were employed in sectors related to information and communications technology, and this clearly shows that Hungary, as a newcomer to the field of employers of immigrant labour, matched the contemporary "more highly educated immigrant" job pattern very well. This sector is, in fact, the leading employer for both groups – that of developed countries and the post-socialist and developing countries.

Keywords: knowledge flow, FDI, brain circulation, CEE
JEL Classification: J24, F21, O52

Introduction[1]

Global competition for highly-skilled workers (HSWs) has placed the international mobility of more highly educated personnel at the very centre of policy concerns. The number of highly-skilled "globe-trotters" has increased rapidly, although this class of migrants still represents only a small fraction of all migrants - of the whole Human Resources of Science and Technology (HRST) population. However, it is no accident that both sending and receiving countries pay careful attention to this very small group of migrants. Highly-skilled (HS) human resources must be taken into account by policy-makers, since it is such skilled people who are essential for the production, diffusion and dissemination of knowledge. They are one of the most important factors linking technological progress, economic growth, and competitiveness, social and environmental well-being. The internationalisation of economic development has noticeably accelerated the spatial movement of people.

The migration of highly-skilled workers varies in its nature according to profession, and the motivational background to outflow and inflow varies also. In the internationalised economy one of the most important initiators of migration / mobility is business, mostly foreign direct investors. Business-driven migration can play an important role in acquiring and disseminating knowledge and in combining skills for generating new knowledge.

This study focuses on one part of the inflow of HS workers, namely on incomers employed by foreign (affiliated) companies in highly-skilled jobs which normally require higher educational degrees. These jobs may either be more or less sophisticated than their previous jobs, but differences in sophistication among such type of jobs goes far beyond the scope of the present survey.

Business-led mobility across countries has two aspects: (1) In the home country it is business which initiates HS inflow as a means of overcoming a lack of specific knowledge or expertise within the country, a shortage of skilled workers in a particular field or the acquisition of highly specialised skills. (2) Business, as an investor or trader in a foreign country, posts employees in host countries for longer or shorter periods.

The brain-gain in several fields is extremely crucial for the transition economies. When located within a socialist system, this type of peripheral industry, arriving late on the

[1] *The paper is based on a report prepared for the EU Brain Drain project (EU ERBHP V2 CT 1999-07).*

scene, was effectively cut off from the major international sources of technology. During the transition period foreign investors could perform both types of business-driven migration (initiating and posting) in their role as initiators. The inflow of more highly educated people may become a genuine "brain gain" if these people are thoroughly involved in scientific/economic activity. Under the circumstances of transition, foreign affiliates seem to offer good examples for the study of business-driven migration and for examining gains in human resources of science and technology (S&T). The supplementary knowledge on which we are focusing can substantially help to compensate for the relatively low innovative performance of these countries.

Central and Eastern European countries, however, are appropriate "laboratories" in which to investigate this movement of foreign investors from the point of view of mobility. Foreign direct investment (FDI) started to penetrate into these countries in the 1990s when a positive correlation between the inflow of HS workers and the inflow of FDI was observable in the advanced market economies. At the same time, both brain-drain and brain-waste in the transition economies accompanied economic and political liberalisation. Political discourses as well as research studies concentrated on outflow (Carrington, 1998; Findlay, 1995; Glaser, 1978; Gokhberg, 1994; Sakkeus, 1997; Vizi, 1992; Walter, 1968), whilst our research is focused on investigation of inflow mobility - which is a very important part of brain-circulation.

This phase of research may assume that the *mobility of a highly-skilled person means spatial outflow and inflow of knowledge*. The assumption is that a mobile person transfers knowledge embodied in him/her from one country or region and/or on a job-to-job, employer-to-employer and sector-to-sector basis, across borders. Such embodied knowledge invariably has a (formally) certified content as well as a tacit content. It is, on the one hand, not fully transferable, whilst, on the other hand, the new environment may support the new combination of embodied knowledge which can lead to positive externalities for both the organisation and the individual.

In this paper we describe a pioneering survey which was developed to investigate the business-driven immigrants who are knowledge-conveyors in terms of brain and skill circulation. This novel form of measurement is currently in its infant stage, but it may be helpful in respect of the collection of information on international mobile HS people and the flow of knowledge.

The aim of this survey was to explore the relationship between foreign direct investment and knowledge flow through migration. We assume that the migration of highly educated people means a flow of knowledge from one country to another, and the question, therefore, was whether the penetration of FDI into Hungary has been accompanied by the appearance of international mobility, that is to say, how foreign investors are involving the Central and Eastern European countries (CEECs) in brain circulation. The survey, therefore, focuses on the role of foreign investors: entities are either small (that is, owned by one or a small number of foreign nationals) or they are giant multinational companies (MNCs). A side-effect of this survey is an investigation into non-FDI-related immigrants who are employed by foreign-owned companies. Consequently, the population examined in this study is that of HS immigrants working for foreign-owned companies - either posted, or simply employed by them.

1 Conceptual Framework

Knowledge may circulate across borders in many forms. Mobility is one of the instruments for the transfer of scientific, engineering, and business knowledge. A mobile human means a conveyor of knowledge. There are several ways for knowledge embodied in highly-skilled personnel to move across borders, and the basic mobility of HSWs is only one of these. The globalising, learning economy needs more mobile human resources. This brain circulation process has different impacts on national economies, on innovativeness, competitiveness and re-investment into knowledge.

The concept of this study derives from three quite distinct types of academic literature. The first lies in the field of innovation research. Here, important understanding has developed around key concepts, such as national innovation systems (Nelson, 1993; Edquist, 2000; Lundvall, 1992), and knowledge-based economies (David and Foray, 1996). An important part of innovation research is concerned with internationalisation, and the case is that internationalisation of the generation of innovation and technology has expanded considerably during the last three decades of the 20th century (Cantwell and Molero, 2003; Meyer-Krahmer et al., 1998; OECD, 1998; OECD, 1999; Patel and Pavitt, 2000; Pearce, 1999). The knowledge-based economies favour innovative networks and development of a dynamics of creation and circulation of knowledge, and so networking has become more and more common among different institutions - both at domestic and international level. The geography of the production of knowledge is on the way to becoming drastically modified. "Multinationals are establishing and

expanding R&D abroad, benefiting from the possibilities offered by ICT to internationalise the learning process along the whole of the value chain." (Cohendet and Joly, 2001, p. 80). Multinationals, in fact, are establishing operations in some significant locations where key competencies for high-quality research are already available – in this way benefiting from combining their own current capabilities with other, highly absorptive capabilities which are not only already active in their own right, but which offer an international dimension.[2]

The second strand of literature lies in the field of migration and mobility. Many academics have recognised (for example Findlay et al., 1994; Salt, 1997) that there is a positive correlation between the inflow of skilled labour and investment spending, as predicted by a model of migration of expertise following the economic theory of globalisation, but this is certainly not always the case. Intra-firm migration / mobility is a known phenomenon - although very little empirical evidence is available. Studying this topic is not easy since business organisations are usually reluctant to afford insight into this process (Winkelmann, 2002), and so the scarcity of studies in this field is due to many factors, the most important among them being the lack of data and general difficulties in measuring the phenomenon.

Another important strand of literature deals with measurement. Two OECD manuals provide detailed information on this issue, namely the Frascati Manual (2002) which defines the research and development population and their measurement, and the Canberra Manual (1995) which deals with human resources in S&T. The latter manual provides a conceptual work for measuring human resources devoted to science and technology (HRST). The total HRST population includes not only those working in research and development laboratories but also personnel such as shop-floor engineers, medical salesman and financial managers.[3] In this way the HRST population is broader than a simple group of scientists who are usually gifted, talented individuals (see the discussion of term in Cheese, 1991; UOE, 2001; David and Foray OECD STI, 1995, p. 27; Wolff, 1996).

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[2] *An important lesson from the experience of many countries is that FDI relates to pools of talent on a de facto, existing basis; foreign investors are not prepared to invest in education or in improving education (Pavitt, 1997).*

[3] *To employ Canberra Manual-type working definitions in this instance: to the HRST category belong those people who (a) successfully completed education at tertiary level in a science and technology (S&T) field of study 'more highly educated people'. (b) Not formally qualified as in (a), but who are employed in an S&T occupation where such qualifications are normally required 'skill level'.*

We have many unsolved problems to face in the measurement of migration of HS workers, including the basic one of the lack of a generally accepted definition of *highly-qualified migration*.

Many different terms are used in the literature to measure and discuss the international mobility of human resources in science and technology.

Definitions employed in scientific literature differ from the definitions found in official documents.[4] The length (of time) dimension is important in these notions but it does not enjoy overall priority over other factors. As Avveduto (2001) summarised the matter, literature sometimes uses the term "skilled international migration", "skilled international labour circulation", "professional transients", "migration of expertise" and "quality migration".[5]

Many different social science studies shed light on the drastically changing character of migration in the late 20th century (Chesnais, 1992; Cervantes and Guellec, 2002; Wolff, 1996; Salt, 1997; Salt and Singleton, 1995). A new wave and style of migration is emerging from the mobility of the scientific and business community.

The recent reshaping of the strategy of multinationals has increased "in-house" mobility and has changed the typical length of foreign postings. The professional pattern of posted personnel also differs from earlier periods. In general, multinationals and other foreign investors are becoming important players in the field of HS mobility. The forms of mobility accompanying foreign investment differ widely in that we can note both bilateral and multilateral posting of HS personnel, training of people in countries other than their normal workplace and long-term collaborative work involving short-term physical co-existence.

Foreign knowledge and the inflow of HRST are important sources of new technology, increasing productivity for any national economy, and foreign investors are becoming increasingly involved in, and responsible for, the migration of qualified personnel.

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[4] *The current UN definition, which is the basic definition for official statistics, defines migrants by calculating the length of stay (1 year + 1 day of residence in another country and foreign citizenship or permanent residence in a different country). This means that simple migration statistics cannot assist too much in classifying HS migrants as emigrant/immigrant or mobile.*

[5] *The original sources in order of notions: Findlay (1990), Cormode (1994), Appleyard (1991), Salt and Singleton (1995) and Todisco (2000).*

The "knowledge" embodied in individuals changes continuously by such means as further education, training and experience, as well as forgotten, disused or devalued knowledge. The impact of foreign highly-skilled workers on the economy of a host country depends on many factors: the differences in the knowledge actually imported by migrants relate to many factors - such as their education, work- experience and accumulated culture regarding the systems of innovation with which they are familiar, and so on. The knowledge actually embodied in “mobiles” can be either tacit or codified knowledge. Tacit or personal knowledge means that the individual concerned knows how to do something without necessarily being able to describe how he/she does it. Learning by doing is, therefore, one way of reproducing tacit knowledge. New people are brought into the company and the by-product of their activities is the diffusion of tacit knowledge (Arrow, 1994).

2 Penetration of FDI in CEECs and Mobility

Foreign investors range from the small foreign company, located in one or two countries, to the giant multinational[6], and distinguished players in the process of internationalisation of labour markets are the trans-nationals. According to the recent UNCTAD 2000 report, roughly 40,000 multinational companies run 300,000 firms in 130 countries of the world, although MNCs actually originate in very few countries (of the 100 top MNCs 88 originated from "the Triad").

The regional structure of investment flow has changed much during the last three decades. Until the beginning of the 1990s the majority of investment flow took place among the most advanced countries - within "the Triad".

Each type of foreign investor has a part to play in international migration, although the MNCs, being such important players in the world economy, are the rule-makers in the field of intra-firm international mobility. In the 20th century these companies accelerated the internationalisation of trade and capital markets and played an important role in national labour markets. During the last two or three decades of the 20th century they were economic initiators of the free movement of people and commenced the internationalisation of business research and development activities.

[6] *Foreign investment is classified as a direct investment if the foreign investor holds at least 10% of ordinary shares or voting rights in an enterprise and exerts some management influence. The term “foreign affiliate” is restricted to those foreign affiliates which are majority-owned.*

Multinational companies are important players in terms of brain circulation. They both export and import knowledge through internal mobility on an international scale. MNCs offer international career possibilities to their own employees, whilst the trans-national companies were always involved in organising the labour market across national boundaries, largely by encouraging people to change their location to where they could be most useful to the company. They brought managers into affiliates and created international career possibilities for people from both corporate headquarters and the affiliates. The differences may be observed by occupation and the status of affiliates within the group, this status relating to the position of individual countries in terms of world competition.

Types of such internal mobility include short-term migration (for example, in training seminars, on-the-job training and study tours within the "empire") and work under circumstances of short or long-term migration from one country to another (although such possibilities are not open to all employees). Both have important roles to play in dissemination, diffusion, accumulation and exchange of knowledge. The tacit and codified knowledge of organisations may be shared.

Foreign-owned companies as employers of immigrants may be classified into three different groups:

1) Long-term immigrants from investor-related countries (either from less or more developed regions). In such cases the home country of the investor and the citizenship of the immigrants are the same.
2) Long-term immigrants from non-investor-related countries (either from less or more developed regions). Here the home country of the investor differs from the citizenship of the immigrants.
3) Short-term immigrants from investor-related organisation (We do not, in fact, concern ourselves with this third group).

Any long-term immigrants may be business-led employees or job-seekers. The “business-driven flow” comprises both employment-driven and employment-initiated flows. In the first case, immigrants accompanying FDI are employees of the investor companies who simply post them from one location to another. The “employment initiator” may head-hunt specialists or recruit new employees through different channels in different foreign countries – but still in order to post them to the investment recipient

country. Business-led, highly-skilled workers are naturally employed as highly-skilled workers.

FDI is a relatively new phenomenon in CEECs. As is well known from the literature, the CEECs were outside the main flow of internationalisation for roughly four decades (WIIW Forschungsberichte No. 215, and Transition Report 1994), but they have now accumulated considerable experience of the influence of non-investment by foreigners in respect of knowledge flow. The less developed regions, which are generally avoided by investors, are usually great sources of migrant labour, including skilled migrants for the longer term, and only political constraints have prevented these countries from being large-scale suppliers of highly-skilled workers. The opening of borders has acted as a safety-valve for what we might perhaps term "pent-up migration".

The collapse of the socialist regimes and the transition of CEECs towards market economies have totally changed the situation. CEECs have become important target countries for foreign investors in the new unipolar world system (Resmini, 2000; Kalotay, 2003; Sass, 2004; Antaloczy and Sass, 2001; Inzelt, 1999, 2000, 2003a).

Specifically, FDI has played a fundamental role in the transformation of the Hungarian economy. One of the most common forms of FDI, that is to say, acquisition, was an important part of the privatisation process. Inward FDI flows (as a factor of GDP and averaged over the period 1990-98) put Hungary at the very top of the list among OECD countries. At the same time, outflow was very limited and very much at the lower end of the ranking table (OECD, 2001, p. 99).

There are many factors (and actors also) involved in establishing the ways in which people and jobs are brought together across borders. If foreign investment is accompanied by employment-based HS migration, then the consequent inflow and outflow will result in effective brain circulation.

The penetration of foreign direct investment in the transition economies offers a good possibility to study how foreign investors lock their local CEE firms into intra-company mobility.

Foreign investors are important players on the Hungarian labour market. (Inzelt, 1994; 2000). As an OECD study (OECD, 2001, p. 102) highlighted, the ratio of foreign affiliates in employment in the Hungarian manufacturing sector is around 50% - as high as in Ireland and Luxembourg. The ratio of foreign affiliates in industrial R&D is also

high in Hungary at 70%. This high figure reflects the economic activity of foreign affiliates, since they carry out relatively more R&D than domestic companies. It is, therefore, worth studying how the posting of people from parent companies and of mobile people from other regions relates to this level of activity.

It was assumed that the internationalisation of employment in CEECs would occur first of all in those companies which had been bought or capitalised by foreigners. The foreigners would upgrade the knowledge of companies by transferring their own knowledge. Other scenarios, however, were not excluded. Foreign investors might preserve the company's capabilities at the same level - or might even downgrade them. These scenarios, however, do not belong to our study.[7] According to their area of employment, the personnel involved might be the managers of subsidiaries of multinationals, professionals, consultants, specialist workers or international experts. The foreign, highly-skilled workers might be transferred within foreign-owned companies, recruited abroad by the company or simply employed locally.

We would like to know whether the penetration of foreign direct investment in Hungary is accompanied by emerging international mobility. Do foreign investors bring highly-skilled people into Hungary to upgrade the knowledge in various fields? Is our economy involved in brain circulation? From the standpoint of the overall migration process, this might be a narrow topic, but it is very important.

We made an attempt to measure the employment-based HS worker inflow into the country. In this connection, an important part of business-led HSW mobility is the long-term business-posted emigration from affiliates and partner organisations. Until now CEECs have not featured on any map of such a type of mobility, even if scattered emigration may be observed towards investor countries and to other locations of the multinationals. This survey does not deal with this (almost negligible) outflow of HRST.[8]

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[7] *Concentrating on brain circulation, we are less interested in the general influence of MNCs on the labour market. We are interested in cross-national HS mobility accompanying foreign direct investment.*

[8] *Generally speaking, the HS emigration from CEECs is not negligible. Here I would emphasize that an outflow through foreign investment channels has, as yet, hardly occurred at all.This channel of knowledge acquisition and dissemination has scarcely existed.*

3 Designing a New Survey

The thorough investigation of data sources (see Country folder on Hungary 2002) illustrates very well that very limited data on R&D mobiles are available and that the data on non-researcher, highly qualified employees are minuscule. The assessment of available sources leads us to conclude that a new survey is needed to fill the gap of missing data and indicators to respond to many important policy questions which are emerging with the internationalisation of economies. One of the important issues is the brain-gain of the business sector in a receiving country.

The IKU Innovation Research Centre of Budapest designed a survey to study the inflow of FDI business-led, highly-skilled workers. The aim was to attempt to measure this process and collect adequate data for further investigation. The survey focuses on the role of foreign investors in HS inflow where the investors are either small foreign firms or giant MNCs.[9]

HRST-related manuals (the Frascati Manual, 2002; the Canberra Manual, 1995) and classifications (UN, 1998) simply touch upon migration-related definitions of this particular population sector. The measurement of brain circulation belongs to different (as yet un-harmonised) statistical domains. The effective realisation of "brain-gain" naturally takes different periods of time for different groups of immigrants, and, if we are to focus on HSW immigrants amongst the newcomers to a country, we need to divide them into two distinct groups. The greater part consists of incoming established HS personnel, although a further part will belong to the receiving country's HRST following a period devoted to accreditation of their HE degree under the rules and regulations of the receiving country. Personnel posted to a country by foreign-owned companies belong to the first group, although it should be remembered that foreign-owned companies, as normal recruiters in the local labour market, may also employ other new arrivals.

[9] *The design of the questionnaire and its testing in other CEE countries are described in an EU report (Inzelt, 2003b). Participatin in the survey process were Katalin Miskolczi (register preparation and survey testing), Nóra Csunderlik (survey testing and running) and Mandy Fertetics (data processing and tabulating). Their valuable work was extremely important for the successful completion of the pilot survey.*

3.1 Questionnaire

The survey method employed was that of a telephone interview combined with a fax-sheet, since such combined survey methods increase the reliability of responses. (The questionnaires can be seen in Annex 1.). This type of questionnaire allows the collection of data on foreign HE employed by a company on the actual day [month] of investigation. This information is extremely helpful in learning the features of HS migrants, although many characteristics of mobility remain unclear. Two directions for further research can bring crucial, additional information to the study of the mobility patterns of HS and of changing business behaviour in employing HS migrants. One is a retrospective survey which makes use of company archives and the other is a direct survey of individuals. We have attempted the second of these. The main characteristics of the survey are described in Annex 2.

It is not easy to identify the target group of the investigation, but the target group of this survey are either partially or totally foreign-owned companies employing highly-skilled immigrants.

The working definition of this sample was that a foreign highly-skilled worker is a person employed in an occupation where a first-degree qualification is normally required and who has worked at the company surveyed for more than 1 year. Those who met these criteria were included in the sample, whether or not their employer was a Hungarian company. (The actual employer might be another firm within the same group but located abroad – or even another company which "borrows" them). This method allowed us to test the relevance of the definitions taken from the Canberra Manual and from UN Migration documentation.

Two categories of HS migrants are employed: (1) Business-led and (2) Job-seekers. In both groups a distinctive group of migrants, returnees, may occur. The returnee has no clear definition, but it is a term commonly used for natives who stay a couple of years or decades abroad and then return to their native country.

In 1998 the total number of foreign-owned companies in Hungary was 26,272, that is one third of all companies (Statistical Yearbook 2000, p. 275-279). Such a large group was unmanageable in relation to our feasibility study and so we were compelled to narrow the circle. It may be assumed, however, that (1) if a firm's ownership is at least 51% foreign, the foreign affiliate is more likely to employ immigrants than others, and that (2) if a foreign-owned firm is innovative, it will employ highly-skilled workers more

frequently than non-R&D oriented, non-innovative firms. Without going into the details of sample selection, I would simply mention at this point that we used three different sources to identify firms which apply double or single filtering criteria.[10]

Only a minority of companies employ foreign HSWs on a long-term basis – that is for more than 1 year. There is, however, a great deal of what we may term short-term migrant activity among the companies which have not employed foreigners for a long time. In this connection, one or two respondents emphasised that highly-skilled foreigners regularly worked in Hungary for short periods.

Among companies who did not respond, it is worth mentioning one group of Hungarian medium and large-size firms owned by large foreign, national or multinational companies. Seven of these reported that records were at corporate headquarters (HQ), but the majority refused to respond to questions relating to the make-up of their workforce based on levels of *education, occupation and nationality*, mentioning "commercial confidentiality" as their reason. This behaviour does not relate to the person, occupation or nationality of the respondent but to the general corporate culture, the culture of the affiliate and the treatment of the affiliate by the group.

The results of sample selection are summarized in Table 1.

Systematic responses were received from 43 companies, *39 of whom employed long-term highly-skilled immigrants in 2000*. The remaining four had employed long-term HS immigrants in the 1990s. The sample, however, includes only those companies who were employers of long-term HS immigrants in 2000.[11]

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[10] *The sources were: The databank of the Ministry of Economic Affairs, which contained information on R&D, innovation, and technology transfer activities (in the broad sense) and on foreign investment. The reference year was 1998. Another source was the "Hungarian Top 200" compiled by "Figyelõ" which included well-known multinationals in Hungary. A further databank of the Ministry of Economic Affairs became available in 2001 and contained data on companies partly foreign-owned - by relevant sector and based on 1999 data. Sources were used consecutively in the sense that when the shortcomings of one source became clear, we moved on to another.*

[11] *The "used to employ" group illustrates the presence of two phases of FDI-related HS immigration, although we do not have retrospective statistical evidence on the HS inflow and outflow of companies. People interviewed mentioned that the company used to have long-term immigrants - for one or two years in many cases. They had arrived in the initial stage when the company was set up (or acquired) by its first foreign owner. The owners arrived or posted a few HS employees to Hungary to inculcate the new corporate culture, to import capabilities which were lacking and to learn the newly set-up/acquired firm's local culture and capabilities. After a few years of co-working these positions were passed on to locals (whether trained abroad by the company or not). Similar tendencies are also to be observed in other post-socialist countries.*

Table 1. **Sources of sample register and steps in selection**			
Steps in sampling	**Number of firms by sources**		
	MEA, R&D[1]	**'Figyelõ' TOP 200[2]**	**MEA, FDI[3]**
Total	725	200	
Performing double filtering criteria*	172	36	1,095
Not employing HSW immigrants**	79	16	638
Refused, disappeared, etc.	53	12	438
Respondents	40	8	19
Employing HSW immigrants for more than 1 year	16	6	17

Notes: MEA = Ministry of Economic Affairs.
**Filtering criteria by sources.*
[1] 51 % foreign ownership and innovation.
[2] At least 51 % foreign ownership among the first 50 in the rank of Top Hungarian.
[3] 51 % foreign ownership and large net sales (about HUF 300 million).
*** Including short-term immigrants.*
The number of firms by sources produces some overlapping.

4 Employment-based HS Immigrants at Foreign Owned Firms (The Main Findings of the Pilot Survey)

The 39 respondent companies employing highly-skilled immigrants provided detailed information on a total of *182 long-term employed, foreign citizens*.[12] In the case of business-led immigrants, we can assume that the organisation posting an employee had a clear wish to transfer the embodied knowledge of the employee in order to realise positive externalities from the new combination of knowledge.

Of a total of 182 highly educated foreign employees, 96 arrived from the home countries of the investors. The vast majority of these (60) came from the same countries or had the same citizenship as the investors. The number of business-led immigrants is somewhere between 60 and 96. Originating from non-investor countries are 86 HS immigrants, 18 of these from developed economies (UK, Belgium, Norway and Portugal) (Table 2).

There is much empirical evidence in the literature which shows that the country of origin, the sector of activity, the size of firm and the relative and absolute size of investment have an important influence on the flow of knowledge between the investor and the receiving countries. Our previous case studies have supported these observations.

[12] *The sample covers 5% of HS immigrants registered by National Employment Office. (Migration Statistics identified 4,384 higher educated immigrants in 1999 - 24% of total immigrants. The other statistical source, The National Employment Office registered 3,771 in the same year.)*

The same influencing factors are as important in the transition economies as they are crucial in other parts of the world. Let us first characterise the investors.

The total number of investor countries is 13, whilst the number of countries sending immigrants is 25. Common to both groups are 9 countries that are both investors and senders of immigrants. Twelve countries which are the source of foreign ownership comprise the advanced European market economies (excluding the USA); whilst another is the post-socialist giant, Russia. The 25 different countries from where immigrants arrived are made up of 13 advanced market economies, together with 8 CEE post-socialist countries and 4 belonging to the developing world.

We do not have exact data on business-driven and job-seeking immigrants, but we can use rough measures to classify respondents into these two groups. It may be assumed that the "business-driven flow" is roughly the same as that of immigrants from investor countries and that the "job seekers" are those who arrived from non-investor countries - including both the advanced market economies and the post-socialist and developing countries.[13] At this stage of transition this rough classification is relevant, although there are exceptions to be found in both groups (See table 2).

We term the first group "business-driven" immigrants and the second "non-FDI-related" immigrants' even though the latter group was also influenced by FDI. Foreign investors have an important influence on labour market conditions in that, during the first period of transition, the companies privatised by foreigners or who were invested in by foreigners, sometimes offered jobs with higher salaries than the others. In several sectors they were job-keepers/creators in the transition period.[14] Our sample covers only those groups of companies which maintained or created jobs. A large group of foreign investors employs no foreigners whatsoever - neither posted nor job-seeking.

[13] *The investor countries in our sample are the developed (advanced) countries - with one exception: Russia. This Russian-owned company employs 1 Russian, which supports our rough measure.*

[14] *Foreign acquisition has produced very different impacts on the job-market. In many cases departments and/or factories were simply closed, but, if the companies recruited or were ready to employ HE job-seekers, they usually offered better prospects than other companies.*

Table 2. **Number of Foreign HS Employees by Country of Investor and Citizenship**

Country of investor	Citizenship of foreign HS employee																												
	Immigrants from country of investor											Immigrants from country of non-investor																	
	Germany	Austria	France	USA	The Netherlands	Finland	Sweden	Switzerland	Russia	Denmark	ALL	Romania	UK	Yugoslavia	Croatia	Poland	Belgium	Ukraine	Norway	Slovakia	Iraq	India	Portugal	Czech Republic	Iran	Egypt	ALL	Total
Germany	25	1			1		2				29	9				1											10	**38**
Austria	2	5		7					1		15	15	3		3						1						22	**37**
France			6								6																	**6**
United States	1										1									1	1						2	**3**
Netherlands	1	1		1	1						4																	**4**
Finland						10					10																	**10**
Sweden	1		1		1	1	6			1	11	17	4	1		1	1		2			2					28	**39**
Switzerland			3	2			1	6			12		3				2			1			1	1			8	**20**
Russia									1		1							1									1	**2**
Denmark				1							1																	**1**
Italy																1											1	**1**
Luxembourg	1		4								5																	**5**
Cyprus												1															1	**1**
Unknown			1								1	6	1	3				1							1	1	13	**14**
Total	**31**	**7**	**15**	**11**	**3**	**11**	**9**	**6**	**2**	**1**	**96**	**48**	**11**	**4**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**86**	**182**

Note: Ranking of investing country by number of firms.

HS immigrant has citizenship of investing country.

4.1 Characteristics by Employers' Organisations and by Employees

From the 39-strong sample 21 investors originated from major, 10 from medium, and 4 from small economies.[15] (The remaining 4 were unknown). The most common foreign owners are Germans (13 of the 39) followed by Austrian (6), and French (4). Foreign investment has, to all intents and purposes, penetrated all sectors of the Hungarian economy. By economic activity, 7 firms were active in the manufacture of chemicals, in the commerce of chemical products and in the rubber & plastics sector. The second largest number, 5, had invested in the metal fabrication, whilst 4 are engaged in the manufacture of electrical and non-electrical machinery, in construction and high-tech services (software, engineering advisors, engineering firms, natural science and engineering R&D activities). Regarding the size of companies, the sample is very rich: since the smallest has 2 employees and the largest 8,427. At the end of 2000 the number of companies in our sample which were 100% foreign-owned was 21. Foreign capital ranging from 90.1% to 99.9% was involved in 8 companies, from 50.1% to 90.0 % in 5 whilst in 3 it was below 50%. Redeployment caused many changes in ownership between the period of selection and the investigation – which is the reason for foreign ownership being below 50% in several companies.

The total number of employees in the sample is 34,965, but data is not available as to how many highly-skilled people are employed by these companies. The total number of foreign employees and the number of foreign HE personnel are also unknown. Clearly, job-seeking, highly-skilled personnel may or may not obtain HS positions, and those who could not are usually missing from an employer's archives. Consequently, there is no one in our sample with higher education who does not perform an HS job. They were not, in fact, excluded from the investigation per se, but virtually no information is available on them through their employer.[16]

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[15] *Here, and in several other tables, we classified countries as investors or as the sending country by the OECD classification of major, medium and small economies.*

[16] *There are many reasons why more highly educated migrants cannot work in HS jobs (e.g. the labour market situation, the receiving country devalues the degree acquired by the immigrant, a limited knowledge of receiving country's language). The acceptance of an immigrant's knowledge also changes in the receiving country according to such factors as the economic situation, the organisation of the recipients and by the degree of assimilation of the immigrant himself (language skills, accreditation of degrees, networking). Some are "under process" for HS in receiving countries; others not. The survey could not identify immigrants belonging to these "no longer" and "under process" groups of HRST. According to our fragmented information, these people do not report themselves as more highly educated if their chances of an HS job are very limited. They like to avoid the possibility of their degree becoming a burdening factor in their employment.*

The total number of foreigners in our sample who were employed in highly-skilled jobs is 182, whilst the ratio of foreign HE employees to the total number of employees is around 0.5%. If we assume that the total number of highly-skilled workers is no more than 10% of all employees (3,497), then the foreign highly-skilled worker category represents 5% of all highly-skilled employees.

Out of the 39 respondent companies, 3 employ more than 10 more highly educated foreigners, whilst the 100% foreign-owned companies (21 in number) employed 75% of these (Table 3). As the last column shows, only 3 companies employ more than 10 foreign HE personnel. Two of these are active in information technology and carry out R&D activities in Hungary, whilst the third is a well-known multinational in the tobacco industry.

As Table 3 shows, half of the firms investigated employ only 1 highly-skilled foreigner and fewer than 10 % employ more than 10 HE personnel. The largest number of foreign highly-skilled workers is 39 (employed by a multinational company). The next in ranking is also an MNC, which employs 22. As we know from other sources, these MNCs have involved their Hungarian affiliates in R&D activity and both joint and shared R&D activities are characteristic of the category.

By size of group, medium and large companies employed 78% of foreign HE personnel and one quarter employed at least 6 such (one of these was to be found among the small companies).

Table 3. **Number of companies by origin of FDI and number of foreign HE employees**

Country origin of investment		Number of companies					
		Total	by number of foreign HE employees				
			1	2	3-5	6-10	11-
Major economies	United States	2	1	1			
	Germany	13	7	2		4	
	France	4	3		1		
	Italy	1	1				
	Russia	1		1			
Total		21	12	4	1	4	
Medium economies	Netherlands	2		2			
	Switzerland	1					1
	Austria	6	3		1	1	1
	Sweden	1					1
Total		10	3	2	1	1	3
Small economies	Denmark	1	1				
	Finland	1				1	
	Cyprus	1	1				
	Luxembourg	1			1		
Total		4	2		1	1	
Unknown		4	2		1	1	
Total		39	19	6	4	7	3

4.2 Key Characteristics of HS Foreign Employees

Relating to the development level of the host country, two main groups of immigrants may be distinguished according to their national origin:

- Immigrants from countries more developed than the host country itself
- Immigrants from countries less developed than the host country itself

In very rough terms, citizenship (in regional terms) might indicate differences in development level and variations in familiarity with types of national innovation system. Each group of HS immigrants has both common and different roles in the S&T system and in the economy of the host country. Table 4 summarizes the origin of foreign HSWs by main region.

Table 4. **Foreign HS employees by regions of citizenship and by gender**			
Region	**Total**	**Male**	**Female**
EU countries	92	86	6
EFTA	8	7	1
New members (Poland, Slovakia, Czech)	6	4	2
Candidate (Romania, Croatia)	51	41	10
Other European countries (Ukraine, Russia, Yugoslavia)	8	7	1
America	11	10	1
Others	6	5	1
Total	182	160	22

Note: Among the Romanians, 2 are Romanian citizens but ethnic Hungarian, 1 of whom has now been naturalised Hungarian; likewise, 1 German and 1 American are Hungarian by origin.

One quarter of the foreign, highly-skilled employees are Romanian citizens (48). These are usually economic and ethnic migrants settling in Hungary or moving from East to West.[17] The second largest group of highly-skilled workers is German (31); which is due to foreign acquisitions and investment. In this category many nationalities precede the Austrians. A special group of migrants, the returnees, may arrive from both groups of countries, and among the immigrants two were identified as returnees posted by foreign owners. However, we know of several other returnees educated in Hungary, holding foreign citizenship and who were posted here. These people usually have an important role as knowledge conveyors and are actively participating in brain circulation.[18]

As regards gender distribution among long-term immigrants, professional women seem less involved in intra-firm mobility than men. The vast majority of HS immigrants (88%) are men - from 25 different countries – and women (12%) have arrived from only 11 different countries. Women may be more reluctant to move for family reasons or they may have fewer opportunities to be seconded or posted by their employers. It is, however, worth noting that only 36% of the females arrived from the advanced countries,

[17] *Liberalisation in CEE countries plays an important role in ethnic-based economic migration. Other motivating factors were significant: economic differences and labour market possibilities in neighbouring countries are serious factors in short and long-term migration.*

[18] *Not only do official statistics find difficulty in collecting data on genuine, returning (HS) migrants; it is not easy even for a specific survey such as ours to collect them. Human resource managers reported as returnees those holding dual nationality and foreign citizens with Hungarian family origins (either born in Hungary or born abroad but speaking Hungarian). If a Hungarian citizen had worked abroad for 5-10 years without changing citizenship, he/she was not included in the immigrant category nor identified as a returnee (one from Germany and the other from the USA).*

whilst the proportion of males is 57%. The gender distribution factor may not be very far from the Hungarian average.

Different generations show various characteristics as knowledge conveyors. The younger generation usually conveys fresh, new knowledge but can offer very limited experience. In other words, there is more codified and less tacit knowledge embodied in younger people, and in this case it is extremely important that they acquire new knowledge wherever they can. On the other hand, the older generation possesses much in the way of familiarity with routine and practice, of skills and competencies which are conveyed from one work-place to another across borders. Their codified knowledge may be either up-to-date or out-of-date - depending on the individual's efforts and success in the life-long learning process.

Two-thirds of immigrants are below 40, so belonging to the generally more mobile population sector (Table 5). By their age 14% (25) employees are above 50, but only 4 of these arrived from post-socialist or developing countries (refugee supplier countries). Different proportions in age groups by country of origin highlight the fact that immigrants from different environments are arriving with different aims, expectations and opportunities. Immigrants from the advanced economies display strong mobility characteristics, in that, for example, young West Europeans and Americans look for jobs in Hungary (in CEECs in general) as a stepping-stone for a future career. More mature Westerners are given a job by their employer as a pre-retirement or "winding-down" position.

Table 5. **Foreign HS employees by main region of origin and age-group**

Region	**Age group**				
	20-29	**30-39**	**40-49**	**50<**	**Total**
EU countries, EFTA, America	16	49	15	22	102
Post-socialist countries	24	21	3	2	50
Others	2	3	-	-	5
Total	42	73	18	24	157

Note: Age distribution was not known in each case.

People from post-socialist and developing countries belong to typical age groups of economic immigrants and represent the most mobile generations. For them Hungary might be a final destination (for example, for Hungarian ethnic minorities from neighbouring countries and for those who were educated in the country and speak the

language). Alternatively, it may be nothing more than a transit stop on the way from their home country towards the more advanced countries.[19]

The picture of age-group by gender is very typical. On average, the female HS immigrants are younger than their male counterparts. Of the females, 73% were below 40 but only 66% of the males .The proportion of females to the total population below 40 is 14%, whilst above 40 it is 7%. The sample is, however, too small for further analysis. If we examine the occupation of immigrants by age group, we can find only senior officials and managers above 60. In the 50-59 age-brackets this proportion falls to 21%, whilst only 6% of all professionals belong to this particular age-group.

4.3 Imported Codified Knowledge

The University degree is a common measure of codified (certificated) knowledge. The information on certificated knowledge is based on the foreign worker's educational qualifications as accepted in the country of origin, but differences in educational systems among the countries of origin of the degree go beyond the investigation of this paper.

The response rate to this item proved lower than to others. We know the degree of education of 60% of employees, and so this part investigates together both the business-led and job seeker migrants who were employed by the companies investigated.

In respect of university degrees, the majority (119 immigrants) had a second degree, whilst two had a third - and no more than 21 had a first degree only. In the class of 'unknown' there are several non-graduates.

The largest group of immigrants have university degrees in engineering. In fact, two thirds have degrees in engineering, of whom half belong to ICT-related fields: electrical engineering and informatics (32% of item respondents). The engineering field was significant among arrivals from both the advanced countries and the former socialist countries (Table 6). Even the total number of arrivals shows almost the same proportion

[19] *In addition to the turbulent migration within the region, Hungary and other CEECs, are becoming target destination countries for many Asians - at least temporarily. In accordance with general migration tendencies, people are arriving from the ex-socialist countries or satellites of the communist world (e.g. Mongolia, Vietnam, Afghanistan, Georgia and Uzbekistan). People from the large Asian developing countries are also among the immigrants, although we could not find many of these in highly-skilled jobs in the companies surveyed.*

of ICT-related engineers as higher among immigrants from candidate countries. 10% of respondents are educated respectively in the natural sciences or in business (management, marketing, and commerce). The majority of business degree holders arrived from EU countries and 35% of these are above 50 years of age. If we look at their occupations, this is self-explanatory (see Table 7 in the next section). People with a degree in the natural sciences came both from the former socialist countries and from the developing countries - 53 % of these are below 40 years of age.

Table 6. **Relationship between field of education and different groups of HS immigrants**

Field of education		**Foreign HS employee from**					
		Developed country			**Developing country**		
		business posted	**business initiated and job seekers**	**total**	**business posted**	**job-seekers**	**total**
Law		1		1			
Social and behavioural sciences	Economics	12	15	27		3	3
	Business	2	1	3			
	Total	14	16	30		3	3
Natural sciences	Biology, maths and computer-related		2	2		10	10
Medicine	General physician					1	1
Engineering	Unspecialised	25	6	31	1	13	14
	Business-engineer	4	5	9			
	Mechanical engineer	4	6	10		7	7
	Production engineer					1	1
	Electrical engineer	4	3	7		10	13
	Chemical engineer	1	1	2			
	Construction engineer	1		2		4	4
	Total	39	21	61	1	35	39
Total known		54	39	94	1	49	53
Unknown		5	11	17		10	18
Total		59	50	111	1	59	71

One interesting feature of those highly-skilled immigrants who arrive with foreign investment is that a home-country origin does not necessarily mean intra-firm mobility in all cases. Several highly-skilled workers were recruited in the home country (or in neighbouring or same-language family countries) specifically to work in the host country. We can assume that this type of recruitment policy which focuses on countries similar to the home-country is a transitory phenomenon. The reason for recruiting from countries similar to the home country (i.e. among the market economies) is perfectly rational: that is, to cover any missing capabilities in the host country and to upgrade knowledge in such areas as financial management, development management and

specialised engineering skills. Naturally, such recruitment policy also reflects the fact that we, as other transition economies, were a great puzzle to many foreign investors and that, in consequence, they preferred to employ leading professionals from their own, better-known environment.

4.4 Knowledge Acquisition and Occupations of Immigrants

Accumulated working culture, skills, competences and certificated knowledge may all inflow through the jobs performed by highly-skilled immigrants. Among the factors involved in knowledge-flow by means of migrants, a common language as a tool of communication is very important. The few exceptions lie in those jobs where communication is less important and where the shortage of specialists is high.[20]

It is well known that Hungarian belongs to a very small language family and is not easy for foreigners to learn. One of the important lessons of our telephone interviews was that immigrants may split into two groups by language requirement - the requirement of posted immigrants to be fluent in the best-known foreign languages. In the initial period of foreign investment Hungarian language skill was supposed to be a crucial knowledge-conveying capability, and one of the functions of returnees was to help in communication with their particular language skills. After a few months, however, it became clear that this function is, in fact, not so important. Immigrants posted for this purpose were replaced very soon - either by locals or by other foreigners who could communicate in one of the better-known foreign languages such as English or German. The requirement was different for job-seeking immigrants from the post-socialist countries and the developing world as their jobs were also different. They usually have to know or learn Hungarian both as an everyday and as a professional language.

In relation to occupations of foreign workers, we used data provided by human resource (HR) managers. These occupations were classified by IKU into ISCO (International Standard Classification of Occupations) categories, although on several occasions we did feel it necessary to consult with the respective HR managers in order to obtain a clearer understanding of the actual occupation quoted.

[20] *A well-educated Afghan dentist cannot work in his field in Hungary since he cannot adequately communicate with clients, even if he is fluent in English and Russian, but Afghan computer scientists can be employed as computer scientists in Hungary even with no Hungarian.*

Highly-skilled immigrants, as reported by companies, are employed in those types of job which require a university or college degree.[21] According to their occupation they were employed in highly-skilled jobs (Table 7).

The pattern of occupation by ISCO category is quite interesting. 43% of immigrants hold "leader" positions, although most of those involved in production and functional managerial positions arrived in the country without management experience. The other 57% are professionals and associates. Out of a total of 101 professionals, it is engineers and architects who form the largest group (45); second come computer specialists. Whilst managerial positions are held by foreigners emanating from developed countries (mainly owners or owners' representatives) there is no significant pattern of professional jobs arising from developed, post-socialist or developing countries.

Table 7. **Number of foreign HS employees by occupation (ISCO88) and citizenship**

Occupation			Citizenship of foreign HS employees							Total	Total in %
			EU	EFTA	NM.*	Candidates	OEC**	America	Others		
1	Legislators, Senior Officials and Managers		58	6	1	6	2	3	2	78	42.9
1.2	Corporate managers		52	6	1	5	2	3	2	71	35.7
	1.2.1	Directors and chief executives	16	2			1	1		20	10.4
	1.2.2	Production and functional department managers	24		1	5		2	2	34	23.1
	1.2.3	Other departmental managers	4							4	2.2
1.3	General managers		12			1				13	7.1
2	Professionals		33	2	5	45	6	8	2	101	55.5
2.1	Physics, mathematics and engineering science professionals		19	2	1	42	2	8	2	76	41.8
	2.1.3	Computing professionals	6	2	1	18	1		1	29	16.5
	2.1.4	Architects, engineers and related professionals	11			23	1	8	1	44	24.7
2.2	Life science and health professionals (biological scientists, chemists, pharmaceutical sales personnel)				1		3			4	2.2
2.4	Other professionals (Business professionals)		14		3	3	1			21	11.5
3	Technicians and Associate Professionals								2	2	1.1
Unknown			1							1	0.6
Total			92	8	6	51	8	11	6	182	100.0

*Note: * NM=New member **OEC=Other European Countries.*

[21] *According to the experience of many other studies and our face-to-face interviews with immigrants, several graduates are employed in non-highly-skilled jobs for a variety of reasons (language, non-recognition of their degree, and the situation in the labour market) - for example, a Mongolian military engineer working as a maintenance mechanic is not included in the HS population. Without going into detail, we would like to emphasise that companies reported people as highly-skilled (HS) immigrants if they were employed in jobs requiring a degree.*

The number of arrivals from investor and non-investor countries shows that the recruited and posted managers (people with a background in the business sciences) are almost the same. (This business-related inward migration is directed towards certain crucial jobswhich did not even exist before transition.) Amongst engineers from the developed countries those who were posted represent two-thirds of the total number of engineers from the developed countries. This relatively large proportion illustrates the perceived importance of upgrading engineering knowledge in several fields and of co-operating in R&D activities in other fields.

The relationship between occupation and field of education is interesting, both variables being known in respect of 80% of the sample. One third of senior officials and administrators are graduates in the fields of social and behavioural sciences and law. Only one member of these groups was reported as holding a business degree. A majority of others in managerial positions have various engineering degrees, and, of a total of 40 engineering graduate managers, we found 20 who had a clear, distinct specialisation.

The strong correspondence between occupation and field of education illustrates very well that both those professionals who were posted here because of their profession and the job-seeking immigrants could obtain HE jobs if their degree or knowledge was considered relevant by the employers.

As regards the *sector of employment*, the largest single group of immigrants (one third) were employed in sectors related to information and communications technology, and it clearly shows that Hungary, a newcomer to the field of employers of immigrant labour, matched well with the contemporary "HE immigrant" job pattern.

This sector is the top employer for both groups – that of the developed countries and the post-socialist and developing countries. However, the proportion of HE immigrants from post-socialist and developing countries is higher (58%) than of those from the developed world.

Immigrants with an educational background in the natural sciences are employed only in three sectors, in Chemicals, in Radio, Television and Communications Equipment - and in "Services 2" (i.e. High-Tech Services). A background in Engineering and Business Sciences appears in almost all sectors.

5 Conclusions

The premise of this study was that the migration of highly educated people means a flow of knowledge from one country to another. This approach takes into account the migrants as knowledge conveyors from one country and/or sector to another, and the investigation focused on the inflow of HSWs from the perspective of the receiving countries' employers. The internationalisation of economies is clearly changing the size, direction and character of employment-based migration.

The question, therefore, was whether the penetration of foreign direct investment (FDI) into a transition economy has been accompanied by emerging international mobility, that is to say, how foreign investors are involving Hungary in brain circulation. Hungary, together with other CEECs, is a good laboratory for such studies, since the penetration of FDI coincided with the process of globalisation in the knowledge economies.

CEECs have accumulated considerable experience of the influence of non-investment by foreigners in respect of knowledge-flow. The period of the command economy system had constrained these economies from being involved in migration in any direction, and the political burden prevented these countries from being large-scale suppliers of highly-skilled workers. Subsequently, the opening of borders acted as a safety-valve for what we might term "pent-up migration". The inflow of HSWs is still narrower than the outflow, but its very presence is a good sign that a country is participating in the circulation of knowledge, since technology upgrading and innovativeness are both supported by the inflow of HSWs.

This newly-designed survey is an attempt to fill the information gap, and it focuses, therefore, on the role of foreign investors: entities are either small (that is, owned by one or a small number of foreign nationals) or they are giant multinational companies (MNCs). This survey investigated HS immigrants who are employed by foreign-owned companies and who arrived either with or without investment.

Most immigrants (one third) were employed in sectors related to information and communications technology, and it clearly shows that Hungary, as a newcomer to the field of employers of immigrant labour, matched well with the contemporary "HE immigrant" job pattern. This sector is the top employer for both groups – that of the developed countries and the post-socialist and developing countries.

Among the different types of business-led immigrants, managers arrived first in Hungary in the initial phase of transition. Foreign owners came here or delegated employees for the initial years of FDI to establish a smooth collaboration or simply to train locals for the tasks and to apply tight controls. The importance of the CEO should not be underestimated in the process of knowledge-flow, transfer of technology, and in changing the rules and behavioural routines. They create an environment for others to employ - or not to employ - their accumulated knowledge and skills and to support upskilling and mutual learning. In the later stages of development, in the late 1990s, other professionals were also led here by business, such as development engineers and designers. Different types of knowledge assets flow into the country through these occupations.

Germination of the seed sown by *posted R&D personnel and their activities has occurred in Hungary*. Involvement in research by MNC affiliates and extramural R&D activities are relatively new phenomena of globalisation, and the participation of Hungarian affiliates matches the new world experience. A few multinationals have posted professionals to manage research laboratories here in order to participate in research tasks allocated to Hungary, and *these are crucial representatives of brain circulation*.

Foreign owners prefer to recruit returnees and they can offer suitable jobs, providing salary and benefits packages fully comparable to those in the West. (This group of people may be identified only by means of oral interviews.)

If we consider the European Research Area, it is not sufficient to measure the process and its impact from the perspectives of the sending and receiving countries of Europe; the cost of transfer from one to the other is also crucial, and the globalising learning economies mean that it is extremely important to focus on such transfer costs. We need to elaborate further the concept of “brain drain”, “brain gain”, “brain waste” and “brain circulation”, but the findings are encouraging for the launching of studies into measuring the content of knowledge-flow through brain circulation.

Observation of the changes in the pattern of HS migrations over a period of time is crucial to learning the pattern of brain circulation and knowledge sharing as well as to obtaining a closer picture of the relationship between systems of innovation and migration / mobility. Relevant data and indicators concerning the size, character and tendencies of HS migration are important to policy-makers, to the business community

and to society in general. The aim of this survey was to explore the relationship between foreign direct investment (FDI) and knowledge flow through migration, and so we attempted to measure the employment-based inflow of HS workers into the region. This research proved that the opportunities of brain gain are open to less advanced countries, and for them a study of brain gain is as important as that of brain drain.

Changing the focus of the investigation from outflow to inflow leads to an important conclusion – that, even if the balance of the outflow and inflow is negative, the simple presence of inflow - and its durability - shows clearly that a country is participating in brain- circulation.

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Annex 1. Mini Survey of HE Foreign Labour Force in Firms

General Data

Name of the employing organisation: In Hungarian In English

Address: Webpage:

Name of contact person: Title of contact person:

Telephone number: Fax number: E-mail address:

In what language can he/she give information?

Nationalities	Per-son	Age-group	Gender F/M	Education		Field of sc.	Occupation	Since when employed by		Perm. issued
				Degree	Depart.			This firm	Mother/Aff.	
... country	1)									
	2)									
... country	1)									
	2)									
... country	1)									
	2)									

**The question about country of birth was optional (only to mention if different from nationality or citizenship).*

Annex 2. Lifelines of the Hungarian Academic Survey on Inflow of HSWs

(Business Sector)

Methodology	Characteristics
Kind of survey	Academic survey
Survey unit	Firms with foreign ownership and employing highly skilled immigrants.
Classification	ISIC Rev. 3 (two digit level); ISCO; ISCED
Definition	Canberra on HRST; UN on migrants
Obligatory/voluntary survey	Voluntary
Size of survey Number of responding firms employing HE immigrants - gross - net Number of highly skilled foreign workers employed by responding firms - gross - net	 43 39 207 182
Cut-off-point	Foreign ownership at least 50% Employing at least 1 HE immigrant
Questionnaire	Self development
Combination with other surveys	Not yet
Reference period	2001
Survey method & implementation	Phone interviews, face-to-face interviews and fax survey

Data collected and analysed by IKU, commissioned by EU through MERIT.