Nath H. K. Migration and Remittances: An Introductory Note // Entrepreneur. 2009 (http://www.entrepreneur.com/tradejournals/article/202802771.htm.)

Dicken P. Global Shift: The Internationalization of Economic Activity. London : Paul Chapman & Publishing Ltd, 1992.

Kamel Rachael. The Global Factory: Analysis and Action for a New Economic Era. Philadelphia, PA : American Friends Service Committee, 1990.

Marmolejo F. International Migration Outlook: Lessons and Experiences for International Education // The Chronicle of Education. 2010. July 26 [online edition].

Kumar N. International flow of students — An Analysis Related to China and India, // Current Science. 2008. Vol. 94(1). P. 34–37.

Talent mobility 2020 — PwC report investigates the future of international work (http://www.pwc.com/gx/en/press-room/2010/talent-mobility–2020.jhtml)

The growth of Cross-Border Education, Education Policy Analysis, OECD, Paris, 2002.

India Sends Maximum Number of Science & Engineering Students to US // The Economic Times (http://economictimes.indiatimes.com/articleshow/6147148.cms.)

Brain Circulation — watsonwyatt.com

Cross-Border Higher Education and Development, Policy Brief, OECD, Paris, January, 2008.

Stafford N. Russian science losing its edge, 02 February 2010 (http://www.rsc.org/chemistryworld/News/2010/February/02021001.asp)

Schiermeier Q., Severinov K. Russia woos lost scientists // Nature. 2010. Vol. 465. P. 858.

Ellerman D. Policy Research on Migration and Development. Mimeo, 31, 2003.

Dunnewijk T. Global Migration of the Highly Skilled: A Tentative and Quantitative Approach // UNU Working Paper Series. № 070. 2008.

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The Effect of Transition on Croatia's Scientific Drain

This paper focuses on the transition period in Croatia to investigate a specific time and place of the scientists' drain. The paper is largely based on the findings of three empirical studies. The actors of scientific and technological development were investigated in 1990 and 2004 using samples of the overall population of scientists in Croatia (scientists and researchers employed in universities, institutes and R&D units in the private and public sector), and in 1998 using a sample of researchers under 35 years of age.

Keywords: brain drain, scientists' drain, potential scientific drain, brain circulation

Introduction

although it is not yet a full member of the European Union, Croatia is no longer a closed country. In the second part of the 20th century, when it was an integral part of the socialist Yugoslavia, some Croatia's scientists established communication with the world

by individual permanent emigration to developed countries, mostly the USA and Western Europe. Some emigrated for economic reasons, often giving up their scientific career in their new environment, while others emigrated in order to fulfil their scientific ambitions under better professional conditions.

However, it cannot be said that there were no other types of communication with the world at that time. From as early as the 1960s, eminent natural scientists, for example, would publish their work in international journals and collaborate in foreign research centres without permanently leaving the country. For the social scientists, however, the authorities were not inclined to the international cooperation during the 1950s and 1960s. Even later, when the political climate became more liberal, social scientists were mostly uninterested in cooperation outside the borders of Yugoslavia, partly due to their locally oriented topics of research, and partly due to their non-stimulating environment[1].

Today, about twenty years after the country became independent, the scientific potential of Croatia amounts to around 10,000 scientists and researchers. Encouraged by the demands of the new science policy to open up Croatian science to the world and to harmonize it with global (European) scientific standards, Croatian scientists are increasingly more motivated towards (perhaps compelled to engage in) international scientific cooperation and are intent on publishing their findings in renowned foreign journals. According to a study of the social and scientific characteristics of doctors of natural and social sciences conducted by the Institute for Social Research in Zagreb, 63.4 % of doctors of natural sciences and 44.6 % of doctors of social sciences cooperated with international colleagues on a regular basis, and 60.7 % of natural scientists and 49.4 % of social scientists took part in international and/or foreign scientific projects in the period between 1999 and 2004.

The greater openness of Croatian scientists to international cooperation, and the increased opportunities for international scientific competition without leaving Croatia permanently, allow us to assume that the propensity of Croatian scientists to go abroad has been diminishing, and that the traditionally great (one-way) drain of Croatian scientists is easing.

The goal of this paper is to show that the propensity of scientists to leave the country *permanently* varied according to the changes in the social and professional conditions after 1990 (Croatia's independent phase).

The analyses contained in this paper are largely founded on three empirical studies of Croatian scientists and researchers. All three studies were conducted as a mail survey at the Zagreb Institute for Social Research.

The 1994 and 2004 studies covered the whole scientific population — scientists and researchers employed at universities, institutes and in R&D units in the public and private sector. Both studies were based on 8.6-percent samples of 921 and 915 respondents respectively. The samples were representative in terms of gender, age, scientific field and type of institution, but they were selective in terms of scientific qualifications (a preponderance of doctors of science).

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[1] Once it was broken off in 1946, communication with the world was never resumed to the full extent within the framework of the former socialist system. Even the most accessible form of international cooperation, publication in international journals, was usual only in the later period and only in some fields. Yugoslavia, for example, ranked 48th in the number of papers published by its scientists in *natural and technical sciences* in internationally renowned science journals in 1988. The situation was much worse in social sciences: it ranked 61st out of 143 countries (Me narić, 1990).

The third study, conducted in 1998, covered all 1.692 young Croatian researchers (under the age of 35), and the realized sample of almost 50 % (840) was representative in terms of gender and age, but partly selective in social and professional terms (type of institution, qualification structure). A subsample from 1990, consisting of 230 researchers below 35 years of age, was used for comparisons of young scientists.

Framework

The topic of the international migrations of scientists, which includes the *drain* of Croatian scientists, has been a peripheral problem in the recent sociology of science. There are no relevant sociological analyses of the factors and courses of external, i.e. international, migrations of scientists. This topic has been neglected primarily because of the scant interest shown by developed countries which have not been (sufficiently) affected by the *drain* of their own scientists. Nevertheless, a rising number of analyses of Russia's outflow of scientists since *perestroika* until today (Mirskaya, 1995, 1997; Strepetova, 1995; Markusova, 1996, 1999) and new interest for the topic in world's less developed region (Khadria, 2003; Wei Ha et al., 2009; Jiménez et al., 2010) has supplemented the numerous, sociologically weak analyses of the *drain* of scientists from the countries of the scientific periphery conducted around the middle and the second part of the last century, (Grubel, Scott, 1966; Beijer, 1967; Johnson, 1968; Patinkin, 1968; Oteiza, 1968; Gish, 1970; Portes, 1976; Oommen, 1989).

A surge of interest in these issues occurred in the early 1960s when concerns about an ever increasing number of British scientists being absorbed in American space, military and industrial research were voiced in Great Britain. In 1962 the often disputed term *brain drain*[2] *was coined and used in a British Royal Society report, which marked the growing interest in the issue of the external migration of highly educated people (primarily into the USA), drawing on the example of British scientists (Royal Society, 1962: 32)*.

Recent output on the topic (Chompalov, 2000; Okolski, 2000; Velev, 2002; Dumitrescu, 2003; Sretenova, 2003; Stalford, 2003; Cismas, 2004; Langer, 2004; Lungescu, 2004) confirmed the 1990s predictions (Fassman, 1994) that a number of analyses would appear dealing with the *drain*s from the EU newcomers, as well as from candidate countries, into the more developed European socio-geographic space.

Concurrently with the reports of the EU newcomers and prospective members, some recent studies from developed European countries also emerged (Meyer, 2001; Mahroum, 2001, 2003; Vogt, 2002; Ackers, 2003; Morano-Foadi, Foadi, 2003; Millard, 2005). A new surge of interest shown by developed countries in the outflow of the highly educated was also predictable, bearing in mind the projections that a larger portion of around four hundred thousand European researchers who currently live and work in the USA would not return into the scientific and research systems of their home countries (*EU Born Scientists and Engineers Employed in US* — Eurostat).

[2] B. Thomas was the first to draw attention to the inappropriateness of the term brain drain in as early as 1969 at the Demographic Movements Conference in London. Against the wish of a larger number of experts in international migrations, the term brain drain has become a part of scientific terminology.

The Tradition of the Croatian Scientists' Drain

So far, the Croatian scientific drain has been studied primarily at the level of *potential* drain, largely focusing on Croatian scientists' future intentions regarding international migration.

Institutional records of transitional changes in Croatian scientific and research potential has not always been standardised or completely transparent. The decrease in the number of scientists and researchers recorded particularly in the first half of the 1990s and the subsequent reversal of the trend are often perceived from incomplete records and outdated methodologies that have not specified the type, nature and structure of the changes. The problem becomes even worse when data connected directly with the scientific drain are interpreted. There have never been any reliable records in Croatia on the scope of the scientist drain; the drain has existed solely as an impression, speculation or an estimate.

Despite the fact that Croatia is a country with a long tradition of emigration, a country that for years shared the fate of all poor and underdeveloped areas, there have been no statistical data on the number of highly-educated emigrants and experts, especially data on the number of scientists who left the country as a part of a wider contingent of migrants[3]. However, Yugoslavia kept very precise records on foreign workers (*gastarbeiter*) without university education. The difference in the records on "dogsbodies*"* and doctors of science was indicative of the nature of the society that educated individuals and experts were abandoning, as Croatian sociologist Josip Županov (2001), an expert on this issue, observed.

A step forward from the *grey area* of the Croatian *brain drain* has been a few attempts of Croatian intellectuals in Croatia and abroad (during last 10 years) to establish a virtual meeting point on the internet to create the basis for future insight into the scope and other characteristics of the expatriate part of the Croatian scientific population[4]. Furthermore, the first congress of Croatian scientists from Croatia and abroad (2004) demanded that political effort be invested into the reversal of the long-lasting trend of the drain of Croatian scientists, and that return migration be fostered[5]. One of the conclusions of the Congress explicitly states that the *brain drain* is a wrong form of cooperation between the home country and foreign countries, and it should be replaced by the *circulation of brains*, i.e. the process of interaction of local and foreign *brains.*

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[3] In the mid 1980s, the Institute for Social Research of the University in Zagreb compiled an address book with 330 names of Croatian émigré scientists. The address book served for empirical research of scientific emigration in 1986 and was created in a special survey of Croatian scientific institutions (140) and eminent scientists in Croatia (234). Also, the latest edition of the biographical directory of Croatian emigrants in the USA and Canada, which was authored and published by Vladimir Markotić (Markotic, 1973), was compiled with the help of several renowned Croatian scientists abroad. The address book was also supplemented with the data from the American Men and Women of Science series, found at the time in the library of the American Consulate in Zagreb.

[4] Based on these attempts of Croatian intelectuals, National and University Library in Zagreb has launched the project "Croatian scientists in the world". Also, a few books: "Eminent Croatian Scientists in America" (1997, 1999) and "Eminent Croatian Scientists in the World" (2002, 2003, 2006, 2008) have been published by Croatian Heritage Foundation and Matrix Croatica.

[5] Following the conclusions of the Congress, the Minister of science, education and sports sent an invitation for cooperation to rectors of Croatian universities late in 2004, with the aim of initiating the procedure for the urgent resolution of the applications of scientists who wanted to permanently return to Croatia and who had shown their scientific excellence, as well as similar applications from potential (young) scientists.

Motivational Aspects

For years, theoretical patterns of motivation of the scientific drain, i.e. scientists' international migration, were founded on variations of the push-pull factors[6]. Social and professional *push* factors of the home country were contrasted with the *pull* factors of the promising host countries. However, scientific migrations were also considered rather peculiar compared to general migrations. Scientists' decisions on a radical change of their working and living environment are based primarily on intrinsic motivation related to professional aspirations and expectations. Scientist's motives thus differ from those of the rest of the population inclined to emigrate principally driven by economic and/or political motives — economic prosperity, safety and/or freedom.

Freedom of choice is an important factor in differentiating between the (general) motivational profile of the population and the specific one of scientists. During *hard*, anomic times, "pushed" scientific migrations come close to or *converge* with general migrations in terms of their drives (poverty, endangerment, lack of freedom), while they deviate or *diverge* during *better* times, when greater opportunities are at hand; and this is precisely the time when the motives peculiar to the scientific profession and career preferences are brought to the fore (Golub, 2004).

Effect of transition on motivational aspects

The final decade of the last century was an extremely difficult period for the Croatian people. It began with the fall of the socialist system and the breakdown of the Yugoslavian governmental and legal framework, which was followed by the Homeland War and the controversial post-war period. State and social institutions were reorganised and the larger part of the state-owned sector was privatised, and all this at the time of an economic slump and high unemployment. The result was dramatic social differentiation and the pauperisation of a large portion of the population.

Unemployment and the bleak situation in the wider social context of the late 1990s were the primary reasons for young people of different social and professional status to say that, if they had the choice, they would try their luck outside Croatia[7]. Furthermore, data from the Employment Bureau report as many as 150,000 persons under 30 years of age without a permanent job, and 115,000 people at their most productive age, between 30 and 40, looking for jobs.

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[6] The first studies of the motives of the scientific drain were conducted in 1968 by Wilson and Gaston (1974); in 1970 by Visaria (1977); in 1974 by McKee and Woudenberg (1980); and two years later by McKee alone (1983; 1985). In Croatia was established empirical base for motivational classification with mentioned research in 1986 (Prpić, 1989).

[7] In late 1998 and early 1999, the Zagreb Institute for Social Research conducted a study on the value systems of the young and on social changes in Croatia. The distribution of the propensity to migrate abroad (which amounted to 61.4 %), tested on a representative sample of 1,700 young people, was the following: 40.0 % of young Croatian citizens would leave the country for a longer period, but not forever; if they were offered an interesting opportunity, 18.3 % of respondents would leave forever; 3.1 % of respondents would leave the home country permanently given the opportunity (Štimac Radin, 2002).

It could be expected that such a social context would encourage an increased migration of all segments of the population, especially the educated segment which was more competitive on the global labour market and thereby more likely to find ways and means of migrating. Thus, even the scientists who left the country in the 1990s were not only looking for better conditions for research and professional challenges, but many of them, especially those of the younger generations, were driven by economic motives to ensure a better means of subsistence, even outside the world of science.

A comparison of the top four motives for the *potential* emigration of young Croatian scientists (under 35 years of age) obtained by studies conducted in the opening year of the transition period (immediately before the first democratic election in 1990), and eight years later (1998), shows that *economic* reasons for emigration rose to the very top of the list (90.4 %). The second apparent change occurred on the level of *social* and *political* conditions in the country, which were not included among the top four reasons for emigration in 1998, despite their continued relevance for a high portion of respondents (57 %). They were replaced in the hierarchy of *push* factors by the *position* of science and scientists in Croatian society (78 %). According to both studies, better *conditions* of scientific work and research abroad and better *career prospects* remain close to the very top motives of potential emigration of the young.

In the context of the already mentioned differentiation between general and scientific migrations, these data suggest the presence of both scientific and economic motives at both times, while the end of the socialist era also witnessed political motives for migration. Two general and two scientific motives were almost equally represented in the 1990 study, while in 1998 there was one general and three scientific motives. However, the single general economic motive dominated the scientific ones. At the very end of the socialist period, and especially eight years later, the external migrations of young Croatian scientists were strongly marked by social and economic factors, and scientists shared the fate of the greater part of Croatian citizens who looked to find solutions for their unfavourable living conditions and social and occupational position outside their home country. At the same time, the migrations were significantly marked by motives on which some analysts and theoreticians of social and spatial changes base their distinctions between scientific and general migrations. As far as the changes in the ranking of motives in the said eight-year period are concerned, the strengthening and predominance of economic over scientific motives could be interpreted as an indicator of an extremely difficult social and economic situation in the country. This was considered a strong *push* factor of potential and actual migrations of Croatian scientists in the 1990s.

Paradoxical Drop in the Propensity to Leave the Country

The propensity of Croatian scientists to move abroad permanently, or the incidence of thinking about leaving Croatia, should be observed separately in the segment of the overall research population and in the segment of young scientists. Judging by their readiness and propensity to migrate permanently, the young showed by far the greater *drain* potential.

The data in Table 1 are very revealing. In 1990, as many as 60.7 % of the scientific population were ready to consider the possibility of migrating abroad in order to improve their economic and/or professional status, while the figure almost halved (32.5 %) in 2004. This

change in the attitude of Croatian scientists towards emigration should be considered symptomatic, both on the national and the global level. Changes in the intention rates of young scientists, whose generational profile, but also worse social and lower professional position, makes them more positively disposed to make changes, are even more telling. Near the end of the socialist, i.e. pre-transition, period (1990), only slightly fewer than 10 % of scientists under 35 years of age did not consider the possibility of going abroad. Eight years later (1998), the share of young scientists determined not to leave Croatia rose to one third, reaching almost one half of the young scientific population in the next six years (2004)[8].

Table 1
Changes in the Propensity to Emigrate

	1990	1998	2004
SCIENTIFIC POPULATION			
Staying	39.3		67.5
Considering leaving	54.3		28.7
Decision to leave or taking steps to leave	6.4		3.8
Total	100.0		100.0
Chi-square = 304.369, df = 2, p = 0.00			
YOUNG SCIENTISTS (under 35)			
Staying	9.6	36.7	42.7
Considering leaving	78.7	56.0	50.2
Decision to leave or taking steps to leave	11.7	7.3	7.1
Total	100.0	100.0	100.0
Differences between 1990 and 2004: Chi-square = 279.859, df = 2, p = 0.00. Differences between 1998 and 2004 are not significant.			

The drop in the rate of intention to emigrate was first noticed among young scientists. This quotation from the year 2000 illustrates the situation:

It is interesting that the structure and propensity to emigrate are very similar or almost identical in the scientific population in 1990 and in young scientists in 1998. Not on the generational level, though. Since the very characteristics of their age make young people more inclined to change (enthusiasm, keenness to discover new things, unwillingness to reconcile themselves with the gap between their aspirations and the chance to realise these aspirations), and since their social position makes them able to reach radical decisions more easily (lack of professional inveteracy, lack of obligations in their private lives, etc.), it is almost certain that the survey of the complete population of scientists in 1998 would reveal that the propensity to leave had dropped even more dramatically (Golub, 2000: 140).

This was confirmed by research conducted in 2004 which showed that the intention rate of the overall scientific population was reduced to less than one third (32.5 %). Furthermore, the portion of scientists determined to migrate, i.e. those who had decided to

[8] Russian research conducted in 1994 recorded a fall in the propensity to migrate in a comparable post-socialist period. According to the study, only 4 % of Russian scientists wanted to leave Russia permanently, and only 12 % of them wanted to spend a limited period of time abroad. The majority of the latter were leaders in Russian science and prominent young researchers (Mirskaya, 1995).

emigrate or who were already taking steps in that direction, was also shrinking. On the level of the scientific population, the situation was as follows: in 1990 6.4 % of this population were *determined* emigrants, while the figure dropped to 3.8 % in 2004. Among the younger generation of scientists, in 1990 11.7 % of these scientists were determined to leave or were already taking steps to leave the country, while in 1998, their share fell to 7.3 %, only to drop to 7.1 % in 2004.

The drop in the intention rate of Croatian scientists, observed several times in the study of the changes of the overall Croatian society in the transition period, reflects a complex and multi-faceted impact, which can be briefly described along three lines.

(1) There is the context of Croatian society where 1990 still represented the epoch of socialism. The same year marked the end of this era, but the people were still thinking in the *old* way and in *old* categories. Processes of transition, which ensued after the radical social and political changes, caused even greater recession and deterioration of many segments of the social and living standard. They also caused a real economic collapse and the decline of many activities and industries, as well as enormous unemployment. Such living and professional conditions only boosted the desire to find a better life outside the country. However, perhaps illogically and paradoxically, these processes also sparked a certain manifest determination to face economic and occupational problems in the home country. An atmosphere of great expectations from impending changes prevailed in Croatia. The possibility of establishing a different social and professional environment through projects of social transformation became a *new moment* which differed from the experiences of the earlier system.

(2) There were also two real factors, alongside this hypothetical, psychological aspect. On the one hand, the global aspect of the *drain* of Croatian scientists had its own actual givens. The echo of the 1970s and even 1980s, when Croatian scientists were accepted more easily and more frequently in foreign countries, still reverberated very strongly at the very beginning of the 1990s. Furthermore, many Croatian scientists were establishing successful scientific careers and attaining remarkable results abroad at that time. The situation in the developed countries changed in the years that followed, and new trends emerged in the employment of foreign labour. Although it was still easier for highly-educated individuals and experts to penetrate into individual segments of the international labour market, finding a job in the R&D and higher education sector was becoming increasingly difficult. However, no adequate study has so far been made on the repercussions of the influx of scientists and highly educated experts from the countries of the former Soviet Union on the economic, military, science and R&D sectors of the developed countries following the collapse of the Union.

(3) The third and probably the most important factor of the reduced propensity of the Croatian scientific population to emigrate after the 1990s was the revolution in global communication which was founded on completely new technologies. The new modes of communication, available to all, sparked a process of levelling out the (overly) great differences between the scientific centres and the periphery. Today, the portion of the potential *drain* driven by scientific and professional motives has at hand a variety of other opportunities for its professional advancement, even if it stays in Croatia. Talented and competitive persons have far greater opportunities to cooperate with and become involved in international scientific teams, activities and projects via virtual contact, which has opened up the possibility of participation in relevant research even without being physically present at one *centre* for a longer time. Given the confinement of Croatian science in the pre-transition period when communication, with the exception of that related to natural sciences, was rare or even com-

pletely absent in some scientific fields, emigration was practically the best way to come into touch with the relevant scientific world. Therefore, the reduced need to emigrate permanently for scientific and professional reasons seems also to be the result of the arrival of new communication opportunities. Consequently, the new forms of cooperation that include shorter stays abroad help transform the brain drain into "brain circulation".

Social and Professional Factors of the Potential Scientific Drain

Let us return to the significantly reduced segment of the Croatian scientific population that still had some intention of leaving the country in the later stage of the Croatian transition. A question arises: can certain characteristics of individuals determined to leave the country be discerned even in such a narrowed segment of the *potential* scientific drain? In other words, can the patterns of the drain or the profile of the Croatian scientist determined to leave the home country be identified?

The inclusion of fundamental demographic variables — gender and age — into the data on the scientific drain showed the irrelevance of gender differentiation[9], and the extreme importance of age differentiation among scientists.

Earlier analysis revealed the greater propensity of younger scientists to migrate. The data showed an above-average proportion of scientists in their 20s and 30s in the *potential* drain, while above-average proportions of scientists in their 50s and 60s were recorded among the scientists who were determined to stay in the home country. For the sake of comparison with earlier research, the age of 35 was taken as the divide. The data from Table 2 specify average and extreme age values of the most recent potential *drain* (2004).

Table 2
Age of Potential Scientific Drain

	Average age	Youngest scientists	Oldest scientists
Not planning to leave	48.6	24	72
Thinking about leaving	39.8	25	65
Having made the decision to leave 40.5	25	64	
F-ratio: 44.780, significance of F-ratio: 0.00			

The *potential* drain shows a great dispersion in terms of age, ranging from persons who have only just graduated and entered the world of professional scientific and research work (24 years of age), to sixty-year-olds whose active professional career is drawing to an end. The propensity of older scientists to emigrate is partly indicative of the actual opportunities that experienced experts are presumably offered, regardless of their age, and it could be partly indicative of a certain revolt or protest against the actual professional situation which dissatisfies older scientists as well.

Several socializational factors of the potential *drain* proved significant. Persons coming from urban areas, and families in which fathers were also educated, were more likely to emigrate. A somewhat larger share of scientists who were determined to stay in the home

[9] Gender differences are not statistically significant (Chi-square=1.776, df=3, p=0.62).

country were socialised in a rural and provincial environment and in families of lower educational status. The only deviations from this regularity were, to a certain extent, scientists from families where they were the second generation of scientists, and whose propensity to stay and to migrate was almost equal.

Among the work-related and professional factors of the *potentia*l drain, the type of scientific institution and the scientific field showed no statistically significant relation to the scientists' drain.

Given the higher proportion of younger scientists in the *potential* drain, one might expect that the majority among them would be individuals who had not (yet) attained any scientific qualifications. However, some eminent scientists who had been invited abroad on earlier occasions to take part in scientific projects, to deliver lectures at universities, or to participate in scientific conferences, all with paid expenses, were also inclined to leave Croatia. Among them were scientists who were particularly active in interactive scientific conferences, and scientists who were proficient in foreign languages. Esteemed scientists who performed gate-keeping roles in the entrance and advancement of younger colleagues in the world of science (by writing reviews, grading master's and doctoral theses) showed greater inclination to stay in the country.

These data indicate the existence of two types of prominent scientists: first, a scientist who is modern, on the move, outgoing and cooperative; and second, a scientist who is traditional, immobile, authoritative and willing to transfer knowledge. A certain determination to leave the country and become directly involved in global science could be expected from the first type of eminent scientist, while the second type is more likely to stay in the home country.

Among the factors relating to family and the economic situation, the scientists' marital status, number of children, housing status and monthly income of the household proved to be significant for *potential* drain. Thus, single persons, persons without children, persons who live in rented flats or with their parents, and persons of lower income could be said to be more inclined to emigrate abroad.

Motivational Factors of the Potential Scientific Drain

The reasons for the potential outflow of Croatian research population ties in directly with the already presented comparison of young scientists' motivational factors for emigration in 1990 and 1998.

By extending the comparison to cover the period up to 2004 on the level of the scientific population, a better insight will be gained into the changes of motivational patterns of emigration, this time for the whole fourteen-year long period of Croatian transition.

Table 3 shows that the reasons for possible scientific migration from Croatia have remained almost the same, with negligible differences, or, in other words, there were no changes in the ranking of motives for emigration between 1990 and 2004[10].

[10] Before embarking on an analysis of the findings, the technical construction of the table itself should be discussed. The questionnaire used for the 1990 study of scientific potential offered seven possible reasons for migration abroad, while the 2004 study added an eighth reason – *the status of science and scientists in Croatian society.* By coincidence, this motive ultimately shared 3rd and 4th place with the *greater opportunities for scientific promotion and recognition* in foreign R&D, which made it

Table 3
Longitudinal Comparison of the Reasons for Possible Emigration

Reasons for possible emigration	1990 Rank	x*	2004 Rank	x**
Better conditions of scientific work	1.	4.44	1.	2.81
Economic reasons (salary, housing, living standard)	2.	4.04	2.	2.68
Greater opportunities for scientific promotion and recognition	3.	3.86	3.	2.66
Position of science and scientists in Croatian society			3.	2.66
Social, economic and political conditions in Croatia	4.	3.51	4.	2.39
Family reasons	5.	3.03	5.	2.22
Desire to change the way of life	6.	2.86	6.	2.15
Conflicts at work	7.	2.19	7.	1.81

* Average result in the rank-order scale from 5 to 1 (very important, important, neither important nor unimportant, unimportant, completely unimportant).
** Average result in the rank-order scale from 3 to 1 (important, neither important nor unimportant, unimportant).

Identical findings on the reasons for the possible migration of Croatian scientists in the 1990 and 2004 studies could lead to the conclusion that nothing had happened in the professional and social environment in the observed fourteen years that could have changed the scientists' motivation for emigration. However, changes in the motivational pattern of the potential migration of young scientists between 1990 and 1998, with economic reasons coming to the forefront, call for caution in making such assumptions[11]. The severity and profundity of changes that affected Croatian society in the period of transition could not leave intact the delicate substance of the drives and motives for migration. A more reasonable claim is that, since the 1998 study of the young scientific population, there have been indications of certain processes of revitalisation of scientists' social and professional life in the last five or six years. After the war and the post-war depression, the social and professional reality, as measured by the motivational pattern of the scientist *drain*, returned to its *initial* state.

Thus, if we assume that the dominance of economic reasons for the migration of young scientists in 1998 could be extended to the motivation pattern of the overall scientific population of that period, better conditions for scientific work have today once again become the most relevant drive for possible scientific emigration (Table 4). Its primary importance for potential emigrants has partly overshadowed the still highly positioned economic reasons.

possible for these two reasons to be merged into 3rd place, and for the number of ranks in the comparable 2004 study to be reduced to seven as well. Furthermore, the 1990 ranking was founded on the average value of the position of an answer on a five-point rank-order scale, and in 2004 on a three-point scale. Consequently, comparative values for both years could serve only as the basis for determining the rank of a particular reason.

[11] In 1998, the highest number of young researchers, as many as 90.4 % of potential emigrants, would leave the country primarily because of the low standard of living (small salaries, lack of adequate housing).

However, together with other relevant scientific and professional reasons (rank 3), it provides grounds for identifying scientific migration as a distinct form of migration.

Table 4
Importance of Individual Reasons for Possible Emigration in Year 2004 by Degree (Structure in %)

	Unimportant	Neither important nor unimportant	Important
Better conditions for scientific work	4.4	9.9	85.7
Economic reasons (salary, housing, living standard)	5.5	21.2	73.3
Greater opportunities for scientific promotion and recognition	6.8	21.2	72.1
Position of science and scientists in Croatian society	5.8	22.2	72.1
Social, economic and political conditions in Croatia 1	6.0	29.0	54.9
Family reasons	24.9	28.3	46.8
Desire to change the way of life	24.6	35.5	39.9
Conflicts at work	41.6	36.2	22.2

Factorisation of the eight reasons for migration abroad was conducted with the aim of identifying the motivational structure.[12] A factor matrix rotated using the *oblimin* method (Kaiser) is presented in Table 5 which includes correlations higher than 0.60.

Table 5
Factors of Motivational Interest in Possible Emigration

Reasons for emigrating	Factors		
	F1	F2	F3
Better conditions of scientific work	0.891	-	-
Greater opportunities for scientific promotion and recognition	0.878	-	-
Social, economic and political conditions in Croatia	-	0.852	-
Position of science and scientists in Croatian society	-	0.713	-
Desire to change the way of life	-	-	-
Family reasons	-	-	0.819
Economic reasons	-	-	0.606
Conflicts at work	-	-	-

The first extracted factor (F1) covered better conditions of scientific work in foreign countries and greater opportunities for scientific promotion and recognition in foreign R&D.

[12] Three patterns or factors of the propensity of Croatian scientists to migrate abroad extricated in the 2004 study covered almost 60 % of the explained motivational variability. The first factor accounted for 29.9 % of explained variance, the second factor to 16.9 %, and the third factor explained 12.7 % of the motivational variability.

This is a pure scientific and career motivational *pull*-matrix. The second factor (F2) formed the *push*-matrix, encompassing the general social pressure at the level of social, economic and political circumstances in Croatia with the position of science and scientists in Croatian society. The third factor (F3) covered family and economic reasons for possible emigration: salary, housing opportunities and everything that determines the living standard, in the sense of fundamental needs, and presents a purely extrascientific motivational pattern.

Based on the extent of the already explained variability of motivation and its saturation with factors, the motivational patterns of the possible drain of scientists from Croatia, structured in the said way, show a certain priority of scientifically-driven motives. The first motive is a purely scientific motivation. The second factor is also infected by professional reasons, i.e. it includes dissatisfaction with the position of science and scientists in Croatian society. Only the third factor, with a somewhat lower saturation and a lower percentage of explained variability, combines extrascientific and economic reasons for possible emigration.

Analysis of the findings gave rise to the following question: is it possible to identify the social and professional profile of a scientist which could be related to the factors of motivational interest in leaving the home country?

The procedure of *regression analysis* using factor *scores* was used to determine the possibility of associating the social and professional characteristics of Croatian scientists with different motives (motivational factors) of their potential migration. The results, however, did not reach a degree of significance that would serve as a basis for establishing certain generalised patterns.

Previous Stays Abroad

"If science has no country, the scientist does!" said Louis Pasteur (1822–1895), the founder of bacteriology, when he returned his *honoris causa* to the Faculty of Medicine in Bonn in 1870, at the start of the French-Prussian war. His words forcefully express the fine inner connection between a man and his social and geographical background which exists deep in every expatriate and which surfaces only in the moments of disturbance of his everyday life. A return home can be prompted by very different situations and reasons, individual plans and decisions. This is indicative of the complexity of the process we usually refer to as the *brain drain* and which is in fact a complicated mechanism of circulation. Even if, from the standpoint of the emigration country, the *brain drain* may be seen as the state of a loss or reduction of a portion of the highly-educated population, when observed as a phenomenon *per se*, it is a rather non-transparent and complicated process. The flows of the *brain drain* are not always predictable, direct, or one-way. Remigration processes and the staggered *brain drain* (when migrants do not go directly to their permanent destination but temporarily, for periods of varying length, work in other countries) make the study of the *brain drain* even more complicated.[13]

We attempted to obtain fragmentary insight into the complexity of the overall process up to the level of remigration by asking Croatian scientists about their previous longer stays in foreign countries.

[13] The history of emigration of Croatian scientists alone reveals trans-continental paths, via Australia to the US or back to Western Europe, via South Africa to New Zealand or Canada, not to mention changes in the European destinations of Croatian expatriate scientists (West Germany, Switzerland, France, Great Britain, Sweden, etc.).

Reasons for Staying Abroad

In the 2004 study, the question about longer stays in foreign countries was answered by 876 Croatian scientists, 194 of whom stated that they had stayed for a longer period abroad. We compared the reasons for their stay abroad with similar answers received by 193 repatriates surveyed in 1990 (Table 6).

Table 6
Longitudinal Comparison of Reasons for Staying Abroad

Reasons for staying abroad	1990 N = 193 (24.2 %)	2004 N = 194 (25.0 %)
1. Scientific advancement (postgraduate, doctoral, postdoctoral courses)	53.4	56.3
2. Lecturing at foreign universities (on leave)	5.8	4.2
3. Participation in scientific work (on leave)	13.2	16.1
4. Employment abroad, but not in science	16.5	11.7
5. Employment abroad, in science	11.1	11.7
Total	100.0	100.0
Chi-square = 6.085, df = 4, p = 0.19		

No significant changes in the proportion of repatriate scientists with longer stays abroad were noticed, either on the level of statistical significance or on the level of the structures in the observed fourteen-year period, with the figures hovering around one quarter of the scientific population. Stays for scientific advancement, postgraduate, doctoral or postdoctoral courses, and participation in scientific work, with the permission of the institution at which the scientist was employed in Croatia, rose slightly (by 2.9 structural points), while stays for lecturing at foreign universities and employment outside science dropped by 1.6 and 4.8 structural points respectively. The level of temporary employment in foreign scientific institutions remained almost the same — slightly over 11 % of all spells abroad.

These findings lead to the conclusion that there is a constant return flow of scientists who joined certain foreign scientific centres at some point and were employed in scientific systems worldwide. This flow is rather small, but if the figures for the return after scientific advancement or lecturing at foreign universities or participation in international research while maintaining a post in Croatian scientific institutions are included, it can be concluded that there is a significant transfer of global scientific achievements into Croatian science arising from such spatial circulation of Croatian scientists.

Some Characteristics of Stays Abroad

Over one half of Croatian scientists who had stayed abroad for a longer time had lived and worked in foreign countries at least once (53.6 %), somewhat less than one third had stayed abroad twice (30.1 %), while only 30 respondents from the 2004 study (16.4 %) had stayed abroad several times. In terms of the length of their stay, 21 % of them had stayed abroad for 6 months (which was the bottom limit in the study), 43 % had stayed up to one year, 16 % between one and two years and 20 % of scientists who went abroad had stayed

there for over two years. According to the findings, the United States of America remains the most attractive destination, with the largest number of repatriates returning from there in both the 1990 and 2004 studies (Table 7).

Table 7
Longitudinal Comparison of Foreign Destinations

Foreign destinations*	1990 Rank	1990 %	2004 Rank	2004 %
United States of America	1	27.4	1	36.0
(FR) Germany	2	21.4	3	13.0
France	4	10.4	5	6.0
Great Britain	5	7.0	4	10.0
Other West European countries	3	19.8	2	26.0
Eastern Europe and (countries of the former) USSR	6	5.4	6	5.0
Arabian and African countries	7	4.3	7	3.0
Other countries	8	4.3	8	1.0
Total		100.0		100.0
Chi-square = 74.425, df = 7, p = 0.00				

* Outdated and rather clumsy formulations of foreign destinations are the result of the great geopolitical changes that took place over the observed fourteen years, especially in Europe. One pattern had to be adopted to ensure comparability, so the one from 1990 was selected. However, the destinations observed in 2004 thus require an additional explanation. In 1990, other West European countries included Switzerland, Sweden, Italy, Austria, the Netherlands, Denmark, Belgium and Finland, and in 2004, in order of importance, Italy (9 %), Austria (6 %), Sweden (4 %), Switzerland (4 %), the Netherlands (2 %) and Norway, Ireland and Portugal with 1 % of Croatian expatriate scientists who returned to the home country. In 1990, East European and USSR countries included Czechoslovakia, the German Democratic Republic, Poland, Hungary and USSR, while in 2004 they included Slovenia (2 %) and Hungary, Russia and the Czech Republic (1 %). Concerning Arabian and African countries, pre-transition returnees came back from Libya, Algeria, Egypt, Ethiopia, Iraq and Iran, while the repatriates from the 2004 study came back only from Algeria (2 %) and Ethiopia (1 %). Other destinations where Croatian repatriates had previously stayed were Japan, Canada, India, South America and Mexico, and later only New Zealand (1 %).

Apart from the United States, the the most attractive destinations for Croatian scientists were (FR) Germany, France, Great Britain, and, increasingly, Italy. These countries were ranked 2nd, 4th and 5th in 1990, while the 2004 analysis showed the growing dominance of other countries, especially Italy, over Germany. France dropped from 4th to 5th place. Other groups of countries more or less maintained their rankings, but it should be noted that the number of countries from which Croatian scientists returned home was shrinking over time.

Reasons for returning to Croatia

In 1990 the reasons why Croatian scientists working abroad returned home were compared with the reasons given in one of the first studies of this kind, in which 335 scientists

who returned from the United States to Great Britain stated almost the same reasons for their return as Croatian scientists, but in a somewhat different order (Vas-Zoltan, 1976:96).

Table 8
Longitudinal Comparison of Reasons for Returning Home

Reasons for returning	1990	2004
Private, personal or family reasons	33.7	34.5
Temporary employment (expiry of contract)	24.5	15.5
Patriotic reasons, debt to one's country, homesickness	20.4	18.1
Continuing scientific career in Croatia	10.2	19.8
Unsuitable way of life abroad, lack of prospects,employed in jobs they were not educated for	7.1	9.5
Completing one's education in Croatia	4.1	2.6
Total	100.0	100.0
Chi-square = 11.376, df = 5, p = 0.04		

While the dominant reason for the return of the British scientists was the end of their temporary stay (41 %), followed by family reasons (36 %), Croatian scientists stated the same reasons, only in the reverse order (Table 8). Fourteen years later, a markedly lower number of respondents stated the expiry of their temporary work contracts as the reason for their return, falling from 2nd to 4th position. A *good job offer in Great Britain* was ranked 3rd (19 %) in the British study. This motive could be correlated to our category of *continuing scientific career in Croatia*, which was ranked 4th in 1990 and rose to second place in 2004 (19.8 %), thus coming rather close to its British counterpart.

An *unsuitable way of life abroad, lack of prospects and job unrelated to one's education and training* were ranked 5th by Croatian scientists, both in the 1990 and 2004 studies. These could be correlated to the reasons ranked 4th to 6th in the British study: preference for the British way of life (13 %), dissatisfaction with the job or prospects overseas (11 %), and inability to accommodate to the way of life on the other side of the Atlantic (7 %). *Pattern of life* as a source of discomfort and a reason for return was particularly marked in French scientists who found it hard to cope with the process of *Americanisation,* as Robert Mosse[14] claims, and to adjust to the American research system, which was explained by *French national pride*.

Judging by its rank on the list of primary reasons for return, Croatian scientists did not have many problems adjusting to a new environment. However, adjustment issues may have been converted into expressions of patriotism and homesickness which were ranked 3rd in

[14] The syndrome of discomfort of French scientists in American society reflected two different world views and systems of values that were manifested in the feeling of lower job security, especially after the age of 45, a lower degree of security of scientific advancement, harder work, negative effects of competition within team work, the presence of the boss and the imperative of subordination, lesser autonomy and responsibility for one's work, fewer opportunities for extra earnings and other activities, much less personal pride in one's own scientific achievements, less free time and holidays, inability to find the appropriate type of entertainment (different food, topics of conversation, reading, etc.) (Mosse, 1968: 161).

both Croatian studies. Patriotism was not prominent in the British study, ranking 8th on the list of reasons for return to the home country (6 %).

The purpose of these comparisons is to show that a certain universality of scientific migrations exists, regardless of spatial, temporal and civilisational differences. This universality manifests itself in the almost identical reasons for return to the home country stated by Croatian and British scientists. Naturally, differences in national and cultural identity and differences of world view exist, and they are manifested through varying experiences and evaluations of different socio-cultural environments. We could say that Croatian scientists who had experienced work abroad returned home either for personal or for objective reasons, the former being slightly more dominant. More precisely, the reasons of the first, third and fifth rank were mostly personal in nature, while those of the second, fourth and sixth rank were more objective.

Conclusions

The brain drain, in the sense of a one-way movement of educated people that may be employed in high technology, in the R&D sector, and in universities in the developed world is slowly becoming a thing of the past for Croatia. The long tradition of the permanent outflow of Croatian scientists, mostly to the USA, Canada and developed European countries, has outgrown its use, both as a way of catching up with global science and as a pattern of integration into the main stream of contemporary science. Naturally, the push factors of the social environment which were particularly strong in the first half of the 1990s (in wartime and in the aftermath of the war) will maintain their influence in generating the brain drain, although their influence is expected to lessen.

A final recapitulation of the discussion of the issue of the Croatian scientific drain in the period of transition requires a few additional comments on Croatian social reality.

In a social setting where employment was not a normal condition but an almost unattainable goal for a great part of the population (especially those in the most vital and productive age group), the propensity of almost two-thirds of employed young scientists to migrate abroad (63.3 %), recorded in the late 1990s, was an impressive testimony of their feelings at the time, ranging from protest and discontent to resignation, and a reaction to their personal, social and professional position. The wide range of feelings, shown by an abundance of individual observations, was at the time a strong critique of the scientific milieu (an insignificant share of projects that were almost exclusively funded by the state, insufficient funds and obsolete research equipment) as well as of the overall social surroundings (Golub, 2003).

The propensity of young scientists to emigrate recorded in the late 1990s was used as a control factor, because a decreasing propensity of the overall scientific population would have been identified if only 1990 and 2004 survey data had been compared. By a simplified interpretation of the social and professional impact to the propensity to migrate, a conclusion could have been reached that living and working conditions had improved constantly in the 1990s, which was not the case. Within the framework of changes in the overall social situation effected by the transition, the drop in the Croatian scientists' intention rate presumably reflects a far more complex and multi-faceted impact, which could be summarised as:

— a new psychological experience after the breakdown of socialism created by the more open (European) perspectives of Croatian society, and great expectations of change in the social and professional sector;

— increasingly more difficult employment abroad compared to the 1970s and 1980s when Croatian scientists were accepted in the scientific and R&D systems of developed countries more easily;

— levelling of the (overly) great differences between scientific centres and the periphery as a result of the revolution in global communications based on new technologies that are available to all.

— the ever greater inclusion of Croatian scientists in the international division of scientific work thanks to the opening up of the Croatian scientific and social system to international communication. This helps transform the scientists' drain into a circulation of scientists without permanent emigration from Croatia.

Even though earlier analyses focused on the *potential* scientists' drain, the conceptual need to unite all aspects of the circulation of scientists also requires a certain insight into the process of remigration. Respondents' previous experiences in working abroad confirmed the existence of a small-scale, but permanent, return flow of Croatian scientists who had worked in foreign scientific institutions. The return flow is not great, amounting to around 11 % of all longer stays abroad. However, if this is added to the figures of return home following scientific advancement, lecturing at international universities, or participation in foreign research while maintaining a post in a Croatian scientific institution, this rather small return flow becomes indicative of a rather high degree of spatial circulation of scientists. This proves that a significant transfer of global scientific achievements into the Croatian scientific space is taking place.

References

Ackers H. L. Citizenship, Migration and the Valuation of Care in the European Union // Journal of Ethnic and Migration Studies, Special Issue on Family and Migration in the New Europe. 2003. Summer.

Beijer G. The Brain Drain from the Developing Countries and the Need for the Immigration of Intellectuals and Professionals // International Migration. 1967. № 5 (3/4). P. 228–234.

Chompalov I. Brain drain from Bulgaria before and after the transition to democracy // Paper presented to the Bulgarian Research Symposium and Network Meeting, Atlanta, Georgia, 2000. April.

Cismas C. Special situation of young researchers in Central and Eastern Europe // Paper presented at the European Science Open Forum. Stockholm. 2004. 25–28 August.

Dumitrescu A. et al. Science policy, mobility and brain *drain* in today's Romania // Paper presented at the Symposium on Science Policy, Mobility and Brain Drain in the EU and Candidate Countries, Centre for the Study of Law and Policy in Europe, University of Leeds. 2003. July.

Eurostat. Structural indicators, 2001 (http://europa.eu.int/comm/eurostat).

Fassman H. European East West Migration // International Migration Review. 1994. № 28 (3). P. 520–538.

Gish O. Brain Drain. Some Critical Comments // International Migration. 1970. № 8 (4). P. 203–204.

Golub B. Potencijalni egzodus istra iva a u inozemstvo (Potential Exodus of Researchers into Foreign Countries) // Prpić K., Golub B. Znanstvena produktivnost i potencijalni egzodus istra iva a

Hrvatske (Scientific Production and Potential Exodus of Croatian Researchers), Institute for Social Research of the University in Zagreb. Zagreb, 1990. P. 63–155.

Golub B. Potencijalni (profesionalni i vanjski) egzodus mladih znanstvenika (Potential /Professional and External/ Exodus of Young Scientists) //, U potrazi za akterima znanstvenog i tehnolo kog razvoja (In Search of the Actors of Scientific and Technological Development) / K. Prpić (ed.) ; Institute for Social Research of the University in Zagreb. Zagreb, 2000. P. 129–186.

Golub B. Za to odlazimo? (Why Do We Leave?) // Dru tvena istra ivanja. 2003. № 12 (1/2). P. 115–140.

Golub B. Hrvatski znanstvenici u svijetu (Croatian Scientists Abroad), Zagreb Institute for Social Research. Zagreb, 2004. P. 216.

Grubel H. G., Scott A. D. The International Flow of Human Capital // American Economic Review. 1966. № 56(2). P. 270.

Johnson H. G. An 'Internationalist' Model // The Brain Drain, Macmillan / ed. by W. Adams. New York ; London, 1968. P. 69–91.

Jiménez J. et al. Mobility or brain drain? // The Case of Mexican Scientists, Sociology of Science and Technology. 2010. № 1(1). P. 89–108.

Khadria B. Case study of the Indian scientific diaspora // Scientific diasporas / ed. by R. Barre. Paris : IRD, 2003.

Langer J. The special situation of young researchers in Central and Eastern Europe // Paper presented at the European Science Open Forum. Stockholm, 2004. 25–28 August.

Lungescu O. EU newcomers risk 'brain drain' // BBC News. 2004. 27 February (http://news.bbc.co.uk/1/hi/world/europe/3492668.stm.)

Mahroum S. Europe and the immigration of highly skilled labour // International Migration. 2001. № 39 (5). P. 27–42.

Mahroum S. Brain gain, brain drain: an international overview // Paper presented at the Austrian Ministry for Transport, Innovation and Technology Seminar. Alpbach, 2003. 22–23 August.

Markotic V. Biographical Directory of American and Canadians of Croatian Descent, The Research Centre for Canadian Ethnic Studies. Calgary, 1973. P. 206.

Markusova V. A. et al. Information Behavior of Russian Scientists in the 'Perestroika' Period, Results of Questionnaire Study // Scientometrics. 1996. № 37(2). P. 361–380.

Markusova V. A., Arapov M. V., Aversa E. Collaboration between American and Russian Scientists, 1993–1997 // Proceedings of the 7-th Biennial Conference of the International Society for Scientometrics and Informometrics, July 2–8. Colima, Mexico, 1999.

McKee D. L., H. W. Woudenberg. Some Reflections on the Loss of Canadian Economists to the United States // International Migration. 1980. № 18 (1/2). P. 3–12.

McKee D. L. Some Specifics on the Brain Drain from the Andean Region, International Migration. 1983. № 21 (4) P. 488–499.

McKee D. L. Argentina and the Brain Drain: Some Perspectives from Expatriates in the United States // International Migration. 1985. № 23 (4). P. 453–459.

Meyer J. et al. Scientific nomadism and the new geopolitics of knowledge // International Social Science Journal. 2001. Vol. 168. P. 309–321.

Millard D. The Impact of clustering on scientific mobility: a case study of the UK, Innovation // The European Journal of Social Science Research, Special Issue: Scientific Mobility in the European Research Area: Promoting Balanced Growth. 2005. Vol. 18 (3). P. 343–359.

Mirskaya E. Z. Russian Academic Science Today: Its Societal Standing and the Situation within the Scientific Community, Social Studies of Science. 1995. Vol. 25 (4). P. 705–725.

Mirskaya E. Z. International scientific collaboration in the post-communist countries: modern trends and priorities // Science and Public Policy. 1997. Vol. 24 (5). P. 301–308.

Morano-Foadi S., Foadi J. Italian scientific migration: from brain exchange to brain drain // Paper presented to the Symposium on Science Policy, Mobility and Brain Drain in the EU and Candidate Countries, Centre for the Study of Law and Policy in Europe, University of Leeds. 2003. July.

Mosse R. France: Some Case Studies // The Brain Drain, Macmillan / ed. by W. Adams. New York ; London, 1968. P. 157–165.

Okolski M. Recent trends and major issues in international migration: Central and East European perspectives // International Social Science Journal. 2000. Vol. 165. P. 329–341.

Oommen T. K. India — 'Brain Drain' or the Migration of Talent? // International Migration. 1989. Vol. 27 (3). P. 411–425.

Oteiza E. A Differential Push-Pull Aproach // The Brain Drain, Macmillan / ed. by W. Adams. New York ; London, 1968. P. 120–134.

Patinkin D. The 'Nationalist' Model // The Brain Drain, Macmillan / ed. by W. Adams. New York ; London, 1968. P. 92–108.

Portes A. Determinants of the Brain Drain // International Migration Review. 1976. Vol. 10 (4). P. 489–508.

Prpić K. Odliv mozgova: Motivi vanjskih migracija znanstvenika (Brain Drain: Motives of the Scientists' Emigration) // Revija za sociologiju. 1989. Vol. 20 (1/2). P. 7–18.

Royal Society. Emigration of Scientists from United Kingdom, A Report of a Committee Appointed by the Council of the Royal Society. London : The Royal Society, 1962. P. 32.

Sretenova N. Scientific mobility and 'brain drain' issues in the higher education sector in Bulgaria // Paper presented at the Symposium on Science Policy, Mobility and Brain Drain in the EU and Candidate Countries, Centre for the Study of Law and Policy in Europe, University of Leeds. 2003. July.

Stalford H. Free movement Post Accession — Transition arrangements in Poland and Bulgaria // Paper presented at the Symposium on Science Policy, Mobility and Brain Drain in the EU and Candidate Countries, Centre for the Study of Law and Policy in Europe, University of Leeds. 2003. July.

Strepetova M. The Brain Drain in Russia // Working Papers 55, Institute for World Economics, Hungarian Academy of Sciences. Budapest, 1995. P. 27.

Štimac Radin H. Rizici nezaposlenosti // Mladi uo i trećeg milenija / eds. V. Ili in, F. Radin ; Institut za dru tvena istra ivanja u Zagrebu, Zavod za za titu obitelji, materinstva i mlade i. Zagreb, 2002.

Vas-Zoltan P. The Brain Drain: An Anomaly of International Relations, Akademiai Kiado. Budapest, 1976. P. 151.

Velev K. Young scientists in Bulgarian universities and the brain drain problem, International Conference — Attracting Young Scientists: Strategies against Brain Drain. Sofia, 2002. October.

Visaria P. Determinante odliva mozgova (Determinants of the Brain Drain) // Teme o iseljeni tvu. 1977. № 7. P. 17–38.

Vogt M., et al. Räumliche Mobilität und Karriere. Mobilität von Wissenschaftlernnen in Österreich, Materialien zur Förderung von Frauen // Wissenschaft, Bundesministerium f r Bildung, Wissenschaft und Kultur, Band 15. Wien, 2002.

We Ha, Junjian Yi, Junsen Zhang. Brain Drain, Brain Gain and Economic Growth in China : UN Development Programme // Human Development Reports, Research Paper. 2009. № 37 (August). P. 35.

Wilson J. A., Gaston J. Reflux from the 'Brain Drain' // Minerva. 1974. Vol. 12. P. 459–468.

Županov J. Odljev mozgova: oti li iz zemlje u kojoj je uloga znanosti u dru tvu bila i ostala sasvim marginalna (Brain Drain: Left the Country Where Science Had and Still Has a Marginal Role in the Society) // Vjesnik. Zagreb, 2001. November, 8.