Department of Social Geography and Regional Development Faculty of Science, Charles University, Prague, Czech Republic



## Migration–Europe's Integration and the Labour Force "Brain–Drain"

(Report of the Czech Republic)

Jarmila Marešová, Dušan Drbohlav, Věra Lhotská

(with the collaboration of Petr Pavlík - chapter 1 and Jiří Loudín - co-operation on chapter 4)

Prague, January 1995

### **CONTENTS:**

### **INTRODUCTION**

#### **1. ECONOMIC SITUATION**

#### 2. POPULATION DEVELOPMENT

- 2.1. Population by age
- 2.2. Population by sex
- 2.3. Natality and Fertility
- 2.4. Mortality

#### 3. MIGRATION

- 3.1. Migration Development after the Second World War
- 3.2. General Trends in the 1990's
- 3.3. Migration of Scientists from the Czech Republic

## 4. TRANSFORMATION OF THE RESEARCH SYSTEM

- 4.1. The Academy of Sciences
- 4.2. Universities
- 4.3. Institutes / Firms / Corporations outside the Academy of Sciences and Universities
- 4.4. Some Objective Obstacles to the Development
- 4.5. Elaborating on Factors of Age and Financial Situation

### 5. METHODOLOGY – STUDY DESIGN, QUESTIONNAIRES, RESPONDENT POPULATION

## 6. RESULTS ON POTENTIAL MIGRATION / MOBILITY OF SCIENTISTS

- 6.1. Who Took Part in the Survey, What is the Situation like?
  - 6.1.1. Social Demographic Characteristics
  - 6.1.2. Personal Characteristics of Professional Career
  - 6.1.3. Professional Activities and Working Conditions
  - 6.1.4. Living Standards (Including Financial Situation)
  - 6.1.5. Hierarchy of Values
  - 6.1.6. Professional Mobility External Long-Term Migration (General Assessment of the Process)
  - 6.1.7. Professional Mobility External Short-Term Movements (General Assessment of the Process)
  - 6.1.8. Experience from Travelling Abroad
  - 6.1.9. Consequences Following Long-Term Stays Abroad
  - 6.1.10. Role of the "Administration"
  - 6.1.11. Professional Mobility Internal "Brain-Drain" (General Assessment of the Process)
- 6.2. External Long-Term Migration / Mobility
  - 6.2.1. "Profiles" of "Firm" Migrants, "Firm" Non-Migrants and Those Who are Hesitating about whether to Migrate
  - 6.2.1.1. Who Are "Firm" Migrants?
  - 6.2.1.2. Who Are "Firm" Non-Migrants?
  - 6.2.1.3. Who Are Those Who are Hesitating about whether to Migrate?
  - 6.2.1.4. Summary of Results on Migrant's "Profiles"
  - 6.2.1.5. Factors Conditioning Intentions to Migrate Abroad
- 6.2.2. Summary of Results
- 6.3. External Short-Term Mobility ("Brain-Exchange")
- 6.4. Internal Mobility
  - 6.4.1. "Profiles" of Internal Migrants and Non-Migrants

- 6.4.1.1. Who Are Potential Migrants? 6.4.1.2.
- Who Are Potential Non-Migrants?
- 6.4.1.3. Who Are "Firm" Non-Migrants?
- Summary of Results on Migrant's "Profiles" 6.4.1.4.
- 6.4.1.5. Factors Conditioning Intentions to Change an Employer within the Republic

6.4.2. Summary of Results

#### 7. COMPARISON OF RESULTS OF EXTERNAL AND INTERNAL **MIGRATION / MOBILITY**

#### 8. **REGIONAL DIFFERENCES IN POTENTIAL MIGRATION (THE CITY OF** PRAGUE VIS-A-VIS THE CITY OF BRNO)

- 9. MAIN RESULTS OF REAL MIGRATION SURVEY
- 10. SOME ASCERTAINMENTS FOLLOWING THE QUESTIONING **DEANS / DIRECTORS**
- CONCLUSIONS AND RECOMMENDATIONS 11.

## **INTRODUCTION**

The study has been undertaken as part of a comparative study which aims at analyzing on one hand real and potential "brain drain" of scientists / researchers / developers – including university teachers (hereafter only termed scientists) and on the other hand "external and internal" "brain drain" of scientists etc., in 10 selected ex-communist countries of Central / Eastern Europe<sup>1</sup>. While the whole research activity was funded and organized by European Commission, a Bulgarian research team was responsible for managing international co-operation, i.e. for bringing methodological and methodical aspects into harmony and for writing, based on countrie's reports, a "real comparative research report". The Czech national team worked under the auspicies of the Department of Social Geography and Regional Development of the Faculty of Science, Charles University.

It is not necessary to advocate a theme of the research as such. The post-revolutionary, transition era of "new life" in ex-communist countries is now accompanied by so natural, open co-operation with developed Western economies that it brings about a necessity to cope with many new (or relatively new) and "strange" phenomena. Without any doubt, the state of science and the migration of scientists also belong, in relation to further economic and social-economic development, among those topics which should be a priority. Not only countries of origin, but also those of destination are involved. This inter alia justifies why Central / Eastern Europe together with its "Western" partners plays an integral part in solving the issue in question. Accordingly, this is why such a project has been launched.

This Czech report is organized and structured in the following way:

After desribing and explaining what is happening in the economic field – the general environment which to a large extent conditions potential as well as real migration / mobility of scientists (one of the most important determinants of international migration) along with the demographic situation – attention is then paid to two further processes, those of migration and the research system in the Czech Republic. Thus, the general overview, the frame into which the survey itself is put, is sketched out. This is followed by a chapter on methodology describing study design, questionnaires, and the respondent population. The results of the survey are logically structured into the following parts which concentrate on potential migration / movement – external and internal long-term and short-term migration / mobility. The "Profiles" of those concerned are then given, and the factors conditioning character of intentions as to whether to migrate / move or not are found and pinpointed. Comparison of results of external and internal migrations / movements creates a further chapter. Regional differences of potential migration / movement are briefly disscussed using the example of comparisons between the city of Prague and city of Brno. The main results of real migration survey are introduced prior to the last chapter where the main conclusions, recommendations and prospects can be found.

As for the work on this Czech report, several general remarks should be made. After considering the situation, the team came to the following conclusions which were also respected when writing the study:

- Due to rather a complicated "mixture" of various types of data and due mainly to its "soft" character, not so exacting mathematical-statistical methods were applied. Differences among variables were measured by the Chi-Square (Pearson) test, not forgetting the Gamma coefficient.
- Hypotheses were not explicitly formulated and tested within this report, since this step is expected to be undertaken by the coordinator who has been supplied with suggestions from the Czech side. Nevertheless, we implicitly tested some premises (and more or less proved their validity). They inform us, independent of this survey, about the "objective state" of the science and education sectors (see part 4.4.)
- The situation in the Czech Republic was compared to that in other countries only to a limited extent. Despite the fact that we had the respective files at our disposal, it seems to be very difficult, perhaps even impossible to interpret such files in a satisfactory way when being unfamiliar with the factors behind the figures, the circumstances that condition reality.
- Selected important tables of data tied to surveys in the field a quite important source of information – were not included in the text. They are presented separately at the end of the study as an Annex.

A comparative study brings many advantages but also some disadvantages as well. To mention only some of the latter linked with this study: The point concerns a rather limited homogeneity of the whole "Central /

<sup>&</sup>lt;sup>1</sup> Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Bulgaria, Romania, Lithuania, Latvia and Estonia.

Eastern European sample". Though the analyzing of real as well as potential scientist's leaving the Czech Republic for a long period of time is very important in general, a study of this kind should also have been undertaken at the very beginning of the 1990's. It was at that time that, as far as concerns the Czech scientific / research arena and international contacts, the "cards were dealt". Since the current situation in the Czech Republic might and does vary from that in other countries (in terms of the "content" but also "organizational structures" etc.), the application (only with a few exceptions) of the same "philosophy" and, accordingly, questionnaires, might seem problematic<sup>2</sup>.

Also, while (and maybe because of) all the teams worked together on the questionnaire, some important aspects were underestimated or omitted: For example, the potential number leaving a country for a period between 6 and 12 months has not been ascertained, and due to some methodical limits it is not possible to compare in detail the importance of external movements (out of a country) vis-a-vis internal ones (within a country), as not too many "objective" characteristics were asked for contrary to subjective ones.

Besides these problems, we also had to overcome "internal difficulties".

Nowadays, to deal with statistics of any kind is rather a risky undertaking. First of all, new registration systems have just been installed or are being changed right now. Accordingly, in many areas it is not possible to make any satisfactory comparison over time.

It must be said, that monitoring the development of science and education, let alone a deep analysis of connected migration movements is something unusual in the Czech Republic. Therefore, we were able to gather knowledge and relevant information from only a limited number of suitable secondary sources (see e.g. Müller, 1992, Čermák, 1993, Teorie, 1994, Eastern, 1994, Hradecká, Čermáková, Maříková, 1995). Yet, for example, the data base of the Czech Statistical Office concerning mainly employment in the sphere of research and development (excluding the Academy of Sciences of the Czech Republic and universities) has so far not been too reliable<sup>3</sup>. When searching for individual data, the situation proved to be even more precarious. Thus, concerning our field work, a ban on releasing such data, the scraping of former data bases with new ones having only been installed one or two years ago, the overburdened personnel departments, are the main factors which have made the study difficult from an objective point of view and caused, for example, the results on "real migration" to be far from satisfactory.

Similarly, when describing the situation in the field of international migration, obstacles also come into the play. For example: the number of emigrants leaving the Czech Republic every year is unknown since there is no functional registration system installed to cover such information. Thus no-one can reliably diagnose net migration for the whole Republic!

In addition, the transformation is changing reality relatively quickly. Apparently, not only the "methodical issue" but also the current dynamic era does not make a comparison reasonable. As a consequence, we are not able, for example, to document whether, and if yes, to what extent our sample (of potential migrants) differs from the population as a whole. In light of this, the 1991 Census seems to be a rather obsolete source of information.

Despite some slight concerns (see above comments), however, it seems that the study has, in many aspects, elucidated the situation. It has brought new facts that are important not only for an "international platform" but also for the Czech Republic itself.

#### **1. ECONOMIC SITUATION**

Before World War II, Czechoslovakia was a developed market economy and a pluralist democracy, with an average GDP per capita comparable to that of Austria – according to some estimates, in 1938 the GDP per capita in Austria and Czechoslovakia was \$400 and \$380 respectively. The former Czechoslovak Socialist Republic was until November 1989 part of the economic, political and security structures of the

<sup>&</sup>lt;sup>2</sup> For example, as far as the Czech Republic is concerned, it has been, from the very beginning, unrealistic to assume that the questionnaire on "real migration" (for personnel departments) could have completed.

<sup>&</sup>lt;sup>3</sup> Several factors come into the play, for example: 1) Not so high response to statistics in general, i.e. to forms which are to be filled in by enterprises; 2) Different understanding what "research and development" activities in fact are; 3) Only since 1996 the forms are prepared in a way which corresponds to a new reality and also to OECD classifications, thus, the interpretation of results as such has been very difficult so far.

former Soviet block. Although it was, together with East Germany, one of the most industrialized COMECON members, its economy was one of the most centralized ones with a practically non-existent private sector – in the late 80's the GDP share of the private sector did not reach one percent. Four decades of central planning, massive state regulation and only limited links to the world economy have caused a relative deterioration of the country's position inside the group of industrialized countries. By 1990, Czechoslovak GDP per capita at current exchange rates was estimated by the World Bank at \$3,300, comparable to that of Venezuela but only slightly above one fifth of that of Austria. However, in terms of purchasing power parity, the Czechoslovak GDP per capita was only slightly below that of Greece in 1990 and more or less the same is true about the Czech GDP per person at present.

	In Current Exchange Rates	In Purchasing Power Parity
Czech Republic	3,487	8,196
Slovakia	2,319	7,043
Hungary	3,993	6,432
Poland	2,333	5,366

 Table 1: Domestic Product per Capita in 1994 (in \$ US)
 VS

After the fall of the Communist regime at the end of 1989, a radical economic, political and social transformation of the country has begun. At present, after 6 years of radical economic reform, it can be said that all fundamental systemic changes have already been made but the overall transformation process is far from being over. Although the Czech economy is exceptionally stable from the point of view of macroeconomic indicators, main problems now exist in the microeconomic sphere, on the level of firms. The Prague Stock Exchange was reopened in 1993 after a pause of more than 50 years but the Czech capital market still does not resemble standard capital markets in developed countries, because it reflects neither the real situation nor development of the firms and the whole economy. Instead of allocating financial resources to most profitable enterprises it still serves mostly for redistribution of ownership rights and concentration of ownership.

The main systemic components of the economic transformation have been the following:

- macroeconomic stabilization;
- liberalization of prices and foreign trade;
- privatization;
- convertibility of the currency;
- tax reform.

The transformation process was to a considerable extent slowed down by the disintegration of the Czech and Slovak Federal Republic. As a consequence of that two new independent states were established at the beginning of 1993 – Czech Republic and Slovakia. The split showed up to be rather costly for both successor countries but major conflicting issues, such as the financial settlement, have already been overcome.

	1993	1994
Czech Republic	0.1	1.1
Slovakia	-6.8	-5.8
Hungary	-5.7	-7.4
Poland	-2.8	-2.7
Slovenia	0.5	-0.2
Romania	-0.1	-4.3
Bulgaria	-13.6	-7.2
Estonia	0.2	0.0
Latvia	1.0	-2.0
Lithuania	1.1	-3.0

 Table 2: State Budget Balance (% GDP)

The policy of macroeconomic stabilization, which has consisted mainly in fiscal and monetary discipline in order to avoid hyperinflation, has provided a solid base for all the other transformation steps. The Czechoslovak government pursued restrictive fiscal policies, registering budget deficits of less than 3% of GDP in 1991 and 1992. The Czech Republic alone generated a deficit of 2.1% of GDP in 1991 and reduced

7

the deficit to 0.2% in 1992. After the separation, the CR had a state budget surplus of 0.1% of GDP in 1993 and 1.1% in 1994. There is expected a budget surplus also for 1995. In 1994 the government debt was only 15.2% of GDP and this share will decrease to about 13% in 1995. Thus the CR, besides monetary stability, fulfils also the two fiscal criteria from the set of 5 Maastricht convergence criteria.

	1993	1994
Czech Republic	20.8	10.0
Slovakia	23.2	13.4
Hungary	22.5	18.5
Poland	35.3	32.2
Slovenia	32.3	19.8
Romania	2,561.1	137.0
Bulgaria	73.0	96.1
Estonia	89.8	47.7
Latvia	109.1	35.9
Lithuania	88.7	45.1

Table 3: Inflation Rate (Consumer Price Index)

Together with restrictive fiscal policy of the Czechoslovak government, the Czechoslovak central bank imposed a highly restrictive monetary policy in 1990–91, followed by a somewhat more relaxed policy in 1992. The Czech economy experienced a 10% rise in the consumer price index in 1990, as market economy started to be introduced, and a 58% jump in 1991 as prices were freed on a large scale. Inflation in the CR decreased to 11% in 1992 but rose to 21% in 1993, influenced in large part by the introduction of the value added tax in January 1993. Inflation in 1994 was 10% and the estimates for 1995 are around 9%. This is the lowest figure from all the ex-Communist countries in transition.

While broadly liberalising prices, the government initially maintained a relatively strict system of wage controls. Its goal was to keep the rise of wages below inflation. However, this measure had created a lot of controversy, especially after it was re-imposed in July 1993, as being inconsistent with the general free market philosophy of the Czech economic reform. Now, there is no wage regulation in the CR any more. At present the state regulates roughly 5–6% of all prices, incl. rents, energy, public transport and telecommunications. In the budget of households these items represent around 15%, given the present price structure and spending patterns. A policy of further deregulation of the remaining state–controlled prices is expected in the coming years.

	1993	1994
Czech Republic	3.5	3.2
Slovakia	14.4	14.8
Hungary	12.1	10.4
Poland	16.4	16.0
Slovenia	15.4	14.2
Romania	10.2	10.9
Bulgaria	15.9	12.9
Estonia	3.9	5.3
Latvia	5.3	6.5
Lithuania	1.6	3.8

 Table 4: Unemployment Rate (%)

One of the important transformation measures consisted in major devaluation of the crown (by 64% vis-avis the US dollar in the autumn of 1990) and pegging of the crown in January 1991, to a basket of five western currencies (this basket was later reduced to two currencies). The calculations of a real effective exchange rate indicate a gradual but persistent real appreciation of the Czech crown in transition years: between January 1990 and December 1994 the real exchange rate based on consumer price index appreciated by 20.4%. On October 1, 1995, a new foreign exchange act, which introduced the external convertibility of the Czech crown (the internal convertibility was introduced in 1991), came into force. This act goes beyond the article VIII of the International Monetary Fund statute, because besides practically all transactions of the current account of the balance of payments, some transactions of the capital account were liberalised, too. Full capital account convertibility is expected by the year 2000.

Unemployment was an unknown phenomenon in Czechoslovakia between 1948 and 1990. After 1990 it became a standard economic feature in all post-Communist economies but in the CR the unemployment rate never exceeded 4.4%, which was a peak reached in January 1992. It was 3.5% in 1993, 3.2% in 1994 and should not surpass 3% for the whole of 1995.

	1993	1994
Czech Republic	-0.9	2.6
Slovakia	-4.1	4.8
Hungary	-2.3	2.0
Poland	3.8	5.0
Slovenia	1.3	5.4
Romania	1.0	3.5
Bulgaria	-2.4	1.4
Estonia	-3.5	4.0
Latvia	-15.0	2.0
Lithuania	-27.1	1.5

Table 5: Gross Domestic Product Growth in Constant Prices, 1994–1995

This is not only one of the lowest figures in Eastern and Central Europe but also in the world. In contrast, in Slovakia the unemployment rate grew much more rapidly, reaching 11.8% in 1991 and fluctuating between 10% and 16% thereafter. It must, however, be added that the low joblessness in the CR conceals a certain hidden unemployment and labour-hoarding. Nevertheless, there are many other factors which have influenced unemployment trends over the last 6 years: labour participation of women and persons in retirement age decreased (while before 1990, up to 26% of persons in pension age were working, at present it is only around 11%); lower unit labour costs have made the pressure to substitute capital for labour weaker; economic revival has brought new job opportunities and thus has increased the number of jobs offered; high absorption capacity of small private businesses, especially in the tertiary sphere, has enabled large shifts of employment among the sectors; and last but not least, labour offices have worked rather successfully, their activities being oriented on creation of new jobs, programs to foster employment of fresh school leavers, and retraining schemes.

Unlike most other Central and Eastern European countries in transition, the Czech government has decided not to impose structural changes from the top and also does not have any explicit industrial policy. However, the privatization process itself has contributed significantly to certain structural changes which have already taken place. E.g. the share of the sector of services on the economy and the labour force has increased significantly (it stood at 53% share on the GDP in 1994). The privatization program consisted of a strategy, covering restitution of property to previous owners or their heirs, privatization of smaller units in public auctions (small scale privatization), and privatization of large and medium-sized firms (large scale privatization). In 1993 the small-scale privatization program ended and in 1994 the voucher privatization of large enterprises was concluded. As a consequence of this the share of the non-state sphere on the GDP is around 70% at present. However, the stake of the National Property Fund in many large enterprises and commercial banks is still very high. For this reason the process of restructuring is not proceeding as fast as it would be desirable.

In 1991 and 1992 the officially recorded Czechoslovak GDP declined by an estimated 14% and 7% respectively. However, what had occurred in those years was of a very different nature than what is called "recession" as part of the business cycle in standard market economies. We can rather speak of a "shake-out" of non-viable economic activities, which could exist only in protected COMECON markets, with distorted price structures and with huge state subsidies. In 1993, following the separation of Czechoslovakia into the Czech and Slovak Republics on January 1, the CR succeeded in virtually halting its GDP decline, while in Slovakia the decline still continued at almost 5%. In 1994 the Czech economy recovered at a 2.6% growth and the GDP growth for 1995 is expected to be around 5%. Rising domestic demand, for both investment and consumer goods is playing the greatest role in this respect. The investment increase was 6.4% in the first half of 1995 in constant prices.

The accelerating economic growth is on one hand accompanied by an increasing surplus on the capital account of the balance of payments, and on the other hand by an increasing trade deficit which could exceed 8% of GDP at the end of 1995. In general, government economists tend to point out at the growth of domestic aggregate demand (especially the gross fixed capital formation) and at the improving terms of trade, the economists from opposition parties are questioning both the structure of Czech exports (high percentage of raw materials and semi-finished goods) and the unfavourable trends in competitiveness. Given the fact that foreign exchange reserves of the central bank cover more than the value of imports for a period of 6 months, the size of the trade deficit is not alarming yet. However, it could become so if the present trends continue for a long time in the future. As far as foreign capital inflow is concerned, besides the highly beneficial foreign direct investment which stood at \$5.3bn at the end of September 1995 (since the beginning of 1990), there has been also a considerable inflow of short-term capital of speculative character which increases the danger of high inflation because of its pressures on the money supply.

Although the total real Czech GDP will reach only around 85% of its 1989 level and real average wage should reach around 95% of its 1989 level at the end of 1995, the qualitative changes which have been taking place in the CR, have prepared solid preconditions for a sustainable economic growth in the future and with it also the standard of living will be on the rise.

## 2. POPULATION DEVELOPMENT

The Czech Republic's present development<sup>4</sup> is a part of the natural transition toward a new pattern of reproductive behaviour, a model corresponding to the post-industrial organization of society. If the Czech Republic has espoused this organization "with a leap", its attendant processes naturally tend to undergo radical development changes. In fact the intensity of the current changes (in both fertility and mortality) is approximately in accordance with the scope of the Czech Republic's demographic development lagging behind arroud 1990 (see table 6) (Burcin, Kučera, 1995).

	Fertility		Mortality			
Country	Total fertility rate	Czech level from 1990 reached in the year	Males (years)	Czech level from 1990 reached in the year	Females (years)	Czech level from 1990 reached in the year
Czech Republic	1.89	-	67.5	-	76.0	-
Denmark	1.67	1976	72.4	< 1951	77.8	1972
Italy	1.29	1978	73.5	1961	80.2	1974
Germany <sup>1)</sup>	1.45	1972	72.9	1971	79.3	1978
Netherlands	1.62	1973	74.0	< 1950	80.0	1966
Austria	1.45	1974	72.9	1974	79.4	1980

 Table 6: The lag of the Czech Republic behind the demographic situation in selected European countries around 1990

<sup>1)</sup> without the former East Germany

Source: Burcin, Kučera, 1995

In 1994, for the first time since the end of World War I., the Czech Republic experienced a population decline. The balance of births and deaths was negative while the number of deaths exceeded number of live births by over 10,794. Even though the migration balance of the Czech Republic was positive – 9,942 persons<sup>5</sup> – in 1994, the migration surplus was not sufficient to offset the natural decline.

<sup>&</sup>lt;sup>4</sup> Both by its area, 78.9 thousand km<sup>2</sup>, and the number of inhabitants, 10,333 thousand, the Czech Republic belongs amongst the smallest countries of Europe. The average population density, 131 inhabitants per km<sup>2</sup>, ranks it, however, among the group of medium populated countries in this region.

<sup>&</sup>lt;sup>5</sup> Data concerning emigration is not complete and precise.

## **2.1.** Population by Age

The actual age structure of the Czech Republic's population is unstable, affected by numerous fluctuations and deformations of the past decades, particularly by natality waves originating from the period following World War Two and from the 1970's. The long-term decline of births and the related decrease of the number of children result in an ageing of the population and a gradual narrowing of the reproduction base.

In the period between 1990–1994, the proportion of children (in the age of up to 14 years) in the Czech population declined from 21.1 per cent to 19.4 per cent. The representation of persons in productive age (15–59 years) increased moderately, from 61.1 per cent in 1990 to 62.6 per cent in 1994. The share of persons in postproductive age was more or less stagnant, i.e. 18 per cent.

The index of ageing (i.e. the ratio of persons older than 60 years to the population in pre-productive age) consequently increased to 95.4 per cent.

The decline in the number of children also accelerates the growth of the mean age of the population. In 1994, the mean age of the Czech Republic's population reached the highest value ever recorded -37 years (35.3 for males and 38.6 for females).

The most important change in the age composition of the Czech population, which has manifested itself since the beginning of the 90s, has been the shifting of the numerous cohorts born in the years of the high natality wave, in the 70s, into the highest fertility age. This shift has also provided the preconditions for the emergence of a new, secondary wave of increased numbers of births. However, the change of the population climate in the early 90s, i.e. delaying of marriage by young people, and, consequently, the delaying of the birth of the first child prevented the emergence of the expected wave.

## **2.2.** Population by Sex

In the composition of the Czech Republic's population by sex, females slightly predominate, similar to all comparable countries. The proportion of females is 51.4 per cent of the total population or masculinity index (ratio of males and females) reaches 94.7 per cent

From the point of view of the portion of males and females by age, a considerable predominance of females exists in the age over of 60 years connected with the lower mortality intensity of women in this age as well as with the consequences of World War Two. On the other hand, in the age categories up to 45 years males predominate in numbers.

## 2.3. Natality and Fertility

Since the beginning of the 90's the population of the Czech Republic has been decreasing in numbers. In this decrease, amounting to more than 30 thousand persons between 1990–1994, the unfavourable development of natural growth caused by the declining fertility played a decisive role.

The reproduction behaviour of the Czech Republic's population in the last few decades has been characterized by a high level of fertility at the beginning of the female's reproduction period coupled with a concentration of fertility in a narrow age span, orientation to the two-child family model and a short interval between the birth of the first and the second child. These characteristics of reproduction behaviour reflected the population climate which had, to a considerable extent, been artificially created by the social and population policies of that time. Political and economic changes at the beginning of the 90s created quite new and different demographic conditions which reflected thmenselves in the dynamics and directions of the development of natural reproduction of population. Thus reproduction behaviour of the Czech Republic's population has started to draw nearer to the Western model much more rapidly than it was generally expected.

Between 1990 and 1993 the decline in the fertility level reached the same value as that recorded for the whole period of the preceding ten years. Total fertility rate (i.e. the aggregate of fertility rates by age in a given period), which has been under the gross replacement level of 2.1 since the beginning of the 80s, declined from a value of 1.89 in 1990 to 1.44 in 1994 ie, a decrease of 24 per cent. The decrease of the fertility level has also been reflected in the decline in number of births. In 1994, the number of births – a mere 106,915 – reached their lowest level in the whole two hundred-year period of statistical

observation of natality. While in 1990 the crude natality rate reached 12.7 per mill. in 1994 the value of this indicator was merely 10.3 per mill.

Despite a temporary growth in the number of women at the age of highest fertility (20–24 years), due to the existence of strong generations born during the 70's, the decline in fertility and consequently decline in the number of new-born children is likely to continue for several years to come. The proportion of children in the Czech population is thus expected to gradually decrease, from approximately 20 per cent at the present to less than 15 per cent in the next 15 years (Burcin, Kučera, 1995).

## 2.4. Mortality

The development of mortality in the Czech Republic in the post-war period can be divided into two distinct stages.

	1990	1994
Population on 31 December in thousands	10,363	10,333
Population growth <i>per 1,000 population</i>	0.10	-0.10
Natural increase per 1,000 population	0.10	-1.10
Crude natality rate per 1,000 population	12.70	10.30
Crude mortality rate per 1,000 population	12.50	11.40
Total fertility rate	1.89	1.44
Infant mortality rate per 1,000 live births	10.80	7.90
Life expectancy at birth <i>in years</i>		
– males – females	67.50 76.00	69.50 76.60
Mean age in years	36.40*	37.00
– males – females	34.50* 38.00*	35.30 38.60
Net migration <i>per 1,000 population</i>	0.00	1.00

Table 7: Main Characteristics of the Population Development of the Czech Republic in 1990 and 1994

\* in 1991

Source: Data of the Czech Statistical Office

The first stage, approximately up to 1960, was characterized by a relatively sharp growth of life expectancy at birth for both genders, namely due to the pronounced decline in infant mortality. After 1960, however, this trend was reversed; for the female group of population the life expectancy at birth began to stagnate, while for males it began to decrease. It was only since the second half of the 80s when these unfavourable trends in mortality started to slightly improve, while a more marked growth in life expectancy, particularly among males, occurred as late as the early 90's.

In 1994, the life expectancy at birth for males reached 69.5 years and for females 76.6 years. In comparison with the other states of the former communist block the Czech Republic is ranked in second place, behind Slovenia. In the European context, however, it holds a less favourable position, being among the bottom ten countries. On the other hand, by its infant mortality rate -7.9 per cent in 1994 – the Czech Republic drew nearer to the developed countries.

The absolute number of deaths in the Czech Republic has shown a declining tendency since 1990. In 1994, the number of deaths reached its lowest value since 1968 - 117,373. The crude mortality rate also declined considerably between 1990–1994, from 12.5 per mille to 11.4 per mille. Another positive change recorded in the 1990's is the decrease in mortality for adults and the older population, particularly of males between the ages of 60–69 years.

The newly established trend in the development of mortality, can in this respect, be considered to be promising for the future. It may be presumed that, in a similar way to the diminution of differences in fertility and natality rates between the Czech Republic and the Western European countries, the differences in mortality and life expectancy levels will also continue to decline. The decline in the level of mortality and the lengthening of life expectancy to approximate values attained in the most developed countries is, however, a long-term matter.

## 3. MIGRATION

## 3.1. Migration Development after the Second World War

The period between the end of the World War II and the late 80's in former Czechoslovakia can be characterized by a prevailing negative balance of external migration.

After the end of the World War II the expulsion of Germans, particularly from the border regions of the Czech Republic, began. Different estimates speak about 2,500–2,900 thousand Germans expelled from Czechoslovakia by 1947 (Srb, 1993). This exodus was only slightly offset by the return of former Czech and Slovak emigrants, who left the country due to the conflict (according to official estimates some 200 thousand persons returned between 1945–1947) (Marešová, 1993).

Another mass migration wave was connected with the events of 1948. The Communist coup in February began the long period characterized by a permanent net outflow. Population loss due to external migration (both legal and illegal) is estimated to be approximately 600 thousand persons in the period between 1948–1990 while the highest migration declines occuring at the end of the 40's and the 60's.

Structural (official) data concerning emigration from the Czechoslovakia for this period are available only for the legal group of emigrants. Some 70–90 per cent of emigrants were left for European countries. The most attractive country of destination was the Federal Republic of Germany, followed by Greece, Austria, Hungary and former Yugoslavia. Among non-European countries Canada, USA and Australia had dominant positions. Presumably illegal (unregistered) emigrants also in the most part headed for Germany or another Western European country (Drbohlav, 1995). From the point of view of sex composition, men prevailed among all emigrants (legal and illegal together), while particularly young, more educated people were leaving.

By contrast, immigration to Czechoslovakia was quite a low during the mentioned forty-year period (in the 80s about 1,000 persons per year). Unlike statistics on emigration official data on immigrants are more precise and credible. The largest proportion among immigrants coming to the territory of Czechoslovakia in the period until 1990 was represented by nationals of other Eastern block countries, particularly of Poland and the Soviet Union. The majority of the immigrants from these countries were women (Marešová, 1993).

During the whole forty-year period of the Communist regime the migration between Czech and Slovak Republics had a specific, distinct nature. The migration balance of the Czech Republic in relation to Slovakia was permanently positive, while the highest migration surplus was recorded at the beginning of the 50's (c. 11 thousand persons a year). In the course of the years, the migration gain of the Czech Republic continuously declined, to c. 3–4 thousand a year in the 70's and 80's. Nevertheless, for the whole post-war period of the existence of the common state the inflow of migrants from Slovakia, constituted mainly by the economically active part of the population in the productive age, considerably contributed both to the growth and improvement of the age structure of the Czech population.

## **3.2.** General Trends in the 1990's

With the opening of the borders in 1989 and the subsequent reform of legislative conditions, the long-term trends of external migration in the Czech Republic started, in principle, to change.

In comparison with the second half of the 80s, at the beginning of the 90s the migration turnover increased. Beginning with 1991, migration deficits between the Czech Republic and foreign countries had turned into increases<sup>6</sup> (Populační vývoj České republiky 1994). The Czech Republic has thus begun to change from a former emigration country, to then become a transit country, before finally becoming a country of destination<sup>7</sup>.

The advantageous geographic location (on the boundary of Western and Eastern worlds), successful results of the economic transformation, relative stability of the political climate in the country, are all factors which place the Czech Republic in an exceptional position within the group of transforming countries.

Numbers of migrants from different European and non-European countries heading for the Czech Republic has grown constantly since 1990. Foreign nationals, particularly those who are coming for the purpose of the gainful employment, represent the vast majority and give an evidence about the current economic attractiveness of the Czech Republic. The above trend can be illustrated by the following data: In the period of 1992–1994 the total number of registered immigrants (both permanent<sup>8</sup> and long-term<sup>9</sup> residence holders) in the Czech Republic swelled from 49,957 to 104,343. Out of this figure, foreigners with a valid long-term residence permit rose more than three times, from 20,428 to 71,230 in the same period. A majority of foreigners with a long-term residence permit are Ukrainians, Vietnamese and Poles. The figures for Ukrainians and Vietnamese have been increasing recently, in particular. Among the permanent residence holders, nationals of Poland represent the largest group (40 per cent).

Contrary to ever-increasing immigration the intensity of permanent emigration has had a declining tendency since the beginning of the 90s. According to the data of the Statistical Office the gross emigration rate of the Czech Republic dropped from 0.4 per mill. to 0.03 per mill. during the period of 1990–1994. In other words, absolute numbers of registered emigrants decreased from 4,113 in 1990 to a mere 265 persons in 1994, i.e. to the lowest level for the whole post-war period of statistical observation of migration.

However, one should have certain reservations when evaluating these statistics. Their main and fundamental shortcomings – incompletness and inaccuracy – are connected with the difficult registration of emigration in the present conditions of free movement of people across the borders (in 1991 emigration passports were abolished and only people who voluntarily deregistered from their place of permanent residence in the Czech Republic are counted as "emigrants"). The data on emigration thus underestimates the real number of emigrants and may be used rather as a "gross" indicator for the depiction of general migration trends than as precise statistical characteristic.

Since the beginning of the 90's new forms of "emigration" of Czech nationals have started to develop. Short-term, particularly labour migration has been gaining more importance as compared with long-term migration movements abroad.

<sup>&</sup>lt;sup>6</sup> However, available data on emigration is not precise and credible

<sup>&</sup>lt;sup>7</sup> In comparison with traditional immigration countries, the Czech Republic is not a "country of destination" in the best sense of the word. The contemporary unwonted inflow of migrants to its territory is rather of temporary nature, reflecting, in particular, the increasing interest among foreign nationals to gain employment in the Republic.

<sup>&</sup>lt;sup>8</sup> In accordance with the 1992 Law on Residence of Foreigners and the Amendment of 1994 a permanent residence permit on the territory of the Czech Republic can be granted to a foreigner on the basis of following reasons:

<sup>-</sup> for family reunion purposes, when his wife / her husband or other close relatives in the family are Czech citizens or were

granted a permanent residence on the Czech Republic's territory,

<sup>-</sup> in humanitarian cases,

<sup>-</sup> if the matter is in the foreign political interests of the Czech Republic.

<sup>&</sup>lt;sup>9</sup> In accordance with the above law long-term residence can be granted to a foreigner for the time necessary for the fulfilment of a given purpose with a maximum duration of one year. This period can be repeatedly prolonged, if applied for by an alien. In most cases the purpose of long-term stay is to gain employment or to carry on business.

However, unlike the "boom" of labour migration movements which was characteristic especially for the period of 1992–1993 a marked decline in intensity of these movements has been evident for the past two years. For example, the numbers of registered seasonal migrants declined considerably, by about 50 per cent, between 1992–1995. A similar trend is also estimated in regard to the numbers of Czech commuters.

This fact can be explained in several ways. On one hand, regulations concerning employment of foreigners from non-member states of EU have been adopted in the developed neighbouring countries, Germany and Austria, where, naturally, the main streams of Czech migrants have headed for. On the other hand, some recent surveys have indicated a certain decrease in the interest to work abroad among the Czech population. This is most probably connected with an improving situation in the domestic labour market (a low, recently even declining level of unemployment, a rise in real population incomes).

## 3.3. Migration of Scientists from the Czech Republic

Statistics on emigration of scientists are not available for the Czech Republic. A certain "substitute" in this respect may be data on emigration according to education.

From the available data for the 80's and 90's the following facts are evident:

The proportion of emigrants with higher education has always been lower in comparison with other education groups of emigrants.

Migration development in the second half of the 80's can be characterized by relative stability, while the shares of highly educated people fluctuated between 11 per cent – 14 per cent a year out of the total number of emigrants.

At the beginning of the 90's, a certain amplitude in the more or less continuous development occurred. In 1992, the total number of registered emigrants declined considerably, by about 89 per cent in comparison with 1991. By contrast, the share of highly educated emigrants rose to 28 per cent. However, it is very problematic to draw any conclusions on the basis of these statistics. As has been mentioned above, since 1992 a change in method of recording emigration has occurred in the Czech state statistics and thus this simple explanation lies ready to hand.

The lower propensity of highly educated persons to leave to go abroad is also confirmed by results of recent surveys.

According to a survey that was carried out by the agency "AISA" in October 1994, 15 per cent of the Czech Republic's population would choose to live in a foreign country. As far as concerns highly educated people, however, only 10 per cent would choose this strategy.

Similar results have been proved by a survey of the Centre of Empirical Surveys (STEM) from summer 1995. When asked the question "Are you thinking of working abroad?" only 14 per cent of people with higher education answered positively (i.e. "*definitely yes*" or "*probably yes*"). The relevant shares among other education groups were substantially higher (between 42 and 72 per cent).

## 4. TRANSORMATION OF THE RESEARCH SYSTEM IN THE CZECH REPUBLIC

The transformation of the national research system, which is under way in the Czech Republic, can be rightly comprehended only as an integral part of the overall transformation of society. As values, norms, contents and forms of communication are changing in the society, those are changing also in specific context of research community in specific forms of social (institutional and personal) and cognitive changes.

In the period after November 1989, the country's research potential was found to be heavily overstretched both in terms of staff and the share of its expenditure in the gross national product. It was ill-structured both in terms of thematic structure and concerning proportion among technical, natural and social sciences, inefficient and relatively isolated from international science<sup>10</sup>.

Regarding the strategy for achieving the chief objectives of the transformation, two contradictory concepts emerged. According to the first one, the process of the transformation of research should be a process with

<sup>&</sup>lt;sup>10</sup> We do not mention "inner drawbacks", for example, the outdated technical and information outfits.

well-defined priorities and means of a state science policy and should therefore represent a regulated process. The other theory viewed the transformation as a process aimed at opening up space for the flexible and democratic search for optimum alternatives by adopting certain elementary starting points and principles corresponding with the overall political and economic aims of society. Within this particular concept, which eventually prevailed and received support from the state authorities and the largest section of the research community, transformation processes have assumed a more spontaneous nature.

Regarding the system changes, the process of transformation was characterized by setting the "climate of democracy" throughout the research community, by an abolition of direct state intervention into research, launching competitive funding for projects and introducing competetive conditions in general; the enterprise-based research sector started applying principles of privatization and a free market economy, which has fundamentally changed the prevailing methods of organization and funding.

The changes are reflected in the dynamics of research and development indicators, which were particularly high in the first years of the transformation process (see below). The major and rather dramatic changes (institutional, personal and economic), were carried out in the period between 1990 and 1993, since then the situation has relatively stabilized<sup>11</sup>.

In many cases a huge reduction staff in the numbers in many research and development institutes, sometimes called the "exodus", occurred<sup>12</sup>. Besides losing compromised or unqualified and inefficient employees an "involuntary" loss occured when young and talented researchers left. Thus, the aging process within science which has been well known since the 1970s and 1980s has continued (Hradecká, Čermáková, Maříková, 1995). However, when analyzing the last two years 1994 / 1995 the aging process within the Academy and universities has been halted but the rather unfavourable age structure has survived – only about 10% of professionals within both types of institutions are younger than 30. On the other hand, the loss of staff in absolute terms has not always been at the expense of the educational structure. The quality of the scientific personnel has started to increase in relative terms (the example of the Academy).

Regarding research and development expenditures, though financial means which are released for research and development from the state budget increased and were increasing over time (see also table 8), estimates tell us that the real value of research and development expenditures had fallen by about 50% in the period of 1990–1993. In comparison with data for 1989, the fall would be even more. The share of research and development in GDP (expenditures concern both the state and the private sectors) is now about 1% in the Czech Republic. Ranking low among the advanced European countries.

<sup>&</sup>lt;sup>11</sup> As of the end of December 1994, there were 58 institutes of the Czech Academy of Sciences (including library and archives), 23 universities with 125 faculties and according to the not very reliable statistics (see Introduction) other 542 institutes / firms / corporations whose prevailing activities reside in doing research and development in the Czech Republic.

As of the same period, perhaps slightly more than 60,000 emloyes (depending on what auxiliary services are included) worked officially (were statistically registered) for the institutes the prevailing activities of which were devoted to science, research and development. Out of these roughly 35,000 (34,994) researchers and developers (including university teachers) worked in the field of science, research and development (with regard to universities and the Academy only those which completed university, with regard to other intitutes possibly also those which completed secondary school – the limits of the statistics). Out of these 3,128 worked for the Czech Academy of Sciences, 13,942 for universities (both teachers and researchers) and 17,924 for other institutes / firms / corporations. According another unofficial source, out of the latter number some 9,000 might be those who completed university education.

<sup>&</sup>lt;sup>12</sup> The applied research in industry, construction, transport and postal and telecommunications services was particularly hit (Hradecká, Čermáková, Maříková, 1995).

Financial Means for:	1991	1992	1993	1994	1995	1996
R&D	3,793	4,162	4,378	4,551	4,897	6,239
Academy <sup>2</sup>	1,168	1,446	1,246	1,347	1,276	1,713
$GA^{3}$			201	466	623	769
<b>R&amp;D</b> share in $GDP^4$	0.530	0.520	0.480	0.440		

Table 8: Financial Means Released for Research and Development from the State Budget<sup>1</sup>, the Czech Republic, (Millions of Czech crowns), 1991–1996

Source: Internal material of the Czech Ministry of Finance; Statistical Yearbook of the Czech Republic 1995. Praha, Czech Statistical Office 1995.

Notes: <sup>1</sup> These figures concern "proposed money". The reality is, however, more or less the same.

<sup>2</sup> The Czech Academy of Sciences.

<sup>3</sup> The Grant Agency.

<sup>4</sup> If also including financial means coming form the private sector, then, the share of research and development in GDP fluctuates around 1%.

According to the Government Directive on the field of research and development No.282/1994, the scope of state financial stimulation for research and development should be increased over time with the improvement of the economic situation and reach as high as 0.7% of the GDP.

As far as funding the research is concerned, a new point is the launching of a competitive system of project funding, the so called "grant system". (In general, state target-oriented funding of projects has been gaining more importance over time and should significantly dominate over institutional funding of organizations in 1996). The Grant Agency of the Czech Republic was established in 1992. It has its own part in the state budget. The amount of money distributed through grant competition is increasing every year (table 8) and it is of fundamental importance for each research institute to be successful in grant competition. Moreover, besides the Grant Agency, there are other internal branch grant agencies, namely at some of the ministries. It should be noted that grant systems are open to any applicant, whatever the sphere/area of science<sup>13</sup> and organizational framework he / she comes from. Hence, university staff, for example are, besides the grant system within Charles University, intensively involved in those grant schemes mentioned above.

During a period of dynamic change, the standard indicators usually lose some of their value; this applies to research and development indicators of a society in transition as well. That is why a research team of centre for Science Technology Society Studies at the Institute of Philosophy of the Academy of Sciences of the Czech Republic conducted a sociological survey in which 50 case studies were collected describing and explaining the real process of transformation in Czech research institutions. The findings of that survey will be made use of in the following part (for more see Teorie 1994 – Provazník, Filáček, Frýdová-Křížová, Loudín, Machleidt, 1994).

In each of the sectors – the Academy of Sciences, universities and other institutions dominated by applied and industrial research – the transformation has taken on specific character.

### 4.1. The Academy of Sciences

The paramount objective in the transformation of the Academy of Sciences was to rebuild it into a modern scientific institution of non-university research whose primary mission is to carry out research in prospective and socially relevant branches of the natural, technical and social sciences, and to conduct it at a level comparable with international standards. So far, the most important outcome of the transformation process has been the wide-ranging selective reduction of staff and the number of institutions, with all less efficient, productive and vital staff, including those working on less prospective research projects, having left the Academy. The number of scientific institutions has dropped from 82 to 59. The Academy shrank, reduced the number from a total of 12,060 employees and 5,367 research and development workers with university education in 1990 to 6,365 and 3,128, respectively, by the end of 1994 (see table 9 – Annex – for

<sup>&</sup>lt;sup>13</sup> For instance, in 1993 the Grant Agency, based on the results of the competition, distributed financial means in the following way: 31% to projects in the field of natural sciences, 26% to technical sciences, 20% to medical sciences, 13% to agricultural sciences and 9% to social sciences (Teorie, 1994).

more on the contemporary structure of the Academy). This represents a decrease in the number staff by 47.3% and 41.8% respectively.

Within the Academy the major reduction occured in mid 1993 when some other structural changes also occured (e.g. the establishing of some new workplaces in cooperation with other institutions like universities or private institutes). The changes were based on a rather deep and systematic evaluation of the individual institutes. The huge reduction also corresponded to the considerable reduction in the budget the Government provided to the Academy in 1993. The individual areas of science were affected as followst: Out of 24 institutes belonging to mathematics, physical and earth sciences 4 were cancelled, of the 31 institutes pertaining to life and chemical sciences 9 were cancelled and of the 25 institutes within humanities and social sciences 7 were cancelled<sup>14</sup>. In addition, the practice of the Academy having its own development workshops was abolished. The social sciences sector, though the smallest, underwent the greatest changes (moral and political reasons for leaving).

One of the most remarkable features of the transformation process, however, is that despite the massive cubacks, the creative potential of the research sector has been at least partly preserved. Over the past five years most of the Academy institutes have managed to raise their rate of publications by 50–100% (per researcher) in major international "high-impact" scientific journals. Basically, this is the result of the successful strategy applied by the Academy: to reduce and to transform institutions and, simultaneously, to preserve and develop creative potential. On the other hand, some of the young prospective and talented scientists have left the Academy. In 1994 the figure was about 500 (Průběh, 1994). The latest information tells us that no outflow of the youngest professionals, under 30, occured in 1995. On the whole, the people who had decided to leave the Academy usually found attractive and well-paid jobs primarily outside the research sector, in business, banking, the decision-making sphere or elsewhere. Some of them went abroad. The most important reason for leaving the Academy was unambiguously connected with the inadequate financial reward (Hradecká, Čermáková, Maříková, 1995). Also, with respect to particularly young professionals, reasons like outdated technical outfits and a feeling of uncertainty and anxiety about the future of the Academy itself played a significant role.

Another noticable result of the transformation of the Academy of Sciences is the growing competitiveness of the academic climate. This has been achieved mainly thanks to the combined system of institutional and project funding. The share of project funding is nowadays so high that research teams which have failed to win grants are facing an imminent threat of collapse. Besides grant competition, a system of evaluation has been introduced according to which each researcher and each institute are periodically evaluated. Together with Czech researchers, representatives of international science also participate in the evaluation process.

Key spheres determining the success of the transformation of the Academy are well-developed, cooperation with foreign partners and an ever-increasing rate and scope of cooperation between Academy institutions, universities and the non-university research sector.

## 4.2. Universities

The main task of the transformation in higher education is to raise the volume and level of research. The changes should cover two levels: Firstly, the share of higher education research in higher education activities should be strengthened – until recently, it has significantly been dominated by teaching; Secondly, more emphasis, in terms of the national research system, should be put upon universities at the expense of the Academy of Sciences, where until now, a majority of research activities have been carried out.

The first phase of the transformation of higher education institutions (roughly between 1990–1991) was characterized by dynamic development along with structural changes in the teaching process. The number of "subjects" as well as university staff both increased. While there were 20 universities (including 4 relatively independent pedagogical faculties) and 83 faculties in 1990, in 1994 there were 23 universities and 125 faculties in the Czech Republic (see table 10 in Annex). 24,494 new students were enrolled at universities in the Czech Republic in 1990, while 33,444 began their studies in 1994. A degree of

 $<sup>^{14}</sup>$  As of the end of 1993, when taking 1989 as 100%, institutes belonging to mathematics, physical and earth sciences had 55,5% of their staff, the institutes pertaining to life and chemical sciences 55.9% and institutes of humanities and social sciences 43.2% of their staff.

"administrative diversification" within the areas / disciplines but also spatially, is evident (i.e. new regional universities were established).

In the second phase of the transformation, attention has been focused on the problem of research. The role of research as an economic factor is also changing. At the beginning of the transformation, research was the first victim of the financial restriction. However, after the introduction of the grant system and the broadening of the possibilities to enter international competition for grant funds, research has become an economic contribution to higher education.

The result is that in higher education the pressure on research performance is growing, the requirements on research results as part of personal career have been substantionally increased and research is generally becoming the key activity in most Czech universities. The amount, as well as intensity of research has increased immensely; the growth in the number of research programs ranges from 30% to 80%.

As far as the situation in personal structure is concerned, there have been no dramatic changes in the numbers of personnel so far. The reduction comprises at most hit units about 20% in natural and technical sciences; in the humanities there has been a substitution of teaching personnel by research personnel rather than a reduction. However, a very significant decrease can be observed in non-research personnel, among technicians, in administrative and information services. On the average, the decrease is estimated to be 30%. Regarding the age of staff, universities also "suffer" from rather very old age structures.

A highly positive effect of the transformation is the development of international cooperation – the unhindered participation in international science represents a new intellectual and financial (through competition for international grants) source for the Czech research.

The same applies to the intoduction of a new system of funding via grant competition. The decline of the institutional non-competitive funding of university research is estimated to be on average between 20-25%, with some units even indicating a fall of 70%. With the launching of the competitive grant system in 1992–1993, the situation has changed and some winners and losers have emerged. Research units successful in grant competitions assess their own financial situation as being better than before the transformation. The successful units acquire about 30% of their entire financial means through grant competition.

The structural deficiencies in the proportions of technical, natural and social sciences are now being reformed. In the past, it was determined not only by the backward structure of Czech industry with laid the dominance of heavy industry, but at the same time by an official concept of education which stress on technical, professional and administrative skills while neglecting the cultural, humanistic and critical dimensions of science and education; humanities, natural and social sciences were underrepresented. Since the beginning of the 1990's, the share of humanities and social sciences in higher education has been increasing. For example, in 1989 18% of newly enrolled students were to study humanities / social sciences, while in 1993 this figure was  $28\%^{15}$ .

### 4.3. Institutes / Firms / Corporations Outside the Academy of Sciences and the Universities

The public and industrial research sector (enterprise-based research) comprising institutions either independent or a part of an enterprise and conducting research either for public purposes (health care, environment and the like) or for industry has also been undergoing a complex transformation (see table 11 in Annex). This type of research is closely connected to the economy<sup>16</sup>. Hence, the effect of the "painful economic transformation" upon these research institutions was in many cases rather severe. The number of workers involved in enterprise-based research has dropped significantly since 1989. It should be stressed,

<sup>&</sup>lt;sup>15</sup> The share of individual scientific branches / areas within higher education, measured by the number of newly enrolled students was, in 1993, as follows: technical faculties 33.5% of the total number of 30,334 students, social science faculties 27.7%, pedagogical faculties 15.1%, natural science faculties 9.3%, medical faculties 5.4%, agricultural faculties 4.5%, and others (theological, art and sports) 4,5%.

<sup>&</sup>lt;sup>16</sup> According to statistics, at 542 institutes / firms / corporations (with a vast majority of them with more than 25 employees) with nearly 18,000 employees who were active in the field of research and development at the end of 1994, 7,843 (44%) were registered under the pure "research and development" label. Here they are other three the most frequent industrial branches with more than 1,000 researchers and developers: manufacture of machinery and equipment (15%), manufacture of motor cycles and trailers (10%) and manufacture of other transport equipment (7%).

however, that enterprise-based research has been heavily overstaffed in the past. In addition, it was very inefficient and, to a considerable extent, discharged functions other than research activities. Over time, its structure has become obsolete due to the ongoing changes in the Czech economy and its opening up to the outside world.

At present, the enterprise-based research sector is passing through a far-reaching transformation, a fundamental transition from state to private funding. Maximum efforts are being exerted in the transformation process to conduct research activities based as much as possible on a contract basis.

Nevertheless, the main achievement is the fact that the enterprise-based research sector is undergoing a genuine internal restructuring process. Research teams and institutions are searching for new, ever stronger links with the industrial, agricultural, and service sectors, the state authorities and institutions. Changes are also being made in the thematic content of research work according to customer requirements and interests.

However, the enterprise-based research sector in the Czech Republic is being transformed in a situation where industrial, agricultural and other enterprises are themselves being transformed, privatized and restructured, where the latter's underlying interest in innovations and research findings has not yet been (and cannot be) sufficiently developed and well defined in terms of content. This, naturally, poses difficulties for enterprise-based research.

## 4.4. Some Objective Obstacles to the Development

All in all, no matter how the situation – regarding the transformation of the research system in the Czech Republic – seems to be rather optimistic, there are some serious problems (some of them have been mentioned) which, for the time being, further hamper even more appreciable progress on the road towards a fully advanced, reasonable and efficient national research system. In the following part we will formulate some of the objective obstacles regarding the Academy and the universities<sup>17</sup>. They seem to be valid either for both sectors – the Academy and the universities – or for only one of them. They may trigger and they do trigger a movement / migration of researchers (including teachers) which could be called the "external or internal brain drain":

- The age structure of the staff of the scientific sector is very unfavourable, ie, relatively very old (the worst situation seems to be, in this respect, within the private sector). If new young professionals will not enter the sphere, it will, without any doubt, lead to progressive ageing and thus in many aspects a worsening of the "quality" of the whole research and development sector over time.
- Financial rewards for "normal" work in research and development are relatively low in comparison to the other economic branches of society. It does not function as a "pull" factor, but rather as a strong "push" factor. As a consequence, researchers and developers (including teachers) are, in order to earn additional money, overworked (e.g. the "hunt for grants"), and occupied with various kinds of additional commitments. Thus, for instance, teachers generally do not have enough time to prepare high quality lectures for their students.
- There is a bad climate within institutes / departments / research teams, a large bureaucracy ("red tape") and the imposition of a principle of "seniority" which discriminates against young personnel ("gerontocracy").
- Allotment of financial means "from the top" is rather problematic and does not follow a "principle of merit". As far as the "internal organizational structure" of individual subjects (e.g. faculties) are concerned, always not so clear and fair (e.g. in terms of the flow of money) between either departments themselves or between departments and "headquarters".
- There exists a so called "internal and invisible brain drain" without there being any movement. It resides in: 1) the fact that an expert often does work which can be done and (should be done) by a less qualified person, 2) the fact that some professionals have left some important fields / specializations and switched to other, more attractive fields (e.g. computer science).

<sup>&</sup>lt;sup>17</sup> The situation in the other sectors – at other research and development institutes / firms / corporations is rather more diversified, dynamic, complicated, and unclear, not so very well mapped, and thus, not very well known.

Due to the painful economic transformation which has, of course, also touched industry, for the time being, especially within some branches there is less demand for applied research from the side of industrial enterprises. On the other hand there is an general "hunt for brains" especially within the private sector, (but also, for instance, within state ministries) which attracts scientists by the excellent working conditions that they are offered there.

### 4.5. Elaborating on Factors of Age and Financial Situation

Now, we will elaborate two important aspects: the process of aging as one of the important "consequences" and wages as one of the key "causes" leading to the current situation to what is developing in the field of research and development in the Republic in the 1990s.

Since data on age structures are rather difficult or even impossible to obtain, we will briefly mention in this regard the situation at the Czech Academy of Sciences as presented by Hradecká, Čermáková, Maříková, 1995. Nowadays, the Academy has to face up to the ageing process. For example, there is a complete lack of researchers between the age of 30 and 45. Based on the results of a survey in summer 1995 in which most of the Academy's institutes were contacted, the institutes belonging to mathematics, physical and earth sciences had only 12.6% of researchers younger than 35 in 1995, as opposed to 18.3% in 1990. The equivalent figures for the institutes pertaining to life and chemical sciences were 19.6% and 20,9% respectively, and for the institutes of humanities and social sciences 11.0% and 9.8% respectively.

Another survey concerning the situation at 12 selected institutes of the Academy in 1993 (Teorie, 1994) shows that the position of those younger than 40 (in comparison with those who are older than 40) was in most cases lower than 50%. apart from one institute, the position of those older than 60 was between 6.1% and 21.7%.

Though some for the time being unoffical data indicate that, for example, no losses of the youngest professionals (under 30) occured in the Academy in 1995, the above figures clearly show how serious the ageing process is and could be in the future.

Despite the rather low prestige which activities connected with research and development have among the young and skilled population (Hradecká, Čermáková, Maříková, 1995), the prestige of researchers and developers within the whole Czech society (the public) is consistantly one of the best<sup>18</sup>. However, the evaluation of researchers and developers in terms of wages does not go hand in hand with this "appreciation" at all.

For example, the wages regarding the two categories where one can clearly find researchers and developers (including university teachers), i.e "research and development" and "education", are not so far above from the average wage of 7,866 Czech crowns (about 300 US \$) per head in the Czech Republic for the first half of 1995. While wages in the former category are 10% above the average and their rise (dynamism), as compared to the same period of the last year, also very nearly copies the average rise, wages in the latter category are 8% below the average and, moreover, their rise has been slower<sup>19</sup>. It demonstrates table 11, where wages are given for selected economic branches.

<sup>&</sup>lt;sup>18</sup> Professors / assistant professors and researchers ranked as third and fourth, respectively, on the prestige ladder in 1990, 1992 as well as in 1995 (based on representative surveys – Tuček, Machonin, 1992, Kterých, 1995), just behind physicians and ministers in 1990 and 1992 and state and private physicians in 1995. Relatively, their positions have even slightly improved over time (e.g. 1992 versus 1990). In 1968 they ranked as fourth and sixth, respectively.

<sup>&</sup>lt;sup>19</sup> It is interesting that in 1990 the distance of the both sectors from the average (at that time 3,337 CZK) was more or less the same: +10% and -9%. However, the variability of wages was considerably lower. While using different branches for statistical purposes in 1990 as compared to the contemporary situation, sector with the highest average monthly wages ("designing, making projects / designs") was about 20% above the average and with the lowest average monthly wages ("housing management") was about 16% below the average.

Selected Branches	Average Monthly Wages per One Worker				
	First Half of 1994	First Half of 1995	Index, 1995/1994, in (%)		
Research and Development	7,344	8,677	118.2		
Education	6,312	7,224	114.4		
Agriculture, Hunting and Forestry	5,539	6,430	116.1		
Industry	6,584	7,803	118.5		
Manufacturing Industry	6,333	7,533	118.9		
Construction	7,186	8,330	115.9		
Electricity supply	7,681	9,134	118.9		
Banking, Insurance	11,689	13,372	114.4		
Health	6,591	7,492	113.7		
Public Administration	7,983	9,419	118.0		
Total, Czech Republic	6,667	7,866	118.0		

Table 12: Average Monthly Wages (in CZK) per One Worker in Selected Branches of the Czech Economy, Czech Republic, the First Two Quarters of 1995

Source: Zaměstnanost a mzdy pracovníků v evidenčním počtu organizace v České republice, za 1.–2. čtvrtletí 1995. Praha, Český statistický úřad 1995.

Notes: Employees of private enterprises (excluding the smallest one and of those which are not registered within the mercantile registry) and of those included in the budgetary sphere are presented.

Though the two categories in question have the highest percentage of highly qualified persons and their work is very demanding in terms of complexity and creativity, their wages are, for example, behind the public administration sector, electricity supply sector, some sub-branches of the manufacturing industry and, of course, behind the banking / insurance sector – which is 70% above the average! The situation of the education sector itself is even more precarious. Taking into account disadvantages of a measuring by the average which in this case rather "underestimates" university teachers, it should be stressed that the education sector ranks as the eleventh worst economic branch (in terms of the level of wages) out of the main fourteen branches which are statisticly registered. Furthemore, out of 22 sub-branches of the manufacturing industry, workers in 14 have on average higher wages than teachers (mid 1995).

When analyzing the statistics of the individual sectors (the Academy and the universities), the figures tell us the average monthly wage per capita (regarding the entire staff) in the Czech Academy of Sciences was 8,181 Czech crowns in 1994 (6,827 in 1993, 5,434 in 1992, 4,483 in 1991 and 3,763 in 1990).<sup>20</sup>

The average monthly wage in the universities (staff as a whole) was 8,337 in 1994. This figure, however, represents the rather high inner variability; when differentiated according to different categories of teachers, the wages vary from 6,866 (for lecturers) to about 15,000 Czech crowns for professors.

As far as the young generation is concerned, a young professional who has just finished his / her studies and begins a career within the state research and development sphere, has a wage about 5,000 Czech crowns (brutto).

To compare the situation with another field which, besides others, might and does compete with the two state sectors in the question of attracting "brains", we will mention the results of Coopers & Lybrand's analysis (according to MF Dnes, 14th December 1995). It shows that between June 1994 and June 1995 wages for Czechs working for foreign firms in Prague were as follows: head typist – 18,600 Czech crowns, head accountant – 33,800 Czech crowns, personnel manager – 33,800 Czech crowns and sales manager – 45,800 Czech crowns (furthemore, it also mentioned that the figures are underestimated).

From the above characterization it is obvious that the existing financial conditions for researchers and developers (including teachers) are far from satisfactory. The amount of money provided for their "normal", necessary, fairly important and irreplaceable work is not commensurable and not adequate to the importance of their task.

<sup>&</sup>lt;sup>20</sup> Note: The inflation rate in the Czech Republic for the corresponding years, beginning with 1994 was 10.0%, 20.8%, 11.1%, 56.6% and 9.9%.

# 5. METHODOLOGY – STUDY DESIGN, QUESTIONNAIRES, RESPONDENT POPULATION

The survey was done under the umbrella of Charles University, Prague, the Department of Social Geography and Regional Development.

Three special questionnaires were prepared to tackle issues of both potential and real migrati-on / movements. The aim of the survey was to get a picture of the contemporary situation and that which would describe the past and also sketched the future prospects. The questionnaires were worked out (in English) in cooperation with all the country teams which were involved in the project. Nevertheless, the Czech versions of the "international questionnaires", encompassing some additional questions, were designed. The survey was addressed to three separate groups of respondents:

- The first questionnaire was devoted to potential emigration of scientists (it mainly ascertained professional career and its motivation, professional mobility long-term and short-term emigration / movements, internal "brain drain" and socio-demographic characteristics of respondents). For this purpose individual researchers were contacted.
- The second questionnaire touched real migration and the information was get through personnel departments and their staff (rather detailed pieces of information on an "employment history" and the contemporary situation of an individual employees were asked for).
- The third questionnaire revealed some opinions relevant to the issue via questioning deans / directors / managers of the respective institutions (summarizing some emigration / movement data for an institution as a whole, information on destination countries and qualitative evaluation in terms of what does it mean the loss of scientific staff for respective institutions were to be gained).

Pragmatically, the respondents (only those who completed higher education and who are active in the field reseach and development) were classified in the following way: 1) researchers and developers from the Czech Academy of Science, 2) teaching staff and researchers from universities and 3) researchers and developers working in other scientific / research institutions out of the above mentioned groups (i.e. state research institutes, non governmental research institutes etc.).

As far as sampling is concerned, a "quota" method was used. When selecting respondents, the following criteria were applied in order to have a "proportional representation" of the sample:

- 1. Research field (natural sciences including medical, agricultural, engineering / technical and social sciences);
- 2. Founder (see also above institutes of the Academy of Science, universities / faculties and others, i.e. state research institutes outside the Academy of Sciences, non governmental research institutes, etc;
- 3. Administrative position;
- 4. Age;
- 5. Sex.

While the first two criteria had been selected in advance (by the research team), with regards to criteria 3.-5. it was up to the individual inquirers to adhere to the rules of proportionality "in the field"<sup>21</sup>.

The survey (field work) took place between 24th May and 18th June 1995 when most of the questionnaires on potential emigration were distributed among the respondents and also re-collected for the research team. Responses to the both questionnaires on real migration, though distributed at the same time as those for potential migration, were delayed. It took until September before at least some of the respondents returned the questionnaires and thus enable the survey to be completed (for more on this – please see below).

Students of geography at the Faculty of Science in Prague were in charge of the field work. Before beginning the survey, the student inquirers had been specially trained. The "quota" selection of the respondent was applied, while a combination of face-to-face interviews (on average taking about 45

<sup>&</sup>lt;sup>21</sup> The latter criteria could not be adhered to strictly in many of the selected institutions. For example, in many cases (institutes) males predominated among scientists, and persons in the age of 40 years and older predominated over younger categories. At the same time it was rather difficult to contact a person in a high administrative position since they were usually very busy and hence not too well-disposed to any answering any queries.

minutes) and a method of "finding the respondent, handing over the questionnaire and then collecting it" was implemented<sup>22</sup>.

Prague, by far the most important centre of science, research and development in the Czech Republic, was the regional unit of main interest. Yet, rather a small sample of respondents (selected also according to the above mentioned criteria) were contacted in the city of Brno, in the region of South Moravia. Thus, there was at least some indication of a possible regional differentiation in terms of the phenomena in question.

As far as the potential migration survey was concerned, we have included the following 39 bodies in our research sample, where a total 935 respondents, who subsequently filled in the questionnaire ,were contacted. Of the contacted bodies, 15 institutions had their orientation in the field of natural sciences, 14 were primarily engineering / technical oriented institutions and 10 belonged to social sciences. Actually, we selected:

#### A. 14 universities (faculties)

Czech Technical University (ČVUT). Faculty of Nuclear Physics and Faculty of Engineering Faculty of Natural Sciences of Charles University (UK) First Faculty of General Medicine of Charles University Agricultural University Faculty of Law of UK Faculty of Philosophy of UK University of Economics University of Chemical Technology ČVUT, Faculty of Architecture ČVUT, Faculty of Electrotechnical Engineering ČVUT, Faculty of Civil Engineering Faculty of Mathematics and Physics of UK Faculty of Social Sciences of UK Faculty of Education of UK

- B. 16 institutes of the Czech Academy of Science
  - **Institute of Philosophy Institute of Physics Geophysical Institute Institute of Microbiology Economics Institute** Institute of Sociology **Institute of Inorganic Chemistry Nuclear Physics Institute Institute of Rock Structure and Mechanics Institute of Radio Engineering and Electronics Institute of Organic Chemistry and Biochemistry Institute of Electrical Engineering Institute of Chemical Processes Institute of Physiology Institute of Computer Sciences** The Czech Language Institute

<sup>&</sup>lt;sup>22</sup> About 15% of the questionnaires were completed via a face-to-face interview. The pilot survey in the fall of 1994, however, proved that both the method of the "interview at the office" as well as of "filling in the questionnaire at home", are replaceable. Reasons preventing the inquirers from arranging interviews with the respondents at the office were mainly connected with either the fact that the respondents were very busy at the time or there was an inhibition towards giving information to the "secret areas" of some institutions (inaccessible to the public). In this case, personnel departments helped in distributing and collecting the questionnaires.

#### C. 9 institutes / firms / corporations outside the Academy of Science (both state-run and private)

Czech Institute of Geology Czech Hydrometeorological Institute Institute of Education Water Research Institute Research and Experimental Institute of Aviation Institute of Research and Use of Fuels Research Institute for Geodesy, Topography and Cartography Institute for Research, Production and Use of Radioisotopes Research Institute of Power Generation

Regarding the potential migration issue, we contacted all the above bodies. Altogether, 1,200 questionnaires were spread distributed to among the respondents within the above bodies in Prague. The rate of return for the questionnaires was relatively high. We obtained 935, i.e. 78% were, to varying degrees, completed. Out of all the respondents, 302 (32.3%) worked for the Institutes of the Academy of Science, 433 (46.3%) for universities, 110 (11.8%) for a state research institute outside the Academy of Science, 46 (4.9%) for non governmental research institutes and 44 (4.7%) for others. As for the scientific field, 467 (49.9%) of respondents, based on their own expressions, were active within the field of natural science (medicine and agriculture included), 242 (25.9%) in the engineering / technical field and 226 (24.2%) in the social sciences.

The sample of 935 respondents (when talking about the potential migration survey) covered 2,7% of the total number of researchers and developers in the Czech Republic (see chapter 4). Similar shares can be counted for individual employers – the Academy, universities, etc. They represented 9.7%, 3.1% and 1.1%, respectively, of the current numbers of scientific staff.

As for Prague itself, it contains about 42% of the whole scientific, research and development staff of the Republic<sup>23</sup>. Hence, we covered about 6.3% of the scientific staff in Prague in the survey. As far as concerns individual employers in Prague, we succesfully contacted 10.5% of those who work for the Academy of Science in the field of research and development, 6.2% of those from the universities and 4.1% of those from other institutes / firms / corporations.

In addition, as mentioned above, we also contacted several research and development institutions in Brno:

Institute of Scientific Instruments of AV ČR Archaeological Institute of AV ČR Institute of Biophysics of AV ČR Institute of Analytical Chemistry of AV ČR Institute of Geonics of AV ČR **Institute of Physics of Materials Research Institute of Brewery and Malt Institute of Veterinary Medicine Research Institute of Children's Health Center of Transport Research** Faculty of Business Administration of Technical University in Brno **Philosophical Faculty of Masaryk University** Faculty of Law of Masaryk University **Faculty of Natural Sciences of Masaryk University** University of Veterinary and Pharmaceutical Sciences in Brno **Technical University** 

Altogether 151 respondents filled in and returned the questionnaire. Those from institutes of the Academy of Science (43) represented (28.5%), from universities (82) (54.3%), from state research institutes outside the Academy of Science (18) (11.9%), from non governmental research institutes (7) (4.6%) and from others (1) (0.7%). As for the scientific field, (75) (49.7%) respondents in Brno, based on their own

<sup>&</sup>lt;sup>23</sup> The figure had to be partly estimated, since in several cases, when one institute of the Academy "occupied" two cities, we had no information on such a proportion at our disposal. We assigned 50% of the whole staffs to both towns.

expressions, were active within the field of natural science (medicine and agriculture included), (49) (32.5%) in the engineering / technical field and (27) (17.9%) in the social sciences.

Regarding Brno, which may possibly contain about 18% of the total number of Czech scientific staff<sup>24</sup>, these 151 respondents represented about 2.4% of its scientific staff.

All in all, in spite of some shortcomings<sup>25</sup>, the results of the potential migration survey seem to be reasonable and rather fruitful.

As far as concerns the real migration surveys, out of those institutes which are mentioned above we contacted only 30 in Prague. 33% represented universities (faculties), 33% institutes of the Czech Academy of Science and 33% other institutes / firms / corporations outside of the Academy. These selected subjects were provided with both the questionnaire for directors / deans / managers and that for personnel departments. 22 (73%) directors / deans / managers responded to the questionnaire and their answers can be included in the analysis:

A. Five universities (faculties)

Faculty of Natural Sciences of Charles University Faculty of Law of UK ČVUT, Faculty of Architecture ČVUT, Faculty of Electrotechnical Engineering ČVUT, Faculty of Civil Engineering

B. Ten institutes of the Czech Academy of Science

Institute of Philosophy Institute of Physics Geophysical Institute Institute of Microbiology Economics Institute Nuclear Physics Institute Institute of Rock Structure and Mechanics Institute of Electrical Engineering Institute of Physiology Institute of Computer Science

C. Seven institutes, firms, corporations outside the Academy of Science (both state-run and private)

Czech Institute of Geology Czech Hydrometeorological Institute Water Research Institute Research and Experimental Institute of Aviation Institute of Research and Use of Fuels Research Institute for Geodesy, Topography and Cartography Institute of Nuclear Research (additionally included)

As for the questionnaire for personnel departments, we received questionnaires informing us about 359 persons from the following 10 subjects (33%):

<sup>&</sup>lt;sup>24</sup> Besides the above "sketched" estimates, which are described in the table notes, we had to overcome the limitations of the statistics and to assign weight to the city of Brno given the fact that we knew the figures for those working outside the Academy and universities only in the South Moravia region (which includes Brno). We assigned 75% for the city of Brno.

<sup>&</sup>lt;sup>25</sup> For example, the survey had to be realized at a rather inconvenient time (the exam period at universities, the beginning of the holidays, intensive work on projects which had to be finished by the first half of the year). Secondly, not all the important aspects of the issue in question were covered, e.g. not mentioning the possibility of leaving to go abroad for a period longer than 6 months and at the same time shorter than 1 year. Third, some questions were ambiguous, e.g. those dealing with terms like a "modern way of life" and a "social ladder" and hence, difficult to interpret.

#### A. 1 university (faculty)

**ČVUT, Faculty of Nuclear Physics and Faculty of Engineering** 

B. Five institutes of the Czech Academy of Science

Institute of Philosophy Institute of Sociology Nuclear Physics Institute Institute of Rock Structure and Mechanics Institute of Physiology

C. Institutes / firms / corporations outside the Academy of Science (both state-run and private)

Czech Institute of Geology Czech Hydrometeorological Institute Institute of Education Research and Experimental Institute of Aviation

The real migration surveys are far from being "representative"<sup>26</sup> and the results can in no way be generalized. There are several reasons for this fact (see also Introduction): First, both the questionnaires seemed to be rather demanding and time-consuming. The personnel departments were not able to fulfill the tasks being in general very busy with other commitments (albeit money was offered to cover their work). Yet, these persons were often participated in filling in the questionnaire which was directed to their directors / deans / managers. Secondly, some of the data which we were searching for was too detailed and, in fact, no-one could officially monitor such information in the Czech Republic. Thirdly, the data bases of many institutions have been changing since the beginning of the 1990s, mainly since 1992 or 1993. Thus, it is very difficult to get compatible data over a period of time – methods and "items" (and the data to be obtained) of collecting have changed and some of the files have been inaccesible. Fourthly, some of the respondents were not willing to give personal data, referring us to the Law enjoining the use of "individual" (personal) data.

All in all, the results of the real migration surveys outlined a scenario which may help to clarify some aspects of the migration process. However, one cannot use these results for generalizing either at the level of the Czech Republic or within any breakdown by specific characteristics.

In order to at least partly overcome the shortcomings of the real migration surveys, questions indicating some aspects of the real migration situation in the past, from potential migration survey, can be used.

As far as statistical methods are concerned, as has already been mentioned, due mainly to rather a complicated "mixture" of various types of data and because of their "soft" character, not too sophisticated mathematical-statistical methods were applied. Differences among variables were measured by the Chi-Square (Pearson) test, not forgetting the Gamma coefficient.

## 6. RESULTS ON POTENTIAL MIGRATION / MOBILITY

### 6.1. Who Took Part in the Survey, What Is the Situation Like?

After specifying the selection of respondents (quota sampling – see above), we will concentrate in this chapter upon describing who, in fact, entered the survey in terms of three sets of characteristics: social-demographic characteristics, living standards and financial situation. In addition, the political preferences of the respondents will be outlined. Such pieces of information are very important and to some extent predetermine the "model of the respondent's behavior". To be "precise", we should compare, where suitable and possible, the characteristics of the sample with that of the general population of the Republic. This would be possible through data taken from the 1991 Census. Such information, however, is out of date and because of the current, very dynamic era, such a comparison would be in many respects misleading. Therefore, to see whether the characteristics of our sample differ from those of general population, we will mention the results of several contemporary representative opinion polls.

<sup>&</sup>lt;sup>26</sup> In fact, we can speak about them being truly representative only if a random sampling method is used.

The base is made up of 935 respondents. Figures are given in percentages and also include "missing cases", provided they did not exceed the share of 2% of the whole sample. If they did exceed this threshold, the percentages are re-counted and the reader informed of the "new base".

## 6.1.1. Social-Demographic Characteristics

Males clearly dominated over females (71.6% versus 27.9%). The average age of the respondent was 44.6 (mode 42.0 and median 45.0). 72.9% were married and 19.9% were single. 73.8% of the respondents had at least 1 child. 19.6% of the respondents had 1 child and another 17.6% 2 children under 18. In turn, 34.0% already have adult children (older than 18). As far as nationality is concerened, the vast majority were Czechs – 95.3%.

## 6.1.2. Personal Characteristics of Professional Career

Most of the respondents, one half of the total sample, were researchers active in the field of natural science (medicine and agriculture included). Almost coincidental shares, 26% and 24%, were represented by respondents of technical and social disciplines.

As far as the place of work was concerned, respondents from universities markedly predominated (46%). The second most numerous group was formed by scientists employed in an institute belonging to the Academy of Science (32%). Some 12% were employees of state research institutes outside the Academy of Science and only 5% were researchers and developers of non-governmental research institutes.

The proportion of those who had obtained an academic degree was realtively high. Nearly half (47%) of the total sample were people with a Ph.D. On the other hand Masters of science (or graduates) represented 40%.

Following from the age structure, characterised by the prepoderance of scientists older than 40 years, more than half of all persons involved (54%) had work experience in the field of science of longer than 15 years. By contrast, the lowest percentage, a mere 4%, were persons active in the field of science for less than one year.

Among all of the respondents, persons without any position in academic (university) hierarchy were predominant (45%). Heads of departments and heads of sectors represented the same percentage of 16% each. The smallest category, with only 4%, was formed by directors (deans) of institutes (universities).

### 6.1.3. Professional Activities and Working Conditions

A majority of respondents had published at least one article (70%) or paper from an international conference (72%) abroad (i.e. during the whole period of their professional career).

In the period between 1990–1995, more than a half of all respondents (57%) had participated in conferences, seminars or workshops abroad, while 54% of these scientists (N=536) had not attend any more than three times.

The second, most frequently mentioned reason of visit to a foreign country was short-term training or a fellowship up to 3 months. This reason was mentioned by 42% of the total sample of inquired persons. Most of the respondents (40% of those who answered positively - N=393) have been abroad for the above purpose once or twice.

The other reason for a visit to a foreign country, mentioned by a quarter (26%) of respondents, was work on a joint-research project. Approximately half (46%) of the respondents (N=245) who went abroad for this reason, had been there only once.

On the other hand the sporadically stated reasons for foreign business trip there were; a post graduate study, study connected with obtaining of Ph.D., or a permanent part-time job (the portions of respondents stateing one of these alternatives varied between 1% - 5%).

Regarding the length of stay, the longest period spent abroad was mentioned by respondents who passed a study connected with obtaining a Ph.D. The average length of stay in this case reached up to 29 months.

The average length of stay abroad for the purpose of short-term training or a fellowship was 2,5 months. The average length of stay in the case of work on a joint-research project was 6 months. For reasons of postgraduate study or a permanent part-time job, respondents spent on average 11, or 14 months abroad, respectively.

The most frequently visited country mentioned by respondents in all cases (with the exception of post graduate study and study connected with obtaining a Ph.D.) was Germany.

At the time of inquiry, a total of 402 scientists (43%) were working on a joint-research project with colleagues from another country. In the most of stated cases German partners participated in these projects (17%), followed by colleagues from Great Britain (11%) and France (11%). As for partners from an Eastern European country, collaborations with scientists from Poland, Hungary, Slovakia, Slovenia and Russia were mentioned most often.

A majority of the projects had been paid for by national research funds (26%) or European Union programmes (17%). On the other hand, only 2% had been sponsored by domestic business corporations.

When asking the respondents "What are your impressions from joint research work with the foreign partners (scientist)?" the most frequent answers were:

- good,
- very good,
- mixed,
- excellent collaboration and good partner relationships,
- professional quality, demands for professional work,
- there are no substantial differences between our own projects and joint-research projects with foreign partners,
- there are substantial differences as to the professional level of foreign partners, they quite often do not have sufficient skill,
- bad (redundant bureaucracy, bad human relationships).

When evaluating their working conditions most of the respondents (57%) have had an opportunity (always or often) to participate in the selection of team members. On the other hand, almost two thirds (64%) have had to deal with tasks which could have been carried out by less qualified colleagues, either always or often. In their everyday work, 57% (always and often) feel an interest in the problems they are working on. Many more respondents, 80%, think that they are sufficiently informed in their field. As far as the technical facilities needed for their work are concerned, more than half of the sample (62%) believe that their situation is convenient in this respect.

#### Knowledge of Foreign Languages

Among the respondents those speaking Russian (96%) and English (95%) languages predominated. Another frequently mentioned foreign language was German (74%), followed by French (31%) and Spanish (10%).

#### 6.1.4. Living Standards (Including Financial Situation)

Living standards are measured by the facilities and amenities of a flat. Thus, for example, 57.0% of the respondents had their own flat or house, 68.9% their own car, 46.8% their own personal computer and 40.0% a foreign currency bank account. On average, a respondent – as a member of a household – had about 23 square meters of living floor space within a flat at his / her disposal.

Nearly half of the respondents (47%) stated that they have managed to survive (but at the same time, they have no savings)<sup>27</sup>. While about 7.3% of the respondents were in a rather precarious situation (a lot of debts or living on their own savings), about 42% could save some money from their income. Only about 3% were able to save a substantial amount of their income.

<sup>&</sup>lt;sup>27</sup> For example, albeit slightly differently formulated, this exactly corresponds to the results of opinion polls in July 1994 and 1995 (Občané, 1994, Jak, 1995). These involved a particularly large sample of the whole population (more than 1,000 respondents).

About 46% of the respondents informed us that their earnings from their scientific work (without additional income) represented more than 50% of the entire family's income (About 10% of the families are totally dependent upon the respondent's earnings).

As far as other possibilities are concerned of how to increase one's income, those from "publications" (41.9% yes versus 58.1% no) and from "incidental contractual scientific services – consultancy, advice etc." (37.8% yes versus 52.2% no) were particularly favoured. Excluding "other possibilities", activities in the non-scientific field contributed on average 11.6% (for yes versus 88.4% no) to the entire additional income.

If the dimension of time is taken into account, the past (the period since 1989 up to today) was perceived more positively than the future (the next 2 years). About 26% stated that their past personal (including a household) financial situation has not changed, about 41% said that it had improved (either significantly or slightly) and about 30% stated that it had deteriorated (either significantly or slightly). Regarding future prospects, about 39% believed that the situation would not change. The corresponding figures for an "improving and deteriorating" situation were 25% and 30%, respectively.

All in all, when evaluating the financial situation of scientists, the state is far from being satisfactory. Reasonableness, calmness and modesty are the factors which hamper a radicalization of this social group. Nevertheless, the respondents stated that adequate gross (basic) earnings per month for their work – when also taking into account earnings of other employers and employees within other sectors of the economy – should be about 18,000 crowns. Their contemporary earnings per month represent about 47% of this sum (see part 4.5.).

The majority placed themselves in the middle of the scale which measures the position on the social ladder within the society -68.2%. If practically ignoring the two extremes, nearly 19% put themselves close to the bottom and, by contrast, about 12% close to the top.

Regarding political preferences of the respondents, one can mention a right-wing orientation. While about 31% sympathized with the centre, 38% rather inclined to the right. Yet, about 13% seemed to be real "right-wingers"<sup>28</sup>.

### 6.1.5. Hiearchy of Values

Among the values (factors) considered by most of the respondents to be important "professional fulfilment", "independence in work", "availability of key publications" as well as "up-to-date scientific information" predominated. On the other hand, i.e. mostly unimportant, were "career development" and "modern way of life".

When evaluating under which conditions the respondents could most probably achieve these values in the next five years, the following aspects were stressed. As for values put in the top places from the point of view of their importance, i.e. "professional fulfilment" and "independence in work", most of the respondents believe that they are achievable when continuing in scientific work at home. According to the opinion of many respondents other important values ("up-to-date scientific information", availability of "key publications"), are possible to achieve in the case of continuing in scientific work either at home or aborad (the portions of respondents endorsing either the alternative "at home" or "abroad" were approximately the same, i.e. cca 40%).

By contrast, achievement of values like "financial prosperity" or a "modern way of life" was seen, by most of repondents, as possible on the assumption they left the scientific field.

<sup>&</sup>lt;sup>28</sup> As compared to the sample representing the Czech population as a whole (Zařazení, 1996), while there are not so many of those who hesitate to declare their preferences among scientists as it is within the country sample, scientists seem to be rather inclined to right-wing orientation (51% versus 40%).

## 6.1.6. Professional Mobility – External Long-Term Migration (General Assessment of the Process)

When asking scientists in the Czech Republic: "What would you do if, in the course of the next few months, you receive an offer to go abroad", a fellowship for more than 1 year would be prefered by 64.2% (N=904) and research work for more than 1 year by similar share -65.0%. However, only 10.7% and 10.8% respectively would accept it without any hesitations. Non-research work for more than 1 year was acceptable for about 35% of respondents.

In absolute terms, only 40 respondents (4.4%, N=915) intended to leave for a foreign country for more than 1 year and are arranging their departure. 86 more (9.4%) would like to do the same but at the moment have not undertaken specific steps. Anther 167 (18.2%) would like to leave but not now. The rest prefered to stay in the Republic.

Among those who intended to leave, unambiguously, the most important step (also in the international context) which has been undertaken in connection with intention to leave the country was "looking for assistance from colleagues abroad" – it concerned 46.2% (yes versus 53.8% no, N=301). On the other hand, "looking for an intermediary employment agency abroad" (6.0% yes versus 94.0% no) and "addressing domestic institutions distributing fellowships" (17.3% yes versus 82.7% no) were not too significant both at the country's and international levels. Also, "reading advertisements" (27.6% yes versus 72.4% no) as an means of installing contacts abroad does not seem to be so popular with respondents in the Czech Republic.

As far as the length of the intended stay is concerned, the vast majority, 90.6% (N=297), were going to stay in a foreign country for the shortest available time – between 1 and 3 years. An intention to stay there "for ever" was expressed by only 2.3% of the respondents. West European countries (55.4%, N=289) followed by the USA (27.0%), Canada (9,3%) and Japan (2.4%) were the most attractive destinations as a place to go and work. No single Eastern European country was mentioned in this context.

When selecting the above countries, two sets of reasons particularly came into the play: "better conditions for my scientific work", "I know(speak) the language" (both about 78% yes versus 22% no, N=294) and "I have already been there and I am familiar with the conditions", "high living standards and high earning potential" (57.5% yes versus 42.5 yes and 54.8% yes and 45.2 no, respectively).

The following premises belonged to the most important "general" factors which a respondent takes into account when deciding to leave the country for more than 1 year. They only confirm what has been proved with the example of individual countries – "perfect working conditions and fair rewards for work" and as much information as possible about the potential destination. They are as follows: "Better conditions for my scientific work" (N=298, for 86.9% very or rather important), "a signed contract of employment or training through an official state institution" (85.1%) and "accurate and detailed information about the country I wish to leave for" (75.9%).

Concerning the sponsoring / financing of the given stay abroad, the recipient institution played, as in other countries, by far the most important role. 86.1% (yes versus 13.9% no, N=288) of respondents state that just such an institution should cover the costs of the stay. The intention of relying on one's own personal or domestic "administrative" sources was quite minimal response.

When specifying the type of working activity abroad, three particular activities (also regarding other countries) were convincingly prefered than others: "work at a research organization (university) with a formal contract of employment" (35.9%, N=284), "receiving professional training" (23.6%) and "work on a joint research project" (19.7%). Perhaps only about 10% of respondents are to be involved in non-research activities abroad.

Without a doubt, the most important factor which could dissuade respondents from leaving the country for more than 1 year is "separation from the family" (83.5% – in a decisive way or to some extent, N=877). Two other important factors (in descending order) are closely linked with typical personal reasons ("homesickness" – 49.3% and "health problems" – 44.7%). By contrast, for example, possible hostility / xenophobia towards foreigners in the country of destination is not felt as being a problem at all (96.8% – no importance or to a limited extend).

# 6.1.7. Professional Mobility – External Short-Term Movements (General Assessment of the Process)

40% (N=911) of the respondents intend to go abroad for less than 6 months and are going to be real "brainexchangers". The two most frequently stated reasons byfar for such a stay in the "West" were a "short-term scholarship or fellowship – training and education" 57.4% yes and 42.6% no, N=366) and "joint-research project, research work" (54.1% yes and 45.9% no). Nonetheless, obtaining a Ph.D. and undertaking postgraduate studies in the "West" do not seem to be too attractive. Again, in this context the "East" is not popular at all (see also part 6.1.6.) with the respondents in the Czech Republic.

As far as financing is concerned, reliance upon a recepient institution, as in the case of a long-term stay, is obvious. While only 25.1% (yes versus 74.9% no, N=358) of respondents rely on their present institution in this matter, 70.1% (yes versus 29.9% no) of respondents mention that their short-term stay abroad is to be funded by the recepient institution.

## 6.1.8. Experience with Travelling Abroad

About 70% of respondents have already had some experience in arranging a trip abroad. The greatest difficulties which respondents have faced when arranging their trips were connected with financing the trip and accommodation (52.2% yes versus 47.8% no, N=645). Albeit, having relatively low shares of "possible difficulties", "administrative problems in my scientific organization" were considered to be the second most weighty problem (16.9% yes versus 83.1% no). It is not a problem to get a visa in the Republic.

17.9% (N=907) of respondents were not often able to undertake the trip despite the fact that they were invited and approved as participants in a conference or workshop. It has happened rarely to 41.3%; 15.5% have never been invited.

## 6.1.9. Consequences Following a Long-Term Stay Abroad

The answers to the open-ended question: "How would you define the consequences for the country reulting from the emigration of our scientists?", were summarized and are given below. Though not all of the respondents responded to the question, those who did quite often defined opinions in accordance with the formulations which are pin-pointed below. "Negative points overshadowed positive points", though the latter aspects were also mentioned.

The main consequences as mentioned by respondents may be sketched in the following manner:

- Stagnation of the economy and development as a whole (technology, know-how and the like), a deepening of economic and political dependence upon developed western societies.
- Deterioration of the intelectual and cultural potential of the country.
- Stagnation of scientific disciplines, deterioration of the level of teaching / lessons at universities.
- Loss of the continuity in research.
- Shortage of top specialists, danger of some scientific disciplines becoming "extinct".
- Increase of the average age of employees in research institutions and at universities, the shortage of members of the "young generation" in the sphere of science.
- Increasing self-reliance of the nation (realizing that "we are not worse than others").
- Growth of mutual exchange, which is beneficial for both sides, the establishment of new contacts.
- Gaining of new professional and language skills.

Similarly, respondents also characterized the consequences of the emigration of scientists for their institute (university). Though some of the respondents did not give an answer, and though some mentioned that "it is irrelevant to their institutes", the opinions of the others may be summarized in the following way:

- Shortage of top specialists, shortage of qualified university teachers.
- Decrease in the prestige of the institute, deterioration of the level of teaching / lessons at universities.
- Interruption in continuity of research; concentration upon less important activities / research fields.
- Worsening of the quality of team work, leading in some places to the breakdown of team as such.

- Increase in the average age of employees; mostly only persons near to / in post-productive age, further, those incapable of doing demanding and creative research work and enthusiasts remain. Growing overburden of those capable who remain.
- New opportunities for the younger generation to gain experience and knowledge.
- The "brain drain" to the private sector within the country is more important.

#### 6.1.10. The Role of the "Administration"

The attitude of the institute / university administration (management) "towards those colleagues who have undertaken steps to continue their scientific work abroad" is rather favourable. 41.7% (N=918) of respondents proclaimed that there is a supportive "policy". By contrast, only 2.3% of institutions created, in the respondent's eyes, obstacles; 28.9% seem to be indifferent. 27.1% of respondents did not know or they did not express an opinion.

#### 6.1.11. Professional Mobility – Internal "Brain-Drain" (General Assessment of the Process)

When asking respondents "Do you intend to change your present employer (institution) this year (1995) if you stay in the Czech Republic" only 1% answered "definitely yes" and 8% probably yes. 39% respondents stated the answer "probably no" and almost a half of the sample, 49%, answered "definitely not".

The above frequency distribution indicates that at present the propensity to internal mobility among Czech scientists is not so high as has been generally expected. Nearly 90% of all questioned scientists would probably, or definitely not change their present employer within the Czech Republic. However, it is necessary to take into acount the time limit stated in the question (this year). Presumably with a more indefinitely stated question (e.g. "Do you intend to change your present employer?") the percentage of those intending to change the employer could be higher.

This hypothesis was to a certain extent confirmed by the answers of the next question (B 69) concerning the intention to change employers in a longer-term prospect and possible alternatives of further activities of respondents.

Approximately one quarter of answers (25%) indicated a change of the hitherto employer in the future, while the most frequently mentioned alternatives were private business research units (consultancy companies,...), another state research institution and public administration.

Assessing the possibility of their return to science after a certain period, the same portions of respondents have endorsed two different opinions. One third of those who intend to leave the scientific sector ("brain loss", N=370) believe that they would come back after some time. On the other hand, the same percentage see their return as impossible.

A majority of respondents intending to leave do not have any concrete alternatives and up till now have not undertaken any steps to change the present job. Nevertheless, more than half of them believe that their current employer would display an indifferent attitude to their decision to leave the institution.

The demand for scientific outputs is, according to most of the respondents, bigger on the part of foreign commissioning institutions (44% positive answers, N=906), than on the part of state organizations (41% positive answers) and private institutions (40% positive answers).

Excluding the reason of a dismissal, most respondents would give up the academic career if they could find a better paid job in the Czech Republic. On the other hand, only a quarter of respondents intend to always work, under any conditions, in the field of science.

### 6.2. External Long-Term Migration / Mobility

## 6.2.1. "Profiles" of "Firm" Migrants, "Firm" Non-Migrants and Those Who Are Hesitating about whether to Migrate

The entire sample of 935 respondents was divided into three groups according to the declared intention to migrate abroad. The first group of "firm" migrants represents the 40 (N=915, 4.4%) respondents who answered question B5 (see Annex), "Do you intend to leave for a foreign country for more than 1 year"?, with "Yes, I am arranging my departure"<sup>29</sup>. The second group of "firm non-migrants" is composed of the 622 (68.0%) who answered negatively: "No, I do not intend to leave the country". The third, and last group are those who favoured migration but at the same time delivered some hesitation (253, 27.6%): "Yes, at the moment I intend to leave but I have not undertaken any specific steps" or "Yes, but not now"<sup>30</sup>.

Describing "profiles" of the respective groups helps us to elucidate what "parameters" are hidden behind their behavior.

## 6.2.1.1. Who Are "Firm" Migrants (N=40<sup>31</sup>)?

### Social-Demographic Characteristics

Males clearly predominated over females (85% versus 15%) – more than within the whole sample. The age structure, one of the key variables which, of course, conditions some other variables (for example, marital status, number of children, financial situation, position in academic hierarchy but in some way also traits, hierarchy of values etc.) tells us that "firm" migrants are a relatively young group. About one third of them were younger than 30 and the next 28% younger than 40. Only 8% were above 60. These portions differ very much from the whole sample where the respective figures were about 13%, 22% and 13%, respectively.

Accordingly, the portions of single persons were high -43%, while shares of divorced and widowed were low -5%. Married respondents represent 53%.

45% of the respondents had a child, hence the significantly smaller share than in the case of the whole sample which was 74% (about 13% have 1 child, 23% 2 children and 10% 3 or more children). About two thirds of the children were under 18.

### Professional characteristics and working conditions

About 63% of the respondents were active in the field of natural science, 23% in social sciences and 15% in the engineering / technical sphere. Compared with the structure of the whole sample, natural science was more important and, in turn, the engineering / technical sphere not so relevant when characterizing "firm migrants".

Institutes of the Academy of Science of the Czech Republic represented 40% (more than the "average" which is 32%), universities 47.5%, state research institutes outside the Academy 10% and the rest (non governmental research institutes and others) by about 3%, which was also different in comparison to the whole sample (about 10%).

The academic level (educational), amount of work experience and position in the administration were relatively "lower" (in comparison with the "average"), thereby logically corresponding to the younger age of this group of respondents. 45% were masters of science (or had "only" graduated from university).

<sup>&</sup>lt;sup>29</sup> Based on questions B1–B4, if in the course of the next few months, they would receive an offer for going abroad, "firm" migrants would prefer a "fellowship for more than 1 year" or "research work for more than one year" to "non-research work" and "other" activities. The former options would be accepted without any hesitation by 49% and under certain circumstances by another 43%. The respective shares for the latter options 51% and 36%, respectively.

 $<sup>^{30}</sup>$  The recommendations of the Bulgarian coordinator could not be strictly observed. If the following answers were added (regarding "firm" migrants (1 within B1–B4 and 5 from B12), regarding "firm" non-migrants (4 within B1–B4) and those who "hesitate" (2, 3 within B1–B4 – see Annex)), then only, respectively, 3, 110 and 39 respondents – altogether 16% of the whole sample – would come into the play. Therefore, the groups were formed only according to the answers to the question B5.

<sup>&</sup>lt;sup>31</sup> This relatively low absolute figure must be kept in mind when using and commenting om percentages.

However, the share of those with a scientific degree higher than a Ph.D. was about 18%, hence higher than the average (12%). As for work experience, 40% have had experience in the field of science for 0-5 years. Regarding position in the administration, 50% had no position. Only 5 (13%) respondents of this group were either directors or deputy directors, deans or vice deans or heads of departments.

About 83% have published at least one of their articles, books, or chapters in a book abroad or had personally presented their paper at an international conference. Furthermore, about 78% have been abroad at least once since 1989 because of one or more activities connected with a fellowship (50%), postgraduate study (15%), Ph.D (3%), work on a project (48%), permanent part-time job (10%) or participation in a conference (58%). The share characterizing work on a project was significantly higher than the "average" (28%)

Concerning the countries with which the respondents have had some working experience, ie, which they have visited in connection with their jobs, Germany clearly dominated over other countries (about 27% of all the "movements" of various kinds). France was second with about 14%. Other countries did not exceed the threshold of 10%.

60% of "firm" migrants are currently working on a joint project with colleagues from another countries.

About 56% of the respondents had had (always – A often – O) the opportunity to participate personally in the selection of team members which they were to work with on a given task. About 67% (A+O) had had to deal with tasks which could be carried out by less qualified colleagues. In their everyday work, 64% (A+O) had felt that their superiors were interested in the problems they were working on. 87% (A+O) stated that they had the possibility to possess enough and up-to-date professional information.

About 63% (A+O) informed us that they had technical facilities which helped them to do their work successfully.

#### Living Standards (including Financial Situation)

For example, about 50% of respondents owned a flat or house, 60.0% a car, 40% a personal computer and 63% a foreign currency bank account. Apart from telephones, but mainly foreign currency accounts, the shares "lag behind" the "average".

As far as housing is concerned, one third of the respondent's households had under 15 square metres of living floor per member at their disposal. The respective share concerning 31 square meters and more was 23%.

Nearly half of the respondents (48%) are managing to survive (without no savings). 15% had a lot of debts or living on their own savings. This is two times the average. On the other hand, the share of those who save a lot of their income – about 5%, more, albeit raher minimal, than the average (3%). In addition, one fifth of the responent's households were totally dependent upon the scientist's earnings. Altogether, about 58% said that their earnings for their scientific / pedagogical work (without additional income) represented more than 50% of the whole family's income.

Income was most frequently increased through "publications" (45% answered "yes") and "incidential contractual scientific services – consultancy, advises" etc. (33%). In comparison with the "average" (7%), the importance of "ownership (shared ownership) of a business in scientific field" (18%) seemed to be significant as well.

It is not surprising that 43% stated that they had additional income from "interests and dividends", since the country has undergone a large privatization process and many people have shares of various privatized enterprises.

When evaluating the personal financial situation since 1989, the respondents have considered past development as more positive than negative. However, the difference is not too big -43% (improved significantly – IS or slightly – ISL) versus 35% (deteriorated significantly – DS or slightly – DSL). As for future development, the picture was more optimistic. 40% believed the situation would improve (IS+ISL), whilst 18% believed it would deteriorate (DS+DSL). 35% thought that nothing would change. Such optimism does not confrom to the rather pessimistic view of reality expressed by the whole sample (25% it will improve – IS+ISL versus 30% it will deteriorate – DS+DSL).

Slightly more than one third of the respondents would like to have a gross (basic) salary for their work of less than 14 thousand crowns. By contrast, nearly 30% would consider more than 25 thousand to be an adequate reward. The rest would prefer something in between 15–24 thousand.

One quarter of the respondents placed themselves "to the left" of the middle of the scale (towards the bottom) which measures the position on the "ladder" within society. The middle itself is represented by 63% of the respondents. Compared with the "average", this group evaluated its prestige in society lower. As for political orientation, those with a right-wing orientation significantly prevailed within the group. 70% sympathized either "slightly" or quite clearly with the right. It is much more in comparison to the whole sample.

#### Hierarchy of Values

At a general level, out of the offered factors (values – see Annex) respondents intensively stuck to the following principles: "Independence at work" (it is very important – VI or rather important – RI for 100%) was the most important factor; the other values in descending order are: "good research infrastructure", "up-to-date scientific information", "professional fulfilment" and "availability of key publications". Their respective shares (VI+RI) were around 90%. On the other hand, what did not seem important was "status in an organization" (it is not important at all – NI or rather unimportant – RU for 40%). Opinions about other values like "modern way of life", "career development", "job security" and "prestige in the society" were clearly not so important (figures for NI+RU vary from between 25% to 18%). Just in these four cases, the group was different from the "average". Excluding "job security", which is in comparison "underestimated", the other values were seen by the group as being more important than by the whole sample.

When evaluating under which of the following conditions -1) continuation in scientific work in their country, 2) moving to another field of activity in their country and 3) continuation of scientific work abroad - they could most probably attain these values in the next five years, the following aspects are worth stressing. Out of those values which were seen to be the most important (see above) only "independent work" was believed by most of the respondents (63%) to be achievable if continuing scientific work "at home". According to the majority of the "firm" migrants, another four important values (see above) are possible to achieve only abroad (the respective shares vary from between 63% to 80%). Regarding "financial prosperity", "prestige in society" and "career development" in between one third and one quarter of the respondents are convinced that these values may be achieved by moving to another field of activity in the Czech Republic.

In comparison with the whole sample, "abroad" was unambiguously preferred to the Czech Republic as to how to achieve all the values. One can find the greatest differences in favour of abroad in the case of "professional fulfillment", "status in organization" and "up-to-date scientific information".

### 6.2.1.2. Who Are "Firm" Non-Migrants (N=622)?

#### Social-Demographic Characteristics

This group is the largest one, and because of its "weight" also to large extent influences the parameters (structure of frequencies) of "the average". Thus, this sub-chapter might in some way and to some extent be a supplement to the overview on the characteristic features of the whole sample.

Males predominated over females (68% versus 32%). The age structure was, in comparison to "firm" migrants, clearly shifted towards the older categories. Out of this group about 44% were older than 50, whilst those above 60 represented nearly 17%. Only 28% were younger than 30.

It seems that other variables were tied to the age structure. There were 78% of married, 16% single and 7% of divorced and widowed persons within the group.

71% of the respondents had at least one child (about 23% had 1 child, 46% 2 children and 8% 3 and more children). Out of these (children) 52% were adults, above 18 years of age.

#### Professional Characteristics and Working Conditions

About 48% of the respondents worked in the field of natural science, 28 in the engineering / technical sphere and 25% in the field of social sciences.

49% of "firm" non-migrants worked for universities, 28% for institutes of the Academy of Science of the Czech Republic and about 11% and 12% respectively for state research institutes outside the Academy and others (non governmental research institutes and others).

As far as academic degrees are concerned, 41% of the group were masters of science (or had "only" graduated from university), 46% had a Ph.D. and 14% a scientific degree higher than a Ph.D. As for work experience, in correspondance with the older age structure nearly 62% have had experience in the field of science for more than 15 years. Regarding position in the administration, while "firm" non-migrants were mostly composed of those with no position (some 40%), directors, deans (or their deputies) and heads of departments represented a quite significant share of about 23%.

About 79% have published at least one article, book, or chapter in a book abroad or have presonally presented a paper at an international conference. Since the revolution, about 69% have been abroad at least once to in connection with a fellowship (46%), postgraduate study (6%), Ph.D. (0.3%), work on a project (23%), permanent part-time job (5%) or for participation in conference, workshop etc, (56%).

About 38% of the "firm" non-migrants are currently working on a joint project with colleagues from another country.

About 62% of the respondents had (A+O) the opportunity to participate personally in the selection of team members they were to work with on a given task. About 63% (A+O) had to deal with tasks which could be carried out by less qualified colleagues. In their everyday work, 61% (A+O) felt that their superiors were interested in the problems they are working on. 80% (A+O) stated that they had the possibility to possess enough and up-to-date professional information.

About 60% (A+O) mentioned that they had technical facilities which helped them to do their work successfully.

#### Living standards (including financial situation)

About 60% of the respondents owned a flat or house, 47% a country house, 70% a car, 47% a personal computer and 38% had foreign currency bank account.

As far as housing is concerned about 30% of the group's households had under 15 square metres of living floor per member at their disposal. The respective share concerning 31 square meters and more was 14%.

As far as concerns the current financial situation of the family, about 42% "firm" non-migrants mentioned that they were able to survive (however, not saving any money) and 48% could save some money from their income. 6% had to face a lot of debts or had to live on their own savings. By contrast, 3% proclaimed that they saved a lot of their income. When measuring the importance of a scientist's earnings vis-a-vis the whole family, 44% said their earnings for their scientific / pedagogical work (without additional income) represented more than 50% of the whole family's income. For 8% of families it was the only "regular" (not including additional) income which the family had.

Income was most frequently increased via "publications" (44% "yes") and "incidental contractual scientific services – consultancy, advice" etc. (37%). Activities outside the scientific area like a "permanent part-time job under a contract in a non-scientific sphere" and "ownership of (shared) business in non-scientific field" were not so typical in the group. 7% and 17%, respectively, answered "yes" to the above activities.

Again, as in the case of "firm" migrants, interest and dividends served as an additional form of income for a rather significant part of "firm" non-migrants (41%). It may be presumed, however, that this form of income might not be of great importance in general.

When evaluating the personal financial situation (for the respondent and their households) since 1989, more "firm" non-migrants mentioned that it had rather improved than deteriorated. The difference was 43% (IS+ISL) versus 29% (DS+DSL). However, as for financial prospects in the future, the picture does not seem to be too optimistic. Thus, while about 22% believed the situation would improve (IS+ISL), 30% believed it would deteriorate (DS+DSL). 42% were convinced that nothing will change.

As regards the financial reward for scientific work, one fifth would judge as adequate gross (basic) earnings below 14 thousand, while 19% above 25 thousand. The rest declared for earnings in between these two poles.

71% of "firm" non-migrants considered themselves to be in the middle on the ladder which measures social status within society. A slightly "downward" trend prevailed, since 16% placed themselves "to the left" of the middle of the scale (towards the bottom) as compared to the 13% who tended to see themselves as nearer the top.

Regarding political orientation, those who prefered the right ("unambiguous or rather sympathising with the right") dominated (48%) over those who prefered the left (13%). The centre was represented by about 33% of the respondents.

## Hierarchy of values

At a general level, out of the offered factors / values (for more see Annex) the following belonged to the most preferred among respondents in the group: "professional fulfilment", "up-to-date scientific information", "independence in work", "availability of key publications" and "good research infrastructure" (the shares of VI+RI vary from 93% to 85%). By contrast, "career development" (VI+RI is 16%), "modern way of life" (22%), but to lesser extent also "status in the organization" (32%) and "prestige in society" (37%) did not seem to be too important.

When considering the conditions under which "firm" non-migrants could most probably achieve the above values in the next five years, the most "attractive" for the respondent's group seemed to be "continuation of scientific work in the Czech Republic". It was particularly true for the following values: "independence of work", "status in the organization", "job security", "recognition from colleagues" and "professional fulfillment" (in all the cases the share exceeds 70%). In turn, when speaking about "good research infrastructure", "availability of key publications" and "up-to-date scientific information", a relatively greater number of respondents (between 49% and 43%) were inclined to endorse the opinion that "continuation of one's work abroad" would be one of the best solutions in order to fulfill the scientific mission.

Regarding "financial prosperity", "prestige in society" and "career development" between one half and one third of the "firm" non-migrants were convinced that these values could be achieved by moving to another field of activity in the Czech Republic.

## 6.2.1.3. Who Are Those Who Are Hesitating about whether to Migrate (N=253)?

In many "parameters", this potential migratory group stands "somewhere in between" the two groups above – "firm" migrants and "firm" non-migrants. Therefore, we will pin-point only some selected aspects in this sub-chapter where those who agree upon migration abroad but at the same time have some hesitation to do so (an inactive approach or postpone migration) differ and leave the line "in the middle" (the significance of the difference is not statistically measured here, see part 6.2.1.5.).

## Social-Demographic

Age as a very important variable just stands "in the middle". Thus 34% of the respondents were between 30–39 and 26% between 40–49. This feature conditions many others.

Concerning the number of children, compared to other two groups this group was characterised by having the highest percentage of two and more children under 18 (40%).

This group also had, for example, in comparison with the other two, the highest portion of those who have worked in the field of science for between 1-5 and 6-10 years.

#### Professional Characteristics and Working Conditions

Some 55% of the respondents worked in the field of natural science, 23% in the engineering / technical sphere and 21% in the field of social sciences.

41% stated that they worked for universities, the same share for institutes of the Academy of Sciences of the Czech Republic and about 13% and 5% respectively for state research institutes outside the Academy and others (non governmental research institutes and others). Thus, the position of the Academy was slightly "overestimated" as compared with the "average".

Regarding academic degrees, those who had a Ph.D. represented the biggest group (also in terms of the other two groups) with 52%, followed by those with a master of science degree (or had graduated from university) with 40% and those with a scientifid degree higher than a Ph.D. (8%).

Directors, deans (or their deputies) and heads of departments represented about 14% of the group, while those with no administrative position about 53%.

As far as international contacts which are connected with a "scientific job" are concerned, it is worthwile to mention that while this group generally stood "in the middle", members of this "hesitatnt" group have been abroad more often than members of the other two groups (83%). This also concerned and may also be caused by the higher portion of respondents informing us of how many times they have participated in conferences, workshops etc (63%). As for "short-term training and fellowships", the relative intensity was as high as in the case of "firm" migrants.

53% of the respondents are currently working on a joint project with colleagues from another country.

71% (A+O) – the highest share out of all the groups – had to deal with tasks which could be carried out by less qualified colleagues. In their everyday work, 55% (A+O) – the lowest share out of the all groups – felt that their superiors were interested in the problems they are working on.

On the other hand, about 67% (A+O) – the highest figure compared with "firm" migrants and "firm" nonmigrants – declared they had technical facilities which helped them to do their work successfully.

#### Living Standards (including Financial Situation)

While generally respecting staying "in the middle", the respondents seemed to be vis-a-vis other two groups under-equipped in terms of country houses and telephones. In turn, they had more computers at their disposal than the others did (48%).

As far as the present financial situation of the family, about 59% – the highest share out of the groups in question – mentioned that they were able to survive (however, not saving any money). 2% (the lowest share) proclaimed that they saved a lot of their income.

The "logical succession" of the groups was further eroded when analyzing the types of additional work undertaken by the respondents. Hence, in the case of a "permanent part time job under a contract in another scientific organization", "lectures in another research institute", "incidential contractual scientific services (consultancy, advice, etc.)" and "other" activities the shares of the "hesitant" groups were the highest. By contrast, when speaking about "ownership (shared) of a business in the scientific field" and "publications" the shares were the lowest.

15% proclaimed that they were receiving benefits from the state.

As far as concerns financial prospecst for the future, the "hesitant" migrants voted more for an "unchanging situation" and also more for its deterioration than would correspond to its "middle position" (DS+DSL is 33%)

#### Hierarchy of Values

When analyzing values, both at the general level and when respondents were to indicate under which conditions the values could probably be attained, the "logical succession" was more or less fulfilled. In both cases 9 out of 12 proffered factors / values followed the "trend".

We only mention that in "hesitant" migrant's eyes "availability of key publications" and, a rather paradoxically (see above), "good research infrastructure" were seen as those factors which could be achieved "only" if one

continue his / her work abroad (68%, 74%, respectively). Such shares were the highest among the respective groups.

## 6.2.1.4. Summary of Results on Migrants "Profiles"

While simplifying the analysis and for the time being without taking into account the statistical significance which would more "precisely" measure a view of the reality (see below), we will briefly summarize what is typical of individual migratory groups.

To define the "average firm migrant", one should particularly point out the following features: He (mainly males come into the play) is relatively young, frequently unmarried (or not having been married), with rather a limited number of children, a master of science, and has been working for the Academy in the field of natural science for a relatively short period of time. Despite his lack of work experience his international contacts tied to his specialization have been widely developed. This particularly concerns co-operation on joint research projects. While the atmosphere (working conditions) within his institute and department seems to vary between being slightly positive and inconsistent (most of them have to deal with tasks which could be carried out by less qualified colleagues), the possibility of gaining enough and up-to-date professional information is pronounced and hence rather highgly appreciated. Though his financial situation is definately below the "average" (in comparison with the whole migratory sample), he has, perhaps because of his international experience, his own foreign currency bank account. The financial means of the whole household depend to a rather large extent upon earnings from his "normal" scientific / educational work. Despite being far from well-off at the moment his attitude towards the hitherto development of his (and his household's) financial situation since Revolution is slightly in favour of a positive view. He also regards the future as being optimistic. Such a positive view might spring from a somewhat promising chance to realize a long-term migration abroad (westward) - "he is arranging his departure" - which is usually accompanied by considerable improvement of the "Eastern" migrant's financial situation. He places himself lower on the social ladder, nearer to the bottom rather than to the top. Obviously, a right-wing mentality is one of his characteristics.

"Professional fulfillment" is on the top on the preference ladder. Thus, it is not surprising that "independence in work" and other factors / values necessary for good scientific / educational work (i.e. "actual scientific information", "availability of key publications", "a good research infrastructure" and to some extent "career development") are those which he acknowledges first of all. At the same time, apart from "independence in work" but including "financial prosperity", he is convinced that just these factors / values can only be successfully achieved abroad.

Unlike the young and rather active, adaptable, flexible and ambitious "firm" migrants, "firm" non-migrants, perhaps mainly because of their age (44% above 50) seem to be generally rather "conservative". They realise that overcoming the rather "unfavourable heritage of science" from the past regime is not so easy for them ("to step across their own shadows"), and give up, sometimes quite logically, aspirations for full appreciation a new "international scientific environment" and concentrate upon professional fulfillment "at home", in the Czech Republic. It is not so "demanding" and, moreover, for the time being it helps them to keep their existing posts.

Males again dominate over females within this group. As it has already been mentioned, the older age structure is typical and conditions other demographic, economic but also psychological characteristics. "Firm" non-migrants are more likely to be married, less likely to be single, and in general have more, and older children. The numbers and types of "academic degrees, the scientific field and type of institutions" are in accordance with the sample – due to relatively significant weight of this group they are not so far from the average values. Professional international contacts are not negligible at all, but definately not so intensive as in the case of their young, active colleagues. When evaluating working conditions, positive opinions slightly predominate above negative ones (the same as in the case of "firm" migrants). In terms of facilities and amenities of a flat / house or other which are at the household's disposal, the situation of "firm" non-migrants is relatively better (apart from the fact that they usually do not have a foreign currency bank). Yet, their financial situation is in their eyes relatively good, out of the respective migratory groups the best. According to their opinions, it has been improved since the Revolution. However, as for the prospects for the next two years, scepticism outweighs optimism (no large changes are expected to occur within their career, in contrast to the opinions of their younger colleagues). The majority place themselves

in the middle of the social ladder. If not, then, nearer to the bottom than the other way round. Right-wing opinions, albeit not so "radical" (see "firm" migrants), prevail within the group.

"Professional fulfillment" and other factors / values necessary for good scientific / educational work accompanied to some extent by "recognition from colleagues" and "job security" are again dominant and at a general level are acknowledged above all. What is important is that though some of the values are said to be successfully achievable abroad – the weight of these opinions, however, is not so high – many other factors / values, including "professional fulfilment", "recognition from colleagues" and "job security" are seen very prospectively when continuing scientific work only in the Republic.

It seems that those who declare an intention to migrate abroad, but at the same time have hesitate about whether to do this, are to a large extent influenced by their age and their family status and situation. Accordingly, their possible migration is hampered by a necessity to take care of their rather small children, who need the care and for whom, for the time being, the "domestic environment" seems to be the best one. On the other hand, they are quite familiar (in comparison with the other respective migratory groups) with the attractive conditions in the field of science which one can find in the developed western world (mainly via various intensive short-term contacts). In addition, their age is not so unfavourable and they are not too heavily burdened with the handicaps of the past (e.g. falling into discredit, poor knowledge of foreign languages, a too limited view of a discipline – lacking international context). Thus, this "hesitant" group, provided conditions for scientific work are not favourable, might in the next couple of years join those "firm" migrants who are now "arranging their departure" in spending a rather longer time abroad.

#### 6.2.1.5. Factors Conditioning Intentions to Migrate Abroad

To ascertain (in a more sophisticated way than in the previous chapter) whether or not the three migratory groups behave more or less in the same way vis-a-vis various social-demographic, economic, psychological and career development characteristics (i.e. how the different intentions to leave for a foreign country for more than 1 year are linked with given independent variables) we use a Chi-Square (Pearson) test. If the difference is significant (at least p < 0.05) we will also outline a "direction of the existing trend".

As far as social-demographic characteristics are concerned, fairly clear tendencies can be pointed out. First of all, the intention to migrate definately increases with decreasing age (p < 0.0001) – see below. This fact directly conditions other ties. Hence, the more single persons, the fewer children "per capita", the greater the probability of an intention to leave the country. Furthermore, one can also find a significant difference among the groups when speaking about children younger than 18. I particular, those who hesitate about whether to migrate have a significantly higher share of such children. Males tend to declare more significantly for a solution to leave the country than females do. The relationship of the intention to leave the country for more than 1 year to the above independent variables can be statistically specified in the following way:

"Age"	$\lambda^2$ (d.f.=8) = 67.8;	p< 0.001
"number of children"	$\lambda^2$ (d.f.=6) = 28.0;	p< 0.001
"number of children under 18"	$\lambda^2$ (d.f.=4) = 29.0;	p< 0.001
"marital status"	$\lambda^2$ (d.f.=4) = 26.9;	p< 0.001
"sex"	$\lambda^2$ (d.f.=2) = 14.3;	p< 0.001

As for the selected professional characteristics, namely a scientific field of work, the place of work and degrees (educational), only the variable of the "place of work" indicated that professionals at institutes of the Academy of Sciences of the Czech Republic are more prone to emigrate and think more of leaving the country than those from other types of institutes.

Furthermore, since work experience in the field of science is closely tied to age, it is not suprising that in this regard the difference among the groups was statistically confirmed as well. This means that those with work experience of between 0–5 years are more inclined to leave the country.

When international contacts are taken into account, publications, a permanent part-time job and previous participation in a conference for example, are not factors which separate the migratory groups from one another, while other factors have this "power": It is proved that with respect to abroad the more frequent the stay abroad (altogether all the types) for post graduate study, Ph.D. study and joint-research projects, the greater the probability to leave the country for rather a longer period.

Also, the respective groups differ when taking into account the fact of whether a scientist is currently working on a project with colleagues from another country. "Firm" and especially "hesitant" migrants stated more frequently that they are involved in such an activity – see below:

"Place of work"	$\lambda^2$ (d.f.=6) = 23.8;	p< 0.001
"work experience"	$\lambda^2$ (d.f.=6) = 46.4;	p< 0.001
"stay abroad (in general)"	$\lambda^{2}$ (d.f.=2) = 17.4;	p< 0.001
"post graduate study"	$\lambda^2$ (d.f.=2) = 10.1;	p< 0.01
"obtaining a Ph.D."	$\lambda^2$ (d.f.=2) = 7.0;	p< 0.05
"joint-research project" (the past)	$\lambda^2$ (d.f.=2) = 20.2;	p< 0.001
"joint project" (the current situation)	$\lambda^2$ (d.f.=2) = 20.2;	p< 0.001.

It is worth mentioning that the evaluation of working conditions (the opportunity to participate personally in the selection of team members, dealing with tasks which could be carried out by less qualified colleagues, feeling that one's superiors have an interest in the problems, the possibility to possess enough and up-to-date professional information and having the technical facilities which help to do work successfully) have no influence upon an intention to work abroad.

Statistically measured, out of the selected facilities and amenities tied to a household, a portion of those who own a country house, a video recorder and a foreign currency bank account is significantly different according to the individual migratory groups. The first two function as "stabilization factors". By contrast, the ownership of a foreign currency account increases the probability of leaving the country. There are no significant differences as to how large a respondent's flat is. However, the current financial situation as well as the position on the social ladder is evaluated differently by members of respective migratory groups. Simply described, the "poorer" the person / household (subjectively evaluated) the greater the probability of he / she leaving the country. Differences regarding the political orientation were found to be very near the limit of significance  $-\lambda^2$  (d.f.=6) =12.2; p=0.058. Nevertheless, the trend signalises an increasing probability of movement with a stronger right-wing orientation. Though the view of one's financial situation in the past does not vary among the groups, there are significant differences as to how the future situation (over the next 2 years) is seen and evaluated. The more "optimistic" the more proniunced the trend for going abroad.

As far as concerns the additional forms of working activity and additional forms of income, there are, with one exception, no marked discrepancies according to the given migratory groups. Only those who have to more frequently rely upon social benefits more often declare a migratory intention or migratory "ideas". Let us summarise this sub-section by "figure language":

"Flat / house"	$\lambda^2$ (d.f.=2) = 13.8;	p< 0.001
"video recorder"	$\lambda^2$ (d.f.=2) = 6.2;	p< 0.05
"foreign currency bank account"	$\lambda^2$ (d.f.=2) = 9.7;	p< 0.01
"current financial situation"	$\lambda^{2}$ (d.f.=4) = 37.0;	p< 0.001
"position on the social ladder"	$\lambda^2$ (d.f.=4) = 11.6;	p< 0.05
"future financial situation"	$\lambda^2$ (d.f.=4) = 17.0;	p< 0.01
"social benefits"	$\lambda^2$ (d.f.=2) = 21.5;	p< 0.001.

It can been proved that the importance of the following factors / values is distinctly perceived and their professing (at a general level) – to some extent, paradoxically, in contrast to real behavior (see above) – enhance the probability of going abroad – "career development", "independence of work", "up-to-date scientific information", "availability of key publications", "a good research infrastructure" and "modern way of life":

"Career development"	$\lambda^2$ (d.f.=4) = 28.5;	p< 0.001
"independence in work"	$\lambda^{2}$ (d.f.=4) = 17.2;	p< 0.01
"up-to-date scientific information"	$\lambda^{2}$ (d.f.=4) = 15.4;	p< 0.01
"availability of key publications"	$\lambda^{2}$ (d.f.=4) = 11.4;	p< 0.05
"good research infrastructure"	$\lambda^{2}$ (d.f.=4) = 15.4;	p< 0.01
"modern way of life"	$\lambda^2$ (d.f.=4) = 20.2;	p< 0.001

The marked differences appear when evaluating by which of the following conditions -1) continuation in scientific work in the country, 2) moving to another field of activity in the country and 3) continuation of scientific work abroad, one could most probably achieve the values in the next five years. Inter-group differences were significant (p varies from between 0.02 and 0.00000) in all (12) cases. Thus, on one hand there is a strong belief in only being able to meet one's wishes and "demands" abroad and on the other hand an opposite trend – a belief rather in "domestic conditions".

#### 6.2.2. Summary of Results

The "firm" migrants are composed of an above-average number of young, mainly male, scientists. Naturally, this fact is linked with other differences regarding social-demographic characteristics. This migratory group, by its professional activity, measured via results of their work which have been published abroad (articles, books, chapters of books and papers), does not differ too much from those who, despite intending to leave the country for more than 1 year at the present time, hesitate about whether to migrate<sup>32</sup>. Comparing again these two groups, also as for the intensity of all types of business jobs abroad there are no too marked differences. What is obvious regarding the "firm migrants", however, is that they are significantly more involved in international joint-research projects, in this very important kind of international research network. This also brings about more deeply getting to know with Western scientific environment, rather close personal contacts and easing further continuation of international cooperation. When speaking about abroad, potential migration movements within the scientific sphere dominates regarding these "firm" migrants. It is obvious when looking at the fact how frequently they would accept the possibility to work abroad in the field of science.

Generally speaking, those "poorer", inclined rather to right-wing political orientation and "optimistic" are characteristic of more intensive proclaiming going abroad to work for more than 1 year. It seems that evaluation of the existing working conditions in the Czech Republic does not influence willingness to work abroad. Thus, subjective feeling of underrating, lack of interest and inadequate provision with facilities when working in given scientific specialization do not provoke various "migratory frame of mind" – do not function as a "push" factor. On the other hand, as far as scientific work, "firm" migrant's pleading for independence, good prospect stability and perfect conditions as a whole confirm that just these factors / values are unambiguously very important "in theory". They "pull" Czech scientists toward the environment where one can find such a conditions, hence, toward the "West".

### 6.3. External Short-Term Mobility ("Brain-Exchange")

This kind of working experience abroad – which has usually very positive effects upon individual scientists as such and given institutes as well<sup>33</sup> – was also, albeit marginally, tackled within the survey. It is obvious that short-term stays abroad have totally different conditionality. They are quite normal and frequent. They are typical and inevitable part of advanced scientific work and are influenced by different factors than in the case of long-term stays abroad for more than 1 year.

Briefly skatching some selected relations, for example, the intention to go abroad for less than 6 months (it concerns 40% out of 911 respondents) does not differ by age categories, and, accordingly, by number of children, marital status, length of working experience and the like. The same is valid, for example, for administrative position and financial situation. What is statistically proved is that differences do exist when taking into account 1) scientific field (those working for natural and social sciences intend to travel more frequently), 2) place of work / type of institution (the intention is the highest among those from the Academy, then, those from universities follow), 3) academic degrees (the higher degree the more intensive intention to travel), 4) marital status (the intention diminishes from single through married to divorced and widowed persons) and 5) sex (males incline to travel more than females do). One can support what has been mentioned by the following figures:

<sup>&</sup>lt;sup>32</sup> Scientists working for the Academy, especially compared to those from universities and non governmental research institutes and "other" institutes, fall into this category.

<sup>&</sup>lt;sup>33</sup> The probability of a return of a scientist is rather high, and thus, via newly gained experience ("brain-echxange") he can enrich an institute and contribute to improving of its work.

"Scientific field" $\lambda^2$  (d.f.=2) = 11.2; p< 0.01</th>"place of work" $\lambda^2$  (d.f.=3) = 33.0; p< 0.001</td>"academic degrees" $\lambda^2$  (d.f.=2) = 6.4; p< 0.05</td>"marital status" $\lambda^2$  (d.f.=2) = 8.2; p< 0.05</td>"sex" $\lambda^2$  (d.f.=1) = 8.1; p< 0.01.</td>

## 6.4. Internal Mobility

To be able to assess the internal mobility of scientists in the Czech Republic from more angles, we divided the whole sample of respondents into three groups according to relevant answers to Q B 68 ("Do you intend to change your present employer (institution) during this year if you stay in your country?").

Potential internal migrants were those respondents who intended to change their employer during the year of the survey, whether their intention was definite or possible (answers B 68 no.1 and 2; N=86).

Potential internal non-migrants were represented by persons who would probably not change the present employer (answer B 68 no.3; N=363) and firm internal non-migrants were those who had no intention to change their employer (answer B68 no. 4; N=456).

## 6.4.1. "Profiles" of Internal Migrants and Non-Migrants.6.4.1.1. Who Are Potential Internal Migrants (N=86)?

#### Social-Demographic Characteristics

More than one half (56%) of the sample were married persons. Around one third of them (35%) were single.

Most of the potential migrants were childless (43%) persons. The second most numerous group (38%) was represented by people with two children. The age of the children was mostly very low, up to 18 years for 78% of respondents (N=50).

The predominace of males (76%) was evident, while the respondents in the age categories of up to 39 years represented a huge majority (58%) of the sample. The average age of the respondents in this group was thus relatively low in comparison with the value for the whole sample (38 years).

### Professional Characteristics and Working Conditions

More than a half (56%) of this group (N=86) were scientists working in the field of natural science (including medical and agricultural disciplines). Respondents from technical and social sciences constituted approximately the same shares -21% for the former and 23% for the latter.

Almost half (48%) of the respondents worked within universities or faculties. As far as academic degree is concerned, 62% of repondents were graduates (Masters of science). Approximately one third were scientists who had obtained a Ph.D.

Among the respondents, those who had worked in the field of science for less than 5 years predominated (38%), while scientists without any position in the administration constituted the majority (51%).

Approximately two thirds of respondents (65%) of this group have published something abroad, mostly articles or papers from international conferences, at least once since the beginning of their professional career. Since 1989 a total of 59 (i.e.69%) scientists have visited a foreign country. The most frequently mentioned reasons for the visit were participation in a conference, seminar (43%) or a fellowship (40%).

At the time of inquiry only a third of respondents were working on a joint project with colleagues from other countries.

About one third (37%) of respondents believe that they *often* have the opportunity to personally participate in the selection of their team members. About 7% less *rarely* have the opportunity. A vast majority (80%) of respondents have to deal with tasks which could be carried out by less qualified colleagues, either *always* or *often*. More than a half of respondents, 57%, do not feel that their superiors are interested in the problems they are working on. A little less than three quarters of respondents (72%) believe that they have sufficient up-to-date information necessary for their professional work, while 70% of these persons (N=60) mentioned the alternative "*often*".

As far as the technical facilities needed for the scientific work are concerned approximately the same shares of respondents evaluated their situation as convenient (51%) or as inconvenient (49%).

#### Living Standards (Including Financial Situation)

As for the facilities and amenities of a household, a colour TV set (77%), telephone (71%) and car (65%) were owned by a majority of the respondents. On the other hand, the percentage of respondents owning a video recorder represented the smallest group in this category

Most of the potential migrants, one third, stated that they had less than 15 square meters of living floor within their flat per a member of their household. Approximately a quarter (24%) gave a value for this indicator of between 16–20 square meters and the same share of respondents mentioned they had 21–30 squares meters per member at their disposal.

A majority of respondents (57%) live from their incomes without the possibility to save anything.

About one half (49%) have additional occasional research activity on the basis of contracts and one third (34%) have some earnings from publication activity.

40% of respondents mentioned additional income from interests and dividends.

More than half (57%) of the sample ranked itself in a middle position on the social ladder.

Most of the potential internal migrants (40%) assessed their present financial situation as worse compared with that before 1989. On the other hand, only two per cent less (38%) thought otherwise.

The portion of those who believed that their finacial situation would improve in the future was 40%.

The proportion of his/her income out of the total family income was estimated by most of respondents as being in the range of 26-50%.

#### *Hiearchy of Values*

The most important factors (values), according to the respondents of this group, were "professional fulfilment" (altogether 93% respondents considered it important, while more than a half of this number stated the alternative *very* important) and "independence in work" (for 85% scientists this factor is important, for 61% of this figure *very* important). Among other important factors there were "recognition from colleagues" and "financial prosperity".

On the other hand, the less important factors were mentioned as being a "modern way of life", "career development" "status in the organization" and "job security".

In the opinion of most of the respondents values like "career development", "financial prosperity", "prestige in society" and "modern way of life" are achievable in the next 5 years if they leave the field of science. On the other hand, values like "recognition from colleagues", "status in organization", "independence in work" and "job security" are possible to achieve by continuing in scientific work at home. "Professional fulfilment", "up-to-date scientific information", "availability of key publications" and "a good research infrastructure" are, on the contrary, factors attainable through continuing in scientific work abroad.

#### 6.4.1.2. Who Are Potential Non-Migrants (N=363)?

#### Social-Demographic Characteristics

Married persons represented a vast majority (73%) among the respondents of this group. Other 22% were single people.

Nearly a half (44%) of the sample had two children. Almost a third (29%) were childless people. The age of the children (among those who had at least one child, N=258) was mostly up to 18 (61%).

Similarly like in the group of potential migrants, as well as in the whole sample, males were markedly predominating with 74%.

However, as compared to the group of potential migrants the shift among the age categories in this respondent's group was evident. The share of scientists up to 39 years decreased to 43%. On the contrary, the proportion of persons in the age category of 40–59 years reached more than a half of the total sample, i.e. 51%. The average age of potential non-migrants thus increased to 42 years.

#### Professional Characteristics and Working Conditions

Similarly like at previous group also among potential non-migrants scientists engaged in the field of natural sciences predominated (49%, N=363). The share of those working in technical sciences reached 30%. The least proportion, 21%, fell on the respondents of social disciplines. About 44% repondents worked at universities. Other frequently stated institutions (by 33% respondents) there were institutes belonging to the Academy of Science.

As far as the academic degree and title are concerned graduates (46%) and Ph.D. holders (46%) consisted the vast majority among the respondents of this category, while the persons active in the field of science more than 15 years predominated (44%).

Nearly a half of this sample (49%) was formed by scientists without any administrative position.

More than three quarters (79%) of respondents belonging to this group have published some of their works (particularly articles -67% – or papers from international conferences -71%) abroad during their professional career. Only a little less (74%) have visited a foreign country after 1989, while the most frequently mentioned reason of the stay abroad there were the participation in conferences, seminars and workshops (60%), fellowships (47%) and joint-research projects (26%).

A little less than a half of this sample (43%) were participating in works on joint-research project with colleagues from other countries in the course of survey.

37% respondents believe that they have *often* opportunity to participate personaly in the selection of their team members. About 7% less do it *rarely*. Two thirds of inquired persons have to deal with tasks which could be carried out by less qualified coleagues, either *always* or *often*. More than a half of respondents, 58%, feel an interest on the part of the superiors in problems they are working on. Approximately 80% believe that they have sufficient actual information necessary for their professional work, while 83% (N=275) of these persons mentioned the alternative "*often*".

As far as the technical facilities needed for the scientific work are concerned the most of respondents (61%) think that their situation is convenient.

#### Living Standard (Including Financial Situation)

Approximately the same percentages of respondents mentioned ownership of color TV set (85%) and telephone (84%). More than a half of the sample owned a car (69%) and flat / house (59%). Similarly like in the case of the potential migrants the least respondents owned a video player (34%).

The most of this respondent's group (N=346) live in the flat its useful living floor is less than 15 square meters per a member of household (33%) or between 16–20 square meters.

The majority of potential non-migrants (55%) live from their incomes without a possibility to save anything.

42% of respondents have an additional income from an incidental contractual research activity and the same proprotion (42%) have some earnings from publications. One quarter (24%) work or make a business in non-scientific sphere and 24% have an own (shared) business either in scientific field or in non-scientific sphere.

40% responents mentioned an additional income from interests or dividends.

The majority of respondents (69%) ranged themselves in the middle position of the social ladder. The largest proportion (38%) of potential non-migrants evaluate their present finacial situation better as compared with that before 1989. On the other hand one third of them assess it as worse. A total of 150

respondents (43%) do not believe in any changes, as far as their finacial situation is concerned, in the future.

The proportion of his/her income in the total family incomes was estimated by the most of the respondents (45%) of this group between 26–50%.

#### Hiearchy of Values

The most important factor for this group of respondents, in the top place, there was "professional fulfilment" (61% respondents mentioned this factor *very important* and 33% *rather important*), than followed "independence in work" (89% respondents appreciate this factor as *important*, out of this 69% *very important*) and "recognition from colleagues"(66% persons stated it *important*). On the contrary as the less important factors there were mentioned both "career development" and "modern way of life" (only 21% respectively 28% respondents stated these factors as important).

Similarly like most of potential migrants also majority of potential non-migrants see the possibility of the achievment of such values like "career development", "financial prosperity", "prestige in society" or "modern way of life" in the next five years if they move to another field of activity in the Czech Republic (the shares of respondents endorsed this opinion fluctuated between 43%–53% at each of the stated values). When speaking about "recognition from colleagues", "status in organization", "professional fulfilment", "independence in work" or "job security" relatively high percentage of respondents (59%–72%) endorsed the opinion that these factors are achievable in the case of continuing in scientific work at home. The values like "availability of key publications" or "actual scientific information" might be achieved, according to view of most of the respondents, both by continuing in scientific work at home and abroad, whilst "good research infrastructure" is the factor achievable under the condition of continuing one's work abroad.

#### 6.4.1.3. Who Are "Firm" Non-Migrants (N=456)?

#### Social-Demographic Characteristics

More than three quarters of the sample (77%) were married people. The proprotion of those who had at least one child was 79% of the total number of these respondents (N=454), while persons with two-children represented a majority (59%, N=361). The children were mostly adult, over 18 years old (in 55% of cases).

As in the case of previous respondent's group the preponderance of males in this sample was significant (70%). Compared with the groups of potential non-migrants and especially potential migrants, however, the average age of the respondents in this group was considerably higher (48 years), while the most numerously represented age category was that of 50–59 years (29%). In fact, respondents above the age of 40 represented about three quarters (76%) of the sample.

#### Professional Characteristics and Working Conditions

One half of this sample (N=456) was constituted by respondents working in the field of natural science. Scientists of social disciplines represented a little less than one third (27%). The least numerous group (with 24%) were the employees in technical sciences.

Most of respondents (44%) worked within universities. The second most numerous group was represented by the respondents at an institute of the Academy of Science (33%).

From the point of view of academic degree, the respondents who had obtained a Ph.D. constituted a majority (52%), while those working in the field of science for more than 15 years were significantly predominant (68%).

Respondents with a position in the administration represented a majority (61%) of this sample, out of them heads of departments (32%, N=278) and heads of sectors (28%) were the most numerous groups.

A huge majority of respondents (83%) have published at least one of their works abroad. The most frequent publications, mentioned by respondents, were articles (75%) or papers presented in an international conference (77%). The proportion of those who had, after 1989, undertaken a business trip to a foreign

country was 74%, while the most frequently stated reasons for this trip there were participation in a conference or seminar (64%), a fellowship (48%) or joint-research project (30%).

A little less than one half (46%) of respondents mentioned their on-going participation in a joint project with colleagues from another country.

Altogether, 69% respondents believe that they have an opportunity to personally participate in the selection of their team members, out of this 58% (N=291) have the opportunity *often*. Nearly two thirds of repondents (64%) have to deal with tasks which could be carried out by less qualified colleagues. Approximately the same share (65%) of respondents feel that their superiors have an interest in the problems they are working on. As far as the possession of up-to-date professional information is concerned a huge majority of respondents (88%) believe that they are informed sufficiently, while 68% of them (N=392) believe they are informed *often*.

In comparison with the groups of potential migrants and potential non-migrants, the highest percentage of the respondents (66%) have technical facilities which help them to do their work successfully.

#### Living Standards (Including Financial Situation)

As in the whole respondent's sample more than half of firm non-migrants owned a telephone (87%), colour TV set (85%), car (71%) and flat / house (60%). Apart from a PC, video player and foreign currency account, in all the cases the portions of owners were above the average values.

As far as housing is concerned, nearly 60% of respondent's households had under 20 square meters of living floor per member at their disposal. The respective share concerning 31 square meters and more was 17%.

More than half of the respondent's sample (55%) are able to save either some money or a lot of their income. About 40% of respondents are able to survive (without any savings).

The proportion of the respondent's salary (without additional income) amounted, in the most cases, to more than 50% of the total family income (at 54% respondents).

Nearly half of the respondents (46%) mentioned an additional income from publications and about one third stated incidental contractual scientific activity (e.g.consultancy, advice, etc.).

45% scientists had, during the previous year additional earnings from interest and dividends.

When comparing their present financial situation with that of before 1989 nearly half of the respondents (48%) endorsed the opinion that it has improved *significantly* or *slightly*. Little more than one quarter (28%) assesses it as worse.

As far as their expectations for the future were concerned, opinions of respondents were more pesimistic. Only a quarter of them believe that their financial situation will improve (*significantly* or *slightly*). On the other hand about a third think that it will deteriorate.

### Hierarchy of Values

The factors (values) most preferred among the respondents of this group seemed to be as follows: "professional fulfilment", "up-to-date scientific information", "availability of key publications", "independence at work" and "a good research infrastructure" (the shares of respondents stating an answer *very important* or *rather important* varied from between 93% to 87%). On the other hand, "a modern way of life" (only 24% respondents stated it as being important) and "career development" (25%) were mentioned as being less important factors. To a lesser extent "status in the organization" (35%) and "prestige in society" (39%) did also not seem to be too important.

When considering under which conditions firm non-migrants could most probably achieve the values in the next five years, "continuing in scientific work in the Czech Republic" was the most frequent answer in a majority of cases. As for values like "professional fulfilment", "recognition from colleagues", "status in the organization", "independence at work" and "job security" the shares of respondents stating the above answer exceeded 70%. In turn when speaking about "a good research infrastructure", "availability of key publications" and "up to date scientific information", a relatively higher proportion of respondents (47% - 52%) endorsed the alternative response – "continuing one's work abroad". As for "financial prosperity",

more respondents (38%) believed that this value could be achived by moving to another field of activity in the Czech Republic.

#### 6.4.1.4. Summary of Results on Migrant's "Profiles"

When we evaluated frequencie's distribution among the respondent's groups some differencies appeared.

The group of "potential" migrants, i.e. those who stated an intention to change an employer in the Czech Republic, (their decision being either definitive or possible), can be characterized by the following features:

The average age of this group is relatively low, 38 years. This fact, naturally, corresponds with some other indicators of the demographic structure (the above-average proportion of single persons, a limited number of children) or professional career (higher numbers of graduates and scientists without any position in the administration, limited work experience in the field of science). Professional activity, measured via international contacts (i.e. number of publications abroad, foreign business trips, participation in joint projects), is also lower.

The perception of the atmosphere (working conditions) within the institution is more negative (most of the scientists have to deal with tasks which could be carried out by less qualified colleagues, they do not feel that their superiors are interested in the problems they are working on).

Though their financial situation is rather below the "average" (more than half of this sample succeed in surviving without the possibility to save anything), there are no greater differences in comparison with other respondent's groups, in regard to the household facilities or measurements of the living floor space of their flat. When comparing their current financial situation with that of before 1989, an above-average share have a negative view. By contrast, they more often expect an improvement in this situation in the future than other groups. Regarding to their position on the social ladder an above-average proportion of the repondents ranked themselves rather nearer to the bottom.

It is possible to assume that the prevailing dissatisfaction with the financial situation migh be one of the reasons for the higher preference of "financial prosperity" in the hierarchy of values and, consequently, one of the main reasons for leaving the scientific field (an appreciably high percentage of the respondents see a possibility of achieving this value in moving to another field of activity).

The group of "firm" non-migrants have differed markedly from the above respondents in many respects. Unlike the young "potential" migrants, persons of an older age predominate (the average age is markedly higher – 48 years). In consequence, other characteristics conditioned by the age structure also differ. Married persons and relatively more, mainly adult children are more typical for this respondent's group. The shares of "academic degrees" as well as "positions in the administration" are above-average. Similarly, the amount of work experience in the field of science, longer than 15 years in the most cases, significantly differenciates the "firm" non-migrants from the other respondent's group.

Publication activity and frequencies of business trips abroad, as well as collaboration on international projects, reflecting the intensity of their international contacts, are above-average.

When evaluating working conditions, positive opinions prevail over negative ones. At the same time, the assessment of their current financial situation is the best, relatively, out of all respondent's groups (a majority of the respondents are able to save something from their income, and a significant share have felt an improvement in their financial situation since 1989). On the other hand, most of the "firm" non-migrants see the futher development of their financial situation rather pessimistically (perhaps with regard to their age structure, they might not expect any considerable progress in their professional career). The majority of them place themselves at a middle position on the social ladder. However, the percentage of those who rank themselves nearer the top places is higher in comparison with the other groups of respondents.

"Professional fulfilment", "independence at work" as well as some factors necessary for successful scientific work are considered by most of the "firm" migrants to be of the greatest importance. In comparison with other groups of respondents (in particular with "potential" migrants) the preference of the value "job security" is higher. According to most of the respondents the above values can be achieved, in the relatively short period of five years, by continuing with scientific work in the Czech Republic.

It seems that those who probably would not change an employer, i.e. "potential" non-migrants, represent a "mean" between "potential" migrants and "firm" non-migrants. For example, their average age, 42 years, is not so far from the average value of this indicator for the both marginal groups. Similarly, the values for other characteristics (demographic, professional, economic) are more or less comparable with the average values for all these groups of respondents. As regards preference of values (factors), "potential" migrants are closer to the opinions of "firm" non-migrants.

## 6.4.1.5. Factors Conditioning Intentions to Change an Employer within the Republic

To be able to assess which of the factors (characteristics) condition the internal mobility of scientists in the Czech Republic, we use a Chi-Square (Pearson) test (for more details see chapter 5).

When assessing the statistical significance of social-demographic characteristics in the internal mobility process, we arrive at the following ascertainments:

First of all, it is obvious that an intention to change a job unambiguously increases with declining age. In consequence, some other demographic characteristics linked with age, i.e. marital status, number and age of children, appreciably differenciate the three groups of internal migrants. Suprisingly, sex does not seem a determinating factor in this respect. The above relations may be expressed statistically in the following way:

"Age"	$\lambda^2 = (d.f.=8) = 92.6;$	p< 0.001
"marital status"	$\lambda^2 = (d.f.=4) = 21.7;$	p< 0.001
"number of children"	$\lambda^2 = (d.f.=6) = 24.0;$	p< 0.001
"children under 18"	$\lambda^2 = (d.f.=4) = 31.8;$	p< 0.001.

As far as the professional characteristics are concerned, neither scientific field nor place of work differentiate the groups of respondents from each other too significantly. By contrast, academic degree and position in the administration are factors whose significance was statistically confirmed, ie, the intention to change a job declines with increasing academic degree and increasing administrative position.

Similarly, length of work in the field of science, as a factor closly linked to age, significantly differenciates the groups of migrants. Thus those younger, with work experience in science of up to 5 years show a greater propensity to change a job than older ones who have been working in this field for a longer period.

Regarding professional activity tied to international contacts ie, number of publications and participation in conferences and workshops are the factors which separate the respondent groups from one another. The frequency of these contacts increases with decreasing willingness to change an employer and thus, comfirms the influence of the age (older non-migrants have more of these contacts).

As far as concerns subjective evaluation of working conditions (opportunity to participate in selection of team members, dealing with tasks which could be carried out by less qualified colleagues, feeling that one's superiors have an interest in the work being carried out, the possibility to possess enough and up to date professional information and having sufficient technical facilities) some differences appear among the groups of respondents. It is possible to say that the perception of all the aforementioned factors is more negative with a greater inclination to leave (see below):

"Academic degree"	$\lambda^2 = (d.f.=8) = 50.4; p < 0.001$
"position in the administration"	$\lambda^2 = (d.f.=6) = 26.7; p < 0.001$
"work experience"	$\lambda^2 = (d.f.=6) = 81.3; p < 0.001$
"publication abroad"	$\lambda^2 = (d.f.=2) = 14.8; p < 0.001$
"participation in conferences"	$\lambda^2 = (d.f.=2) = 14.8; p < 0.001$
"selection of team members"	$\lambda^2 = (d.f.=6) = 31.3; p < 0.001$
"dealing with tasks"	$\lambda^2 = (d.f.=2) = 6.1; p < 0.05$
"lack of interest from superiors"	$\lambda^2 = (d.f.=2) = 14.1; p < 0.001$
"enough information"	$\lambda^2 = (d.f.=4) = 23.2; p < 0.001$
"technical facilities"	$\lambda^2 = (d.f.=2) = 8.7; p < 0.05.$

As regards the factors characterizing living standards, a statistical dependence of the propensity to change a job upon certain variables has been proved.

Statistically measured, the proportions of persons who own some household facilities do not substantially differ according to the groups. More significant differences only appear as far as ownership of a colour TV or telephone is concerned.

The contemporary financial situation as well as position on the social ladder are the factors which significantly differentiate the individual migratory groups. It is obvious that those who are "poorer" show a greater propensity to change an employer. Retrospective and future views on one's financial situation also vary among the groups. However, whilst changes in one's financial situation after 1989 are perceived more negatively with an increasing willingness to move, the future expectations are more optimistic among those who intend to leave. Similarly, different forms of additional incomes distinguish the three groups of respondents from each other. Income from non-research activities, from one's own business as well as earnings from activity within the field of science (particularly incidental research activities) more often represent a "supplement" to the family budget among those who are inclined to change a job.

The above relations can be summarized thus:

"Ownership of colour TV"	$\lambda^2 = (d.f.=2) = 6.6; p < 0.05$
"ownership of telephone"	$\lambda^2 = (d.f.=2) = 13.9; p < 0.001$
"present finacial situation"	$\lambda^2 = (d.f.=4) = 43.8; p < 0.001$
"position on social ladder"	$\lambda^2 = (d.f.=4) = 25.6; p < 0.001$
"past financial situation"	$\lambda^2 = (d.f.=4) = 10.5; p < 0.05$
"future financial situation"	$\lambda^2 = (d.f.=4) = 12.9; p < 0.05$
"additional income":	
<ul> <li>– outside of science</li> </ul>	$\lambda^2 = (d.f.=4) = 20.6; p < 0.001$
– in science	$\lambda^2 = (d.f.=4) = 20.6; p < 0.001$
– own business	$\lambda^2 = (d.f.=4) = 22.1; p < 0.001$
<ul> <li>incidental research activity</li> </ul>	$\lambda^2 = (d.f.=2) = 8.9; p < 0.05.$

It has been proved that the importance of some values (factors) is perceived differently by the respondent groups. This particularly concerns "financial prosperity", "job security" and "up to date scientific information". Whilst the first factor is considered more important with an increasing willingness to change a job, the importance of the latter increase in converse relation, i.e. with lower propensity to leave:

"Job security"	$\lambda^2 = (d.f.=4) = 18.8; p < 0.001$
"financial prosperity"	$\lambda^2 = (d.f.=4) = 16.3; p < 0.01$
"up to date scientific information"	$\lambda^2 = (d.f.=4) = 12.2; p < 0.05.$

Marked dissimilarities appear when evaluating under which of the following conditions: (1) continuation in scientific work in the country, 2) moving to another field of activity in the country and 3) continuation in scientific work abroad) one could most probably achieve the values in the next five years. Statistically significant differences have been confirmed in all the (12) cases (p varies from 0.01 to 0.00000). Thus, one can find opposite attitudes between the two main groups of internal migrants towards the preference of leaving the scientific sector on the one hand and continuing in scientific work at home on the other hand.

#### 6.4.2. Summary of Results

The decision to change an employer in the Czech Republic is a strategy, in particular, of a younger generation. The group of potential migrants have thus been composed particularly of scientists of younger age, ie, up to 39 years. This fact is, of course, linked with other social-demographic characteristics (marital status, number and age of children etc.) and characteristics of professional career (limited amount work in the field of science, lack of an academic degree or a higher position in the institution's administration).

On the other hand, the field of scientific activity or type of institution has not played any role in the decision to leave the institution. By contrast, professional activity measured via number of publications abroad and participation in international conferences has more significantly differentiated the group of potential migrants from other respondent groups. Generally, it may be said that scientists who are more professionally active show a lower propensity to change an employer in the Czech Republic

Similarly, regarding subjective evaluation of working conditions, some differences among the respondent groups have appeared. Thus, working conditions are perceived by those thinking about a change of job more negatively in comparison to groups of more "stabilized" scientists. A dissatisfaction with the level of self-assertion within an institution (e.g. lack of interest on the part of superiors, underappreciation of their qualification) might be one of the "push" factors leading to internal brain-drain / brain-loss.

The potential migrants also prefered, more often than other respondent groups, the value of "financial prosperity" (even though as far as the estimation of their optimum salary is concerned thay do not sidnificantly differ from the other groups). On the contrary, probably as a result of their age composition, they do not consider the value "job security" as being too important. In contrast to this the above value is considered to of above-average importance among firm non-migrants.

Evaluating the conditions under which they could most probably achieve the values in the time horizon of five years, the two main groups of potential migrants and firm non-migrants are differentiated from each other by the following points:

The group of potential migrants mostly see the possibility of fulfilment of their professional ambitions (i.e. carrer development, prestige in society, independence at work) and financial prosperity in the field of non-scientific work in the country. In turn, most firm non-migrature endorse the opinion that their professional ambitions might be fulfiled in the case of their continuing in scientific work in the Czech Republic.

The survey found no substantial differentiation among the housing conditions of respondents largely due to the persistent levelling situation in the field of housing in the Czech Republic. In this context, however, the formulation of the question "Which of the following does your household own?" has played a role ("household" was not clearly defined). At the same time, more significant differences in household facilities among the groups have not appeared.

As far as the subjective perception of their economic situation is concerned the group of potential migrants have assessed it more pessimistically. This corresponds with the fact that most of these respondents have to supplement their "normal" salary with additional income.

## 7. COMPARISON OF THE RESULTS OF EXTERNAL AND INTERNAL MIGRATION / MOBILITY

The aim of this chapter is to briefly indicate whether there are differences between the factors conditioning on the one hand external migration and on the other hand internal mobility. For practical reasons, both selected groups are considered as separate samples without any mutual overlapping, even though one can expect the reality to be a little different from this simplification.

At the same time, different questions in terms of time as to when to leave the country (external migration – without any time limits, sometime in the future) and to change an employer (internal movements – during 1995) are not, in this case, taken into account.

Leaving the Czech Republic for more than one year, as well as the change of employer within the country is a strategy particularly prefered by young scientists. In both cases the intensity of movement unambiguously increases with declining age. Accordingly, other social-demographic or professional characteristics, i.e. marital status, number and age of children and amount of work experience, also correspond to the above mentioned trend.

It is worth pointing out is that sex is not the important factor which differentiated significantly groups of internal migrants / non-migrants, contrary to groups of external ones, where males are typical representatives of "firm" migrants. This result is confirmed by a number of other surveys on wilingness to leave the country for abroad for rather a long time.

Regarding characteristics of professional career the both groups are conditioned differently. While among the group of internal migrants / non-migrants the academic degree was a factor differentiating the main subgroups (the higer degree, the lower tendency to change an employer), within the group of external migrants / non-migrants its influence has not been proved.

Quite important differencies appeared when taking into account some indicators of professional activity tied to international contacts. As far as the internal mobility is concerned it seems that professional activity

measured via number of publications and participation in conferences and workshops is linked with the age of respondents and, consequently with their lenght of work in the filed of science. Thus the "firm" nonmigrants, who are composed mostly of the older people, have more the above contacts. On the other hand the youngest of the subgroups (potential internal migrants) do not invest too much in their scientific activities.

This correlation has not been proved at all among the group of external migrants / non-migrants. In this case the age does not seem to be a "discriminating" factor in terms of professional activity. In turn, the youngest "firm" migrants are those who are characteristic of very intensive contacts with abroad (through stay abroad for the purpose of post-graduate study, Ph.D. study, and especially joint-research projects) even as compared to other "older" groups in question. This fact signalizes that just the group of young "firm emigrants" is very active in this respect (this is linked with their higher scientific ambitions and their higher "quality" of scientific work) and they have better preconditions to continue working in the field of science abroad.

All in all, it seems that those who are arranging their departure abroad might be better scientists than those who intend to change an employer within the Czech Republic. Other important differencies concern working conditions. They do not play any role when speaking about external migration. By contrast, as to internal mobility their importance is statistically significant. Thus, working conditions are perceived by those thinking of a change of an employer more negatively as compared to the older and more "stabilized" scientists. It seems that such aspects like e.g.lack of interest on the part of superiors or underestimation of their qualification etc. might be some of "push" factors leading to the leaving the current job. Another common "push" factor – concerning the both groups (internal and external mobility) – is financial situation of the respondent's families. It is obvious that those who are going to leave the country or change a job are "poorer" and put themselves relatively lower on the social ladder than those who intend to stay.

Again, there is a common feature for both subgroups (of "firm" and "potential" external / internal migrants) residing in more positive expectations as to their family financial situation in the future.

In comparison with the external "firm" migrants the importance of various types of additional incomes among the group of those who intend to change an employer in the Czech Republic has been proved. Simultaneously, the preference of the value of "finacial prosperity" are above-average among the "potential" internal migrants.

In turn, external "firm" migrants are not inclined to declare directly the importance of financial means in their hierarchy of values. Rather, they see the improvement of their financial situation via career development. At the same time they prefer betterment of their working conditions ("achievement of actual scientific information", "availability of key publications" and "good research infrastructure") above all. Let us summarize, looking at which of the conditions could most probably lead to the achievement of the professional ambitions quite logical results may be formulated: Most of the potential internal migrants see fulfilment of the above ambitions by leaving the sector of science for another field of activity in the Czech Republic. On the contrary, the "firm" external migrants prefer further development of their scientific career abroad.

## 8. REGIONAL DIFFERENCES IN POTENTIAL MIGRATION / MOVEMENT (THE CITY OF PRAGUE VIS-A-VIS THE CITY OF BRNO)

To compare the situation spacially, besides Prague – the real heart of scientific life in the Czech Republic – we also carried out the survey in the second most important scientific centre, the city of Brno (see part 5). Two main obstacles made the comparison rather difficult: Firstly, the whole sample in Brno was rather small (N=151) and thus any kind of generalistion is rather a problematic step; Secondly, the structure of both samples to some extent differed from each other, Brno's sample of respondents being younger (In Brno it was 42.8 years and in Prague 44.6). Accordingly, the number of respondent with work experience of between 0 and 5 years was 12% higher in Brno than in Prague. Males consituted 77% of the sample in Brno in comparison with 72% for Prague). Furthermore, Brno's sample, as compared to Prague's, had 7% more respondents from engineering / technical scientific field at the expense of the social sciences, 8% more working in universities and 4% less working in the Academy.

These differences hinder us from specifying what (whether "internal" tied to the structure of the samples or "external") individual factors might explain possible variations between the "models of behavior" of the two samples in question. Despite this fact, without taking into account statistical characteristics, both samples were juxtaposed with each other.

A little surprisingly, the two samples (touching a very wide spectrum of aspects) only slightly differed for a vast majority of answers (differences concerning individual items within the distributions were often lower than 5%, and only rarely exceeded 10%). Hence, the "weight" and importance of the results of the whole survey carried out in the Republic were in some way strengthened. If some differences do exist, they have indicated that the Brno scientific community may be, in comparison with that in Prague: 1) not so willing to invest "everything" in "pure science" as such at the expense of other activities which also bring more personal profit ( a more "pragmatic" orientation), 2) in some cases a more closed community not having so intensive international working contacts with abroad, 1) potentially more "on the move" both outside the country and outside the scientific sector within the country. This is proved by the following figures:

- 3% are arranging their departure for a foreign country for more than 1 year (4% in Prague).
- 11% intend to leave the country for more than 1 year but at the moment they have not undertaken any specific steps (9% in Prague).
- 24% intend to leave the country for more than 1 year but not now (18% in Prague).
- 2% intend to definitely leave their present employer in the given year (1% in Prague).
- 13% intend to probably leave their present employer in the given year (8% in Prague).

Bearing in mind the above mentioned obstacles, one cannot draw far-reaching conclusions from this comparison. Nevertheless, in relation to the similarity "in behavior" of both samples, it is wortwhile to stress that, for example, the slightly higher the propensity for leaving the national / scientific sphere in Brno (as compared to Prague) may "only" be caused by the higher proportion of males and younger scientists in its respondent sample<sup>34</sup>. However, such a hypothesis and many others must be proved by further, deeper analysis of the issue.

## 9. MAIN RESULTS OF REAL MIGRATION SURVEY

The survey among personnel department's experts of research institutes (universities) has resulted in a total of 359 valid questionnaires. However, it is necessary to point out that the information obtained from these questionnaires cannot be generalised in any way due to the disproportional representation of different types of institutions and their scientific orientations in the sample (a significantly above-average share of natural scientific disciplines, absence of institutions belonging to universities). Another important factor which should be taken into account is the different standard of personnel department's registers. This factor appreciably influences the quality of completed questionnaires.

In spite of this, the data from questionnaires have given a series of information confirming the results of the main, potential migration survey.

Data from the real migration survey proves that the external migration of the Czech researchers and developers is a marginal strategy in their professional career. Out of the total number of 359 employees who finished their labour contract (the number excludes those who retired) only 14 persons left to work abroad, i.e. a mere 4%. However, even characteristics related to these negligible numbers confirmed the result of the main survey. Most of the scientsts leave for abroad for the purpose of continuing in their scientific work (11 of the sample; N=14), while their choice in this respect is not a "mystery trip". All of those who were continuing in scientific work abroad, had left on the basis of an invitation from a foreign institution, which at the same time supported their stay. Likewise the results on potential migration, the ascertainments from the real migration survey also prove the continuation in collaboration in joint-research projects, the grasping of opportunities arising from mutual professional contacts. All the scientists who continued in their scientific work abroad had had a fellowship or post graduate study longer than one month in their host country before. The choice of the country which they left for is closely tied to these stays – with the exception of two cases all the scientists left for countries where they had passed the study (fellowship).

<sup>&</sup>lt;sup>34</sup> These factors of age and sex might suppress others which function in an opposite direction – as "barriers" of movement.

Regarding the fact that it is necessary to carry out more detailed analyses of the structural characteristics of these 14 external migrants, we will only refer to their age composition.

Those who left for abroad, are mostly in the age up to 39 years (85%), with males markedly predominant over females. The age structure is, of course, in close relation to several indicators of professional career – scientists without any position in the administration within the institution hiearchy, as well as those with lower academic degrees prevail.

The outflow from research and development institutions in the period of 1989–1995 was a particularly a reflection of the internal movement of scientists within the Czech Republic. The highest intensity of these movements was recorded between 1991–1993, when 67% of the total sample of 359 scientists left their hitherto employer. Since 1993, a decline in the internal mobility of scientists has been evident, most probably connected with the saturation of the labour market in the field research and development acivity. Newly established institutions have already created their professional teams and new job opportunities have not arisen in such an intensity as in the aforementioned period of 1991–1993. An analogous trend has also been evident as far as the public administration sector is concerned, and where a number of employees of research institutions have moved to since 1990.

Information concerning their futher professional careers are not known in 10% of cases of the total figure of 345 scientists who changed an employer within the Czech Republic. For the assess ment of the structure characteristics of internal migrants only the 303 records containing the relevant data were used.

A majority of the scientists (47%) had found a job in the field of science, while one half of them moved to the growing private sector. A quarter left for public administration, possibly, but to a lesser extent, for public services. The remaining roughly 29% is a rather differentiated group.

It is worth pointing out that the dependence of the choice of further work assertion on age has not been confirmed statistically (even though 85% internal migrants were in the age up to 49 years). On the other hand, some tendencies indicate a differenciation in the preference of certain work places in relation to the migrant's age. For example, the private sector is preferred by young people, up to 29 years (a quarter of those who left for this sector were in the age of up to 29 years, while in the whole sample of internal migrants the share of these young persons reached 16%). In contrast to this, older persons, in the age of between 40–49 years, more often choose a job within public administration and services (36% of those who left for this sector were in this age category while making up only 26% of the whole sample of internal migrants).

However, with regard to the low frequencies of internal migrants in selected fields of activity, there can, in this respect, be no generalisation of the aforementioned tendencies.

In connection with the statistically unprovable dependence of a choice of further employment upon age, a more significant correlation with the professional characteristics of migrants (length of work experience, position in the administration, academic degree) has not been confirmed.

As far as sexual composition is concerned males clearly predominated, while their share reached 77% of the total sample of internal migrants. This sexual ratio was also preserved in the selected fields of further migrant's work activity. The public administration sector, where approximately the coincident shares of males and females moved, represents an exception.

#### 10. SOME ASCERTAINMENTS FOLLOWING THE QUESTIONNING DEANS / DIRECTORS

From the survey on directors, deans and managers of scientific institutions, 22 questionnaires were completed. The survey suffers from many objective shortcomings (see part 5). Let us only stress here that the interpretation of the results by type of institution and research orientation is a rather problematic step, since the sample is relatively small and we do not know its "level of representativeness".

It is obvious that a decline in the numbers of research and development staff occured in these instritutions between 1988–1994 as a consequence of a quite significant restructuralization process within the scientific sector. However, the scientists who moved out of the sphere have found new places in the Czech labour market. As in the case of the results on personnel department's experts, the top scientific management have no interest in external migration movements (abroad). Within the questionned institutions, only a quite

negligible number of those who left for abroad (to work there) between 1988–1994 has been evident. One can see the highest intensity of such an "outflow" between 1992–1993.

The results tell us that in this regard, the USA, Canada, Germany, Switzerland and Great Britain belong among the most attractive countries.

External labour migration is closely linked with participation in research projects, fellowships and the like. Data revealed by directors (deans) / managers proved that the most frequent form of international cooperation is participation in research projects, workshops, conferences and short term study journeys lasting no longer than 3 months. On the contrary, post-graduate study and Ph.D. study are rather rare activities when developing international contacts.

## 11. CONCLUSIONS AND RECOMMENDATIONS

The contemporary state of higher education and the research and development sphere in the Czech Republic is a mirror of the existing transformation era. Though some important tasks in the sector in question are still to be still fulfilled, the basic transformation steps of installing new organizational structures, new models of their management (respecting the market-driven economic environment) and partly also new systems of work have been implemented. Logically, this process has brought about a necessary and rather large reduction in the size of the research and development sector (see part 4.). The contemporary search for a new "face and soul" within the sector has put a perhaps even greater burden on those scientists (including university teachers) who have stayed than on those who 1) have left for abroad (one can only estimate that the whole number was not too significant) or 2) to much larger extent have "successfully" left the science sector for another occupation within the Czech Republic, (in the most part to the private sector (banks, consultancy, and so on). To some extent, since the very beginning of the 1990s when the "great shaking and shake-out" occured, the research and development sector is now at the second crossroads today. Since the situation has more or less stabilized, one is now quite familiar with new "parameters" and, thus, can consider his / her role within the "game". As far as scientists and their positions within the education and research and development sectors are concerned, the following picture, based on our survey, indicates what basic future scenarios might be realized as to whether and, if yes, where to go.

Some 4% of the respondents (40, N=915) intend to leave for a foreign country for more than 1 year and are arranging their departure. 9% (86) would like to do the same but at the moment have not undertaken specific steps. Another 18% (167) would like to leave but not now. The rest (68%) would prefer to stay in the Republic. This situation seems to correspond to that which one find in Slovakia and to a lesser extent in Hungary and Slovenia (see table 4 in Annex).

When asking scientists in the Czech Republic: "What would you do if, in the course of the next few months, you receive an offer to go abroad", 64% (N=904) would prefer a fellowship for more than 1 year and a similar share (65%) research work for more than 1 year. However, only about 11% in both cases would accept it without any hesitations. Non-research work for more than 1 year is more or less acceptable for about 35% of respondents.

When asking respondents "Do you intend to change your present employer (institution) during this year (1995) if you stay in the Czech Republic" only 1% (13) answered "definitely yes" and 8% (73) probably yes. 39% (363) of respondents stated the answer "probably no" and almost half of the sample, 49% (456) answered "definitely not". These parametres seem to be similar to those in Slovenia (see tables in Annex).

Before evaluating what the above sketched facts mean or might mean for society we have to formulate the following premises:

- The science, research and development sector is to have an important and irreaplaceable role within Czech society.
- Any international movements implemented within the scientific sector are benefical to the Czech Republic except those in which a scientist stays and works abroad for more than 5 years<sup>35</sup> or forever (we follow the questionnaire categories). However, shorter-term stays (in between 1 and 5 years) bring

<sup>&</sup>lt;sup>35</sup> It does not mean at all that these people could not enrich the Czech Republic's science in a long-term horizon.

uncertainty regarding whether a scientist, despite his / her declared preference to return to the Czech Republic, will really undertake such a step ie will really return<sup>36</sup>.

 Migration outside of science to "anywhere" is considered to be a loss for the national science, research and development sector as such. (Such a movement, however, need not be a loss for the society).

In the light of these premises the situation as a whole does not seem to be critical. However, realizing that nearly one third of the sector might be on the move out of the contemporary "slim" sphere of science to go abroad is, without a doubt, worth pondering on.

In addition, despite the fact that the above results on internal mobility of scientists do not confirm huge movements, about one quarter of the respondents do not refuse to change his / her employer. Without any doubt, this would be to some extent a loss for the scientific sector.

The interrelation between conditions which a scientist has and will have at his disposal (including, of course, financial rawards) and a model of his / her behavior (activity, leaving, resignation and the like) will determine the future of the sector<sup>37</sup>. Leaving aside the, in our eyes rather unacceptably liberal, fully non-interventionist government policy in terms of handling the sector (see also Eastern, 1994), much lies in Governmental hands or bodies for which the Government is responsible. Of course, not only direct support but indirect support, implemented by creating a reasonable conditions and an acceptable environment is important. Besides the top organizational structures themselves, "local administration" within individual institutes and the human factor itself represent important tools conditioning the state and the climate in the scientific "micro field".

To gain a view of the state of the sector in question is even more complicated, since the current society functions as a very open network interwoven with many interrelations some of which have been extended abroad. One should realize that besides academic and research and development communities as such and the governmental institutions at the national and regional levels, national business communities, transnational corporations and international organizations come also into the play (see also Eastern, 1994) and influence and condition events in the scientific sphere in the Republic.

Based on the results of the survey we shall (besides more detailed conclusions summarized within the text – see 6.2.1.4.; 6.2.2.; 6.4.1.4.; 6.4.2.; 7.; 9. and 10.) formulate below some basic recommendations for improvement of the situation. The main goal of our endeavour<sup>38</sup> is to stabilise the staff structure in the field of science, to improve it and make it more efficient and competitive but also to make it more humane and respectable.

Paradoxically, the processes of stabilization and improvement are to a large extent – if "abroad" comes into the play – antagonistic to each other. While the "rejuvenation" of the sector should lead to its improvement in the future, it is at the same time just the younger scientists are more inclined to leave for abroad for more than one year (from where it is unclear whether they will return). In addition, these young scientists are typical of the more intensive short-term international contacts (realized via movements) – in other words, they are typical of the improvement "themselves" and, accordingly, of the sector of science as well. However, these activities seem to be the first step towards long-term migration abroad. To some extent they lead to a "destabilization" of the field in a short-term perspective.

#### **Recommendations for Czech bodies:**

- It is vitaly necessary to make the staff of the scientific sector significantly younger than it is nowadays ie, to attract young people at the expense of the gerontocratic strata.
- To attract new scientists as well as to stabilize the sector (i.e. to prevent those who now work for the sector from leaving it and from leaving the Republic for any length of time) scientists must be fairly rewarded for their "normal" (not including additional) work. This necessitates that earnings should be

<sup>&</sup>lt;sup>36</sup> Based on the survey, 96% of those who intend to leave a country for more than 1 year fall into this category.

<sup>&</sup>lt;sup>37</sup> Only about 24% (N=912) of the respondents proclaim they intend to always work (under any circumstances) in the field of science.

<sup>&</sup>lt;sup>38</sup> Besides these conclusions and recommendations, those springing from the, for the time being well-known reality (not based on the survey but often in accordance with its results) and formulated within part 4.4. should be taken into account.

higher than now. The Government could, by this method, show its appreciation of the importance of scientists, thereby bringing its evaluation more into harmony with high prestige which this group enjoys within the society as such. The importance of this step is evident since the rather low living standards seem to clearly clearly a "push" factor leading to an intention to leave the country for a longer period (to the creation of brain-drainers). Similarly, financial prosperity seems to be a very important factor for stability in terms of internal mobility of scientists.

Conditions closely linked with scientific work in the Republic should be improved. Besides others, this particularly concerns: "a good research infrastructure, up to date scientific information, availability of key publications". Despite this, these qualities, which are to large extent also connected with "professional fullfilment" do not function as a "push" factor in the case of potential for leaving the country for a long time, but they do operate as a "pull" factor. The "West", which offers "the best quality" in the above respects, attracts Czech scientists. Working conditions prove to be quite important in the decision to leave an employer within the Republic as well.

To meet such demands, there is a need to mobilize the inner resources of the respective scientific institutions as well as a need for Governmental bodies to deliver more financial means to the sector for this purpose.

Without any doubt, the policy of promoting temporary short-term (see 6.3.) and long-term exchanges of scientists in order to allow to them gain experience in the West should be pursued further. However, some "safety measures" for preventing the country's loss of scientists to the West should be drawn up and applied.

### **Recommendations for international bodies:**

To further develop co-operation between "Western" and Czech research institutes seem to be of high importance. Actually, the solution may lie in expanding grants toward high-performance institutes and individual specialists from the Czech Republic, in increasing possibilities for both sides to work "next to each other" and together (e.g. on a common research project). While doing this, the "Western" partner which is in co-operation with the Czech side should try to 1) realize such co-operation under the condition that what will be "learned" (and perhaps partly done) abroad should also be "returned" to the Czech Republic, 2) transfer more activities as such to the Czech territory.

#### **REFERENCES, DATA SOURCES:**

- Central and Eastern Europe and the European Union; Problems and Prospects of Integration. Gütersloh, Bertelsman Foundation Publishers 1995.
- Čermák, V.: Education in the 90's in the Czech Republic (High-Grade Schools and the Transformation Process). Prague, Institute of Sociology, Academy of Sciences of the Czech Republic 1993.
- Česká republika. Slovenská republika; Ekonomické přehledy. Paris, OECD 1994.
- Drbohlav, D.: Česká republika a mezinárodní imigrace. In: Geografická organizace společnosti a transformační procesy v České republice, Hampl M., (ed.) Praha, Katedra sociální geografie a regionálního rozvoje Přírodovědecké fakulty UK, 1996 (in print).
- Eastern and Central Europe 2000. Final Report; Sudies 2 G. Gorzelak, B. Jalowiecki, A. Kuklinski, L. Zienkowski. Brussels, Luxembourg, European Commission 1994.
- Economic Reform Monitor. (Internam manuscript). Brussels, European Commission, September– November 1995.
- Evidenční počet, mzdové prostředky a průměrné mzdy pracovníků za 1.–4. čtvtletí 1991. Praha, Federální statistický úřad 1993.
- Hradecká, I., Čermáková, M., Maříková, H.: Analýza příčin odchodů mladých pracovníků z Akademie věd České republiky. Praha, Sociologický ústav Akademie věd České republiky 1995.
- Jak hodnotíme svou životní úroveň. Praha, Institut pro výzkum veřejného mínění 1995.
- Kterých povolání si vážíme? Praha, Institut pro výzkum veřejného mínění 1995.
- Marešová, J.: Causes and Consequences of Emigration from Central and Eastern European Countries. Report for the Czech Republic. Geneve, UN (in print).
- Müller, K.: Scenario for Science and Technology Development. Prague, Institute of Sociology, Czechoslovak Academy of Sciences 1992.
- MF Dnes, 14 December 1995.
- Nikolski, V.: Pět let transformace ekonomik v postkomunistických zemích střední Evropy. Mezinárodní politika No. 11, 1995.
- Občané hodnotí svou životní úroveň. Praha, Institut pro výzkum veřejného mínění 1994.
- Populační vývoj České republiky 1994. Praha, Přírodovědecká fakulta Univerzity Karlovy, katedra demografie a geodemografie 1994.
- Provazník, S., Filáček, A., Křížová-Frýdová, E., Loudín, J., Machleidt, P.: Transformace vědy a výzkumu v ČR. In: Teorie vědy. III (XVI), No. 3–4. Praha, Kabinet pro studium vědy, techniky a společnosti při Filozofickém ústavu AV ČR 1994, pp. 5–152.
- Průběh transformace Akademie věd České republiky k 31.12.1994. Prague, Office of the Presidium 1995.
- Research and Development Council of the Czech Republic and State Support for Research and Development. Prague, Office of the Presidium 1995.
- Soubor ekonomických ukazatelů resortu školství, mládeže a tělovýchovy ČR za rok 1994; Pracovníci a mzdové prostředky. Praha, Ústav pro informace ve vzdělávání Praha 1995.
- Soubor informací o AV ČR; rok 1994. Praha, AV ČR 1995.
- Soubor informací o AV ČR; rok 1993. Praha, AV ČR 1994.
- Soubor informací o ČSAV; rok 1990. Praha, AV ČR 1991.
- Srb, V.: Pohyb obyvatelstva na území Československa 1938–1944. Demografie, No. 2, 1993.
- Statistická ročenka České republiky 1995. Praha, Český statistický úřad 1995.

- Statistika školství 1990/91. Praha, Ústav pro informace ve vzdělávání 1991.
- Švejnar, J. (ed.): The Czech Republic and Economic Transition in Eastern Europe. San Diego, Academic Press 1995.
- Teorie vědy. III (XVI), No. 3–4. Praha, Kabinet pro studium vědy, techniky a společnosti při Filozofickém ústavu AV ČR 1994.
- Trends in International Migration. Paris, OECD 1995.
- Tuček, M., Machonin, P.: Prestiž povolání v České republice v roce 1992. Sociologický časopis, 29, No. 3, 1993, pp. 367–382.
- Vizi, S.E. Reversing the Brain Drain from Eastern European Countries: The "Push" and "Pull" Factors. Technology in Society, Vol. 15, 1993, pp. 101–109.
- Vysoké školy, koleje, menzy a vysokoškolské knihovny ve školním roce 1994/95. Praha, Ústav pro informace ve vzdělávání Praha 1995.
- Vývoj obyvatelstva České republiky v roce 1994. Praha, Český statistický úřad 1995.
- World Development Report. Washington, World Bank 1994.
- Zaměstnanost a mzdy pracovníků v evidenčním počtu organizace v České republice za 1.–2. čtvrtletí 1995. Praha, Český statistický úřad 1995.
- Zaměstnanost a mzdy pracovníků v evidenčním počtu organizací v krajích a okresech ČR za rok 1994.
   Praha, Český statistický úřad 1995.

## Annex I

## Table 9: Average Adjusted Number of Personnel at the Academy of Sciences, 1994

I. Mathematics, Physics and Earth Science

Institute	Staff	Research and Development Staff with Higher Education
Astronomical Institute	119.2	55.5
Institute of Physics	576.1	288.1
Mathematical Institute	80.3	57.6
Institute of Computer Science	86.9	52.0
Nuclear Physics Institute	190.1	110.6
Institute of Information Theory and Automation	120.4	66.5
Institute of Physics of Materials	110.1	48.0
Institute of Plasma Physics	92.0	45.2
Institute of Electrical Engineering	36.7	20.7
Institute of Hydrodynamics	53.5	29.1
Institute of Scientific Instruments	100.6	41.3
Institute of Radio Engineering and Mechanics	130.9	63.7
Institute of Theoretical and Applied Mechanics	53.4	34.6
Institute of Thermomechanics	104.1	57.0
Geophysical Institute	115.1	58.1
Geological Institute	70.6	42.1
Institute of Dosimetry of Radiation <sup>1</sup>	11.6	5.9
Institute of Atmosphere Physics	60.4	33.4
Institute of Geonics	97.9	54.0
Institute of Rock Structures and Mechanics	125.1	54.9

## II. Life and Chemical Sciences

Institute	Staff	Research and Development Staff with Higher Education
Institute of Analytical Chemistry	65.3	39.2
Institute of Inorganic Chemistry	68.8	51.9
J. Heyrovský Institute of Physical Chemistry	145.3	89.4
Institute of Chemical Process Fundamentals	149.4	90.0
Institute of Macrochemical Chemistry	269.1	159.0
Institute of Organic Chemistry and Biochemistry	287.6	125.7
Institute of Biophysics	112.8	62.7
Institute of Entomology	79.9	48.3
Institute of Pharmacology	21.0	11.5
Institute of Physiology	218.9	93.7
Institute of Microbiology	288.3	125.1
Institute of Experimental Botany	124.0	52.9
Institute of Experimental Medicine	73.6	35.6
Institute of Plant Molecular Biology	43.7	26.0
Institute of Molecular Genetics	219.2	85.8
Institute of Animal Physiology and Genetics	84.0	45.2
Institute of Botany	180.3	63.2
Hydrobiological Institute	26.0	15.8
Institute of Parasitology	58.3	22.8
Institute of Landscape Ecology	92.0	59.0
Institute of Soil Biology	29.9	16.1

Institute	Staff	Research and Development Staff with Higher Education
Library	69.9	18.3
Economics Institute	60.7	38.4
Institute of Psychology	32.8	24.2
Institute of Sociology	47.6	34.0
Institute of State and Law	43.2	26.8
Archeological Institute AS R Brno	51.0	13.8
Archeological Institute AS R Prague	97.2	41.7
Archives	43.9	33.4
Institute of History	76.5	51.1
Institute of the History of Art	42.7	31.9
Institute of Musicology	17.0	13.3
Institute of Contemporary History	38.3	29.4
Institute of Philosophy	105.6	64.0
Oriental Institute	30.2	23.9
Institute of Czech Literature	62.3	45.1
Institute of Ethnology	31.4	19.3
The Czech Language Institute	63.0	49.0
Institute for Classical Studies	20.2	13.2

#### III. Humanities and Social Sciences

#### IV. Services

Place of Work	Staff	Research and Development Staff with Higher Education
Academia, Publishing House	53.3	0.0
Department of Languages	16.1	14.2
Patent and License Services <sup>2</sup>	1.8	0.0
Technical and Administrative Service of Biological Center	59.4	3.0
Service Center	158.4	0.0
Optical Development Workshop	19.5	3.0
Office	150.8	0.0
Total in the Czech Academy of Sciences	6,365.2	3,128.2

Source: Soubor informací o AV ČR, rok 1994. Praha, AV ČR 1995.

Notes: <sup>1</sup>Merged with Nuclear Physics Institute on June 30, 1994.

<sup>2</sup>Abolished on June 30, 1994.

Out of 59 institutes of the AV ČR, including the library and archives, 50 were concentrated in the capital of Prague. Three institutes were located outside Prague (the Institute of Geonics in Ostrava and Brno, the Institute of Landscape Ecology in Brno and České Budějovice and one of the archaeological institutes in Brno). Six institutes had branches in both Prague and Brno (the Mathematical Institute, the Institute of Psychology, the Institute of History, the Institute of Czech Literature, the Institute of Ethnology and the Czech Language Institute).

Czech Universities	Faculties (Mostly including Chancellor's Office)	Teachers	Research Staff
Charles University (UK Praha)	18	3,053.5	423.3
University of South Bohemia in České Budějovice (JČU České Budějovice)	5	340.2	8.3
J.E.Purkyně University in Ústí nad Labem (UJEP Ústí nad Labem)	4	252.8	0
Masaryk University in Brno (MU Brno)	8	1,107.3	140.7
Palacký University in Olomouc (UP Olomouc)	8	839.9	82.7
University of Veterinary and Pharmaceutical Sciences in Brno (VŠVF Brno)	3	152.5	18.2
Ostrava University in Ostrava (OU Ostrava)	4	269.2	0
Higher School of Teacher Training in Hradec Králové (VŠP Hradec Králové)	3	199.2	0
Silesian University in Opava (SU Opava)	3	137.2	1
Czech Technical University in Prague (ČVUT Praha)	8	1,353.7	219.4
University of Chemical Technology in Prague (VŠCHT Praha)	5	363.5	144.5
University of West Bohemia in Plzeň (ZČU Plzeň)	7	519.5	6.1
College of Mechanical and Textile Engineering in Liberec (VŠST Liberec)	5	331.2	11.9
University of Pardubice (UPa Pardubice)	4	245.8	0
Technical University in Brno (VÚT Brno)	9	1,070.1	64.2
Technical University of Mining and Metallurgy in Ostrava (VŠB Ostrava)	6	564.4	4.4
University of Economics in Prague (VŠE Praha)	6	564.4	4.4
University of Agriculture in Prague (VŠZ Praha)	5	392.4	26.3
University of Agriculture in Brno (VŠZ Brno)	5	329.6	115
Academy of Performing Arts in Prague (AMU Praha)	4	239.3	2
Academy of Fine Arts in Prague (AVU Praha)	1	44.6	0.2
Academy of Applied Arts and Industrial Design (VŠUP Praha)	1	60.9	0
Janáček Academy of Music and Dramatic Arts in Brno (JAMU Brno)	3	99.5	0
Total	125	12,625,4	1.316.7

Table 10: Average Registered, Adjusted Number of Teaching Personnel at Universities (Professors, Associate Professors, Research and Senior Lecturers, Lectors) and Research Workers in the Czech Republic in 1994

Source: 1) Vysoké školy, koleje, menzy a vysokoškolské knihovny ve školním roce 1994/95. Ústav pro informace ve vzdělávání Praha, Praha 1995, 191 s. 2) Soubor ekonomických ukazatelů resortu školství, mládeže a tělovýchovy ČR za rok 1994; Pracovníci a mzdové prostředky. Ústav pro informace ve vzdělávání Praha, Praha 1995, 124 s.

Notes: Including educational facilities with a founder: public administration in education, communities and church. It does not include private educational facilities and those under a central body of state administration other than the Ministry of Education, Youth and Physical Training. In addition, on the same date the universitie's staff included 13,093 non-teaching employees, 2,204 working on campuses and 1,130 in refectories.

The chancellor's office is included in 17 out of 23 universities.

Region	Number of Institutes, Firms, Corporations	Total Number of Employees	Professionals Working as Researchers and Developers
Prague	$A^{1} - 113$	A - 8,135	A – 4,866
	$B^{2} - 14$	B - 95	B – 39
Central Bohemia	$\begin{array}{c} A - 63 \\ B - 1 \end{array}$	$\begin{array}{c} A - 3,482 \\ B - 3 \end{array}$	A - 2,213 B - 3
South Bohemia	A - 22	A- 602	A – 383
West Bohemia	$\begin{array}{rrr} A - & 31 \\ B - & 2 \end{array}$	A – 1,009 B – 15	A – 820 B – 3
North Bohemia	A- 43	A – 2,043	A – 1,336
East Bohemia	A – 72	A – 3,310	A – 1,861
	B – 2	B – 3	B – 2
South Moravia	A – 115	A – 6,758	A – 3,901
	B – 8	B – 68	B – 27
North Moravia	A - 72	A – 4,134	A – 2,451
	B - 2	B – 45	B – 19
Total	A – 531	A – 29,473	A – 17,831
	B – 29	B – 229	B – 93

Table 11: Employees (Except Those from Universities and the Academy of Science) Working at Research Institutes / Firms / Corporations Where the Prevailing Activity is Research and Development: by Regions, Czech Republic, December 1994

Source: Internal Material of the Czech Statistical Office.

Notes: <sup>1</sup>Institutes / firms / corporations with more than 25 employees.

<sup>2</sup>Institutes / firms / corporations with less than 25 employees.

Besides all the small institutes / firms / corporations / (with less than 25 employees) the activities of which are placed, in terms of statistics, under the "research and development" umbrella, another 7,750 professionals from institutes / firms / corporations with more than 25 employees also work for the institutes / firms / corporations which fall into the same statistical category.

Other researchers and developers work within other various economic areas / branches.