

## **PART 5. FLOWS AND NON-EU EUROPE**

**Estonia**



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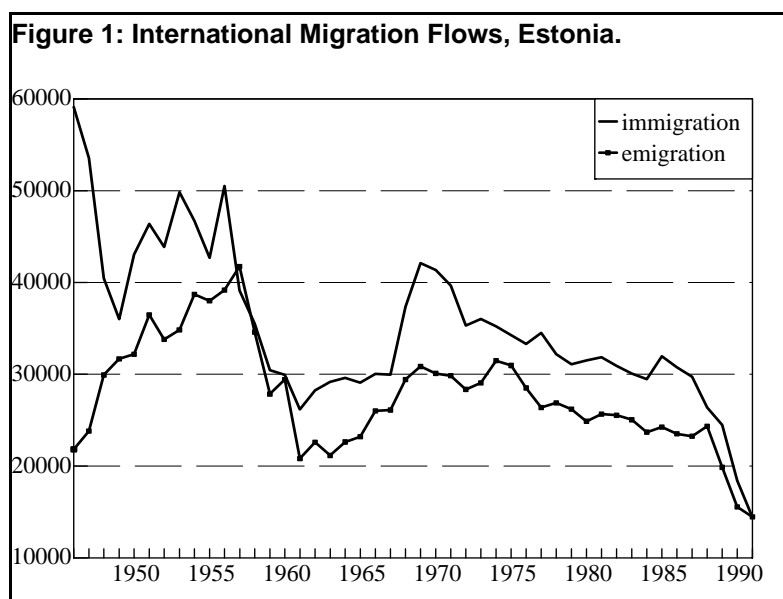
## Estonia<sup>1</sup>

### 1. Historical Overview

Estonia entered a stage of high migration potential in the last quarter of the 19th century following the demographic transition of Eastern Europe (frequently referred to as mobility transition). During this time, Estonia was characterised by intensive emigration and, to a somewhat lesser extend, internal urbanisation. Decreasing migration potential implied gradual cessation of emigration and, since the 1920s, the reduced outflow was directed almost completely towards the urban settlement system of Estonia [Sakkeus 1991]. The establishment of an independent state brought about a noticeable return to migration in the early 1920s.

In the post-war period, Estonia, like other European countries at the same stage of demographic development, became a country of immigration. However, unlike the same reference countries, immigration started about a decade earlier in Estonia and was more intensive. The main reason was the principal geopolitical change resulting from the incorporation of Estonia into the Soviet Union. It is important to note that the Russian Federation as well as other Slavic republics of the Soviet Union were at a different stage of demographic development, particularly characterised by high migration potential after the WW II [Vishnevski, Volkov 1983].

Under the new regime, international migration was for the most part comprised of the flows between Estonia and other republics of the Soviet Union. Two major immigration waves are to be distinguished. The first wave covered the immediate post-war decade with the particularly high intensity of immigration [Sakkeus 1996]. Explanation for this lies in the combination of administratively directed migration flows and the difference in migration potentials, as



mentioned above. Most of the migrants originated from the European part of Russia, in particular from the neighbouring regions. In the second half of the 1950s, immigration to Estonia decreased substantially, however, the intensity remained high in a European perspective (Figure 1).

With relatively well developed infrastructures, Estonia became a cost-effective setting for the development of branches of all-union economy. This brought about rapid growth of new work positions that could not be filled by local population that had decreased during the war period. The decrease of the Estonian population was further aggravated by deportations and

<sup>1</sup> This paper was prepared by Luule Sakkeus and coordinated by IKU for the project *The Brain Drain — Emigration Flows for Qualified Scientists*

arrests. Societal rearrangements of the new political regime were typically carried out by foreign-born population, administratively directed to Estonia. A third channel of increase of immigration was militarization of Estonia including the corresponding infrastructure. Today, the Estonian population is about 10% below the pre-war number.

The late 1960s brought a new wave of immigration that reflected the expansion of the hinterland towards more distant regions, including eastern and southern parts of the Soviet Union. Compared to earlier immigrants, the new ones had few if any historical contacts with Estonia and came from socially and culturally diverse environments, strengthening significantly heterogeneity among the immigrant population itself.

During the second immigration wave, the intensity of international migration, measured by gross migration rate, grew as high as 1.6-1.7. Then, there was a decrease by more than one fifth, after which the gross migration rate declined with the lower rate down to 1.2-1.3 by the end of the 1980s. Since 1988, the decrease accelerated and low rates (compared to the previous decades) were characteristic throughout the 1990s.<sup>2</sup>

## 2. Foreign-Born and Population Heterogeneity

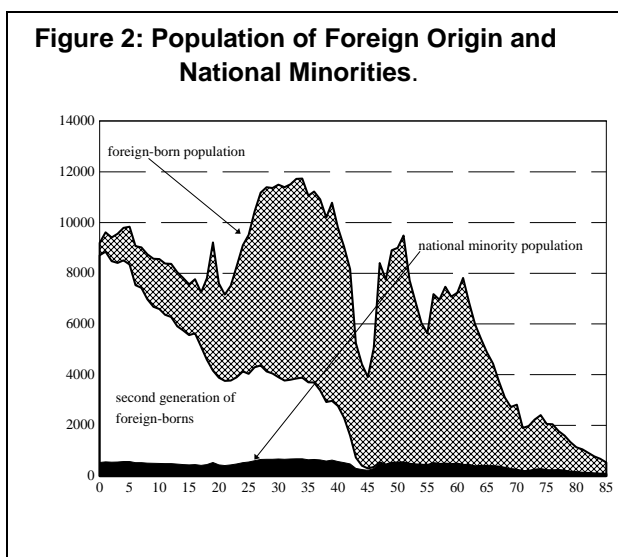
Extensive flows of international migration have resulted in foreign-born accounting for a large share of Estonia's population — in the total population of Estonia, foreign-born account for more than one third, one of the highest representations in the European context (Figure 2).

The 'first generation' of immigrants accounted for 26% of Estonia's population and closely follows that of Luxembourg. This was higher than the corresponding share in Latvia or Switzerland and almost three times higher than in countries like Germany, Austria and Belgium [Council of Europe 1993-1999]. Due to this remarkable proportion, and even more importantly because of the divergent population patterns, the population of foreign-born

requires particular attention whatever demographic or social process in Estonia is considered [Katus, Sakkeus 1993].

The age structure of the foreign-born population reflects the variation in migration flows and reveals the extensive instability with up to threefold differences in neighbouring age groups. Also, in the age groups with the highest concentrations of immigrant population, their proportion accounts for almost half of the total population. Among others, intensive immigration had restrained population ageing in Estonia for several decades. Since the 1990s, however, numerous immigrant population cohorts are already reaching old age, and bringing about the period of very rapid ageing together with all the implications on societal development [Katus et al. 2000].

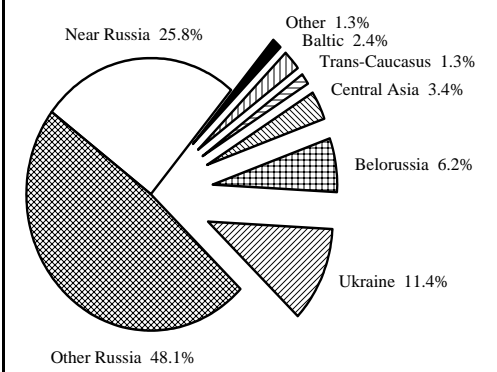
The composition of foreign-born population by their home region is reflecting the migration



<sup>2</sup> Official migration statistics for the 1990s are not consistent with the previous period(s).

hinterland including its extension since the 1960s. As a result, only one fourth of the foreign-born originate from the near Russia or the initial hinterland of the 1940-1950s, i.e. five neighbouring oblasts (regions) and St. Petersburg (Figure 3). Enlargement of the hinterland to East and South of Russia involved all the variety of different regions up to North-Caucasia and Siberia, which together accounted for almost half of the immigrant population in Estonia. Ukraine and Belorussia together form another fourth, increasing the divergence in Slavic origin. Noticeably, the share of Central Asia has been comparable with the share originating from the Baltic countries.

**Figure 3. Country of origin of foreign born population.**



The wide coverage of home regions has resulted in a huge variety in the ethnical background of immigrant population. In the 1989 Census, 120 ethnicities were enumerated, differing by social, cultural and historical background [Viikberg 1999]. Still, over 80% of the immigrants are of Slavic origin (Russians, Ukrainians and Belorussians). The ethnic dimensions coincide with the distinction between native-born and foreign-born populations. This correspondence stems from the fact that in the course of the WW II, Estonia lost most of its national minority population and ethnic Estonians accounted for 97.3% of total population by 1945. Thus, the non-Estonian population represents mostly the first- and second-generation immigrants with the exception of Russian and Ingerian<sup>3</sup> national minorities (40,000 and 30,000, respectively).

Another dimension of population heterogeneity is related to language. The immigration has brought along the growing variety in population mother tongues. However, the language diversity appears considerably below the variety in ethnicity. Typical of an occupied regime, the unification in mother tongues does not imply the transition to the local language but the dominance has been gained by the Russian language.

The same trend is visible in the knowledge of second language. The immigrant population demonstrates low knowledge of the local language, including the second generation of immigrant population. Another diversity is introduced by religious affiliation. Although data on religious affiliation is very scarce, aside the Orthodox also the Moslem affiliation is remarkable.

Regarding the future of immigrant population, the process of integration is likely to take a long time. On one hand, there is no clear preference towards integration by a significant part of immigrant population; on the other hand, return migration intentions are low. In reality quite a large proportion look forward to re-establishing the previous geopolitical situation.

Among the immigrant population with later timing of demographic transition, there are distinct patterns in many, if not all demographic and social processes [Katus 1997a; 1997b; Katus, Puur 1992; Katus, Puur, Sakkeus 2000a; Katus, Sakkeus 1993; Katus et al. 2000; Puur

<sup>3</sup> Ingerians are a Finno-Ugric nation, which inhabited the region from Narva River (on the Estonian border) to Neva River (nowadays St. Petersburg). Their land was called Ingermanland (inherited from Swedish rule) and they had during the Russian Empire their own gubernia also called Ingermanljandskaya. They were expelled from their own territories during the Soviet repressions during the 1930s and in particular during the war, part of them resided in Estonia (therefore we call part of them national minority or even rather regional minority). They in their own language transcribe themselves as Inkeri, sometimes in English they have also been called Ingrians.

1997; Puur, Sakkeus 1999; Sakkeus 2000; Vikat 1994]. According to the research results, it might be concluded that there is no clear evidence of convergence of behavioural patterns in demographic processes, which on their turn affect the development of various other social processes. For that reason the average for the total population in Estonia tends to be meaningless as a rule, presenting the mechanical aggregation of the two different populations.

Restoration of Estonia's independence in 1991 halted the immigration streams from previous Soviet Union. However, it did not introduce significant emigration counter wave. Unfortunately, the migration registration system also collapsed in the 1990s and the collected data on migration has produced a statistical artefact, in particular reflected in the emigration data for the years 1992-1993. In Estonia, territories had been regarded as part of the Soviet Union and had extraterritorial units for army on its territory. When Estonia restored its independence, these territories became automatically territories of Estonia. In the beginning of the 1990s, the Soviet Army started to recall its personnel which ended by the bilateral agreement in 1994. Those who left Estonian territory were included in the migration statistics, although they had never been included in the Estonian population or incoming streams in the first place. That further distorted migration data of the 1990s. In 1998, the Estonian Department of Statistics officially declared it discontinue collection of migration data. Thus, data provided for migrating higher educated persons in 1990s are of limited use to gain an understanding of more recent flows.

### **3. Implications of Long term Immigration for Scientific Personnel**

One of the main implications of the post-war demographic trends to the scientific sphere is the ageing population. The fact that Estonia has one the highest proportions of foreign-born population in Europe (26% [Katus, Sakkeus 1993]) has had only a minor effect on scientific personnel. According to the 1989 Census, only 15% of the scientific personnel were foreign-born and typically engaged in the imported all-Union scientific structures. The intermediate scientific structures imposed by the centrally commanded (mostly of military origin) ministries of Soviet Union were not integrated into the local scientific environment and thus, with their withdrawal, the personnel left. Thus, the emigration to the East had little impact on the national scientific structure.

Emigration flows to the West continue to be low in Estonia. Mostly the background to it lies in the early demographic transition of the Estonian population. The Estonian population, having passed the period of demographic transition, does not have migration potential in its population structure, including the population engaged in science. Most of the emigration is composed of persons in family migration and/or persons of lower education. In contrast, the impact of temporary emigration has increased significantly. In the 1994 survey of Research Personnel, attempts were made to estimate the volume. The aim was to evaluate the patterns of temporary migration: direction; volume; identification of competing regions; and, to evaluate trends in Estonia with other East European countries (referred to in the overview of the results of the survey on real and potential migration of scientific personnel).

### **4. The Economic Situation in Estonia**

In Estonia, as elsewhere in Central and Eastern Europe, the period of relative stability in societal conditions came to an end at the turn of the 1990s. The recent transition has implied

the departure from previous economic isolation, adjustment to world prices, diversification and reorientation of trade flows, substantial influx of foreign investments etc. As a result, former closed economies have become more integrated, and at the same time more dependent, on the developments on the global scene. From the viewpoint of the national economy, adjustment to new realities has necessitated extensive restructuring which has involved substantial declines in previously favoured economic sectors (primary and secondary sector mostly), on one hand, and the emergence and expansion of new/other sectors on the other hand. Aside from sector shifts, there have been significant changes in the demand for particular skills, reallocation of jobs from large to medium and small enterprises, re-emergence of self-employment, diversification of work patterns and so on.

For individuals, the recent transition has implied the loss of previous lifetime job security. The sudden increase of uncertainty is most vividly manifested in decline of employment opportunities and upsurge of unemployment. In most countries of Central and Eastern Europe, the unemployment rate stays near or above double-digit levels (EC 2000a). Similar to the experience of developed market economies, the recent transition has increased the significance of knowledge and information and this is reflected in the resumed growth in education enrolment. However, compared to the former situation, the social safety net and welfare policies in CEEC provide much less to those who have failed to keep up with the pace of change.

When one considers the transition in Estonia against the general experience of Central and Eastern European countries, several features are noteworthy. First, as a member of the former Soviet Union, Estonia's starting conditions were less favourable than in countries like Czech Republic, Hungary, Poland and Slovenia. Due to former close integration, it caused even greater shock. At the same time, the transition needed to take place in parallel with the re-establishment of national institutions. In the 1990s, Second, Estonia opted for a rather radical economic reform, placing few obstacles in the way of price adjustment, international trade, privatisation and foreign investment (Lugus and Hatchey 1995). Liberal economic policies were paralleled with the introduction of remarkably low payroll tax, minimum wage, unemployment benefits and pensions as well as short notification of displacement.

The combination of relatively disadvantaged starting position and the absence of attempts to withhold inevitable changes have resulted in relatively quick structural adjustment in Estonia. Measured by the gross sector shift, for example, only Hungary had greater reallocations of employment between sectors. According to the share of tertiary sector, often used as an indicator of modernisation, Estonia, together with Hungary have reached the levels observed in several countries of the European Union (EC 2000b).

As an implication of the trends in economy during the transition period, the development of science in that context should be borne in mind when evaluating the impact of the changes. Having initiated the independent line of economic development already in the framework of the entity of the Soviet Union, the development of science in Estonia at the early stages of transformation was hampered the reduction of available resources. This made inevitable the quick restructuring in the scientific area. Although funding has not been halted, the proportion allocated for development of science has remained one of the lowest among all the East European countries.

The year 1992 was the severest year for the Estonian economy characterised by the deepest decline of GDP, sharpest decline in the export volumes, highest inflation rate, and decline in private consumption due to a significant loss of savings. However, it was also a turning point

for the Estonian economy, which was initiated by the currency reform in the middle of 1992 and further liberalisation policy, enabling the development of private ownership with speed and rapid orientation from Russia's market to western markets in foreign trade. Thus, it also affected the restructuring of the scientific sphere. Until 1992, almost half of the funds for science outside of Estonia still came from Russia, which together with the currency reform came to halt and made science reorient itself, seeking other sources for funding.

The educational structure and potential of the population of Estonia have to be remarked upon. The high literacy rate in Estonia (94.3% of total population aged 14+ could either read or write) was reported already by the 1881 census. The referred literacy level was typical to Baltoscandian region and exceeded that of several West European countries (Reiman 1937). The expansion of school enrolment continued in Estonia until the late 1960s, with each next cohort reaching higher attainment of secondary and tertiary education. The upward trend in tertiary education, however, came to a virtual halt at the end of the 1960s, and the 1970s and 1980s witnessed stagnation in the proportion of graduates from university or its equivalent. Recent statistics on educational enrolment indicate that the progression rate towards higher education rose sharply during the 1990s. At the end of the 1990s, students accounted close to 40% of the age group 20-24 (ESA 2000). Progress towards a knowledge-based society has been remarkably rapid in the field of communication infrastructure and access to Internet.

## **5. The Reform of the R&D System in Estonia**

The reform of scientific establishment in Estonia was already underway in the period of declaration of sovereignty of Estonia (November 1988) in the framework of the entity of Soviet Union. The first stage of the reform of science in Estonia was aimed at introducing new principles of research funding, at building up a system of science councils and expert commissions and drafting the basic documents for the new structures. At the same time a thorough evaluation of science in Estonia, at first, of research projects (1990-91, carried out by Swedish experts) and then the institutions (1994, conducted by local commissions) was carried out. The reform of the whole research establishment created during the years of Soviet occupation was being prepared. This stage ended in December 1994 with passing the Law on Research and Development and the Law on Universities in the Estonian Parliament (Riigikogu). At the same time, the restructuring of the institutional system of science was underway.

The first question was the reorganisation of the budgeting system by introducing financing of the research projects and researchers in the form of grants. Another significant issue was the reorganisation of research establishment and the status and functions of the Soviet-type Academy of Sciences in the new economic and social environment. The third key target was the reform of the higher education establishment, the professional training of researchers in the new environment and the reform of the system of academic degrees.

The restructuring of science funding saw that during the transition period, institutions engaged in fundamental research must be guaranteed certain basic funds. At the same time, the practice of grant awarding should be developed gradually. Since 1993, the percentage of grants in total funding has increased with every year reaching 28% in 1995.

Between 1990 and 1994, considerable changes took place in the research system of the Estonia, mainly with respect to the former branch institutes and other sector research institutions. During the first years of restructuring of the Estonian industry, most of the independent

scientific research organisations as well as construction and technology units at various enterprises changed their field of activities and form of organisation. As well, ten new research establishments came into being owing to disintegration of the "mother-institutions".

Although comparative data is scarce and only some countries can be compared by the structure of scientific fields over ten years, the available data reveal that Estonia has had different structure of scientific fields as compared to Latvia, Slovenia, Poland and Bulgaria over the time. Estonia is characterised by the far larger share of social sciences together with humanities than all other countries under comparison.

The decrease of the number of people working in the sphere of science as well as the number of researchers and engineers (in Estonia) has been considerable. Among Baltic countries, the decrease in the number of researchers was the least in Estonia - 29% between 1990 and 1994; in Lithuania it was 57% and in Latvia - 83%. The age distribution of research personnel during the period 1983 to 1993 was somewhat alarming: the share of aged researchers had been growing constantly and, correspondingly the share of people under 40 years had decreased. It is a serious problem which reflects the change of preferences of young people. However, it also corresponds to the general trends in the population development where Estonia is showing rapid ageing trends. In 1994, the number of research personnel demonstrated a small increase, but it was due to the widening of the scale of institutions taken into account rather than an increase of the number of personnel. The reduction trend continued until 1995. Up until the end of 1990s, the proportion of scientific personnel compared with the total working age population has stabilised around 4.2 to 4.3 ‰, and is significantly lower than in advanced European countries. However, the figures for Estonia are similar to the situation in Slovenia, and exceeds that of Hungary, Czech Republic, Spain, Italy, Portugal and Greece (OECD, 2001).

It is still fair to say that policy for development of science has not yet been worked out [Martinson 1995]. The function of the Parliament is confined to drafting some (minimum) amount of money in the state budget for research. The Government's attitude has been mostly pragmatic: researchers must concentrate on current needs, on research supporting national economy and solving local problems. Basic research which demands large investments in equipment and supplies is not feasible for Estonia. The understanding that a state innovation system backed by state priority programs must be developed has not yet matured. The restructuring of industry has led to disintegration of large enterprises and to an almost total absence of demand for science by the newly shaped enterprise sector. Funding of science from the business sector has been very low since the transition period. Even in the end of the 1990s, the main funding resources came from public sector, whereas business sector comprised only 24% and funding from foreign funds constituted around 9% 1999. It will slow down the process of transition from a mainly academy- and university-based science to a science-based technology and goal-oriented research science. Science in Estonia in many fields is highly competitive judging from the viewpoint of international scientific community. There are a number of research groups in Estonia doing high-level research in the fields of condensed matter physics, astrophysics, chemical physics, molecular biology and genetics, as well as geology, biochemistry and other fields. This is shown by the greatest number of EC, ISF and other grants per capita in comparison with the other Eastern European countries, by comparatively high citation index and by electing our scientists members of international organisations [Martinson 1995].

## 6. Mobility Patterns of Estonian Scientific Personnel

The information presented in this section on the mobility trends of higher educated population is based on the survey on Scientific Personnel, carried out in 1994 in the framework of the COST A2 joint project for East European countries. This project evaluated the impact of the first transition years on *real* and *potential* migration of scientists.

### 6.1. Findings of Real Migration Survey of Scientific Personnel

The results from the *real migration survey* provide evidence that during the transition period the sphere of science experienced intensive personnel's mobility. Behind the intensive mobility lies the objective restructuring process in Estonia focused mainly to uniting basic research and higher education. This is certainly reflected by the higher exit rate from academic institutes compared to universities. Data from official statistics for 1994 indicate that this process is coming to an end. Another relevant feature of the transition period is the springing up of new scientific structures on non-governmental or private initiatives. Estonia is distinguished among all the countries under investigation by having the greatest proportion (58.8%) of personnel who have left research establishments under investigation for another scientific institution, especially non-governmental and private institutions gaining significant shares in the science restructuring process — this is the highest proportion having remained in science compared to all other countries. After Estonia, the Slovak Republic (39%) and Czech Republic (34%) have significantly lower proportions in this category. This shows the effect of liberalisation policy typical to Estonia its transition towards market economy, one that has enabled new structures to develop in a relatively short period.

Reorientation of the funding system from a state budget-orientation to a research project-oriented grant system has laid the grounds for continuation of research no matter its institutional ownership. It might be revealed that no matter the very restricted funding of science (allocations for science form the lowest proportion of GDP among the countries under investigation) during the transition period (or maybe exactly because of that) it has not produced the flight from science, but rather helped to restructure science in a more efficient and quick way. Estonia is distinguished by having one of the lowest levels of unemployed among the personnel who have left scientific institutions. That corresponds to the overall policy of Estonia towards unemployment, where the benefits are kept at a very low level and in general the unemployment rates for Estonia are comparatively low even for the real unemployment (10-12 percent [Puur 1997]).

The significant proportion of those who did leave during the transition period to take up a job in a foreign country must also be considered. Estonia stands third after Romania and Poland in terms of the share of scientific personnel having left to go abroad. Among those who have left, almost 65% are continuing their scientific work (as high as 81% in engineering and technical sciences). It is among the engineering and technical sciences, there was a greater share of older persons, persons with longer work experience and a higher proportion having a Ph.D. or higher degree. The youngest have left natural sciences, among who the share of those engaged in non-scientific work is also proportionately the greatest. Almost half of those who have left are in neighbouring Scandinavian countries which are geographically close and characterised similar to Estonia's environment. Whether this phenomena for Estonia means brain drain or brain exchange is hard to decide upon with the limited data. The 1994 survey, which over sampled one university (temporary 'foreigners' from one university comprise almost half of all the category for the year), suggests the exchange phenomenon.

The survey reveals that Estonia is characterised by a big turnover of 30-34 year old scientists who have not yet thoroughly established in their research environment and thus are actively mobile between new emerging structures of science. The peak of Estonian scientific personnel's exit is among the younger cohort compared with all other countries under investigation; the same cohort also contribute to those leaving to go abroad. Somewhat older and more experienced research staff are contributing to the restructuring process between academic institutes and higher education establishments. The survey suggests the 45-49 age cohort among the researchers are the least mobile and 'carry' the scientific community in Estonia.

The transition period brought about another effect: science lost those scientists and researchers who had not established themselves: these former scientific personnel are characterised by the lesser frequency of international contacts, greatest proportion without any specific research position, lesser proportion among them with Ph.D. or higher degree.

The restricted economic situation reduced (and replaced) those scientists who were not established with an older age structure and lesser qualification. An almost 30% reduction of scientific personnel resulted in gaps in the age structure and a discontinuity for some fields and disciplines. Thus, the lowest allocation of resources to science in Estonia, compared to other countries, has contributed to the ageing of the scientific personnel to a great extent. If this trend is going to continue it might produce a discontinuity of generations involved in science by the most active personnel leaving and new generation not entering. The latter bears the worst impact on science in Estonia — all of the positive effects of a quick and efficient transition could be lost.

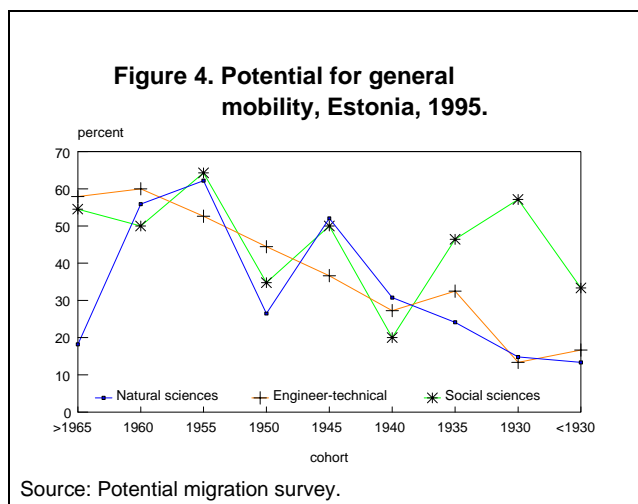
## 6.2. Findings of the Potential Migration Survey

In general terms, the *potential migration survey* supports the notion that Estonian scientific personnel have low potential for mobility, due mainly to the age structure. Research personnel of Estonia, having been reduced during the transition period by 30% and owing to the general advancement of ageing process in its population, has in principal in its composition no potential for intensive mobility. With the restricted funding of science during the transition period, there was a reduction in the proportion of new generation among the research personnel (e.g. their entry to the system halted due to low funding). Even the significant proportion of postgraduate students nearly 30 years of age suggest a late start to independent research. All these factors taken together have resulted in Estonia having one of the oldest research communities among the East European countries, and with a significant proportion of those who have worked in the scientific field most of their working life. This means a general low potential for any kind of mobility, whether in direction towards foreign countries or inside the country.

The survey offers the possibility to envisage the volume, direction and pattern of the scientific community under investigation, on condition that all circumstances would favour the realisation of potential migration. Although improbable from the viewpoint of real behaviour, as a warning, the scope of total potential mobility can be brought out by three main scientific fields (Figure 4).

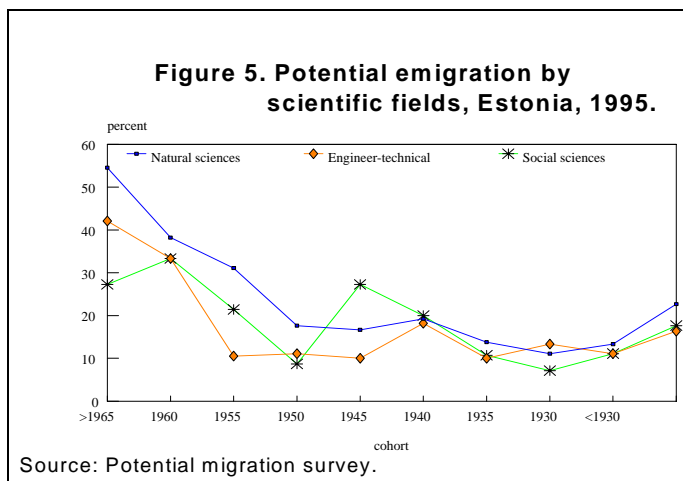
Social sciences are showing the highest probability of potential mobility with 44.4%, if evaluated by the readiness of changing their current employer. However, although the potential abroad rate is comparatively high as well (17.1%), the major part of the potential is going to realise rather inside the country. Another difference from other fields of science is that the

potential for mobility has not significantly concentrated into some particular ages, but is spread among all age groups. The general mobility is more affecting the most active cohort born in 1955 to 1959 (total potential of the cohort is around 65%). The potential for emigration is mostly borne by the cohort of 1945 to 1949, so far having been the most stable cohort, if compared with the data from the real migration survey. This potential remains relatively high for all older cohorts, where social sciences form an exception from other fields of science.



Natural sciences are following with the general mobility potential of 36.1% among all engaged in this field of science. Among them, most mobility is intended towards foreign countries (22.2%), especially falling to all the younger cohorts. Thus the mobility of natural sciences is more the problem of the young, the emigration intention concerning in the youngest cohort more than half of them (54.5%) (Figure 5).

Engineer-technical sciences follow the pattern of the other scientific fields with 35.1% showing potential mobility. However, as this field of science is already characterised by a significant discontinuity in their age structure, the potential is among the very youngest (the only field, which has relatively high proportion of the youngest research personnel) and the oldest (this group also has the highest proportion of the oldest personnel). It is hard to believe that such a potential may be realised



— in some cases, it would involve more than 60% of the cohort engaged currently in science.

Estonian scientists are older and have work experience in the field (length of time). This means that science has the core personnel which in turn determines its field of activity. Thus, considering the relatively later onset of the transition period in Estonia, the fairly high integration of Estonia's research personnel in the international scientific community comes as no surprise. Evidence of this can be found in a higher proportion of those involved in joint international projects, and a high proportion of international contacts whether having been abroad by fellowships or by short-term contracts in its own speciality. Even the amount of publications abroad is higher than the average per scientist in Estonia, especially if one takes into account the fact the opportunities have been available only since 1991. The scientific environment of Scandinavian countries together with their geographic proximity, insignificant language barriers and similar environment as a whole have contributed to the lessening of the potential of real emigration.

### 6.3. Conclusions From the Surveys on Scientific Personnel

In general, the surveys show the main orientation of the mobility, whether realised or potential, is highly oriented towards science. The lack of correlation between the relatively high emigration rate in the real migration survey and the very low potential of this mobility direction in the potential migration survey needs to be considered carefully. Estonia differs from other East European countries by the age composition of the real emigration. The age structure of emigrants does not correspond to the initial demographic potential in these age groups. Although the emigration rate from real migration survey is high, it did not result in the relevant gap in the scientific personnel's age structure in 1995. It seems that the significantly different age structure of those who have emigrated from Estonia during the transition period from all other countries under investigation, especially regarding the main peak in the ages 30-34, needs more study.

The potential migration survey provides some insight into the category of those who can be regarded as firm emigrants, but due to the very low potential, it does not offer a full answer. However, a general explanation might be that regardless of the high proportion of emigrants they add to the significant flow of temporary exits into the international scientific environment, and in the end contribute to the new structures emerging in Estonia's science. The latter statement is based on the very high proportions of short-term (up to 6 months) outflows (e.g. fellowships abroad, in connection with joint research work or part-time employment). In the real migration survey, a sample of those who have a valid working contract with their home institute but are currently abroad account for almost two thirds of the emigration flow and show the high rate of turnover of the international contacts. The proximity of Scandinavian countries and the intensity of contacts with these countries suggest that the emigration might be evaluated as a part of brain exchange process between these countries. Given the real migration survey did not take into account the entry and re-entry process into the scientific institutions during the investigated period, it is difficult to evaluate how many of the "emigrants" returned. The age structure of the research personnel suggests that the reduction of the personnel was due primarily to the lack of young persons entering this field of activity.

The trends in real migration indicate that science has lost quite a proportion of the older personnel, whether by retirement (not revealed in the survey data) or emigration and internal migration. However, due to the advanced ageing process the research personnel by 1995 has still become older. Internal migration reveals that persons who opted fields of activities outside of science tended to be less qualified and older compared with the young non-experienced personnel. In terms of the lower proportion of women engaged in science in general, the real migration trends have not generated any disproportionate results based on gender.

The turnover of personnel inside the science is, according to the survey data, quite insignificant. The data from real migration survey signals towards the high competitiveness of new scientific structures. The structure of the personnel emigrating or moving into new science structures is by all population characteristics very close. However, the potential migration survey indicates, that never mind the highly research-oriented personnel who has remained in science, in its orientations (although potentially) they are much more regarding the possibilities of leaving into non-research areas and private initiatives than the data from real migration has brought out.

The Estonian data mainly refers to basic state research institutes: main universities and academic institutions that account for more than 85% of the research personnel. Both data

sets reveal that the restructuring process has in the first place concerned academic institutions in all aspects: real migration intensities have been higher, reduction of personnel towards more research-oriented more visible, international contacts more intensive. The process is understandable because academic institutes were orientated more towards fundamental research during the Soviet period. The reform of the R&D system in Estonia first focused on the academic institutions. The academic institutes benefited from this — their age structure being relatively younger and in a formal sense, more qualified. However, the potential migration survey indicates that the process has also intensified among personnel in universities. Nevertheless, if one evaluates their integration into the international research community, their orientation mainly towards training becomes evident, the basic difference in orientations of these two types of institutions.

The project revealed that Estonia is in quite a different position compared with that of other East European countries in a number of respects. Belonging to the group of countries whose transition towards open society started relatively later, Estonia still belongs to the forerunners in the science reforming process and the rate of integration into international research community has been very high compared to the short period of its openness. In general terms, the effects of the transition period lean towards the high speed and effectiveness of restructuring processes in the country. Estonian research personnel have become more homogeneous, research oriented and, in general, the loss effects have contributed to the better qualified and experienced personnel's formation in scientific community. In that sense, the severe economic restraints of the period, have to some extent had rather a positive effect. That said, one of the key negative effects has the cease of entry new and young personnel into science. If this trend continues, the positive might turn into a problem, a basis for a discontinuity that science is not going to recover from. The balanced reproduction of human capital is the crucial point in the general development of a little country which is demographically advanced. The low potential of mobility is the result of demographic development of the population and indicates that reduction due to transitional effects can no longer be realised. Ageing of the Estonian research community undoubtedly leads to its further reduction but by the demographic processes. Estonia stands before the task to rejuvenate science, if the country wants to maintain the international competitiveness of its human capital.

## **7. Recent Trends in Migration of the Higher Educated Population in Estonia.**

It is useful to have some insight into how the two groups — foreign-born and native origin — can be characterised in the terms of educational attainment. In the earlier discussion, it was pointed out that the scientific personnel in the academic institutions were typically native-born and for that reason, there has not been significant brain drain during the transition period in Estonia.

The Estonian Family and Fertility Survey (EFFS) provides information on educational attainment (Katus, Puur, Põldma 2002). Analysis of the data tells us of significant educational differentiation between foreign-born and native-born and among the age cohorts. Among the foreign-born population, a greater share among the older cohorts are illiterate which reflects their later onset of demographic transition and corresponding transition in the sphere of education, the share of higher educated population is also higher, in particular in the older birth cohorts. The answer to such a big differentiation lies of course in the underlying trend of the post-war immigration into Estonia, which often was including party personnel and employees for high-level administration in order to impose the Soviet order to the local

population.

Starting with the birth cohort of 1924-1928, the difference between native and foreign population cohorts turns in the favour of native population in respect of proportion of higher education attained. In particular, the difference is expanding in the younger cohorts (those born in 1960s and 1970s). This may also reflect the orientation of the foreign-born population towards acquiring higher education in Russia rather than in Estonia, due to the language barrier. This also means that a higher proportion of those who acquire their higher education outside of Estonia tended to remain there. This also brings out the problem of the future integration trends, which suggest non Estonian-oriented educational attainment among the foreign-born population.

The authors of the cited analysis also bring out an interesting gender differential. It has been widely acknowledged that the Soviet economic structure did not favour higher educated population (especially it was reflected in the differences of wages in favour of blue collar workers) and thus the overall trend in attainment of higher education turned to more women graduating from these establishments. However, this differential does not apply among the foreign-born population in Estonia, most probably owing to the selectivity in immigration trends.

As to the main specialities, the differences among native and foreign origin population are even more distinct and may indicate segmentation of labour market during the Soviet era. For example, compared with the native-born, there is almost more than twice the proportion with technical or technological specialisation among foreign-born. This might partly explain the significant reduction in technical sciences and its personnel in the science sector, in particular, if to bear in mind that this sector was mainly funded by business sector during the Soviet era, which totally collapsed in the first years of transition.

There is information available on the migration of higher educated population of Estonia at the turn of the 1990s. However, it must be cautioned, that the data reflects the volumes which initially were not recorded in Soviet statistics. Up to 1991, the trend of higher educated personnel in migrations indicates a positive balance towards immigration into Estonia. Since then, there has been a general turnaround in the migration directions. Emigration of the higher educated population indicates towards reduction of the streams as well as the net outcome. Although no long officially recorded, recent years indicate a turnaround in the migration streams and according to the data from Ministry of Interior immigration is again prevailing. However, Estonian statistical data does not include, for example, the descendants of post-war refugee Estonians, mainly originating from Western countries, who have returned to their motherland and found their often jobs as counsels in the process of restructuring the Estonian economy. Because of this and other reasons, the inflow of highly skilled population is very difficult to estimate for the transitional Estonia.

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