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Quarterly Bulletin of Statistics Estonia

Today's teacher Laur

Compilation of activity status

International Survey of Children's Well-Being

Partnership index

Occupation and source of income in population censuses

1/2018

Quarterly Bulletin of Statistics Estonia

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STATISTICS ESTONIA

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EXPLANATION OF SYMBOLS

…	data not available or too uncertain for publication
..	category not applicable
x	data are confidential
M	males
F	females

The publication is based on Statistics Estonia's data, unless specified otherwise.

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CONTENTS

NEWS PICKS FROM THE FIELD OF STATISTICS

Reduction in the number of first-time asylum applicants in the European Union

Robert Müürsepp

The picks are based on recent Eurostat data[a].

In 2017, there were 650,000 first-time asylum seekers who applied for international protection in the Member States of the European Union (EU). This was just over a half of the number recorded in 2016, when 1.2 million first-time asylum applicants were registered. Syrians submitted the most applications (102,400), followed by Iraqis (47,500) and Afghans (43,600). Germany accounted for the highest number of first-time applicants in the EU Member States (198,500, or 31%), followed by Italy (20%), France (14%) and Greece (9%). In Estonia, the number of first-time asylum applicants was 180, including 44 Syrians, 15 Russians and 10 Ukrainians.

The ratio of first-time asylum applicants and the population indicates that the number of first-time asylum applicants in the EU was averagely 1,270 applicants per million population. The highest number of first-time applicants relative to the population was recorded in Greece: 5,295 applicants per million population, ahead of Cyprus (5,235), Luxembourg (3,931) and Malta (3,502). In contrast, the lowest numbers were recorded in Slovakia (27 applicants per million population), followed by Poland (79) and Portugal (98). Estonia was one of the countries with the smallest share of first-time asylum applicants: 138 applicants per million population.

At the end of 2017, there were 927,300 asylum applications still under consideration in the EU Member States, of which Germany accounted for 48%. Germany was followed by Italy (16%), Austria (6%) and Sweden (6%).

The wealthiest and the poorest region in the EU differ by 20 times

In 2016, regional GDP per capita was the highest in Inner London - West in the United Kingdom, reaching to 611% of the EU average), followed by Luxembourg (257%), Southern and Eastern region in Ireland (217%), Bruxelles/Brussel in Belgium (200%) and Hamburg in Germany (200%). There were 19 regions with GDP per capita 50% or more above the EU average: five were in Germany, three in the United Kingdom, two in Austria, one each in Belgium, the Czech Republic, Denmark, Ireland, France, the Netherlands, Slovakia and Sweden, as well as in the Grand Duchy of Luxembourg.

The GDP per capita was lowest in Severozapaden in Bulgaria: 29% of the EU average. The following lowest regions in the ranking were Mayotte in France (33%), Severen tsentralen and Yuzhen tsentralen in Bulgaria (both 34%) and Nord-Est in Romania (36%). In total, there were 21 regions with GDP per capita less than a half of the EU average. Of these, five were in Bulgaria and Poland, four in Hungary, three in Romania and Greece and one in France. In the whole EU, there were nine countries where there were no NUTS (Nomenclature des Unités Territoriales Statistiques) Level 2 regions, where the regional GDP per capita would reach the EU average: Bulgaria, Croatia, Cyprus, Estonia, Greece, Latvia, Lithuania, Malta and Slovenia.

In 2016, Estonia's GDP per capita was 75% of the EU average. The corresponding indicators among our neighbouring countries were the following: Latvia 64%, Lithuania 75%, Finland 109% and Sweden 123%. At state level, the wealthiest Member States were Luxembourg (257%), Ireland (183%) and the Netherlands (128%), the poorest Bulgaria (49%), Romania (58%) and Croatia (60%).

[a] http://ec.europa.eu/eurostat/documents/2995521/8754388/3-20032018-AP-EN.pdf/50c2b5a5-3e6a-4732-82d0-1caf244549e3
http://ec.europa.eu/eurostat/documents/2995521/8700651/1-28022018-BP-EN/15f5fd90-ce8b-4927-9a3b-07dc255dc42a

TODAY'S *TEACHER LAUR*

Marti Lillemägi

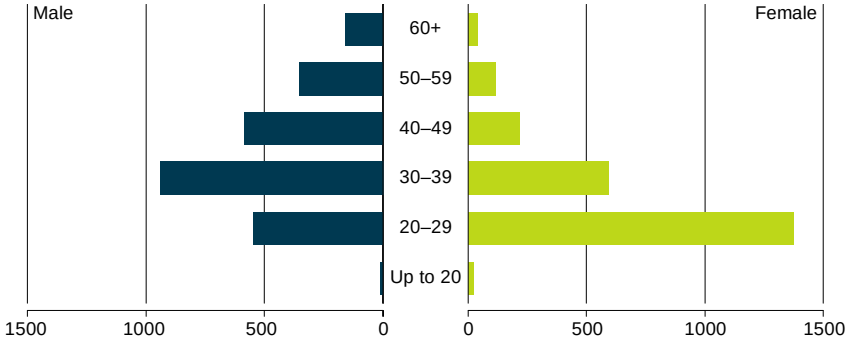
Teachers in Estonian general education schools are mostly women and Estonia ranks among the last in Europe in terms of the share of male teachers. However, a balanced education landscape requires both male and female teachers. This article gives an overview of male teachers in Estonia today, the reasons preventing men from choosing a teaching career and potential consequences of the lack of male teachers.

Introduction[a]

Teachers play an important role in setting the course of our lives and have a major impact during childhood and adolescence. For Estonians, an equivalent of a great teacher is *teacher Laur*, a character from the popular book *Kevade (Spring)* by Oskar Luts. He was kind and understanding, taught the students the basics and supported them through difficult times. More than a century has passed since the events described in *Kevade*, and over time there have been many changes in education in Estonia. Besides nicer school buildings and overall increase in the educational level of the population, the profile of an average teacher has changed.

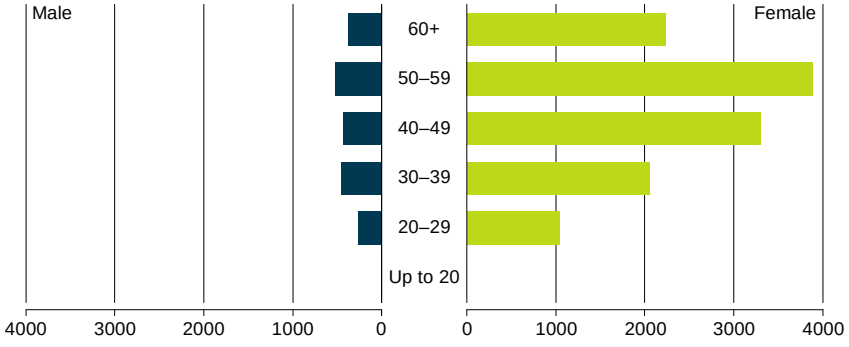
The first official statistics on Estonian teachers date back to academic year 1922/1923, or a couple of decades after the time of the events described in *Kevade* (Figure 1). The data collected by the State Statistical Central Bureau reveal that back then there were a total of 4,987 teachers in Estonian general education schools, and 52% of them were men. Teachers were also relatively young – almost 40% of all teachers were under 30 years old. By contrast, in academic year 2016/2017, general education school teachers numbered 14,581, of whom only 14% were men (Figure 2). Moreover, teachers were significantly older and approximately half of all teachers were aged 50 or older. (Servinski et al. 2018)

Figure 1. Sex and age distribution of teachers, 1922/1923



Source: Servinski et al. 2018

Figure 2. Sex and age distribution of teachers, 2016/2017



Source: Servinski et al. 2018

Therefore, it can be concluded that an average general education school pedagogue is remarkably different from an average teacher a century ago. In the early years of the republic, discussions about teachers brought in mind an image of a younger man like *teacher Laur*, which has by today been replaced by an image of an older woman. However, such a shift over a century in gender balance at schools may affect the quality of education in general.

[a] The analysis is based on the data of Statistics Estonia, Eurostat, Estonian Education Information System and HaridusSilm.

Negative impacts from the lack of male teachers

The lack of male teachers can have a negative effect primarily on male students – in scientific literature, a theory has been evolving for already awhile that the predominantly lower academic performance of boys may be due to the fact that the majority of teachers are female, who are, thus, better at communicating with girls and apply methods that might not suit boys. For example, boys often learn better through visual experiences and, therefore, it is natural for male teachers to use such teaching methods that might improve boys' learning outcomes (Krieg 2005). To gain more advantage of such gender effects, there should be more male teachers at schools (Ammermueller & Dolton 2006).

However, such theories have not been confirmed in empirical studies. Ammermueller and Dolton (2006) failed to prove their hypothesis, when they found that mathematics teachers in the UK did a little better when passing their knowledge to students of their own sex, but similar effect did not occur in the US. According to Krieg (2005), students of the same sex as their teacher do not score better in tests. Carrington et al. (2008) concluded that there was no empirical evidence of improved learning outcome when boys were taught by male teachers and girls by female teachers. Neither did teacher's gender have any significant impact on students' interest and confidence (Sansone 2017). It appears that the overall skill level of teachers is still the most important factor for students (Lahelma 2000).

Moreover, several studies reveal that, compared to women, men can actually perform worse in the teaching profession. According to a study by Krieg (2005), the students of male teachers had 2.7% lower probability of passing a standardised test than the rest of the students. Watson et al. (2017) ascertained that average learning outcomes were better in the classes taught by female teachers than by male teachers. The authors argued that the reason for such differences was the different expectations of teachers – male teachers expected less from their students compared to female teachers and this was reflected in test results. In addition to all of the above, Split et al. (2012) found that the most difficult relationships at schools were between boys and male teachers.

The discussion above may give an impression that the lack of male teachers is not a problem, and instead, their share should be further decreased. However, the situation is not as black and white. Teacher's role at school is not limited to sharing knowledge. Through daily contact with children and adolescents, the teacher influences the development of their worldview and values. Thus, the share of male teachers should be increased not for academic, but for ethical and in a broad sense social considerations (Bullough 2015).

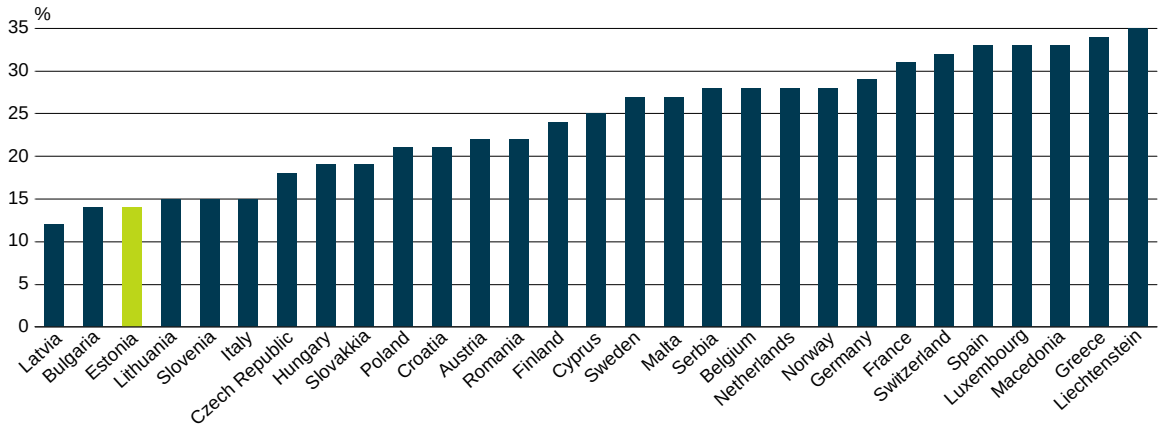
Although there are relatively few men working as teachers, they still have a positive effect on the learning environment at school (Pollitt & Oldfield 2017). According to teachers' trade unions, male teachers are necessary to boost the status of the teaching profession (Lahelma 2000). Furthermore, studies have demonstrated that male teachers are significantly better at using information technology solutions when teaching (Mahdi & Al-Dera 2013). Male teachers represent a positive role model for boys (and girls, though to a lesser extent) – they have a particularly great impact on teenagers and children of single mothers, who see them as father figures (Lahelma 2000). Thus, male teachers contribute to the development of adolescents and their absence has an effect on the entire society.

More effective inclusion of men in teaching is also important to ensure overall teaching quality. Considering that universities do not produce a sufficient number of teachers (OECD 2016), the lack of teachers and the related aging of teaching staff is a major problem both in Estonia and elsewhere in the world. A half of teachers in Estonia are 50 years old or older. The lack of teachers may lead to lowering qualification requirements or an increase in class sizes and teachers' workload, which in turn brings along a lower quality of teaching (Richardson & Watt 2006). If there were as many men in teacher training as women, it would bring significant relief to the problem of teacher shortage.

Estonia stands out with very small share of male teachers

There are still relatively few men among teachers, though. Meanwhile, the large share of women among teachers of general education schools is by far not unique to Estonia (Figure 3). As for European countries, the largest share of male teachers is in Liechtenstein, but even there they account for only slightly over a third of all general education school teachers. Compared to other European countries, it is not looking good for Estonia – in fact, only 14% of teachers in Estonia are men. In terms of this indicator, only Bulgaria and the southern neighbour Latvia lag behind Estonia. Thus, it can be claimed that despite this issue being relatively common, Estonia still has a lot of room for improvement.

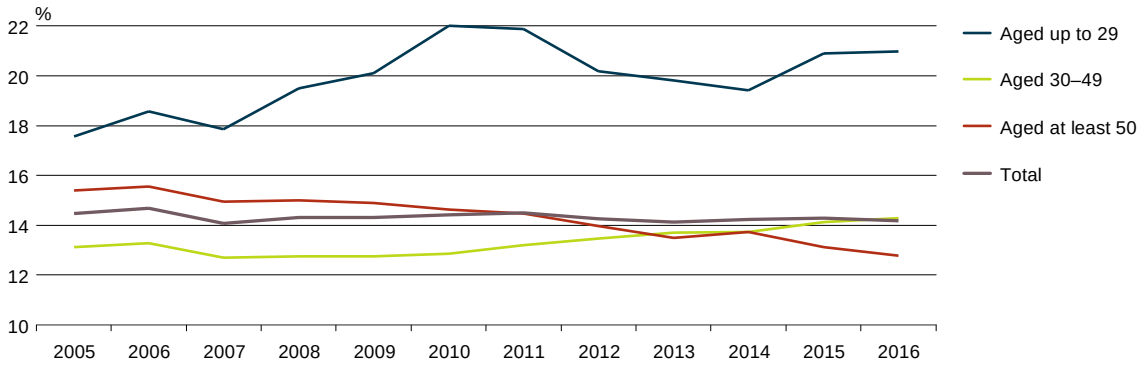
Figure 3. Share of male teachers among general education teachers, 2015



Source: Eurostat

The share of male teachers in Estonia has been relatively stable over the past decade, and on average, one in seven general education school teachers is a male (Figure 4). At the same time, their age structure changes over time. In 12 years, the share of male teachers among young teachers has increased from 18% to 21%. As young teachers get older, there has been a slow growth trend in the share of men among middle-aged (30–49-year-old) teachers.

Figure 4. Share of male teachers by age among general education teachers in Estonia, 2005–2016



By contrast, there has been a slight decline in the share of male teachers among general education school teachers aged 50 and older – whereas 15% of older teachers were male in 2005, the share had dropped to 13% by 2016. On the one hand, this is due to aging teaching staff – the group of middle-aged teachers, which had a very small share of male teachers, is gradually becoming a group of older teachers. On the other hand, it may be assumed that in view of the increasing lack of educators in Estonian schools, the existing teachers are asked to work at an increasingly older age. This, however, may cause an increase in the share of female teachers, because the lower-than-average health of Estonian men forces them to leave the teaching profession earlier than women (EHLEIS 2015).

As there are few young teachers, this age group has a more erratic share of male teachers than other age groups. Yet, it is encouraging that the number of men among young teachers appears to have increased somewhat in recent years – it gives hope that the gender gap among teachers might start to decrease gradually in the future. For a more detailed forecast of future trends regarding young teachers, it is worth looking closer at university graduates in education-related specialties.

Mostly women in teacher training

The specialties taught in Estonian universities in the broad group of studies of education can be divided into four fields of study (Table 1). The field of education science is more oriented towards the scientific side of education and teaching, and as a rule does not produce new teachers for general education schools. Universities also train pre-school teachers who commence work in pre-schools. Teachers for general education schools come from among the graduates of the last two fields of study (teacher training without subject specialisation and teacher training with subject specialisation).

Table 1. Graduates of education specialties, 2016

	Bachelor's degree	Master's degree		Doctoral degree
	Total	Total	incl. in integrated study	Total
Females				
Education science	91	49	0	9
Training for pre-school teachers	223	18	0	0
Teacher training without subject specialisation (class teacher)	47	111	73	0
Teacher training with subject specialisation (subject teacher)	30	146	0	0
Males				
Education science	12	3	0	2
Training for pre-school teachers	0	0	0	0
Teacher training without subject specialisation (class teacher)	0	0	0	0
Teacher training with subject specialisation (subject teacher)	10	29	0	0

Source: EHIS

When looking at the graduates of education specialties in 2016, there is nothing positive with regards to male teachers. A total 780 students graduated from these specialties in 2016, including only 56 male students. Thus, males constituted just 7% of all graduates. Bachelor's degree in education was obtained by 413 students (22 of them male), Master's degree by 356 students (32 males) and Doctoral degree by 11 students (2 males).

The picture becomes even more one-sided when looking at graduates by fields of study. The graduates of education science included 149 female and 17 male students, and graduates of teacher training with subject specialisation included 176 females and 39 males. Two specialties – training for pre-school teachers and teacher training without subject specialisation – had 241 and 158 graduates, respectively, but it is impossible to indicate the number of males, because all graduates were female.

In the two specialties, the graduates of which generally become general education school teachers, there were 334 female and 39 male graduates. As the share of males was only slightly over 10%, it can be concluded that men are less interested in becoming teachers. Therefore, a more thorough investigation is required to determine why the teaching profession is so unattractive for men.

Men encounter many problems when choosing teaching profession

A study carried out in New Zealand ascertained the main reasons that prevent men from choosing teaching profession. Young men pointed out three main factors: the status of teaching profession, low wages and difficulties in communicating with children. As for the status of teaching profession, men emphasised that bystanders often decide on the status of a teacher based on the stage of study in which they are teaching. For example, parents and the rest of the society hold upper secondary school teachers in higher esteem than primary school teachers. However, women may evaluate the status of teaching profession (especially class teacher) differently, because of their better understanding of the specific skills required for working with 30 children on a daily basis. Men also found that in recent years, teachers have lost much of their authority and parents have significantly more decision-making power with regard to school. (Cushman 2005)

The reputation of teaching profession has also been studied in Estonia. The analysis of the Ministry of Education and Research reveals that the problems with teaching profession in Estonia are mostly due to a large workload, low wages and low appreciation of the profession in the society (Valk 2016). The reputation of teaching profession in Estonia is actually considered the lowest by teachers themselves, while it is much more valued by other social groups (Haridus- ja teadusministeerium 2016). Thus, more should be done in Estonia so that teachers would value their own work more.

Wages represent an important factor for any career choice. Richardson and Watt (2006) found that despite the fact that teaching profession requires great specialisation and technical knowledge and stands out with a huge and emotionally straining workload, it is still characterised by a poor social status and low wages. Because of the much-debated gender pay gap, men can find a job with significantly higher wages, while finding a well-paying job is more complicated for women, and thus, they may settle for teachers' wages. Cushman (2005), however, pointed out the opposite effect as well – it is known that women have somewhat lower wage expectations than men, and a high number of women working as teachers may reduce the overall wage level of teachers.

The issue of low wages of teachers has also been discussed for a long time in Estonia, and there has been a remarkable increase over the past few years. Since 2014, the teachers of municipal and state schools have received average wages that exceed the general average gross monthly wages in Estonia. In 2016, the average gross monthly wages of general education school teachers in Estonia were 1,210 euros, which is 64 euros more than the average gross monthly wages in Estonia. It should be considered, however, that many teachers do not work full-time, and consequently receive lower pay – especially in rural areas where schools are smaller and the shortage of teachers is the greatest (Übius et al. 2014). According to the data of the Estonian Education Information System (EHIS), 45% of teachers of general education schools in Estonia worked less than full-time in 2016.

The third obstacle to choosing teaching profession, indicated by male teachers, was communication and physical contact with children. A great number of male teachers educating children in lower stages of study perceived negative attitude by the media and the public, and felt that they were seen as potential child abusers (Pollitt & Oldfield 2017). Such negative attitude and constant tense situation leads to the point where a large share of men choose another profession instead of becoming a teacher.

Male teachers in New Zealand pointed out that extensive media coverage following a small number of child abuse cases involving teachers has altered the attitude of teachers, parents and students alike. Male teachers participating in the study admitted that even after years of teaching experience and building up trust with children and parents, they are still afraid to place a hand on a child's shoulder or console a crying child. Some of them consciously avoided staying in a classroom alone with a child. One teacher told a story about his male colleague, who had a camera installed in the classroom for his own protection. (Cushman 2005)

It has been found in studies that different standards apply to male and female teachers – for example, a male teacher who holds hands with a student at a playground or enters a locker room with children is frowned upon, whereas this is considered normal for a female teacher (Pollitt & Oldfield 2017; Cushman 2005). Men perceived negative attitude from their female colleagues, too (Pollitt & Oldfield 2017). As teaching profession is more frequently associated with women, a prejudice has emerged that perhaps men cannot handle teaching; thus, male teachers have less chance in competing for teacher positions (Kim & Weseley 2017). As a result of the interaction of the above factors, only very few men dare to choose a teacher's career.

Despite difficulties, men still have several reasons to become a teacher. Regardless of low wages and high workload, it has been found that male and female teachers have similar career satisfaction (Richardson & Watt 2006). For male teachers, the reasons for choosing a teacher's career included satisfying work, stable position, support of friends and family and the opportunity to be a father figure for students (Pollitt & Oldfield 2017). Richardson and Watt (2006) highlighted the same factors, as well as challenging work, a desire to work with adolescents, social contribution, shaping the future, supplementary pensions and favourable holiday schedule.

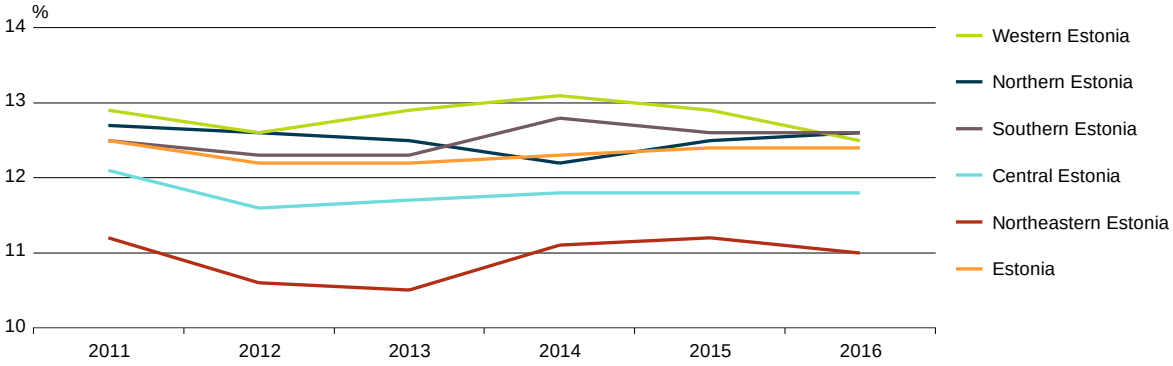
In Estonia, the motivation of male teachers has not been specifically studied. However, Paula Luks (2016) has studied the motivation factors of all students who chose teaching profession. She found that the greatest stimulus for choosing teaching profession is the opportunity to work with children. Other significant factors included serving the society, work opportunities abroad, internal motivation, skills and the desire to be of use. Thus, it can be said that the main motivational factors in Estonia largely coincide with those pointed out in foreign studies.

Profile of a male teacher in Estonia

In order to get a better overview of male teachers in Estonian general education schools, they are observed here first by Estonian regions. However, as it is rather common for teachers to work in several schools, this regional distribution may be problematic. Therefore, the focus here is on how many percent of teaching posts in Estonia are occupied by male teachers (Figure 5).

It appears that male teachers fill approximately 12.5% of all teaching posts in general education schools in Estonia, and this share has been rather stable over the past few years. While the share of male teachers in Southern, Western and Northern Estonia is almost at level with the Estonian average, this indicator is approximately half a percentage point lower in Central Estonia. Northeastern Estonia, or Ida-Viru county, stands out among other regions with only an 11% share of male teachers of all teaching posts.

Figure 5. Share of male teachers of all teaching posts in Estonia by region, 2011–2016

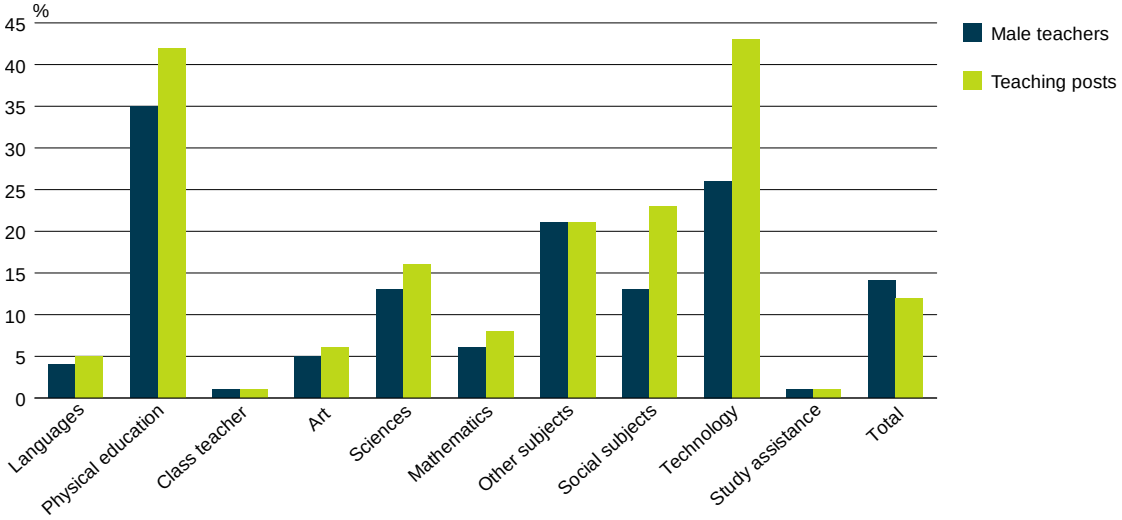


Source: EHIS

Northeastern Estonia is known to be demographically rather different from the rest of Estonia, thus, it is not surprising that it also differs slightly in terms of the share of male teachers. Northeastern Estonia, where the population is mostly Russian-speaking, stands out with more conservative value judgments compared to the rest of Estonia (Lilloja 2010), meaning that the entry barriers of male teachers arising from the above prejudice may have remarkably greater impact. On the other hand, Northeastern Estonia has above-average demand for workers in mining and industry, which are traditionally seen as men's work. Furthermore, teachers in Northeastern Estonia receive the lowest average wages. Such combination increases the probability that men in Northeastern Estonia prefer other professions to teaching.

It is also worth examining which subjects male teachers prefer to teach. As men and women often have different interests, it is logical to assume that they teach different subjects as well (Figure 6).

Figure 6. Share of male teachers among teachers of different subjects, 2016



Source: HaridusSilm

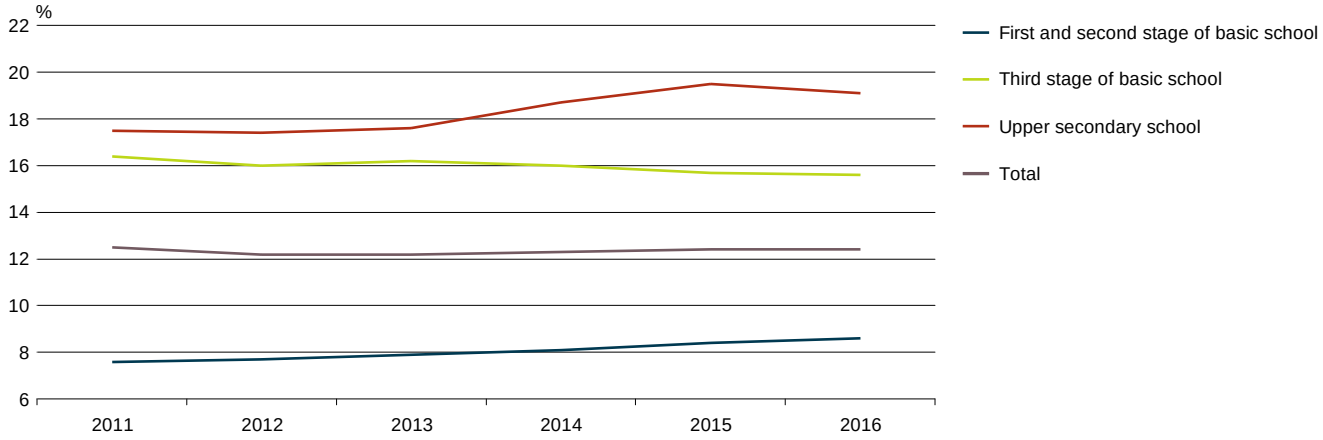
It is noticeable that the share of male teachers is highest among teachers of physical education, technology and other subjects (primarily elective subjects and subjects of individual curriculum) – therefore, it can be said that men tend to teach non-academic subjects. Lahelma (2000) found a similar tendency in Finnish schools. Male teachers account for less than ten percent of teachers of art, languages and mathematics. The shortage of male teachers is particularly striking among class

teachers – there are almost 70 female class teachers per one male class teacher in Estonia. Considering that the job of class teachers is to teach all basic subjects in primary school, they have very close contact with younger students. The shortage of male class teachers may, once again, be related to the general attitude of the society described above, where any contact between a male teacher and small children is disliked. Additionally, there are very few men among study assistance teachers (such teachers are mostly engaged in helping students with special needs who have fallen behind in their studies).

It also appears from Figure 6 that the share of male teachers in each subject group is smaller compared to posts. However, the situation is the opposite when looking at the total number of teachers and posts – male teachers constitute 14% of all teachers, while posts filled by male teachers account for only 12.5% of all posts. This leads to a conclusion that male teachers are more specialised and focus on teaching one subject with a higher workload, whereas female teachers often teach different subjects and each individual subject with smaller workload. The main reason is that there are many male teachers teaching very specific technology subjects and physical education. Assumedly, teaching mathematics is much easier for a teacher of physics than for a teacher of physical education.

The distribution of male teachers by stages of study deserves particular attention. Considering that it is rather difficult to divide teachers by one or another stage of study, it is more reasonable to look at the number of posts filled by male teachers.

Figure 7. Share of male teachers of all teaching posts in Estonia by stage of study, 2011–2016



Source: EHIS

It appears that the share of male teachers is also much bigger in advanced stages of study. Male teachers fill only 8% of teaching posts in the first and second stage of study in basic school, but approximately 16% of posts in the third stage of study in basic school. The number of posts filled by men is even higher (19%) in upper secondary school, and this share has not changed much over the past few years. During the period in question, the value of this indicator has remained relatively stable in all stages of study.

Large variations in the share of male teachers by stages of study may have several reasons. Most likely, the above-mentioned reasons play a role here as well, because when teaching small children male teachers encounter suspicious and disapproving attitude by parents, colleagues and acquaintances (Cushman 2005; Pollitt & Oldfield 2017). Therefore, men prefer working in more advanced stages of study, where students are older and there is somewhat lower risk of misunderstandings. Men may also prefer teaching in higher stages of study because it involves somewhat more social respect.

The fact that many subjects preferred by male teachers (crafts, elective subjects) do not start until advanced stages of study cannot be overlooked. On the one hand, this could mean that men teach more in advanced stages of study because there are fewer subjects of interest to them in early stages of study. On the other hand, it could be discussed that perhaps men choose to teach these subjects specifically to avoid contact with younger students.

Conclusion

Despite similarities in looks, a male teacher in a general education school in Estonia today is very different from beloved *teacher Laur* depicted in *Kevade*. While the teacher in the book by Oskar Luts taught mostly primary school students, male teachers today prefer teaching older students. To the book characters *Arno* and *Toots* the teacher taught reading and calculus, while today instead of mathematics and Estonian language men prefer teaching crafts and physical education.

Admittedly, there are indeed few men among teachers in Estonia, especially in comparison to other European countries. For men, an obstacle to choosing teaching profession is its low status, and wages which do not correspond to the great workload also play a major role. In addition, potential male teachers might be afraid of difficulties in communicating with children. The current male teachers, however, are satisfied with their career choice, because they can challenge themselves, serve as a father figure for students and contribute to the society.

It is important that male teachers work at schools also in the future. Although male teachers might not have a huge impact on learning outcomes, their serving in a teacher's role is important to achieve a greater social benefit. The impact of male teachers on the development of adolescents is as important as that of female teachers. Greater involvement of men in education might alleviate the general shortage of teachers and ensure high quality of Estonian education in the following hundred years.

Sources

Ammermueller, A., & Dolton, P. (2006). Pupil-Teacher Gender Interaction Effects on Scholastic Outcomes in England and the Usa. ZEW - Centre for European Economic Research Discussion Paper No. 06-060. http://dx.doi.org/10.2139/ssrn.927689 (1.02.2018).

Bullough, J. V. (2015). Differences? Similarities? Male teacher, female teacher: An instrumental case study of teaching in a Head Start classroom. Teaching And Teacher Education, 47, 13–21. https://doi.org/10.1016/j.tate.2014.12.001 (1.02.2018).

Carrington, B., Tymms, P., & Merrell, C. (2008). Role models, school improvement and the 'gender gap'—do men bring out the best in boys and women the best in girls? British Educational Research Journal, 3, 315. British Library Document Supply Centre Inside Serials & Conference Proceedings. http://www.jstor.org/stable/40375493 (1.02.2018).

Cushman, P. (2005). Lets hear it from the males: Issues facing male primary school teachers. Teaching and Teacher Education, 3, 227. British Library Document Supply Centre Inside Serials & Conference Proceedings. https://doi.org/10.1016/j.tate.2005.01.012 (1.02.2018).

EHLEIS. (2015). Tervena elatud aastad Eestis (9. väljaanne). http://www.tai.ee/et/terviseandmed/uuringud/download/376 (23.02.2018).

Eurostat. Graduates by education level, programme orientation, completion, sex and age. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=educ_uoe_grad01&lang=en (23.02.2018).

HaridusSilm. Õppeained üldhariduskoolides. http://www.haridussilm.ee/?leht=opetajad_4 (23.03.2018).

Haridus- ja teadusministeerium. (2016). Õpetajaameti kuvandi ja atraktiivsuse uuringu põhitulemused. https://www.hm.ee/sites/default/files/opetajaameti_maine_ja_atraktiivsuse_uuringu_kokkuvote_0.pdf (23.02.2018).

Kim, Y., & Weseley, A. (2017). The Effect of Teacher Gender and Gendered Traits on Perceptions of Elementary School Teachers. Journal Of Research In Education, 27, 1, 114–133. https://eric.ed.gov/?id=EJ1142365 (1.02.2018).

Krieg, J. M. (2005). Student Gender and Teacher Gender: What Is the Impact on High Stakes Test Scores? Current Issues In Education, 8, 9. http://faculty.wwu.edu/kriegj/Econ.%20Documents/Student%20Gender%20Paper.pdf (1.02.2018).

Lahelma, E. (2000). Lack of Male Teachers: a problem for students or teachers? PEDAGOGY CULTURE AND SOCIETY, 2, 173, British Library Document Supply Centre Inside Serials & Conference. https://doi.org/10.1080/14681360000200093 (1.02.2018).

Lilloja, L. (2010). Eesti klassikaline alusväärtusstruktuur Euroopa sotsiaaluuringu põhjal. Magistritöö. Tallinn: TLÜ. http://www.etera.ee/zoom/2116/view?page=1&p=separate&view=0,0,2481,3508 (07.03.2018).

Luks, P. (2016). Motivatsioonitegurid õpetajakutse valikul programmi noored kooli valinute ja traditsioonilises õpetajakoolituses osalejate võrdluses. Magistritöö. Tartu: Tartu Ülikool. http://dspace.ut.ee/bitstream/handle/10062/50505/luks_paula_ma.pdf (23.02.2018).

Mahdi, H. S. & Al-Dera, A. S. (2013). The Impact of Teachers' Age, Gender and Experience on the Use of Information and Communication Technology in EFL Teaching. English Language Teaching, 6, 6, pp. 57–67. http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ1077056 (23.02.2018).

OECD. (2016). Education at a Glance 2016: OECD Indicators. Paris: OECD Publishing. http://dx.doi.org/10.187/eag-2016-en (23.02.2018).

Pollitt, K., & Oldfield, J. (2017). Research paper: Overcoming the odds: Exploring barriers and motivations for male trainee primary teachers. Teaching And Teacher Education, 62, 30–36. https://doi.org/10.1016/j.tate.2016.11.003 (1.02.2018).

Richardson, P., & Watt, H. (2006). Who Chooses Teaching and Why? Profiling Characteristics and Motivations Across Three Australian Universities. ASIA-PACIFIC JOURNAL OF TEACHER EDUCATION, 1, 27. British Library Document Supply Centre Inside Serials & Conference Proceedings. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.497.7146&rep=rep1&type=pdf (1.02.2018).

Sansone, D. (2017). Why does teacher gender matter? Economics Of Education Review, 61, 9–18, Social Sciences Citation Index. https://doi.org/10.1016/j.econedurev.2017.09.004 (1.02.2018).

Servinski, M., Kivilaid, M., & Tischler, G. (Eds.). (2018). Eesti Vabariik 100. Statistiline album. Tallinn: Statistikaamet.

Spilt, J., Koomen, H., & Jak, S. (2012) Are boys better off with male and girls with female teachers? A multilevel investigation of measurement invariance and gender match in teacher-student relationship quality. JOURNAL OF SCHOOL PSYCHOLOGY, 3, 363. British Library Document Supply Centre Inside Serials & Conference Proceedings. https://doi.org/10.1016/j.jsp.2011.12.002 (1.02.2018).

Valk, A. (2016). Õpetajaameti atraktiivsus. Tartu: Haridus- ja Teadusministeerium. https://www.hm.ee/sites/default/files/hmin_opetaja_atraktiivsus.pdf (23.02.2018).

Watson, P., Rubie-Davies, C., Meissel, K., Flint, A., Garrett, L., McDonald, L., & Peterson, E. (2017). Teacher gender, and expectation of reading achievement in New Zealand elementary school students: essentially a barrier?. Gender And Education, 1–20. https://doi.org/10.1080/09540253.2017.1410108 (1.02.2018).

Übius, Ü., Kall, K., Loogma, K., & Ümarik, M. (2014). Rahvusvaheline vaade õpetamisele ja õppimisele. Tallinn: SA Innove. https://www.hm.ee/sites/default/files/talis2013_eesti_raport.pdf (23.02.2018).

COMPILATION OF ACTIVITY STATUS BASED ON REGISTER DATA

Maret Muusikus, Kristi Lehto

In Estonia, a methodology is being prepared for conducting a register-based population and housing census (REGREL) in 2021. As for census characteristics, the biggest number of databases are used for determining activity status. Estonian Labour Force Survey (LFS) is the best reference source to check the quality of register-based activity status. This article provides an overview of the compilation of activity status and the results of the comparison.

Introduction

Pursuant to the definition in the Census Regulation (Regulation (EU) 2017/543), current activity status is the current relationship of a person to economic activity, based on a reference period of one week, which may be either a specified, recent, fixed, calendar week, or the last complete calendar week, or the last seven days prior to enumeration.

Employed persons comprise all persons aged 15 years or over who during the reference week:

- performed at least one hour of work for pay or profit, in cash or in kind, or
- were temporarily absent from a job in which they had already worked and to which they maintained a formal attachment, or from a self-employment activity.

The unemployed comprise all persons aged 15 years or over who were:

- "without work", that is, were not in wage employment or self-employment during the reference week; and
- "currently available for work", that is, were available for wage employment or self-employment during the reference week and for two weeks after that; and
- "seeking work", that is, had taken specific steps to seek wage employment or self-employment within four weeks ending with the reference week.

Pursuant to the Regulation, current activity status has the following breakdowns:

1. Labour force / economically active
   1.1. Employed
   1.2. Unemployed
2. Outside of the labour force / economically inactive
   2.1. Persons below the national minimum age for economic activity
   2.2. Pension or capital income recipients
   2.3. Students
   2.4. Others
3. Not stated

(ibid.)

Permanent residents of Estonia, who cannot be classified as employed, unemployed, persons below the national minimum age for economic activity, pensioners or students are classified as "others". Current activity status "not stated" will not be ascribed in the register-based census.

A person can fall into only one activity status category. First, current activity status is ascribed to persons below 15 years of age who are not included in the working-age population. Next, the employed are given preference over the unemployed and the unemployed over economically inactive persons. Among inactive persons, pensioners are preferred to students, and students are preferred to others.

In the article, the terms "register" and "database" and "reference week" and "enumeration week" are used as synonyms.

Methodology for compiling activity status

Activity status is a census characteristic that cannot be retrieved directly from a single database. A person's activity status is an indicator that changes frequently over time, and there is no register comprising updated information on all activity status components. Therefore, many databases are used in the activity status algorithm, based on which it is possible to decide the activity status of a person in the enumeration week. Databases used for the compilation of register-based activity status are listed in Table 1. For each data source, the activity status ascribed based on the information in the database has been indicated.

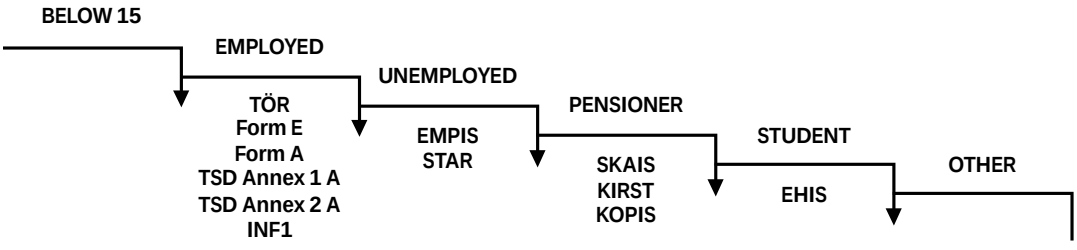
Table 1. Data sources for register-based activity status

Database	Abbreviation	Activity status
Employment register (sub-register of Register of Taxable Persons)	TÖR	Employed
Tax declarations in Register of Taxable Persons:	MKR	Employed
■ business income of a resident natural person	FIDEK form E	Employed
■ income derived in a foreign state indicated in the income tax return for a resident natural person (continuation sheet 8.1)	FIDEK form A foreign income	Employed
■ payments made to resident natural persons in the declaration of income and social tax, unemployment insurance premiums and contributions to mandatory funded pension[a]	TSD Annex 1 A	Employed
■ payments made to non-resident natural persons in the declaration of income and social tax, unemployment insurance premiums and contributions to mandatory funded pension[a]	TSD Annex 2 A	Employed
■ disclosure of recipients of dividends and other equity payments	INF1	Employed
Register of Persons Registered as Unemployed and Job-Seekers, and of Provision of Labour Market Services	EMPIS	Unemployed
Social Services and Benefits Registry	STAR	Unemployed
Social Security Information System	SKAIS	Pensioner
Health Insurance Database	KIRST	Pensioner
Mandatory Funded Pension Register	KOPIS	Pensioner
Estonian Education Information System	EHIS	Student
State Register of State and Local Government Agencies, supporting source for combining TÖR and TSD data. Incorporated in Commercial Register since 11.01.17	RKOARR	

[a] The terms "resident" and "non-resident" refer to EMTA definitions.

The activity status algorithm has a simple overall structure. The enumeration week is the last full working week before the census moment on 31 December. This article is based on register data of 2016, and the enumeration week is 12.12–18.12.2016. First, separate lists are prepared for the employed, unemployed, pensioners and students. Persons in these lists partially coincide, because a person can have more than one activity status (e.g. working student or working pensioner). Furthermore, the lists contain persons not included among permanent residents of Estonia. As census characteristics are published only about permanent residents, activity status lists are linked with the list of permanent residents compiled based on the residency index methodology that has been used in Statistics Estonia since 2016 (Tiit & Maasing 2016; Maasing, Tiit & Vähi 2017). Ultimately, each person is ascribed one activity status. This is done by following the order of priority of activity statuses established in the Census Regulation, presented in Figure 1 along with relevant data sources. However, in the case of persons who meet certain criteria (presented in the subchapter "Activity status based on register data 2016"), the preference of statuses is altered to harmonize the methodologies of REGREL and LFS and ensure their comparability.

Figure 1. Order of priority of activity statuses and data sources



Persons in the status category "below 15" are ascribed directly from the list of permanent residents based on age. Finding persons in the status category "other" from registers is complicated, because there are no databases regarding homemakers, discouraged persons or those taking care of family members. As Statistics Estonia compiles the list of permanent residents on the basis of registers, all persons who were not ascribed a higher priority activity status shall be classified as "other".

The list of persons with activity status "student" is compiled on the basis of EHIS data as at the end of the year. There are data about students in all stages of study (kindergarten, basic school, upper secondary school, vocational school and institution of higher education), registered in EHIS as at 31 December. In the case of students in higher education, those on academic leave shall be separated. Most of them have been registered in TÖR and are ascribed the status "employed".

99.7% of the persons in the list of pensioners originate from SKAIS pension data. From SKAIS, all those persons are included who were entitled to receive pension at least on one day of the enumeration week. From KIRST, those persons were included who were covered with pension-based health insurance during the enumeration week. 34 persons were added to the list of pensioners from KOPIS. The majority of persons receiving funded pension payments were present in SKAIS data (Table 2).

The list of unemployed persons is compiled on the basis of two data sources, but the majority, or 74% of persons are taken from EMPIS (Table 2). From EMPIS, both the unemployed and job-seekers who were registered on at least one day of the enumeration week are included. The registered unemployed, who account for 98% of the source data in EMPIS, are aged between 16 and 63 years. Job-seekers do not have an upper age limit, but the minimum age is 13 years. As the activity status "below 15" takes priority, it prevents a situation where very young persons are ascribed the final activity status "unemployed". From STAR data, those persons were included who were classified as "registered unemployed" or "unregistered unemployed" in the course of the procedure. STAR data are not as reliable as the data of Eesti Töötukassa (Unemployment Insurance Fund). Here, the registered unemployed do not have a strict age limit as in EMPIS (e.g. a person aged 13 was indicated as registered unemployed in 27 cases). It is impossible to distinguish unemployment in the enumeration week; information regarding social status is fixed as at the date of procedure. There can be several procedures per person with a different social status during a year. Therefore, for unemployed persons in STAR, information of the latest procedure in the year is used. When ascribing final activity status, the unemployed aged 64 and over are classified as "pensioner" or "other".

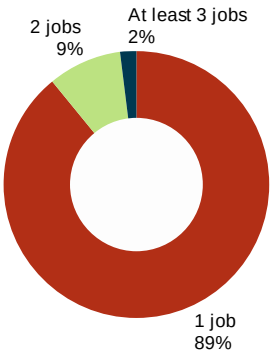
Table 2. Data sources of pensioners and unemployed persons

Data source		Number of persons	Share, %
List of pensioners	SKAIS	409,591	96.8
	SKAIS + KOPIS	11,652	2.8
	KIRST	1,109	0.3
	SKAIS + KIRST	538	0.1
	KOPIS	34	0.0
	SKAIS + KIRST + KOPIS	9	0.0
	KIRST + KOPIS	8	0.0
	Total	422,941	100.0
List of unemployed persons	EMPIS	23,652	61.0
	STAR	9,914	25.6
	EMPIS + STAR	5,202	13.4
	Total	38,768	100.0

A problematic issue with register-based activity status are the unregistered unemployed. There are many unemployed persons who do not remain registered although they have not actually found a job, because that requires performing certain duties. Thus, potential unregistered unemployed persons are searched from EMPIS and STAR data for the last three years (the most recent entry for each person). A list is compiled of persons who at some point before the enumeration week were registered as unemployed, and who do not have a more recent employment entry in TÖR. Persons in this list, who would be classified as "other" after the final compilation of activity status, are classified as previously registered unemployed.

Persons in the list of employed persons are retrieved mainly from TÖR. Included is all employment (except cancellations) that was valid on at least one day of the enumeration week. The one-hour rule prescribed in Census Regulation cannot be applied to the register-based census. Employment which was suspended for the entire enumeration week shall be separated. A single person may have approximately 30 simultaneous registrations of employment in TÖR. In most cases, this occurs if the employers are apartment associations. However, approximately 90% of persons have one employment registration at a time (Figure 2). Those with more than one employment registration must be assigned just one main job for the purposes of the census, which is the basis for determining the occupation, industry, status in employment (employee, entrepreneur, etc.) and location of place of work.

Figure 2. Number of jobs per person in TÖR, 12.12–18.12.2016



For determining main job, gross income and part-time employment rate are linked from the annexes of TSD (Declaration of Income and Social Tax), and dividend data from INF1. These databases are not used for adding persons to the employed, because TSD data does not reflect the period of employment. While the exact dates of employment are recorded in TÖR, the payment month has been indicated in the annexes of TSD and in INF1. For this reason, payments made in December and January are used (a two-month average is calculated if the person received payments in both months) to link as many jobs

as possible in the enumeration week with the income received. Linking is complicated by the fact that the employer indicated in TÖR and the person making the payment according to TSD data are not always the same. Linking is facilitated by the State Register of State and Local Government Agencies, which is used to link all divisions registered as employers in TÖR with corresponding municipality or ministry. Municipalities are usually the ones to make payments registered in TSD to employees of municipal divisions, but they are not consistently indicated in TÖR as the ones making the payments. Out of 213 municipalities, around 100 were indicated as those making payments (prior to the administrative reform). Ministry divisions tend to make TSD payments themselves, but there are some exceptions. For example, Harju County Court makes TSD payments to all other courts except for the Supreme Court. Ministries of Culture, Finance and Social Affairs make TSD payments to their divisions themselves. After linking, a person's main job is ascribed, at first according to the greatest working time rate and, in the case of equal values, according to the largest income. If the largest income was considered first, different place of work would be ascribed to 6,000 persons. After choosing the main job in TÖR, the list of employed persons is supplemented with recipients of business income indicated in form E and recipients of income received in a foreign state indicated in form A. Forms E and A contain annual income, thus it is divided by 12 to get a person's monthly income. The result of linking all five data sources is shown in Table 3. Every employed person is ascribed his or her main source – TÖR, form E or form A. If a person is present both in TÖR and form E, income is compared. Form A is ascribed as the person's main source only if the person does not occur in any other data source of employed persons.

Table 3. Coincidence of persons in data sources during compilation of list of employed persons

Data source of employed person	Number of persons	Share, %
TÖR + TSD annex	542,735	86.2
TÖR	41,747	6.6
FORM_E	15,067	2.4
TÖR + TSD annex + INF1	10,422	1.7
TÖR + TSD annex + FORM_E	8,859	1.4
TÖR + TSD annex + FORM_A	5,427	0.9
FORM_A	3,457	0.5
TÖR + FORM_E	631	0.1
TÖR + INF1	445	0.1
TÖR + FORM_A	414	0.1
TÖR + TSD annex + INF1 + FORM_E	229	0.0
FORM_E + FORM_A	178	0.0
TÖR + TSD annex + INF1 + FORM_A	175	0.0
TÖR + TSD annex + FORM_E + FORM_A	124	0.0
TÖR + INF1 + FORM_E	11	0.0
TÖR + FORM_E + FORM_A	11	0.0
TÖR + INF1 + FORM_A	9	0.0
TÖR + TSD annex + INF1 + FORM_E + FORM_A	4	0.0
Total	629,945	100.0

Activity status based on register data 2016

Activity status has been compiled on the basis of data regarding the enumeration week (12.12–18.12.2016). The compilation uses the list of permanent residents as at 01.01.17, when the population figure published by Statistics Estonia was 1,315,635. In Table 4, two versions of register-based activity status in 12.12–18.12.2016 are presented. Version 1 reflects the result of the algorithm considering only the order of priority of activity statuses. In version 2, the algorithm also includes the determination of the previously registered unemployed and harmonisation of REGREL and LFS methodologies.

Table 4. Versions of register-based activity status, 12.12–18.12.2016

Activity status		Number of persons (Version 1)	Share, % (Version 1)	Number of persons (Version 2)	Share, % (Version 2)	Difference in number of persons
1.1	Employed	625,391	47.5	609,840	46.4	15,551
1.2	Previously registered unemployed	0	0	10,095	0.8	..
	Unemployed	33,372	2.5	32,943	2.5	429
2.1	Below 15	213,609	16.2	213,609	16.2	0
2.2	Pensioner	284,626	21.6	235,487	17.9	49,139
2.3	Student	61,593	4.7	67,282	5.1	–5,689
2.4	Other	97,044	7.4	146,379	11.1	–49,335
Total		1,315,635	100.0	1,315,635	100.0	0

Below is a list of conditions that served as a basis for changing the activity status of some persons in version 2. The number of persons affected by the particular condition is given in brackets.

- Persons receiving pension for incapacity for work are assigned the status “others” (42,327 persons).
- Employed persons whose employment has been suspended are given the status “other” (15,551 persons). The status “other” is given to all persons on parental leave and to those whose employment has been suspended for more than three months.
- Persons with activity status “other” are classified as previously registered unemployed if they are on the list of persons compiled on the basis of EMPIS and STAR data for the past three years and do not have a more recent employment registration (10,101 persons).
- In the enumeration week, there were approximately 2,500 persons under the age of 25 years whose pension is suspended if they are not pursuing their studies. The majority of them were registered in EHIS, while being classified as pensioners according to the order of priority. Due to their age, these persons are assigned the activity status “student”. Some of them were also below the age of 15 years, but it was possible to classify 2,007 persons as students.
- In the case of all pensioners below the age of 50 years registered in EHIS, priority is given to student status (1,878 persons).
- In the case of persons below the age of 25 years receiving survivor’s pension and registered in EHIS, the student status is given preference over pensioner status (1,544 persons). The rest of the persons below the age of 25 years receiving survivor’s pension are given the status “other” (206 persons).
- Pensioners whose pension has been suspended are given the status “other” (1,341 persons).
- If a person aged 64 or over ascribed as unemployed occurs in pensioner-related data sources, priority is given to the status “pensioner” (158 persons). The rest of older unemployed persons are given the status “other” (17 persons).

In further analysis, activity status compiled on the basis of version 2 have been used, where the subcategories of activity status have been altered to make them more similar to census definitions.

Based on registers, one person may have several different activity statuses at a time. Activity status combinations can be divided into three major groups:

- All data sources refer to the same activity status – 82.7% of persons aged 15 years and over (Table 5).
- Data sources refer to at least two activity statuses, the combination of which is acceptable because persons can perform several activities simultaneously (e.g. working pensioner or working student) – 16% of persons aged 15 years and over.
- Data sources refer to at least two activity statuses, the combination of which can be deemed controversial (e.g. working unemployed) – 1.3% of persons aged 15 years and over. The 97,044 permanent residents in the last column of Table 5 were left out from the percentage calculation because during the enumeration week those persons did not occur in any of the data sources used for compiling activity status.

Statistics Slovenia has published an article on register-based activity status, which presents the results as at 1 January 2014, and uses the above division into three groups of combinations of activity statuses (Dolenc 2017). In 75% of cases, Slovenian data sources referred to the same activity status. Combinations of activity statuses that could be considered controversial occurred in 20% of cases. Higher error rate is due to the fact that Slovenia has data sources for finding persons with activity status “other”. In most cases, mandatory health insurance data are used, which in their article is considered to have low quality. The activity status “other” in combination with statuses “employed” or “unemployed” is the main reason for their higher error rate.

Table 5. Coincidence of activity statuses among persons aged 15 years and over, 12.12–18.12.2016

Activity status		Number of persons (Version 2)	Number of activity statuses referred to by data sources						
			1	2		3		4	
			Contradictory	Contradictory		Contradictory		Contradictory	Contradictory
			No	No	Yes	No	Yes	Yes	No
1.1	Employed	609,840	451,661	151,073	3,995	2,302	786	23	..
1.2	Previously registered unemployed	10,095	..	..	..	..	..	..	10,095
	Unemployed	32,943	25,522	0	7,235	0	186	0	..
2.2	Pensioner	235,487	235,289	46	151	0	1	0	..
2.3	Student	67,282	61,593	5,429	233	0	27	0	..
2.4	Other	146,379	57,134	2,169	78	34	14	1	86,949
Total		1,102,026	831,199	158,717	11,692	2,336	1,014	24	97,044

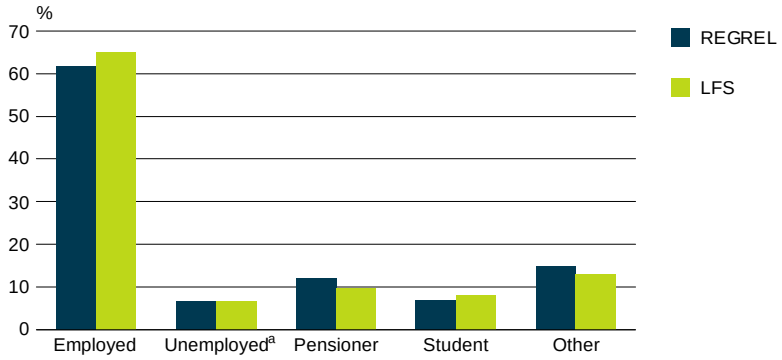
Comparison with LFS

LFS involves all working-age persons aged 15−74 years. Therefore, persons in the same age group in the register-based census are involved in the comparative analysis. LFS contains eight reasons for inactivity:

- retirement age;
- studies;
- military service;
- illness or injury;
- pregnancy leave, maternity leave or parental leave;
- taking care of children or family members;
- discouraged (lost hope to find work);
- other reasons.

To compare with REGREL, the reasons are grouped under three categories: retirement age, studies and other reasons. The analysis starts by comparing the general distribution of register-based activity status, using the average share in the 4th quarter of LFS 2016 (Figure 3) published in the statistical database. The data of LFS 2016 are weighted using the population figure as at 01.01.2016, but register-based activity status is compiled for 01.01.2017 population.

Figure 3. Distribution of activity status according to REGREL (12.12.–18.12.2016) and LFS (4th quarter 2016)



	Employed	Unemployed[a]	Pensioner	Student	Other
REGREL, number of persons	603,102	43,038	117,012	67,282	145,731
REGREL, %	61.8	6.7	12.0	6.9	14.9
LFS, number of persons	638,200	45,100	94,300	77,600	127,000
LFS, %	65.0	6.6	9.6	7.9	12.9

[a] The share of the unemployed is the unemployment rate, i.e. the share of the unemployed in the labour force.

A lower number of persons with register-based activity status “employed” compared to the relevant number in LFS was expected, as it is no secret that there are cases of undeclared employment (Härma 2017). The search for the unregistered unemployed from former registrations in EMPIS and STAR was successful, with just a small difference in comparison with the unemployment rate in LFS. Classifying persons receiving pension for incapacity for work under the activity status “other” resulted in more similar shares of pensioners. LFS pensioners do not include anyone under the age of 50 years, but the youngest persons receiving pension for incapacity for work based on register information were 16 years old. Lower proportion of students is surprising. In LFS, working students should also be classified as employed. According to the register-based activity status, approximately 40,000 students were classified as employed, and approximately 90% of them received income according to TSD. Even the remaining 10% of students with the status “employed” but with no links to their income do not cover the difference of up to 10,000 persons between the number of students indicated in LFS and that of register-based students.

Other Baltic States are also heading towards a register-based population and housing census. In Latvia, the 2021 census will be carried out on the basis of register data and periodic sample surveys where necessary (Vegis & Klusa 2017). At the Conference of European Statisticians in Geneva, Statistics Latvia introduced their methodology for compiling register-based activity status, and compared the results of 1 January 2015 with estimations of Latvian Labour Force Survey. As in the case of the Estonian methodology, they assign activity status “other” to all persons who cannot be classified under any other activity status. Comparison with the Labour Force Survey revealed that the numbers of persons with activity status “employed” and “pensioner” match rather well in Latvia. The problem is the unregistered unemployed, which in Estonia was attempted to be solved when compiling register-based activity status by using previous unemployment registrations found in databases. Latvia considers using imputation in their 2021 census to reduce the difference from the Labour Force Survey. In Latvia, as in Estonia, there are fewer register-based students compared to LFS and more persons with activity status “other”. In Latvia, a register of students in higher education is being established, which should improve the quality of the activity status “student”.

For the purposes of comparative analysis, activity statuses in REGREL and LFS were compared on the level of person records. From the data of LFS 2016, the most recent entry for each person was included, i.e. the data closest to REGREL enumeration week were preferred. As a result, 42% of the records used for comparison are records of the 4th quarter, 22% are records of the 3rd quarter and the remaining 36% are records of the first half of 2016.

By using the LFS data closest to REGREL enumeration week (survey week was week 50), the total coincidence rate was 85.3% (Figure 4). In order to demonstrate the impact of an extended LFS period on the coincidence rate, three additional periods were tested:

- LFS survey weeks 49−52 (December);
- LFS data for the entire 4th quarter;
- LFS data for the entire year.

Survey weeks 49−52 and the 4th quarter had no major impact on the coincidence rate, which dropped by approximately one percentage point. When all the participants in LFS 2016 were included in the comparison, the coincidence rate, as expected, decreased more – by three percentage points. Figure 4 was supplemented with the coincidence rates of version one of REGREL activity status, to show the extent of improvement after the harmonisation of methodologies (approximately 5 percentage points for all periods).

Figure 4. Overall coincidence of REGREL (12.12–18.12.2016) and LFS (4th quarter 2016) activity status

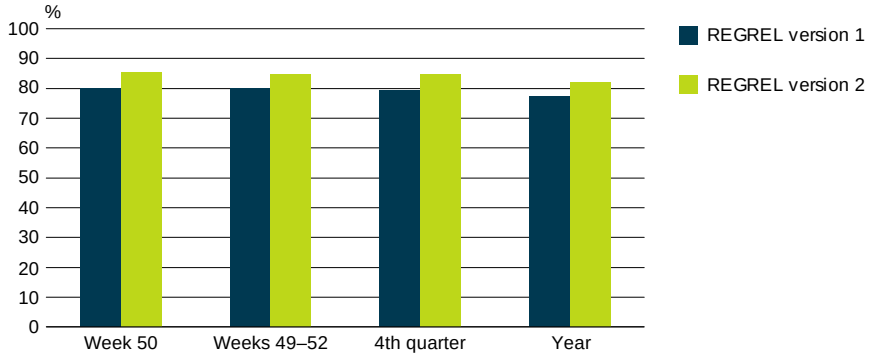


Table 6 presents the comparison of REGREL and LFS 4th quarter coincidence rates for each of the five activity statuses. Comparison is based on LFS 4th quarter because there were very few coinciding persons in the enumeration week (341). The unemployed can be distinguished clearly from the other activity statuses due to their lowest coincidence rate – 46%. The coincidence rate of the unemployed is affected the most by increasing distance from the enumeration week, because unemployment episodes in people's lives are generally several times shorter than those of other activity statuses. Those classified as "unemployed" in LFS in the 4th quarter could have had a different status by the enumeration week. Employment and economic inactivity had a much better coincidence rate. 93% of those classified as employed in REGREL were employed also according to LFS, 88% of REGREL pensioners were pensioners also in LFS and 83% of REGREL students were students in LFS. Coincidence rate among the economically inactive was the lowest in the case of activity status "other" (56%).

Table 6. Coincidence of activity statuses in REGREL (12.12–18.12.2016) and LFS (4th quarter 2016)

REGREL	LFS										Total
	Employed		Unemployed		Pensioner		Student		Other		
	Number	%	Number	%	Number	%	Number	%	Number	%	
Employed	2,774	**93.1**	45	22.4	39	9.0	52	10.6	65	10.7	2,975
Unemployed	36	1.2	93	**46.3**	1	0.2	7	1.4	55	9.0	192
Pensioner	10	0.3	4	2.0	382	**88.0**	0	0.0	135	22.1	531
Student	13	0.4	8	4.0	0	0.0	406	**82.9**	12	2.0	439
Other	147	4.9	51	25.4	12	2.8	25	5.1	343	**56.2**	578
Total	2,980	100.0	201	100.0	434	100.0	490	100.0	610	100.0	4,715

In the Quarterly Bulletin of Statistics Estonia No 3/14, an article was published introducing the results of the comparative analysis of the results of 2011 Population and Housing Census (PHC) and LFS (Rosenblad 2014). Using the 4th quarter of LFS 2011, the activity status coincidence rates were the following:

- employed in both – 92%;
- unemployed in both – 49%;
- inactive in both – 87%.

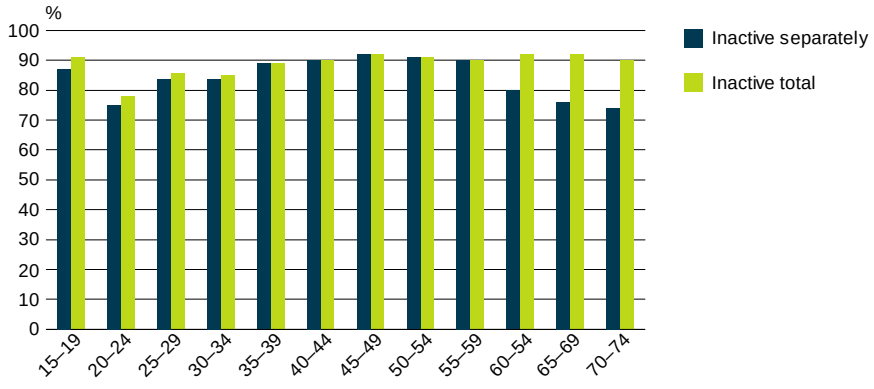
Inactive persons were not analysed separately in the article, but taking into account all pensioners, students and others in Table 6, REGREL and LFS would have a coincidence rate of 86%. Thus, traditional census did not have a significantly better result than the register-based census. The 3 percentage point difference in coincidence rates in the case of the unemployed was the greatest, but assigning this status on the basis of registers is more complicated due to considerable variation in time of unemployment episodes and unregistered unemployment.

Table 6 shows that the greatest difference in the register-based activity status arises from classifying the “employed” of LFS as “other”. These persons work, but have no records in registers. A closer look at the industry of these employed persons in LFS shows that those working in the construction sector clearly stand out. The share of persons working in construction accounted for 8% of all persons employed both in LFS and in REGREL. 28% of the persons classified as “employed” only in LFS worked in construction. Speaking of envelope wages or undeclared employment, construction has always been the most problematic sector. According to the estimation of the Tax and Customs Board, a quarter of the turnover of the construction sector goes to companies that do not declare wages (Ruuda 2017).

The next step was to study the coincidence rate of activity statuses in socio-demographic groups to find out which population groups had a higher and which groups had a lower coincidence rate of activity statuses. In comparison by sex, the rate was better in the case of women. This may be due to a more stable working life of women (Rosenblad 2014). The coincidence rate was 86% for women and 83% for men. By ethnic nationality, the coincidence of activity statuses was the highest in the case of Estonians (86%). The coincidence rate of Russians also exceeded 80%, but the rate for the remaining ethnic nationalities was 75%.

The comparison of PHC 2011 and LFS revealed that in terms of age groups, the coincidence rate of activity statuses increases with increasing age. The most critical group consisted in persons aged 20−24 with 77%. It appeared that the best coincidence of activity statuses occurred in the case of pensioners, because their statuses are generally more homogenous – inactive in most cases. When comparing REGREL and LFS, an even increase in the coincidence rate with increasing age was not detected. The coincidence rate improves up to middle age and starts to decline again in subsequent age groups (Figure 5). Considering that the comparison of PHC 2011 and LFS did not include a separate study of inactive persons, Figure 5 also presents coincidence rates in age groups in the case of adding together the subcategories of inactive persons in the comparison of REGREL and LFS. As in the case of the comparison of PHC and LFS, it can be stated that also in this case coincidence rate increases with increasing age. Age group 20−24 has one of the lowest coincidence rates also in comparison of REGREL and LFS (75%). At this age, people obtain professional education and commence their working life, which involves frequent transition from one activity status to another. This is confirmed by the figures in Table 6, indicating that 10% of students in LFS are classified as “employed” in REGREL. From age 60 onwards, coincidence rate between REGREL and LFS declines significantly. This is largely due to transitions between activity statuses “pensioner” and “other”, which was not studied when comparing PHC 2011 and LFS, because that analysis used an aggregate number of inactive persons. Table 6 shows that 22% of persons with activity status “other” in LFS are given the status “pensioner” in REGREL. According to SKAIS data, in 98% of cases, these are persons receiving old-age pension. As LFS focuses on working life, the reasons for inactivity are not a priority. As a respondent of LFS, a person receiving old-age pension may choose the reason for inactivity himself/herself. In 71% of cases, where the pensioner status in REGREL did not coincide with that in LFS, inactivity was due to either illness or injury. Such information is not available in register-based census, and based on priority order, these persons are classified as pensioners.

Figure 5. Coincidence of activity statuses in REGREL (12.12–18.12.2016) and LFS (4th quarter 2016) by age group



Summary

For the first time in the history of the Baltic States, Estonia and Latvia intend to carry out the 2021 census based on register data. Out of all census characteristics, the compilation of the activity status is one of the most complicated, as it involves many data sources. The currently used 13 databases are sufficient for the compilation of register-based activity status. They cover all activity statuses besides the status "other", which contains persons who are difficult to find in registers. Considering that the structure of the databases is not set in stone, the functioning of the algorithm must be annually checked and adjusted if necessary.

Comparison of LFS data and register data is the best way to check the functionality of the activity status algorithm. Comparative analysis revealed an 85% overall coincidence rate with LFS, which was made possible through the harmonisation of REGREL and LFS methodologies. The most problematic were REGREL and LFS activity status pairs "other-employed" and "pensioner-other". During the compilation of register-based activity status, it was clear that the number of employed persons would be lower than in LFS, as not all employment is registered. The comparison indicated that the greatest cause for the decreased coincidence rate consisted in assigning the activity status "other" to those classified as "employed" in LFS. As the share of persons working in the construction sector increased considerably among the "employed" only in LFS, it is obvious that envelope wages continue to be a serious problem in our society.

Another major decrease in the coincidence rate ("pensioner" in REGREL and "other inactive" in LFS) results from methodological differences that cannot be changed. The compilation of register-based activity status relies on the use of the order of priority. In LFS, however, a person can choose the reason for the inactivity himself/herself, which places a considerable number of old-age pensioners under the activity status "other" due to illness or injury.

Among the unemployed, coincidence level was the lowest also when comparing PHC 2011 and LFS. Unemployment episodes are generally much shorter than those of other activity statuses, and one cannot expect very high coincidence when comparing LFS 4th quarter with a fixed enumeration week.

The results of the compilation of activity status based on register data are similar in Estonia and in Latvia. The statuses "employed" and "student" are underestimated and the status "pensioner" is overestimated. Overestimation of the activity status "other" comes from including in this category all those persons who cannot be classified under other categories. As expected, the status "unemployed" is underestimated due to unregistered unemployment, but this was successfully improved in Estonia by using data of the previous years in the algorithm applied.

Sources

Commission Implementing Regulation (EU) 2017/543 of 22 March 2017 laying down rules for the application of Regulation (EC) No 763/2008 of the European Parliament and of the Council on population and housing censuses as regards the technical specifications of the topics and of their breakdowns. http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1491315145905&uri=CELEX:32017R0543%20

Dolenc, D. (2017). Deriving labour force characteristics from multiple sources in the Register-based Census of Slovenia. http://www.stat.si/StatWeb/File/DocSysFile/9247 (13.02.2018).

Härma, K. (2017). Ümbrikupalgad nõuavad üha suuremat võitlust. Äripäev. https://www.aripaev.ee/uudised/2017/11/27/umbrikupalgad-nouavad-uha-suuremat-voitlust (13.02.2018).

Maasing, E., Tiit, E.-M., & Vähi, M. (2017). Residency index – a tool for measuring the population size. Acta et Commentationes Universitatis Tartuensis de Mathematica, 21 (1), pp. 129−139.

Rosenblad, Y. (2014). On the issues of data comparability: employment and unemployment indicators according to the labour force survey and the census. Eesti Statistika Kvartalikiri. 3/14. Quarterly Bulletin of Statistics Estonia, pp 84–95.

Ruuda, L. (26.09.2017). Veerand ehitussektorist maksab ümbrikupalka. Postimees. https://majandus24.postimees.ee/4255009/veerand-ehitussektorist-maksab-umbrikupalka (13.02.2018).

Tiit, E.-M., & Maasing, E. (2016). Residency index and its applications in censuses and population statistics. Eesti Statistika Kvartalikiri. 3/16. Quarterly Bulletin of Statistics Estonia 3/16, pp. 53–60.

Vegis, P., & Klusa, A. (2017). Administrative data and sample surveys' data usage for determination of economic activity of population in register based Population and Housing Census in Latvia. https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.41/2017/Meeting-Geneva-Oct/GE_41_2017_5_ENG_unofficial_correction.pdf (13.02.2018).

INTERNATIONAL SURVEY OF CHILDREN'S WELL-BEING – AN OPPORTUNITY TO DEVELOP CHILD-CENTRED STATISTICS

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The article gives an overview of Children's Worlds[a], an international survey on children's subjective well-being, focusing on the special character of surveys conducted with children and showing the importance of collecting children's subjective evaluations not only from the academic but also from the administrative point of view. It also provides examples of evidence collected by the survey in terms of what adults would not know without asking children.

About the background of surveys with children

Treating children as a separate social group and part of the society started internationally at the end of the 1980s (e.g., Qvortrup 1991; Qvortrup et al. 1994; Corsaro 1997). The new approach differed significantly from the prior ones, as it viewed a child not as a future adult but as an active social actor and a subject here and now. This new viewpoint is important in both policy formulation as well as for official statistics, because it can significantly alter the statistical picture.

For example, according to the 2011 Population and Housing Census, 2.5% of households in Estonia were households with three and more children, but in these families lived more than a fifth of all children (i.e. under 18-year-old population). In the political sense, this result has an important meaning: if families with many children (2.5% of all households) live in poverty or at a great risk of poverty, their share of all households is likely considered marginal. However, it means living at risk of poverty for at least a fifth of all children. It can be rhetorically said that children "reproduce" poverty (the share of households statistically under poverty threshold of all households is smaller than the share of children living in these households of all children).

From poverty surveys, which started in Estonia in 1993, it became indeed evident that children as a social group are the most vulnerable generation (Kutsar & Trumm 1999; Kutsar 2015). Similarly to poverty, children reproduce social wealth when they live in a safe and caring environment where their development is ensured. Children create the adult society already now: if children's life is good, the society is probably strong and cohesive in the future. Thus, there are two approaches complementing one another: a child here and now and a child as the future grown-up. This makes the regular monitoring of children's subjective assessment of their situation important for shaping well-being in the present as well as in the future.

Why is the study of children's opinions and views so important? Recently, there has been more talk about developing policies that support people's subjective well-being. For example, the 2015 World Happiness Report (Layard & Hagell 2015) included for the first time a separate chapter on children's well-being in its publication. It provides examples of implementing measures in the society that support child well-being. By focusing on children's well-being at school, the idea of schools for well-being is developed, which fits well with the paradigms of positive psychology and positive education (e.g. Noble & McGrath 2015; White 2016).

Internationally, the interest in data collected from children started with the adoption of the Convention on the Rights of the Child at UN General Assembly in 1989. Soon most world countries ratified the convention, assuming responsibility to give children a life that corresponds to their rights. An international group of researchers studying social indicators of children's well-being (Ben-Arieh et al. 2001) admitted that administrative data collected on children so far and the so-called simple counting of children (e.g. how many drop out of school, how many have a certain disease, etc.) is not enough to explain how children themselves think they are doing and to what extent their rights are secured.

Quite soon, it became clear that the assessments of adults about children are not always adequate and correct. The assessments of children and adults cannot be the same, as the viewpoints are those of representatives of different generations: belonging to different generations, children and grown-ups fulfil different roles in the society as well as towards each other (e.g. Casas 2011; Casas et al. 2013; Gilman & Huebner 2000). It was remarked that if a child is considered as a subject, not an object, it should also be believed that the child has age-appropriate social competence and ability to provide subjective evaluations about different aspects of one's life (Mason & Danby 2011).

An important milestone for drawing attention to positive indicators besides the negative ones was the Indicators of Positive Development Conference in 2003 where a project for the development of positive indicators of children's well-being (Child Trends' Flourishing Children Project) was started, organized by the organisation Child Trends. Researchers found that social development lies not only in emphasizing the negative but also in noticing positive indications and finding opportunities to develop these further (e.g. Lippman et al. 2009; Moore & Lippman 2005; Lippman et al. 2014). Next to negative social indicators, positive indicators reflecting children's lives such as life satisfaction and happiness appeared first in international surveys (HBSC, PISA) and then in social reporting (e.g. UNICEF) (Diener 1984; Huebner 1991).

[a] The survey Children's Worlds (Children's Worlds, the International Survey of Children's Well-Being – ISCWeB) is internationally available and free for download on its website www.childrensworlds.org.

By now, the new approach to children and childhood has taken different directions, one of them being the development of child well-being indicators and researching subjective well-being. The latter means developing the concept and measures of well-being as well as the methodology of data collected from children. The work on child well-being indicators has rapidly advanced in the last decade (e.g. the journal Child Indicators Research). Its one practical goal is to develop administrative statistics on children's subjective well-being. The comparative methodology of data collected from children in different countries is also going through rapid development (e.g. Casas & Rees 2015). It is noteworthy that children traditionally used to be invisible participants in the treatment of issues related to them, but they have now become more visible in research, politics and everyday life.

What is children's well-being and how to measure it is one side of the issue. The other side is how children themselves understand well-being, how they assess well-being and its different aspects, which factors support and endanger well-being and to what extent can data obtained from children be trusted.

International Survey of Children's Well-Being – Children's Worlds

Children's Worlds is not the first survey offering an international comparison of children's well-being. It was preceded by the survey Health Behaviour in School-aged Children among 11, 13 and 15-year-old students, which still continues today (HBSC, the Estonian coordinator is the National Institute for Health Development). The PISA test (coordinated by the Ministry of Education and Research) also includes some questions on subjective well-being.

Children's Worlds collects data from children aged 8, 10 and 12, and it is the first international survey in the world with the objective to compare data of children living in different countries, starting with 8-year-olds. The first pilot survey took place in 2011, with 14 participating countries and evaluations of 33,183 children being analysed. This was followed by the main survey in 2013[a], with already 18 countries participating and including the evaluations of 61,234 children on different aspects of their lives (Table 1). The sample of participating countries is representative of the number of children in main school types in the whole country or in certain areas.

Table 1. Sample of survey Children's Worlds, 2013

Country		Country	
Algeria[a]	3,676	Nepal	2,953
Colombia[a]	2,816	Norway	2,864
Estonia	3,118	Poland[a]	3,157
Ethiopia	2,877	Romania	4,104
Finland	2,842	South Africa[a]	3,188
Germany	3,009	South Korea	7,467
Israel	2,800	Spain[a]	3,756
Italy[a]	3,701	Turkey[a]	3,024
Malta	2,584	United Kingdom[a]	3,298
Total 61,234			

[a] Regional representative sample

In the survey Children's Worlds, different types of questions are used to measure the subjective well-being of children. The questions measure 1) the frequency of a certain activity, 2) satisfaction with different aspects of life, 3) agreement with statements describing their situation and 4) socio-demographic indicators. The questionnaire covers eight domains of well-being: your home and the people you live with, money and the things you have, relationships with friends and other people, the area where you live, school, health, time use and leisure time, and oneself. Self-assessments are measured with psychometric scales previously known from psychology (developed by Diener and adapted for children by Huebner; see Huebner et al. 2014).

The questionnaires have been designed taking into account children's ages: the questionnaire for 8-year-olds is the shortest and the one for 12-year-olds is the longest. There are also differences in the length of the rating scales and in graphic presentation. In the questionnaire for the youngest children, the rating scale consists of five points, whereas for 10 and 12-year-olds the scale ranges from zero to ten. The version for the youngest uses emoticons to mark the points on the scale. The emoticons are child-friendly and their design has been reviewed with children. Figure 1 shows the graphic rating scale in the questionnaire for 8-year-olds, which is used for asking about satisfaction with the house or the flat where the child lives.

Figure 1. Example of graphic rating scale in Children's Worlds questionnaire for 8-year-olds, 2013

How happy you feel with the house or flat where you live?

[a] The international data collection of the survey on children's well-being was funded by the Jacobs Foundation. In 2017/2018, the third round of data collection is taking place, with children from forty countries participating. The Estonian part of the survey is supported by Estonian Research Council through personal research funding PUT 1530 (2017–2019). The present article was also written with PUT 1530 support.

A methodological update is the 11-point rating scale in the questionnaires for 10 and 12-year-olds. Only the end points have been marked on the scale and the scale is with a general positive direction: each point on the scale increases the positive rating (Figure 2). At first, it seemed that such a long scale might be difficult for children, but feedback has been positive. Nevertheless, there are differences in the evaluations collected from children compared to adults, which are discussed in the following.

Figure 2. Example of rating scale in Children's Worlds questionnaires for 10 and 12-year-olds, 2013

How satisfied are you with each of the following things in your life?	0 = Not at all satisfied										10 = Totally satisfied
The house or flat where you live?	0	1	2	3	4	5	6	7	8	9	10

Difference of data collected from children

Most people have likely experienced that when children are asked how they are doing, the answer is "great". This is natural and a reaction that makes adults happy, as children are generally very important to them and they are happy to hear when children are doing well. The survey Children's Worlds confirmed that as a rule children give high positive ratings on satisfaction and happiness scales (Figures 3 and 4). This is an expected result as grown-ups have also answered a similar question with answers that fall on the positive side of the scale. The average rating of adults fluctuates between 7 and 8 points on the rating scale (Rees & Main 2015), but the children's average is higher.

Figure 3 shows that 68% of 10-year-old children in Estonia give life satisfaction the highest rating, whereas a half of 12-year-olds do so. The estimated statistical mean is 9 for 10 and 12-year-olds; the median is 10 for 10-year-olds and 9 for 12-year-olds. Figure 4 depicts the life satisfaction ratings of 8-year-olds, where maximum ratings also dominate on the 5-point scale and the share of children giving this rating is higher (76%) compared to the two older age groups.

Figure 3. Assessment of overall life satisfaction of 10 and 12-year-olds in Estonia, 2013

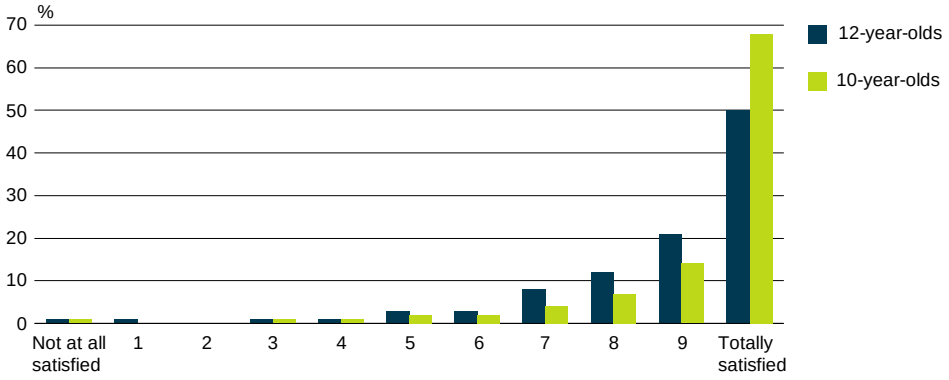
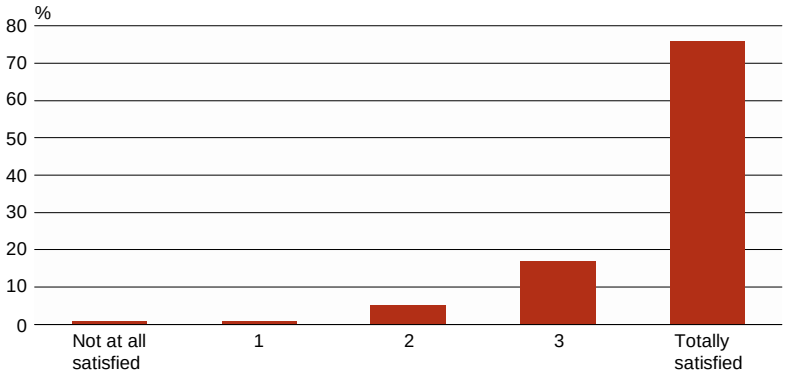


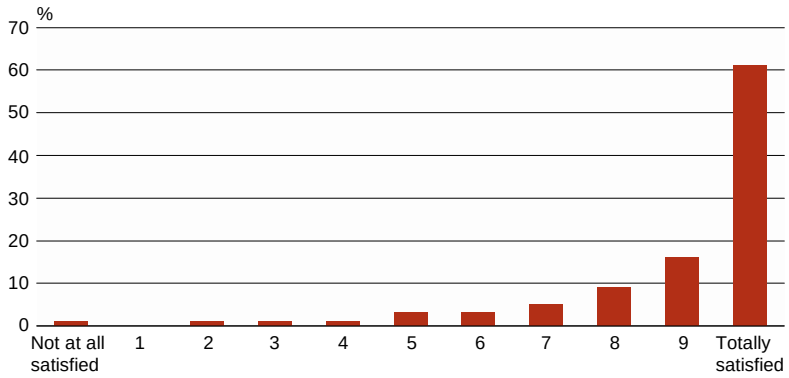
Figure 4. Assessment of overall life satisfaction of 8-year-olds in Estonia, 2013



Therefore, the younger the respondent, the likelier it is that he or she chooses the maximum rating for life satisfaction (i.e. 4 or 10 on the scale). Nevertheless, among 12-year-olds there are more of those children who marked one point less on the life satisfaction rating scale (21%).

The assessments for life satisfaction fall towards the maximum rating also in other countries that participated in Children's Worlds survey (Figure 5), but satisfaction varies in comparison by countries: the most 10 and 12-year-old children who are very satisfied with their lives live in Turkey (78% marked the maximum) and the least live in South Korea (40%). It also appeared that children in Romania gave consistently high ratings of life satisfaction, whereas the ratings of South African children differed the most from each other (Rees & Main 2015).

Figure 5. Assessment of overall life satisfaction of 10 and 12-year-olds[a], 2013



[a] The total sample of countries, the data are weighted equally by age and number of respondents in the country. The total ratings of 10 and 12-year-old children are analysed here.

It is possible to compare the evaluations of children living in different countries by comparing the average ratings (Figures 6 and 7). On the scale 0–10, children in South Korea had the lowest average life satisfaction rating (8.1) and Romanian children had the highest (9.5). Estonian children fell between them (8.8 points). To what extent can average ratings be considered in the case of data obtained from children when the distribution of ratings does not correspond to normal distribution, and which point on the scale could be the borderline for differentiating between a "good" and a "bad" life? There is no consensus among researchers in this question, but in the group of 10 and 12-year-olds it seems to be around 8 points.

What leads to giving low ratings to satisfaction with life and what could the society do so that children would be more satisfied with their lives? The answer to this question is one of the practical goals of the survey of children's well-being: to inform the society of the situation of children by considering their own assessments and to find solutions to improve children's lives.

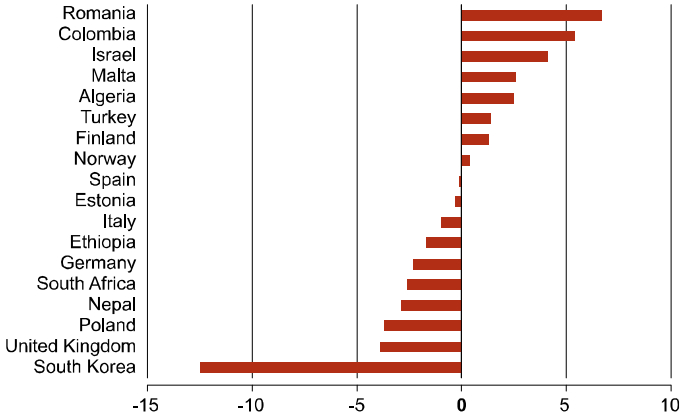
In order to understand the responses of children better, it is necessary to talk to them. Therefore, besides the quantitative survey (questionnaire), a qualitative survey approach that explains children's own understandings, interpretations and view of experiences is also important. Besides the survey Children's Worlds, the qualitative direction (Children's Understandings of Well-Being – CUWB) of the International Society for Child Indicators (ISCI) is becoming more popular. In such studies, the goal is to explain the used concepts and survey evidence obtained from children by using cognitive interviews conducted with them as well as more specific tasks. For example, children are asked to draw what makes their life good. They depict people, things, places, activities and situations as sources of subjective well-being. From the maps drawn by Estonian children, it has appeared that family members, friends and pets are most important to them and home is the most important environment for their well-being. Quantitative methodology is also moving towards the context-based approach: the data obtained together with children reflect the time and space of their production, and the finding from the data analysis and its context-based interpretation come together in the survey evidence.

International comparability of data collected from children

The data of one country tells us some things about the situation of children, but the picture becomes clearer when looking at the results in parallel to the assessments of children in other countries. For example, it can be studied how children in one country evaluate different aspects of their lives in comparison with children in other countries and with the average of all countries (Figure 6). The figure shows that the life satisfaction of 12-year-old children in Estonia is (like that of children in Spain and Norway) closest to the overall average of countries. However, in comparison to the overall average of countries, children in Romania are most satisfied with their lives and children in South Korea have the lowest average life satisfaction.

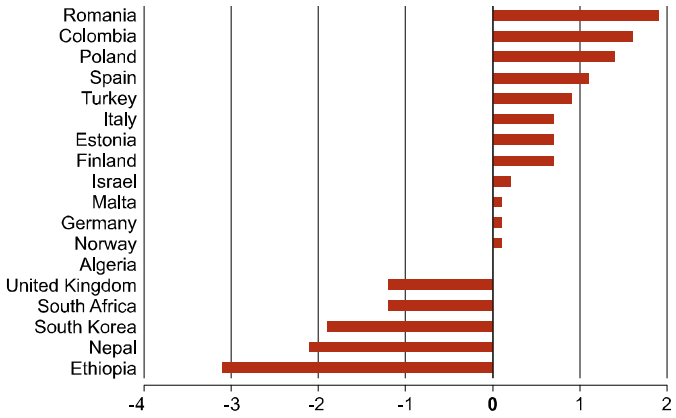
The average life satisfaction assessments of 8-year-olds (Figure 7) in relation to the overall average differ by country slightly from those of 12-year-olds. Children in Romania are again on average the most satisfied with their lives, and life satisfaction is lowest in South Korea, Nepal and Ethiopia. Life satisfaction of 8-year-old children in Estonia, in comparison with the overall average, is higher than in the case of 12-year-olds. Poland stands out as an example, as the average life satisfaction assessment there has changed the most in relation to the overall average of countries.

Figure 6. Average life satisfaction ratings of 12-year-olds[a], 2013



[a] Compared to overall average of countries (8.8)

Figure 7. Average life satisfaction ratings of 8-year-olds[b], 2013



[b] Compared to overall average of countries (3.6)

The uniformly high evaluations of children in Romania when it comes to their lives bewildered both researchers as well as the general public, e.g. the media. The reliability of children's answers was doubted. An argument was presented that Romania is a poor country and, therefore, the children there should not be on average happier than children in rich countries, such as Germany and Norway. Why Romanian children are more satisfied with their lives compared to children in other countries that participated in the survey is not entirely clear yet.

First, children's well-being is both directly and indirectly affected by what is going on in the society (Berk 2000). However, it is important to consider the rule that the level of children's subjective well-being is not determined as much by socioeconomic indicators as by indicators which measure children's relationships and perceptions, incl. how much care, security and love they feel around them (Cho 2017). It can be concluded from this that the objective indicator of poverty or wealth in the society (e.g. the Gini coefficient) does not determine children's subjective satisfaction with life with statistical relevance (Lee & Yoo 2015). This regularity is confirmed also by the map method results depicting the sources of children's subjective well-being, which are obtained with the qualitative survey method.

Furthermore, it has been found that with economic advancement the life satisfaction of adult population increases not linearly with growth in wealth, but at a certain limit, the increase in life satisfaction becomes slower. This phenomenon is called Easterlin paradox after the author who described it (Easterlin & Angelescu 2010; Easterlin et al. 2010). However, Jonathan Bradshaw et al. (2013) found in an overview of subjective well-being in rich countries that children's subjective well-being assessment is related to several children's well-being indicators at country level. The lowest average life satisfaction of children in South Korea is supported by their highest suicidality (Hong et al. 2017) and the greatest variability in the assessments of South-African children might point to great social inequality in the country. According to the World Bank, South Africa is one of the most unequal societies in the world (The World … 2017).

Researchers see many risks in conducting international comparative surveys.

1. When studying children's well-being, it is not completely clear how children in different countries understand well-being.
2. The differences from translation, e.g. the question about satisfaction in English "How happy are you with …" in its direct Estonian translation "*Kui õnnelik sa oled …*" seems foreign in Estonian culture.

3. Possible cultural differences which affect giving more or less critical answers (e.g. the higher-than-average ratings of Romanian children and the lower-than-average ratings of children in South Korea (the possibility of so-called East-European positive and Asian negative bias).
4. Not all questions can be harmonized, as in some countries a specific question cannot be asked. For example, in Estonia and some other countries children were asked whether they had a second home where they also lived, referring to the child living periodically with one parent the other parent. Researchers in several countries could not add this question to the questionnaire.

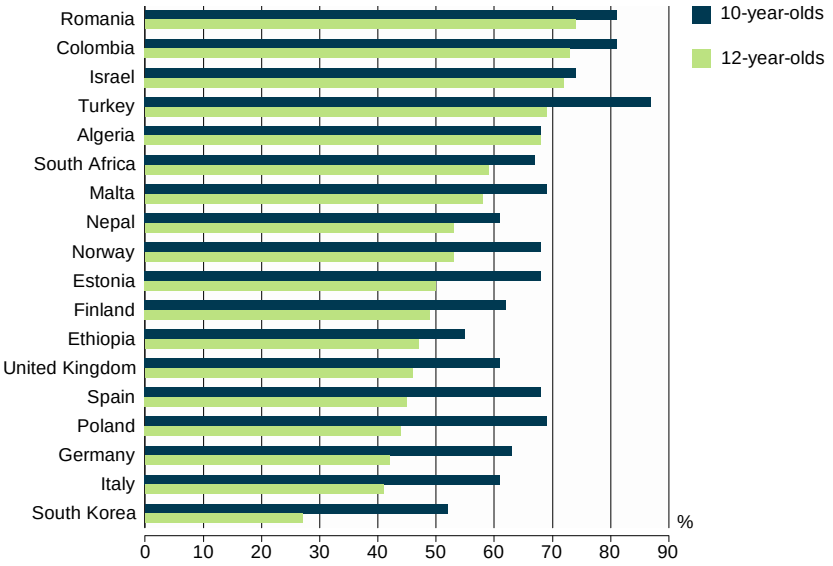
The survey Children's Worlds revealed that even if the analysis of children's average assessments was kept as a reasonable and useful approach, it is important to note how children's answers vary within countries. Main and Rees (2015) observed in the comparative analysis of countries that the variety of subjective assessments of children is greater within countries than between countries. For example, satisfaction with things that a child owns and satisfaction with oneself varied most within countries: 9% of the variability of assessments could be explained by differences of countries and 91% could be explained by differences of individual assessments in a country. Therefore, within a country it is important to pay attention to what creates differences in children's assessment and living environment.

What do children's maximum positive assessments tell that would have not been known without asking children?

Considering children's average assessments of satisfaction with their lives, it should be kept in mind that the average of assessments is useful, although not the best indicator representing children's evaluations. Policymakers could take interest in the group of children whose subjective assessment of well-being is lower than average (approximately a third in evaluating life satisfaction), in order to respond to the situation of these children and apply measures to react to their situation (reactive approach). This, however, does not contribute much to the development, which springs from already existing positive indications (the so-called proactive approach in policymaking). Therefore, besides negative attention, it is important to develop positive well-being indicators for setting targets. The starting point could be how meaningful are the results of studying children's maximum assessments and their dynamics. Many children in different countries gave a maximum rating to their satisfaction with life; therefore, a large number of children who participated in the survey can be analysed and the dynamics within the group with maximum rating can be searched for (crowding in, i.e. addition of those giving a maximum rating / crowding out, i.e. decrease in the number of those giving a maximum rating).

Figure 8 presents the share of children by country who on the scale 0–10 marked ten points, meaning that they are very satisfied with their lives. Comparing 10 and 12-year-old groups, it appears that in general the group of children who are very satisfied with their lives becomes smaller with age. The biggest drop is in the assessments of children in South Korea (approximately by a half) and the smallest is in Israel (only two percentage points on average), whereas in the assessments of Algerian children a significant difference was not noted. It could be said that it was known already previously without asking children that teenagers make their own lives as well as the lives of the people around them difficult, therefore, this overall result is nothing new.

Figure 8. 10 and 12-year-olds totally satisfied with their lives[a], 2013



[a] Only respondents who chose the maximum rating on scale 0–10

Looking at people's life satisfaction over their lifetime, it becomes clear that grown-ups' satisfaction with life is on average lower than that of children. Consequently, over time children move closer to adults in their assessments: the share of those giving maximum ratings decreases among respondents and the so-called crowding out process takes place. This was concluded by Ferran Casas (2016) after he had discovered that 15-year-olds in Spain had a lower average happiness rating

compared to 12-year-olds. In retrospect, the result is predictable and not surprising: the morning of a child's 18th birthday does not change a child's life to the extent that he or she would immediately become very grown up. It is a process: growing up starts already in childhood and adolescence. But without asking children, researchers probably would not have discovered this regularity quite yet.

What influences children's assessments so that these stay at the maximum and which factors push them out of this group? Many analyses (Casas 2016; Lee & Yoo 2015; Klocke et al. 2014) have shown that more than by socio-demographic factors children are affected by relationships in their closest environment: with parents, friends and teachers. An example is school, as the group of those children giving maximum ratings (comparing the assessments of 8, 10 and 12-year-olds) to liking school diminishes in four years in almost all countries participating in the survey (excl. Nepal and Ethiopia). In Nepal and Ethiopia, the trend is opposite (Kutsar & Kasearu 2017).

The drop in liking school among Estonian children is the greatest compared to other countries. Kutsar and Kasearu (2017) demonstrate that more often children drop out of the group who very much like school rather than join it, and the risk of dropping out increases among children aged 10. It also appeared that security is a universal factor in all surveyed countries in whether children like or do not like school very much.

Conclusion

The article gave an overview of some methodological aspects of the international survey Children's Worlds on children's subjective well-being, highlighting the differences of surveys conducted with children. A narrower focus was children's overall life satisfaction as one indicator of subjective well-being.

Studying children as a separate group started at international level in the 1980s. Today, the study of children and childhood has expanded into different areas, including the development of child well-being indicators. It is noteworthy that compared to the past when children were invisible participants in the treatment of aspects related to them, they have now become more visible in studies, politics as well as in everyday life.

Bergmark and Kostenius (2009, c.f. Kutsar & Kasearu 2017) have expressed that, "… by trusting what children say, children would become co-creators of change in their environments", which can be agreed to. Children know how to reliably evaluate different aspects of their lives, because they base their evaluations on personal experiences, feelings and observations. Children's perspective differs from that of adults, and some results could be unexpected and surprising for adults. Therefore, it is necessary to collect even more data from children themselves, in order to better understand their well-being and for adults to help improve children's well-being. It is also important to discuss research findings with children and to collect besides quantitative data also qualitative data, in order that the results can be better interpreted from the perspective of children.

As future adults, children are members of the society, impacting it already now. If their life is good, there is reason to believe that the society is strong and cohesive also in the future when the current children have become adults. Furthermore, the current children as great future parents create good life for their own children, or the children of the next generation. Theoretical approaches to children here and now and as future adults complement each other. The continuous study of children's perceptions of their situation is important in creating well-being in the society now as well as in the future.

Sources

Ben-Arieh, A., Kaufman, N. H., Andrews, A. B., George, R. M., Lee, B. J. & Aber, L. J. (2001). Measuring and Monitoring Children's Well-Being. Social Indicators Research Series. Kluwer Academic Publishers.

Bergmark, U. & Kostenius, C. (2009). 'Listen to me when I have something to say': students' participation in research for sustainable school improvement. Improving Schools, 12, 249–260.

Berk, L. E. (2000). Child Development (5th ed.), pp. 23–38. Boston: Allyn and Bacon.

Bradshaw, J., Martorano, B., Natali, L., & de Neuborg, C. (2013). Children's subjective well-being in rich countries. Working paper 2013-03. Florence: UNICEF Office of Research.

Casas, F. (2011). Subjective social indicators and child and adolescent well-being. Child Indicators Research, 4, 555–576.

Casas, F. (2016). The decreasing-with-age subjective wellbeing trend: new data and new challenges for research and education. Presentation at: Global Summit on Childhood San José, Costa Rica, 2nd April 2016. http://www.isciweb.org/_Uploads/dbsAttachedFiles/DecreasewithageCostaRica020416(1).pdf (24.01.2018).

Casas, F., Bello, A., Gonzalez, M., & Aligue, M. (2013). Children's subjective well-being measured using a composite index: what impacts Spanish first-year secondary education students' subjective well-being? Child Indicators Research, 6, 433–460.

Casas, F. & Rees, G. (2015). Measures of Children's Subjective Well-Being: Analysis of the Potential for Cross-National Comparisons. Child Indicators Research, 8, 49–69.

Child Indicators Research. https://link.springer.com/journal/12187 (24.01.2018).

Children's Worlds. www.childrensworlds.org (25.01.2018).

Cho, E. Y-N. (2017). Links between Poverty and Children's Subjective Wellbeing: Examining the Mediating and Moderating Role of Relationships. Child Indicators Research. doi:10.1007/s12187-017-9453-z.

Corsaro, W. A. (1997). Sociology of Childhood. Thousand Oaks, CA: Pine Forge Press.

Diener, E. (1984). Subjective well-being. Psychological Bulletin, 95, 542–575.

Easterlin, R. A. & Angelescu, L. (2010). Happiness and growth the world over. In Easterlin, R. A., Hinte (Eds.) Happiness, growth, and the life cycle. New York: Oxford University Press.

Easterlin, R. A., McVey, L. A., Switek, M., Sawangfa, O., & Zweig, J. S. (2010). The happiness–income paradox revisited. Proceedings of the National Academy of Sciences, 107(52), 22463–22468.

Gilman, R., & Huebner, E. S. (2000). Review of life satisfaction measures for adolescents. Behaviour Change, 17, 178–205.

Hong, M., Cho, H. N., Kim, A. R., Hong, H. J., & Kweon, Y-S. (2017). Suicidal deaths in elementary school students in Korea. Child and Adolescent Psychiatry and Mental Health, 11, 53. http://doi.org/10.1186/s13034-017-0190-3 (26.01.2018).

Huebner, E. S. (1991). Initial development of the Students' Life Satisfaction Scale. School Psychology International, 12, 231–240.

Huebner, E. S., Hills, K. J., Jiang, X., Long, R. F., Kelly, R., & Lyons, M. D. (2014). Schooling and children's subjective well-being. In A. Ben-Arieh, F. Casas, I. Frønes, & J. E. Korbin (Eds.) Handbook of child well-being, 797–819. Springer.

International Society for Child Indicators – ISCI. www.isci.org (26.01.2018).

Klocke, A., Clair, A., & Bradshaw, J. (2014). International Variation in Child Subjective Well-Being. Child Indicators Research, 7(1), 1–20.

Kutsar, D. (2015). From poverty to wellbeing: Children as subjects of sociological research and emerging agents on the policy arena in Estonia. The Central European Journal of Social Sciences and Humanities, 64, 27−42.

Kutsar, D. & Kasearu, K. (2017). Do children like school – crowding in or out? An international comparison of children's perspectives. Children and Youth Services Review, 80, 140−148.

Kutsar, D. & Trumm, A. (1999). Vaesuse leevendamine Eestis. Taust ja sihiseaded. Tartu Ülikooli Kirjastus.

Layard, R & Hagell, A. (2015). Healthy young minds: transforming the mental health of children. In Helliwell, J.F., Layard, R. and Sachs, J. (Eds.) World Happiness Report 2015. New York: Sustainable Development Solutions Network. http://www.theglobeandmail.com/news/national/article24073928.ece/BINARY/World+Happiness+Report.pdf (24.01.2018).

Lee, B. J. & Yoo, M. S. (2015). Family, School, and Community Correlates of Children's Subjective Well-being: An International Comparative Study. Child Indicators Research, 8, 151–175.

Lippman, L. H., Moore, K. A., Guzman, L., Ryberg, R., McIntosh, H., Ramos, M., Caal, S., Carle, A., Kuhfeld, M. (2014). Flourishing Children. Defining and Testing Indicators of Positive Development. SpringerBriefs in Well-Being and Quality of Life Research. Springer.

Lippman, L. H., Moore, K. A. & McIntosh, H. (2009). Positive indicators of Child Well-being: A Conceptual Framework, Measures and Methodological Issues. Innocenti Working Paper.

Mason, J. & Danby, S. (2011). Children as experts in their lives: Child inclusive research. Child Indicators Research, 4, 185–189.

Moore, K. A., Lippman, L. H. (Eds.). (2005). What Do Children Need to Flourish? Conceptualizing and Measuring Indicators of Positive Development. The Search Institute Series on Developmentally Attentive Community and Society. http://dx.doi.org/10.1007/b100487 (26.01.2018).

Noble, T. & McGrath, H. (2015). PROSPER: A new framework for positive education. Psychology of Well-Being, 5(2), http://dx.doi.org/10.1186/s13612-015-0030-2 (A Springer Open Journal) (18.01.2018).

Qvortrup, J. (1991). Childhood as a Social Phenomenon - An Introduction to a Series of National Reports. Eurosocial Reports Series, 36. Vienna: European Centre for Social Welfare Policy and Research.

Qvortrup, J., Bardy, M., Sgritta, G., Wintersberger, H. (Eds.). (1994). Childhood Matters. Social Theory, Practice and Politics. Avebury.

Rees, G. & Main, G. (Eds.). (2015). Children's views on their lives and well-being in 15 countries: An initial report on the Children's Worlds survey, 2013–2014. York, UK: Children's Worlds Project (ISCWeB).

The World Bank in South Africa (2017). http://www.worldbank.org/en/country/southafrica/overview (24.01.2018).

White, M. A. (2016). Why won't stick? Positive psychology and positive education. Psychology of Well-Being, 6(2), http://dx.doi.org/10.1186/s13612-016-0039-1 (26.01.2018).

PARTNERSHIP INDEX

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Although in developed countries, including in Estonia, state registers are tried to be used increasingly in the production of statistics, the problem sometimes lies in the inaccuracy of these registers, the reason for which is low registering culture and loyalty. In Estonia, there is a serious problem with adequate registering of place of residence, which also changes the structure of households and families in register-based statistics. In this article, an original partnership index calculated on the basis of registers is proposed as a solution, on the basis of which, the partnership of most of the single parents in the registers can be assessed.

Use of registers in official statistics and related problems

Register-based census

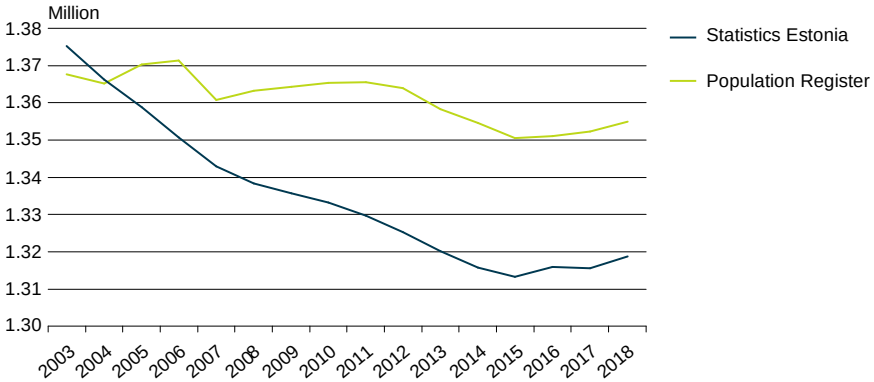
As in several other countries with advanced IT systems, also Estonia has increased the use of state registers for statistical purposes. On the one hand, it reduces the response burden of respondents, and on the other, it is generally cheaper and easier to obtain data from a complete data source than to collect them. Although the majority of state registers are not intended for producing statistics, their use for statistical purposes gives them significant added value (The role … 2006; Main … 2009; Lange 2014; Register-based … 2007). Registries, especially Population Register, have great importance in conducting censuses. It is quite natural to think that if a state has a proper, functional and constantly updated population register, it is possible to organise a census without asking people questions. This is also in line with the EU “once only principle”, according to which a state asks any information from individuals and institutions only once to reduce the response burden (EU-wide …).

However, it is not that easy to use Population Register as a data source for census-taking, because during a census a lot of such information is asked about persons, households, families and their dwellings which is not contained in the register, e.g. composition of households, quality parameters of dwellings, etc. Yet in most cases, registers covering other fields are also available, and if they have common identifiers and constitute a synergetic system, it is possible to conduct a register-based population and housing census (REGREL) relying only or mainly on register data. This system has allowed Sweden, Denmark, Finland, Norway, the Netherlands and Belgium to carry out a register-based census many times already. Austria and Slovenia conducted their last census on the basis of register data. (Di Bella & Ambroselli 2014; Nordholt & Linder 2007; Quality … 2008; Register-based … 2008; Singapore … 2003; Statistics …; The Dutch … 2006; The Slovene … 2009; The Swiss … 2008).

Residency index and its use in Statistics Estonia

In the case of a register-based census, all information required for census is obtained from registers, and hence the census results reflect any inaccuracies found in registers. The only way to improve the accuracy of results is to use several different registers (Maasing et al. 2017; Maasing 2015). This, however, requires the development of an appropriate statistical methodology.

Figure 1. Estimated population size according to Population Register and Statistics Estonia, 2003–2018



The first registry-related problem in Estonia became obvious immediately after the 2011 Population and Housing Census (PHC), when it became apparent that the population figure gained by census was approximately 5% smaller than the population figure in Population Register. For the exact estimation of the current population size, an original methodology based on residency index was introduced, which relies on the activity or representation of persons in various state registers, or so-called signs of life (Zhang & Dunne 2015). Each year, every person permanently living in Estonia can accumulate signs

of life (mathematical indicator for measuring activity in registers) from approximately twenty registers and sub-registers. On the basis of these signs of life, residency index is calculated for every person, and the value of that index is used to decide whether the person is a resident of Estonia or not in that particular year.

Analysis indicated under-coverage of census data and over-coverage of Population Register data (Maasing 2015; Tiit 2012; Tiit et al. 2012). It also revealed the reasons for coverage errors: some persons who had left Estonia had not registered their leave with Population Register, while during the census, certain number of people actually living in Estonia were not enumerated. The reasons included unwillingness to be enumerated, temporary leave, indifference and sometimes also negligence on behalf of the enumerators. Since PHC 2011, population size of Estonia is calculated based on the residency index, and since 2015, the residency index is also used for the calculation of external migration.

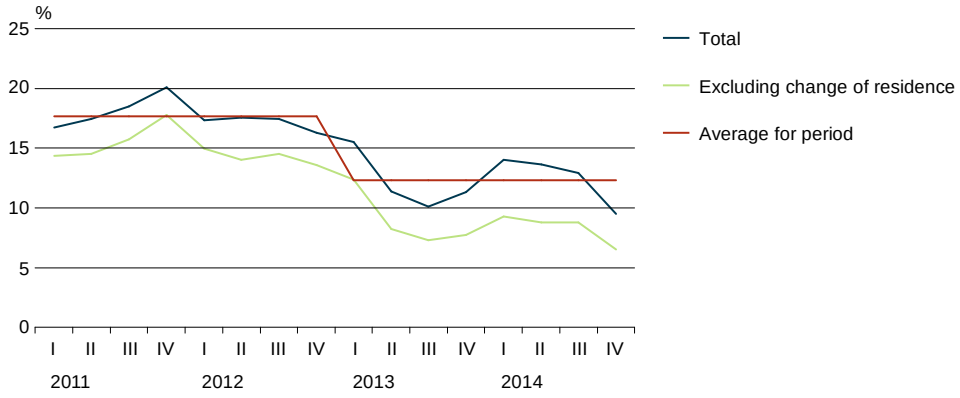
Estonia today is characterised by a relatively large number of transnational residents, i.e. persons living simultaneously in several countries. According to the definition used in census, permanent resident is a person who stays in the country of residence for at least 12 months. However, this means that a considerable number of people are not permanent residents of any country at a certain point in time, because they commute between several countries without living in any of them for a whole year. Such persons are referred to as transnational, whereas this relatively new term has no precise and common definition yet. In any case, several researchers have noted that the word stands for being linked to several countries, and refers to people formerly living in Estonia who are now linked to or commute between different countries while also visiting Estonia for a shorter or longer period (Eesti … 2017). The number of such people can be relatively accurately assessed also by using the residency index.

Problem with actual dwellings

Another substantial problem in population statistics concerns permanent places of residence of the Estonian population. Surveys performed by Statistics Estonia show issues with registering the permanent place of residence: 20–25% of all permanent residents of Estonia have not registered their actual place of residence in Population Register and live at a different address, often in another city and county. The actual place of residence of those people is unknown. If the error occurs on a city or rural municipality level, it means that a register-based census does not provide accurate results about the population of a particular settlement, despite having an accurate overall population figure. The situation was not much better after the most recent population and housing census, because the internet-based interview allowed people to indicate their place of residence at an address different from their actual place of residence, including their officially registered place of residence. As seen from the results of the census, accurate information regarding the place of residence was obtained and registered only during face-to-face interviews, i.e. during the last, or interview stage of the census.

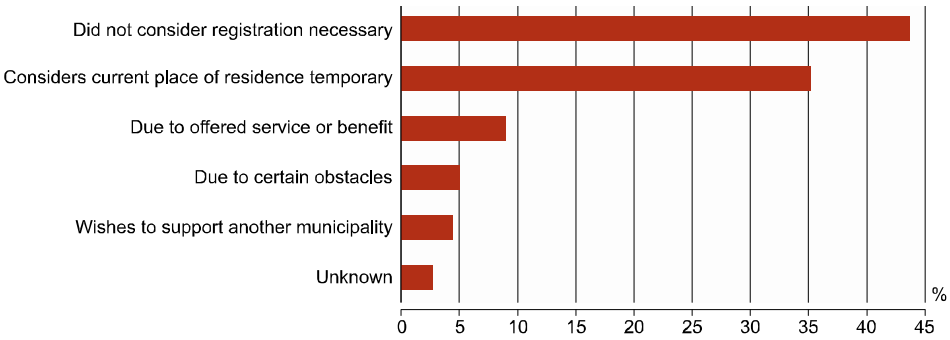
Ultimately, the accuracy of the data regarding place of residence improved less than expected. This was confirmed by surveys, where a considerable number of intended interviewees were not found even after the census due to inaccurate address data (Figure 2). Why is it so? This problem has historical roots. In Soviet times, accurate registration of place of residence was obligatory and the absence of a fixed place of residence was considered almost criminal, but the Riigikogu (Parliament of Estonia) abolished that obligation after the restoration of independence. It was assumed that people would still register their place of residence to maintain their right to use various services. In reality, it did not happen. After some time, attempts were made to fix the situation by re-enforcing the obligation to register the place of residence (along with the requirement to indicate the actual place of residence as registered place of residence), but no sanctions were involved.

Figure 2. Loss of respondents of Estonian Labour Force Survey due to not finding the respondent, 2011–2014



However, some people are still unaware of the re-enforcement of such an obligation, and quite many still believe that the registration of the place of residence is not obligatory or necessary in Estonia today (Figure 3).

Figure 3. Main reasons for false registration of place of residence, 2015



Today, there are several new reasons and factors causing false registration of place of residence. For families with children, the location of schools and kindergartens is very important – parents often prefer to choose a kindergarten not based on their place of residence but near their workplace; schools are of different quality, which is why parents try to enrol their children in schools outside their school district. There are also various local benefits: free public transport, several social benefits, etc. With regard to the administrative reform, there have been campaigns to lure people to a certain municipality – not to live there, but to register as resident – in order to increase the formal number of residents in that particular municipality. Another important factor is the desire of people with two places of residence to register as residents of their country home in order to support the local rural municipality.

Statistics Estonia supplemented the 2015 Estonian Labour Force Survey (LFS) with questions for people who do not actually live in their registered place of residence. The survey results, which were analysed by Helerin Äär (2017), are presented in Figure 3. Although the connection with offered service or benefit is indicated by less than one tenth of the respondents, we may presume that this factor in fact affected the choices made by the almost half of all respondents who did not consider registering the actual place of residence important.

Problem with households

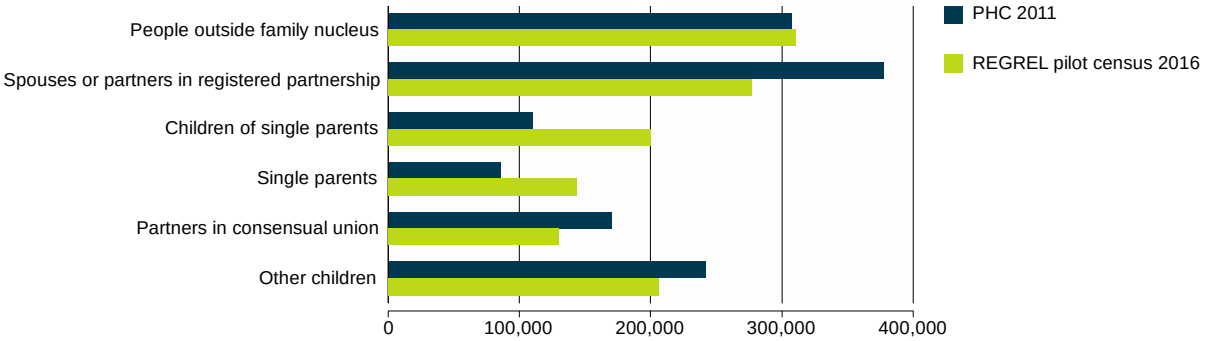
Even greater concern arising from false registration of place of residence is linked to families and households. In the case of a traditional census, interviews (or self-enumeration) are used to determine which persons form a household, i.e. a group of people who share joint resources and whose only formally verified condition consists in that they live together in a permanent dwelling. Considering that household members do not have to be relatives, statistics uses another group: a family in a narrower sense, i.e. a nuclear family (family nucleus), which is determined by being close relatives. The family (nucleus) is formed of either a married or cohabiting couple with or without children, or a parent and child or children. Thus, a household can also be a family, but it may include other members besides the nuclear family, e.g. a grandmother or nanny. It is also possible to have a household with several nuclei – for example, if a household contains married couples of two generations. A person living alone is also considered a household, but not a family.

It is generally impossible to determine a household sharing joint resources based on register data, including register-based census, because in most cases, registers do not have information about the financial connection between persons. However, Slovenia has a household register (Dolenc 2016), which was used in conducting a register-based population and housing census.

In the majority of countries performing register-based population and housing census, households are defined as a group of people living in a common dwelling. In Estonia, the new definition brings about certain changes in the size and composition of households. According to the data of the most recent census, 93.3% of Estonia's occupied dwellings were inhabited by one household, 6% by two households and 0.7% by more than two households. Therefore, we can assume that when using a register-based census instead of a traditional census, there will be more households with either several nuclear families or additional members living with nuclear families, but these changes are not very extensive, remaining below 10% of the total number of households. The same amount of changes are expected to occur in a person's status in the family and household.

However, problems arise if persons do not live in the dwellings registered in Population Register, and the members of an actually functional household are registered at different addresses. Therefore, it is impossible to count them as a household. This concern was confirmed by the REGREL pilot census in 2016, where personal status in the household was distributed rather differently than the structure of household members registered during the 2011 PHC (Figure 4).

Figure 4. Distribution of household members according to 2011 PHC and 2016 REGREL pilot census data[a]



[a] Kristi Lehto. Presentation in REGREL scientific council. Tallinn, 17 May 2016.

There are three reasons for changes in the distribution of household members:

- in the course of five years, changes have occurred in the household structure due to social development;
- changes in the definition of a household cause shifts in the distribution of household members;
- differences in the household structure arise from false registration of the place of residence.

The first factor causes a decrease in the number of married persons due to delayed marriage and emigration. Also the number of children in families of spouses or partners has decreased due to delayed childbirth and smaller younger generation.

The number of marriages and, consequently, married couples decreased in 2012–2016 by about 6% and an approximately equivalent decrease might have occurred in the number of children of married couples. This partially explains the changes in the first and fifth columns of Figure 4. The second factor reduces the total number of households by about 8%, due to the loss of more than a half of households in collective living quarters (apartments and one-family dwellings inhabited by many households) that accounted for 7.3% of independent households. This factor may affect both the decrease in the number of cohabiting couples (second column of Figure 4) and increase in the number of members not included in the family nucleus (should be evident from the rightmost column of Figure 4, but apparently that did not occur). To some extent, the change in the definition of a household may affect the decrease in the number of cohabitation partners due to the fact that they are determined by algorithm (Kütt 2014), and it is possible that some of them were not determined (maximum estimated error 2%). However, the effect is most significant with the third factor, resulting in the frequent distribution of households into parts registered in different places of residence, thus formally becoming individual households. This results in an increased share of single parents and children living with single parents, and a decreased number of married and cohabitation couples.

Possibilities of register-based solutions

Solutions to problems regarding households and dwellings in European countries

In order to solve the current situation, we once again have to turn to registers (Tiit 2015). It is necessary to find data which link persons together as one household and/or family, and secondly, data which link persons with dwellings. Both tasks are interrelated and there are two possible logical solutions.

1. Find for each person his/her “actual” place of residence. Consider all persons in this place of residence as one household, and then algorithmically determine the status of all household members in the household and family.
2. At first, find household nuclei, i.e. pairs, and then form a family around them, link them with a dwelling and with potential other household members.

The problem of determining and linking households with dwellings does not occur exclusively in Estonia. Various countries use different solutions to supplement and adjust the information collected in the course of interviews or register data. Determining the status of household members (especially linking of consensual union couples) is an important task also in the Nordic countries; the algorithm used in Finland is similar to the algorithm tested and used in the REGREL pilot census in Estonia. Another rather common problem is linking households with dwellings, especially in countries, where the addresses of dwellings are not accurate enough (e.g. missing apartment numbers) (The combined … 2017). In such countries (e.g. Iceland), inhabitants are linked with dwellings based on the best match, taking into consideration the characteristics of both dwellings and households (Harðarson & Calian 2017). It is not always easy to form households based on register data, e.g. in Germany, such process involves an algorithm called the household generator (Tiit & Vähi 2017). As the nature of problems varies by country, depending on available information, such problems need to be solved independently, while not excluding the experience of others and searching in each case for as reliable and accurately functioning algorithms as possible.

Determination of partners using register data in Estonia

In organising the Estonian household and dwelling data, it was decided to start with households: first to determine the household nucleus, i.e. pair of partners (spouses or cohabitation partners), then link the pair with their children (if present) and thus form families. As a result, this allows finding partners, families and households also for some single parents, especially for those who only formally live separately from their partner according to Population Register data. The second step involves linking families with dwellings, forming dwelling-based households.

Based on existing information, it is possible to solve the task of determining partners on two levels.

As for narrower task, partners are determined for single parents only (where possible), while making sure that the partners found for single parents do not belong as partners to existing register-based households (i.e. there is no "splitting" of existing register-based families).

As for wider task, the selection of partners does not involve only the above-mentioned "free" persons. Instead, it involves all persons in existing dwelling-based households. Essentially, this task means reviewing and redefining partnerships of the entire population.

In this article, the focus is primarily on solving the narrower task, which will be used in practice in the upcoming REGREL pilot census. For that purpose, the following strategy was chosen.

1. The number of residents shall be determined and the search shall be limited to residents only.
2. Potential partners for every single mother and single father shall be found.
3. Pairs are formed of determined partners, while observing set restrictions and suitability rules.
4. All children of partners are added to the pairs, thus creating family nuclei.

The next step involves finding a dwelling for each family nucleus. This may be a dwelling of either of the partners, common ownership of the partners or a secondary place of residence of both or either of the partners in accordance with the suitability measures. In the course of finding a suitable dwelling, household members outside the nucleus may be added to the family nucleus.

The first step applies to the entire population; the third and fourth steps require using data in Population Register and Land Register. This article focuses mainly on the feasibility analysis of the second step and the description of performance algorithms.

Although at first, it is necessary to solve the narrower task described below, the described methodology is in principle also suitable for solving the wider task, i.e. forming families and households across the entire population. Applicability of the methodology can be improved by adding additional signs of partnership, which does not significantly alter the concept of the method or the content of algorithms.

Signs of partnership

The first step in creating a partnership model consists in finding and defining signs of partnership. The currently used signs of partnership (that may, in principle, have both positive and negative effect) include the following signs from Population Register: *marriage* and additionally the sign of partnership *semi-marriage*, indicating a situation where information about marriage in Population Register is either lacking or controversial; *divorce* and *semi-divorce*, the latter of which is defined along the same lines as semi-marriage; *child*, which denotes the presence of the partners' common minor (18 years and younger) children, and *children,* which unlike all other signs of partnership is not a binary (yes/no) variable, but indicates the number of common minor children of the pair; also *dwelling*, denoting common dwelling of the pair. Information in Population Register was also used to find out whether the persons forming a pair are close relatives or, e.g., cousins; pairs of relatives were mostly eliminated in the course of the analysis (although, e.g., cousins as partners are not precluded in Estonia). Information of the Tax and Customs Board was used to add the signs of partnership *joint declaration* – jointly filed tax return, and *loan* – jointly applied loan (predominantly home loan); the information system of quick processing of payment orders administered by the Ministry of Justice was used to get information regarding *support claim* – claim filed by one person against the other to pay support for common child (a sign of partnership with negative effect). Land Register provided further signs of partnership: *ownership* and *ownership-dwelling,* consisting in, respectively, common ownership of persons and the fact that the place of residence of one person is registered in the dwelling or registered immovable belonging to the other (potential) partner; these characteristics were created by combining the information from Land Register and Population Register. Furthermore, certain moments in time for important signs of partnership are also registered: birth of the youngest child, getting married, etc.

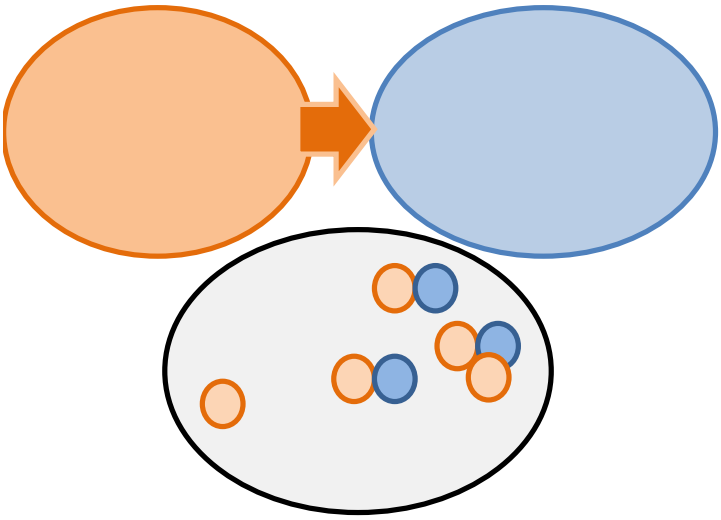
Naturally, one may ask why the characteristic *marriage* is included in the signs of partnership, as there should be no need to link already married couples. However, it is a rather common practice that persons living in actual partnership (including spouses) have, for some reason, registered their places of residence at different addresses, and thus do not constitute a household or family according to register-based statistics. Different signs of partnership have a rather different effect in terms of information, and this is taken into account in further actions.

Partnership model

The next step is to use the signs of partnership to create a partnership index, which, in principle, should yield an assessment about a pair – whether they are or are not partners, i.e. spouses or cohabitation partners. Most natural is to define this index

as a linear combination of the signs of partnership (as binary variables). Based on empirical data, it is necessary to statistically determine the numerical parameters of the index, e.g. multipliers attributed to the signs, and also a threshold that allows to decide which partnership index values indicate that a pair of persons are partners and which indicate that they are not. It is also important to define which persons are considered potential partners, and how to determine a partner if there are several suitable potential partners available for one person (i.e. a person occurs in several potential pairs).

Figure 5. Linking persons by signs of partnership



In the case of the narrower task, when finding partners for single parents, it is considered that the households and dwellings of some persons are known (correspond to register data), and they should not (must not) be changed to solve the task. Potential partners of single parents include single parents, single adults living alone and persons who in another household have either the status *child* (not related to age) or *person not included in household nucleus*. Partners of single parents will not include persons recorded as a spouse or cohabitation partner in another household.

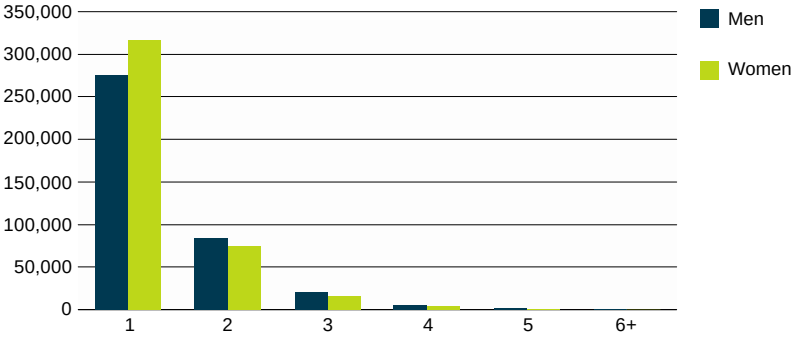
Estonia 2016. Empirical dataset and its use

Database of signs of partnership

The database used to test the model (aggregate index) is compiled on the basis of the data in Estonian registers (Population Register, Tax and Customs Board Register, Land Register, e-File, information system of quick processing of payment orders, address data system). Each partnership sign links two persons aged 18 years or older, one of whom is a man and one is a woman. In principle, any person may occur in the composition of several pairs. Each pair in the database has at least one connection – sign of partnership.

The database contains a total of 796,700 pairs, but they also include pairs of relatives (mostly with regard to common ownership or common dwelling). Based on Population Register data, it is possible to distinguish between the pairs of close relatives (child and parent, sister and brother) and in most cases also more distant relatives (cousins, uncles-aunts and child of brother or sister). All relative pairs are excluded from the dataset used in the further steps of the process. There are 536,334 non-relative pairs, but they include pairs where a partner is represented more than once. Generally, men have more partners than women, but the greatest number of partners in the dataset is 37 for women and 14 for men.

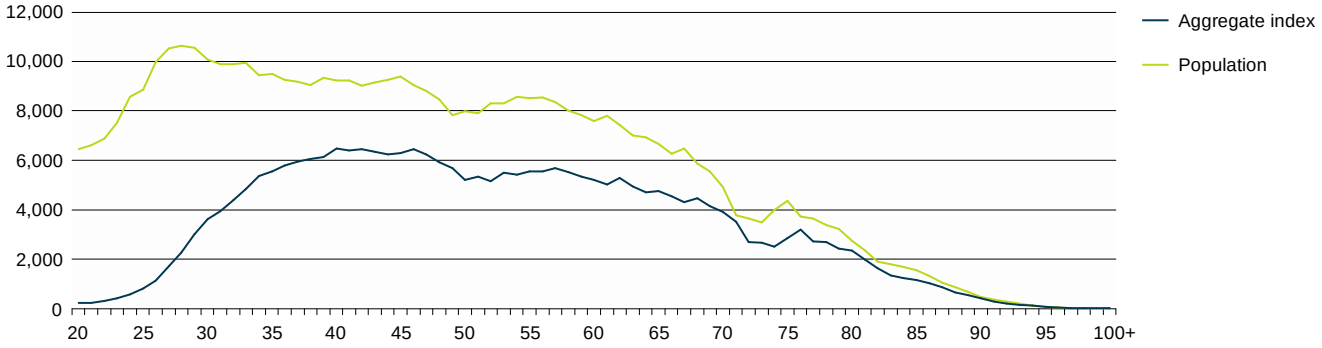
Figure 6. Distribution of number of partners for men and women in the database[a], 2017



[a] The used database of partners includes data as at the beginning of 2017.

Such a great number of partners is caused by a particular characteristic, *dwelling_ownership,* which shows the number of potential partners living in a dwelling belonging to a person, i.e. a person who owns various real estate, accommodating several "potential partners". However, they might have no other characteristics connecting them with the owner of the real estate. Naturally, such sign of partnership alone is not enough to determine the affiliation of partners. The further processed dataset of non-relative pairs contains 387,222 different men and 411,936 different women.

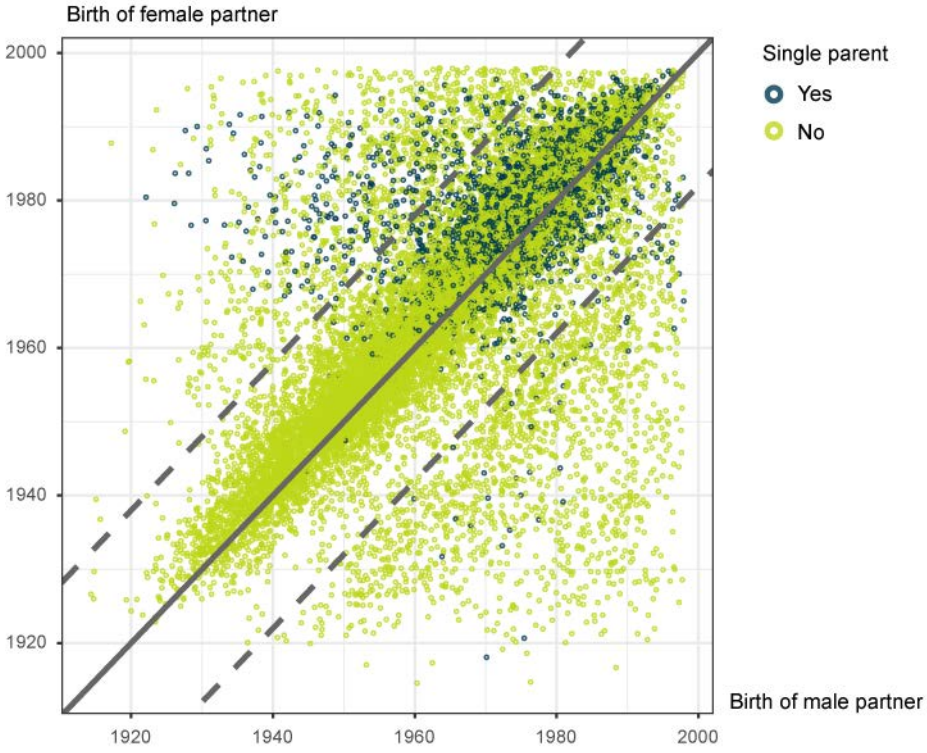
Figure 7. Distribution of men in survey dataset[a] and all men in Estonia by age, 2017



[a] Aggregate index

Figure 7 shows that younger men generally have relatively fewer signs of partnership than middle-aged and older men. The majority of men aged 30 or older have signs of partnership.

Figure 8. Birth times of partners, 1920–2000[a]

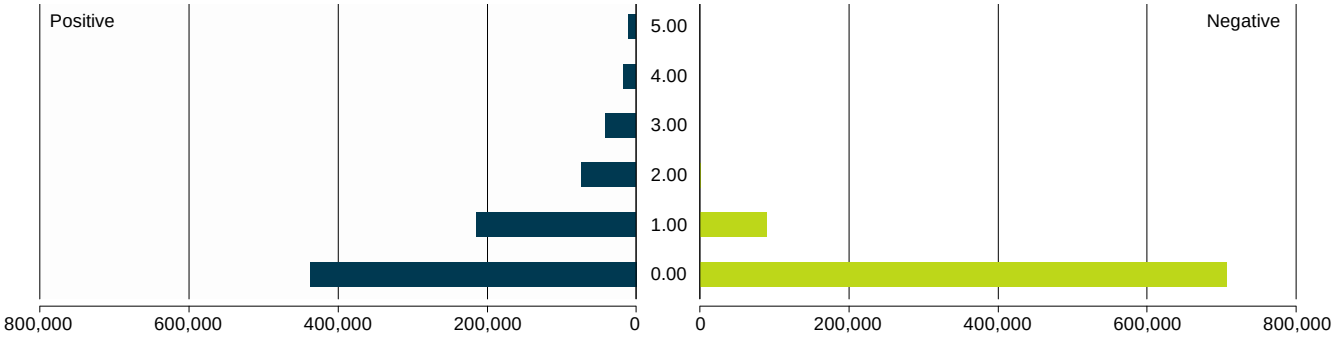


[a] 20,000 randomly selected pairs. The continuous line stands for partners born at the same time and the dotted line for the age difference of 18 years. Red dots stand for pairs where at least one partner was a single parent according to the REGREL pilot census.

Simple sum of signs of partnership

In order to explain the function of the signs of partnership as characteristics describing partnership, the first approximation consisted in the simple sum of signs of partnership (index 0), which was calculated by deducting the sum of negative signs (Figure 9, on the right) from the sum of positive signs (Figure 9, on the left).

Figure 9. Distribution of the sum of positive and negative signs of partnership, 2017



Additional signs of partnership

In order to increase the sensitivity of the partnership index, we modify the signs of partnership by introducing additional information, including time, in particular, and by defining additional signs of partnership, the numerical characteristics of which are substantially different from signs of partnership.

The following characteristics were defined to eliminate the unreasonable effect of large-scale real estate ownership on partnership:

- *OM_osa_M – common ownership* divided by the number of men involved;
- *OM_osa_N – common ownership* divided by the number of women involved;
- *EOM_osa_M – dwelling_ownership* divided by the number of men involved;
- *EOM_osa_N – dwelling_ownership* divided by the number of women involved.

In order to consider the duration of marriage, during which the positive effect of the sign of partnership *marriage* may decrease, the following characteristic was introduced:

- *ab_pid*, the value of which decreases according to the duration of marriage ranging from 1–25 years with coefficient 0.977, and remains constant from duration value 25; for unmarried pairs, the value of this characteristic is 0.

Similar modification was made to the variable indicating the presence of a common minor child:

- *laps_pid*, i.e. the characteristic *child present*, the value of which decreases according to the age of the youngest child in the range of 1–18 years with coefficient 0.977; in the absence of common children, the value of this characteristic is 0.

The excess age difference of partners was considered a negative sign of partnership:

- *m_liigvanus*, i.e. a non-positive characteristic, the value of which is calculated as $0.95^{x} - 1$, where x = difference – 20 if the man is older; if the age difference is <20 years, *m_liigvanus* = 0;
- *n_liigvanus*, i.e. a non-positive characteristic, the value of which is calculated as $0.95^{x} - 1$, where x = −15 – difference if the woman is older (difference = age of man – age of woman <0); if the age difference >15 years, *n_liigvanus* = 0.

The signs of partnership were checked for correlation. As expected, there was a relatively high correlation between certain original variables and derived variables, but the correlation between original variables was high only in the case of the pairs of characteristics *divorce*/*support* and *marriage*/*joint declaration*.

Test dataset

The compilation of a model requires a test dataset with known signs of partnership as well as actual partnership of pairs.

Data collected with recent surveys (ESS 2016, LFS 2015–2017) were used to compile a test dataset with known partnership. Analysis involved 14,042 men and 14,439 women. By adding these data to the signs of partnership dataset, information was obtained regarding the signs of partnership of all the pairs included in the test dataset. However, 4.6% of the pairs added to the survey dataset had no signs of partnership. The average number of signs of partnership was 2.92 for partners in the test dataset and 1.36 for persons without a partner (the direction of signs of partnership was not considered). Also in the test dataset, only non-relative pairs were considered. The dataset contained 8,670 survey-based partner pairs and 10,596 non-partner pairs; in total, 19,266 pairs, i.e. 3.6% of all 536,334 pairs in the full dataset of non-relative pairs.

Determination of partnership index and threshold based on test dataset

The index was formed by using the following models.

1. Logistic regression
2. Linear regression (essentially discriminant analysis)
3. Model of ratio weights
4. Model of logarithmic weights

Each model allowed the inclusion of 20 explanatory variables, but there were also considerable mutual correlations. An overview of each model is given below.

Logistic regression

Predictable probability consists in the presence of a partner (according to the test group data), and this probability constitutes the first partnership index (Table 1). The model was formed by using conditional forward search algorithm, based on all 20 potential explanatory variables. For each additional variable, the aggregate probability of inclusion and exclusion errors was checked. Based on the quality criteria, the model with 19 explanatory variables was the best, with only one possible variable excluded. All explanatory variables included in the model proved to be statistically significant (significance 0.05). The quality of the resulting model (descriptivity level) is described by the characteristics Cox-Snelli R^2 = 0.528 and Nagelkerke R^2 = 0.707, varying between 0 and 1.

The values of the calculated index vary in the range of (0–1), and in the case of standard threshold 0.5, the following error estimations were calculated based on the test dataset:

- inclusion error (original = 0, estimated = 1) 5.4%;
- exclusion error (original = 1, estimated = 0) 8.6%;
- cumulative error 14.0%;
- accurate decisions 86.0%.

Linear discriminant

Here a step-by-step forward selection of variables is used. It appears that all 20 explanatory variables in the model are significant. The value of R^2 used for assessing the descriptivity level is 0.564 and the adjusted R^2 value is 0.563. The second index is formed by a non-standardised estimate calculated on the basis of the model (Table 1).

Using the linear estimate median with the value of 0.4514 in the test dataset as a threshold, a rather successful distinction was achieved:

- inclusion error (original = 0, estimated = 1) 4.3%;
- exclusion error (original = 1, estimated = 0) 9.9%;
- cumulative error 14.2%;
- accurate decisions 85.8%.

Ratio weights

The third index version considers the effect of the signs of partnership in a known dataset, in this case the test dataset. Mean values regarding the dataset of partners (reference = 1) and the dataset without partners (reference = 0) are calculated for each individual characteristic. In the case of original signs of partnership, mean values indicate incidence and ratio weights indicate incidence ratio, but this connection does not apply in the case of derived ratio weights. The found ratios are used as weights in the linear combination of signs of partnership and derived characteristics, thus forming the third index. The index was calculated by excluding some correlated explanatory variables, choosing for the model from the group of correlated variables the characteristics with the largest ratio weights, and thus the model includes 18 explanatory variables, whereas, unlike previous models, this one does not contain a constant (Table 1).

A separate task consists in determining the most fitting threshold for the index. In this case, a threshold is sought which, along with minimising decision errors, would ensure a solution with well-balanced errors. The value for such a threshold for this index was 7.35. In the case of the third index, the probability of estimation errors was as follows:

- inclusion error 6.5%;
- exclusion error 9.1%;
- cumulative error 15.6%;
- accurate decisions 84.4%.

Logarithmic weights

The fourth index was also calculated as a linear combination of the signs of partnership and derived characteristics, using logarithmic weights as weights. The model did not include excess age characteristics, which were present in only a few pairs. Compared to the previous case, index variability decreased considerably. Ultimately, the model contained 16 characteristics (Table 1).

Again, a threshold is sought that, along with minimising decision errors, would ensure a solution with well-balanced errors. The value for such a threshold was 2.75. In the case of the fourth index and a suitable threshold, the probabilities of estimation errors were the following:

- inclusion error 5.3%;
- exclusion error 9.4%;
- cumulative error 14.7%;
- accurate decisions 85.3%.

Multipliers of indices

Table 1 presents the multipliers of all the calculated indices.

Table 1. Multipliers of indices

	Index 1 (logistic regression)	Index 2 (linear discriminant)	Index 3 (ratio weights)	Index 4 (logarithmic weights)
marriage	2.002	0.528	13.696	2.617
ab_pid	0	–0.188	13.956	2.636
support	–1.568	–0.223	0.106	–2.242
dwelling	0.254	0.022	1.796	0.586
dwelling_ownership	–2.973	–0.367	not included	not included
EOM_osa_M	2.132	0.263	2.796	1.028
EOM_osa_N	2.479	0.288	2.622	1.216
loan	0.910	0.089	6.907	1.932
divorce	–2.817	–0.324	0.049	–3.02
child	0.485	0.015	2.915	1.07
laps_pid	7.059	1.118	2.423	0.885
children	–6.036	–0.845	2.22	0.797
m_liigvanus	13.473	0.599	0.012	not included
n_liigvanus	37.748	0.777	0.002	not included
ownership	–1.551	–0.166	not included	not included
OM_osa_M	1.051	0.086	3.689	1.305
OM_osa_N	0.732	0.071	3.375	1.216
semi-marriage	2.027	0.436	4.666	1.54
semi-divorce	–1.531	–0.246	0.815	–0.205
joint declaration	1.059	0.048	26.03	3.259
Constant	–0.639	0.353	not included	not included

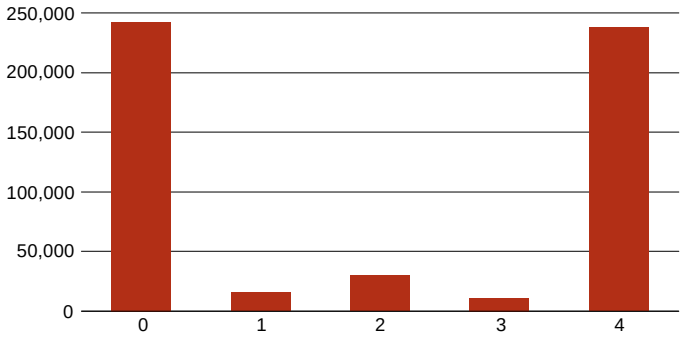
The table shows that some signs of partnership in the model of linear and logarithmic weights are negative; they typically prevail in non-partner pairs, i.e. ratio weights are less than one. Rare characteristics, such as excess age, have unusually high multipliers. Mutually correlated characteristics also have high multipliers, which mostly compensate for each other – this is the case with characteristics *children* and *laps_pid*. As these explanatory variables increased the accuracy of the logistic model, they were not excluded.

Aggregate index

It appears that all four used indices yielded relatively similar results in terms of accuracy, but each set of pairs marked with an index is somewhat different in terms of its composition, as indicated by the fact that their mutual correlations, calculated for all non-relative pairs, varied in the range of 0.81 to 0.95.

All four described decision rules, or indices, reduced to the scale of 0–1 were used for choosing partners, and they were added together, resulting in an aggregate index with the distribution of values among all non-relative pairs described in Figure 10.

Figure 10. Distribution of aggregate index in non-relative pairs dataset, 2017



249,010 pairs, or 46.4% of all non-relative pairs had the minimum value 3. Using the aggregate index as a decision criterion, the inclusion error is 4.0% and exclusion error 10.4%. Thus, the accuracy of the aggregate index is described by less than 15% of decision errors. As for single mothers and single fathers, the share of decision errors based on survey data was 16.6% and 13.4%, respectively.

Analysis of repetitions

Next, only those pairs are observed whose minimum aggregate index value is at least 3, i.e. who should be considered partnership pairs based on the index. They numbered 249,010.

It appears that they include 1,506 pairs, or 0.6% of the total number of entries, with repeated male partners (i.e. appear in two different entries with different partners). The dataset contained 6 men with three potential partners. This dataset contains 759 men who, according to the index, were linked with several partners.

Double repeats of women occurred in the same dataset in the case of 1,194 pairs (0.5% of entries) and in three pairs, different partners were linked with one and the same woman. Thus, it can be said that index-based pairs contained 598 women who were linked with several partners.

Although there are not many pairs that have several partners to choose from, it still requires a decision rule. Apparently, the age of the youngest child is the best for pairs with children: a partner is linked with the person with whom later on a positive sign of partnership has been created (e.g. a younger common child).

Introduction of single parents into households

Finding partners for single parents

First, possible solutions for the narrower task are considered: partners are sought for single parents. The non-relative dataset contains entries with 85,012 single mothers and 14,775 single fathers. These entries do not always correspond to actual single parents, but to persons with minor children, who do not live in their registered place of residence together with their spouse or cohabitant, i.e. partner.

How many single parents can be linked with partners by using the method described above? It appears that the sub-dataset in question (minimum aggregate index 3, no relatives) contains a total of 34,046 pairs with a single mother and 6,515 pairs with a single father, and thus a potential partner was found for 40.0% of single mothers and 44.1% of single fathers. However, this number is not conclusive. Apparently, of the pairs with single mothers, in 458 of the cases, one woman is linked with two men (1.3%) and in 236 of cases, one man is linked with two women (0.7%). As for pairs with single fathers, in 70 pairs, one woman is linked with two men (1.1%) and in 8 pairs, one man is linked with two women (0.1%). All these cases can be solved by means of additional rules described above.

The possibility of finding a partner for approximately 40,000 single parents is in line with the problem that occurred when the data of PHC 2011 was compared with REGREL pilot census data, and it became evident that the number of single parents in the REGREL dataset exceeded the relevant indicator of the 2011 PHC by approximately 50,000 persons. Considering also the effect of other potential factors that change the household structure, the possibility of fixing the difference by approximately 85% based on indices derived from register data is a satisfactory result.

Formation of families

Every person in a partner pair is usually also linked with all his or her minor (18 years and younger) children, or possibly older children living with him or her according to register data, who have not yet formed their own separate family or household.

After finding a partner for a single parent, a family is formed, consisting of a partner pair and children living with both partners (if present). Meanwhile, the children in such a family do not have to be only minors. Thus, a so-called full family is formed, consisting of a married or cohabiting pair and child or children, who do not necessarily have to be common children of the pair. At the same time, also a household is formed, classified as a single-family household without additional members.

Linking dwellings with households

A dwelling is found based on the characteristics which connect a person with a place of residence, i.e. the signs of placement. These include primarily the registered place of residence, registered secondary place of residence, ownership of dwelling, payments connected with the residence and possible financial transactions, and in the future, also electricity meter data and, possibly, mobile positioning information.

In determining a dwelling for a family, the selection involves dwellings connected with all the persons in the particular family (partners, in some cases also their children). Such task usually concerns more than one potential dwelling, including the registered dwellings of both partners, but also secondary dwellings may be considered, and in some cases also registered places of residence of minor children.

The process of determining a dwelling for a family is based on the following conditions:

- the dwelling must be inhabited all-year-round (electricity consumption information);
- there are generally no other families living in the dwelling (there may be exceptions to this rule, e.g. a situation where a dwelling is a private house with relatively large area, or if the dwelling is inhabited by a family of close relatives of one of the partners, e.g. mother and father); it is also possible that the dwelling is inhabited by a single person, e.g. a relative of one of the family members, who is then included in the household;
- the dwelling complies with the needs of the family, i.e. is habitable and has a sufficient number of rooms or area.

If such conditions are met by several potential dwellings, the selection is made based on the number of signs of placement connecting the dwelling with the particular family, whereas the signs of placement of all the family members are added up, i.e. the family placement index is formed.

Thus, the household connected to a dwelling may contain additional members besides the family nucleus, who are person or persons connected to the dwelling attributed to the family.

In exceptional cases, if a family formed based on the partnership index is not linked with any dwelling, this family is linked with a suitable vacant dwelling (corresponding to the above conditions) either in the settlement linked with the family or in an entirely random place in Estonia.

What kind of single parents can be linked with partners?

When comparing persons for whom a partner was found with those who did not receive a partner based on the characteristics (which are rather scarce to describe a person) of the pairs dataset, it appeared that separate indices and the aggregate index produced a more or less the same selection of partners.

In the case of single mothers:

- average pair with found partner: common child in 94–96% of the cases, duration of marriage approximately 10.5 years, age of the youngest child 5.5–6.5 years, average year of birth – mother 1980, father 1977;
- average pair that was not a partnership pair: common child in 52–57% of the cases, duration of marriage 13–14 years (if any), age of the youngest child 11–12 years, average year of birth – mother 1977, father 1971.

In the case of single fathers:

- average pair with found partner: common child in 97–98% of the cases, duration of marriage approximately 12.5 years, age of the youngest child 6.8–7.5 years, average year of birth – mother 1978, father 1975;
- average pair that was not a partnership pair: common child in 44–52% of the cases, duration of marriage 16 years (if any), age of the youngest child 11–12 years, average year of birth – mother 1971, father 1972.

Summary

The analysis showed that it is possible to use the partnership index, which is similar to the residency index, to form families and households. The required positive and negative signs of partnership can be found from administrative registers (incl. Population Register), but to improve the result, more of them should be found and used. There are several ways to determine an index, or a function of the signs of partnership based on the test dataset. This can be done either by classical multivariate statistics or alternative methods, whereas all the cases produce satisfactory results that are suitable for practical use already in the first year. The situation will improve significantly in subsequent years, when the data of the preceding years can be used in the decision-making process.

According to the preliminary error estimation, the sum of inclusion and exclusion errors is approximately 15%. An error this big would be considered excessive if the method was applied to the entire dataset, but in the first approximation, it is applied only to a relatively small share of the dataset (persons who are single parents according to the REGREL pilot census, i.e. 140,000 persons). The average estimated decision error in determining single parents is 17%, which means approximately 24,000 decision errors, including 7,000 erroneously formed pairs. As the total number of households in Estonia is approximately 600,000, the share of erroneously formed pairs and hence the number of households is only 1.2%. The effect of exclusion errors on household structure is more difficult to assess, but the changes in the household structure due to decision errors made based on the partnership index never exceed the limit of 5%.

The formation of pairs is followed by the formation of families and then households, and linking of households with dwellings. The last step is methodologically similar to finding partners: a placement index connecting a household with a dwelling is formed by using the signs of placement. Apparently, some signs of partnership (that were used to link persons) are also suitable as signs of placement, if treated as signs connecting persons with dwellings. It is likely, that certain big data, e.g. electricity data, can also be used as signs of placement. Linking of dwellings and households also allows verification of households formed based on the partnership index.

Sources

Andersen, E., & Utne, H. (2007). The first register-based Census in Norway in 2011: How to comply with international recommendations? Seminar on Registers in Statistics – methodology and quality. Helsinki. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10043.aspx (25.08.2015).

Di Bella, G., & Ambroselli, S. (2014). Towards a more efficient system of administrative data management and quality evaluation to support statistics production in Istat. Paper presented to the European Conference on Quality in Official Statistics. Vienna. 2–5 June 2014.

Dolenc, D. (2016). Defining and identifying households by administrative data in Slovenia. Presentation at ESS seminar. Tallinn. November 2016.

Eesti Koostöö Kogu. (2017). Eesti inimarengu aruanne 2016/2017 „Eesti rändeajastul".

EU-wide digital Once-Only Principle for citizens and businesses. Policy options and their impacts. Executive summary.

Harðarson, Ó. S., & Calian, V. Presentation of Statistics Iceland's leading statisticians in a seminar in Reykjavik during the visit of Statistics Estonia's employees. 30 March 2017.

Kütt, K. (2014). Leibkonnad ja perekonnad registripõhises rahva ja eluruumide loenduses. Master's thesis. University of Tartu, Faculty of Science and Technology. http://dspace.utlib.ee/dspace/handle/10062/42537?show=full (25.08.2015).

Lange, A. (2014). The population and housing census in a register based statistical system. Statistical Journal of the IAOS, Vol. 30, No. 1, pp. 41–45. http://content.iospress.com/articles/statistical-journal-of-the-iaos/sji00798 (25.08.2015).

Maasing, E. (2015). Eesti alaliste elanike määratlemine registripõhises loenduses. Master's thesis. University of Tartu, Institute of Mathematics and Statistics. http://dspace.utlib.ee/dspace;/handle/10062/47557 (25.08.2015).

Maasing, E., Tiit, E-M., & Vähi, M. (2017). Residency index – a tool for measuring the population size. Acta et Commentationes Universitatis Tartuensis de Mathematica, Vol. 21, No. 1. June 2017.

Main Results of the UNECE-UNSD Survey on the 2010 Round of Population and Housing Censuses. (2009). Conference of European Statisticians. Twelfth Meeting. Economic Comission for Europe. Geneva.

Nordholt, E., & Linder, F. (2007). Record matching for census purposes in the Netherlands.

Quality assessment of the register-based Slovenian census 2011. (2008). Census Quality Assurance and Evolution. Joint UNECE/Eurostat Meeting on Population and Housing Censuses. Eleventh Meeting. Economic Comission for Europe. Geneva. 2008SVN_ECE-GUID76e2ecebdc1744a6aaa17cad5787a043.pdf (25.08.2015).

Register-based census 2010 and census test 2006 in Austria. (2008). Joint UNECE/Eurostat Meeting on Population and Housing Censuses. Eleventh Meeting. Economic Comission for Europe. Geneva. 2008 AUT_ECE-GUIDfe5598d2bd5b4af2bd9a8334e1315463.pdf (25.08.2015).

Register-based statistics in the Nordic countries. Review of best practices with focus on population and social statistics. (2007). New York, Geneva: United Nations publication. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10220.aspx (25.08.2015).

Singapore Register-Based Census – Lessons Learnt and Challenges Ahead. (2003). http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10480.aspx (25.08.2015).

Statistics Finland. History of statistics in Finland. http://www.stat.fi/org/tilastokeskus/historia_en.html (25.08.2015).

Zhang L.-C., & Dunne, J. (2015). Census-like population size estimation based on administrative data. https://wiki.helsinki.fi/display/banocoss2015/Presentations?preview=/149296295/170627702/.

The combined census model in Germany – origins, lessons learned and future perspectives. (2017). UNECE Guidelines on the use of registers and administrative data for population and housing censuses.

The Dutch Virtual Census of 2001: a register-based approach combined with survey information. (2006). Conference of European Statisticians. Seminar on population and housing censuses. Econonomic Comission for Europe. Paris. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10110.aspx (25.08.2015).

The role of censuses in a country with a register-based statistical system: Norwegian experiences and plans. (2006). Seminar on Population and Housing Censuses. Conference of European Statisticians. Economic Comission for Europe. Paris. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10101.aspx (25.08.2015).

The Slovene example how to improve the census count in a register-based census. (2009). Census Quality and Disclosure Control. Conference of European Statisticians. Twelfth Meeting. Economic Comission for Europe. Geneva. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10637.aspx (25.08.2015).

The Swiss Census 2010: Moving towards a comprehensive system of household and person statistics. (2008). Neuchatel: Swiss Federal Statistical Office. http://unstats.un.org/unsd/censuskb20/KnowledgebaseArticle10681.aspx (25.08.2015).

Tiit, E-M. (2012). Assessment of undercoverage in the 2011 population and housing census. Eesti Statistika Kvartalikiri. 4/12. Quarterly Bulletin of Statistics Estonia, pp. 116–119. Tallinn: Statistics Estonia.

Tiit, E-M. (2015). Registripõhise rahva ja eluruumide loenduse metoodika ja selle arengusuundumused. Eesti Statistika Kvartalikiri. 3/15. Quarterly Bulletin of Statistics Estonia, pp. 42–64.

Tiit, E-M., Meres, K., & Vähi, M. (2012). Assessment of the target population of the census. Eesti Statistika Kvartalikiri. 3/12 Quarterly Bulletin of Statistics Estonia, pp. 96–108. Tallinn: Statistics Estonia.

Tiit, E-M., & Vähi, M. (2017). Indexes in demographic statistics: a methodology using nonstandard information for solving critical problems. Papers on Anthropology XXVI/1, pp. 72–87.

Äär, H. (2017) Coincidence of actual place of residence with Population Register records. Eesti Statistika Kvartalikiri. 1/2017. Quarterly Bulletin of Statistics Estonia, pp. 80–83.

THE QUESTION OF OCCUPATION AND SOURCE OF INCOME IN POPULATION CENSUSES

Veiko Berendsen

Occupation and source of income is a question asked in every census (and sometimes in sample coverage). The question itself and the purpose of the question have changed many times over the years. The specific occupational title has always been asked, but the results have been published in groups. What is essentially asked, the terminology as well as the grouping have been a constant discussion subject. This continues to be so, because effort is made to match the occupational titles recorded in administrative registers to the internationally and nationally published groups. The article provides an overview on how asking this question has changed throughout censuses and analyses the reasons for these changes.

Introduction

Censuses based on modern principles have been organised for 150 years. The question regarding what kind of work people do and where they get their income from has been asked in every census. In this article, the concept in question is referred to with the terms “occupation” and “source of income”. In different censuses, the questions have differed quite a bit. In every census, it has seemed during the preparatory stage that the question provides the most objective picture of reality, but in hindsight it has been admitted that there has been much objectification. (Szreter et al. 2004: 18)

The question of occupation has been considered as the most complex in censuses because of its meaning and associations. Employment and incomes have continuously changed in the society over the last 150 years. What is asked and the purpose of the question have evolved in censuses as well. Employment and earning has been an important economic question. Initially, the so-called perspective of political economy dominated: what was produced and who were the consumers. In the middle of the 20th century, the question became to be viewed from the perspective of planning the need for labour force and its training. The emphasis moved from a political economy perspective to a sociological view. (Hoffmann 2003: 152) Event and survey statistics on salaries and wages, unemployment, strikes, etc. became more and more important, and professionalization through training and social mobility became new areas of study. However, for a long time there was no common basis for classifying occupations. In 1923, ICLS (International Conference of Labour Statisticians) acknowledged that “it is very difficult, if not impossible, to prepare a general scheme for international comparison so long as clear definitions of the different occupations and a generally accepted terminology do not exist” (International 1924: 13). The problem that was considered already before World War I was solved only after World War II. In 1958, the International Standard Classification of Occupations was finalised; today its fourth version (ISCO-08) is in use. The main feature of the International Standard Classification of Occupations is that it enables comparability in types of jobs through classifying occupations and it is useful for labour market analysis, educational planning, human resource planning, occupational health and safety analysis, wages statistics, etc. (ILO 2007: 2).

At first, it might seem that in the rapidly changing labour market, the working, occupation and income question in censuses, which do not take place often, has little value, as regular statistics and surveys cover the topic. Nevertheless, the traditional understanding is that census provides a comparison opportunity with other forms of statistical activities. A methodical review of census questions at least points to which changes to make in questionnaires. The purpose of this article is to show that what comes with the register-based census would be just another methodological change, such as have happened at least five times in the past. In the register-based census, occupation would not be asked from individuals and coded based on their answers, although data on occupation have been asked from some people in the past. Also, the administrative task of data collection would not be given to the enumerator directly; the questions of quality related to such data collection have always been left to the organisers to solve.

In the article, the main focus is on how the questions asked have changed. The changes in the output tables and analysis are much greater and more difficult to review. Regroupings for comparing changes over time have sometimes not been realisable, for example, in the case of the Soviet period (1989) and contemporary (2000) censuses (Statistikaamet 2003: 16). In the published tables and analysis, the question has always been related to other close questions, such as main and additional income, social status and rank, working while having or not having an independent income, as well as economic activity.

In general, the same two things have always been asked: 1) where do you get money or other income from, and 2) what type of work you do. This will probably not change.

The beginning and development of occupational statistics

The beginning of occupational statistics is connected to wanting to have an overview of people for governing purposes. Even before the term “statistics” started to be used, Frederick William (1620–1688), the Elector of Brandenburg-Prussia, wanted to know how many smiths and carpenters, weavers and tailors he had for building the state and the army, and how much labour force (in today’s terms) he had to bring in. The greater need for skilled labour force was one of the reasons for implementing the accounting. The motivation was that the castles in Berlin were not being built quickly enough. In April 1661, he had

craftsmen counted; for example, he had 1,363 smiths per 2,274 villages. (Behre 1905: 263) Prussians also created a national employment register. This served as a basis for tax collection. Working had to be useful for the country, not for the city, village or guild. This was not as different from a modern-day employment register as one might think. Soon after, the German craftsmen moved on when czar Peter I invited them to Russia. These people also reached Estonia. Ea Jansen cites 19th century traveller Kohl who said that the social stratum of craftsmen, tavern keepers, tradesmen, manor overseers, scribes, forest wardens, mill builders and other workers were the most "unpleasant class of human beings" and "German sheep thieves" (Jansen 2007: 72). The need for a skilled labour force and the attitude of some people towards newcomers is very similar to today's situation.

18th century was famous for efforts to systematize everything. Occupations were not disregarded: there was an effort to compile systematic lists, but it was not successful. When a mechanical understanding of the society was replaced with one emphasizing development, the change in occupations was started to be seen as a reflection of social changes. Indeed, many unheard-of new occupations came to exist, starting from railway workers to typists. The famous Lyon weavers as well as Kreenholm weavers were more than just old ladies spinning wool. The situation has stayed the same; there is always new types of work and new occupations emerging.

On the one hand, there is pressure to acquire new skills and retrain, but on the other hand, there is the centuries-old custom to use fancy job titles. Whereas these days one can hear of office angels, who appear to be glamorous secretaries, in the 18th century, the manor overseer who used to be called *Amtmann* in German became *Obmann*. The most remarkable example is calling heaters at the University of Tartu in the 19th century by the Latin name *calefactor*, with the intention of getting better pay from the state.

The most important issue of producing statistics on occupation was to find a common classification basis. The result was not satisfactory, because, for example, making strings for instruments out of intestines was included with taking care of animals, and making them out of metal was classified under metallurgy. In Germany, several equal criteria were adopted in developing classifications: economic activity (*Gewerbe*), need (*Bedürfnis*) and material (*Stoff*). However, the leading German statistician Ernst Engel had to admit at the statistics conference in St. Petersburg in 1872 that a common international terminology and system did not exist. (Engel 1874: 42) The censuses, occupational statistics, and especially debates in economics and social politics during the last third of the 19th century determined to a great extent what followed. On the one hand, Marxist stratification and other social scientific grouping efforts were spreading, and on the other hand, pragmatic statistics without ideological divisions was making progress.

The problem at hand was that purely occupation-based classification was considered isolating, which did not allow depiction of the economic structure of the country. This meant that a classification of economic activities was needed. On the other hand, it was immediately noticed that considering occupation without regarding social associations, especially at a time when female employment was low and a lot of work was done within family, did not show a person as a member of the society as a living organism, as expressed back then. (ILO 1923: 10)

Next, the focus moved to answering questions and output as standard tables, which would reflect structure and associations. It seems that associations that were considered important were published and analysed. Nevertheless, progress was made in occupational statistics towards developing a classification, and its most important international basis was Jacques Bertillon's nomenclature with 12 major groups. These were the following: 1. Agriculture (*Exploitation de la superficie du sol*), 2. Mining (*Extraction de matiēres minérales*), 3. Industry (incl. cottage industry) (*Industrie*), 4. Transport (*Transports*), 5. Commerce (*Commerce*), 6. Army and police (*Force publique*), 7. Public administration (*Administrations*), 8. Liberal professions (*Professions libérales*), 9. Capitalists and dependents (*Personnes vivant principalement de revenues*), 10. House servants (*Travail domestique*), 11. Without a specific profession (*Désignations générales sans indicationd'une profession déterminée*), 12. Non-productive consumption (*Improductifs*). In addition, this nomenclature had 206 second-level groups and 499 third-level groups. (Bertillon 1895: 226–262)

In the last quarter of the 19th century and the first half of the 20th century, the tradition of censuses as well as national traditions in how to treat occupation and income developed. In Estonia, the approach changed according to the state that organised the census.

Census questions

On the questionnaire form, the most obvious focus is on what is being asked. Naturally, more detailed guidelines are presented, but the wording of the question is noticed first. The following comparative table (Table 1) shows that what has been asked in censuses has constantly changed. Three facets appear here:

1. conceptual change over time, which reflects a change in the understanding of what to ask;
2. the extent of the change in the meaning of the question;
3. linguistic change which divides into two: first, a terminological change in definitions, and secondly, comparability in different languages, as many censuses have been in multiple languages.

In the table, first comes the original wording of the question in Estonian and in some cases in German and Russian. The Estonian language version has existed in every census, except for the trial census of Livonian cities of 1867. Next, related questions, if any, were added. For every census, a comment has been added about the questionnaire, question meaning and published tables, i.e. on the basis for grouping the questions. The number in front of the questions shows the number on the questionnaire form.

Table 1. Comparison of occupation and income questions in censuses

Census	Occupation and income question	Related questions
1867	*Gewerbe und Beruf*	*Stand* *Bauerstand, Andere Stände*
	A house list (*Hauslist*) was used, where persons were listed on rows. If there was no occupation, the cell was left empty. A partially two-level and partially three-level division was published. The first level was 16 groups, the third level was added to the group "large and small industry" (*Grosse und kleine Industrie*), which included 7 second-level groups and a total of 97 third-level occupations. The group included craftsmen as well as cottage industry and industry. Workers and day workers (*Tagelöhner*) were included in one group.	
1881	9. a) *Kutse, ammet või teenistus ja teenistuse seis* b) *Sissetulekuga eraammet või töö* 9. a) *Hauptberuf oder Hauptgewerbe bei Angabe des Dienstverhältnisses* b) *Mit Erwerb verbundene Nebenbeschäftigung*	Did not exist
	A personal form was used which was in three local languages (Estonian, German, Russian). A secondary activity or income has been added, which was difficult to phrase in the Estonian language of the time; the concept of private occupation (*eraammet*) is certainly incomprehensible. 230 occupations were published in the Governorate of Livonia. A system was used which was divided into production and consumption and their sub-divisions (more about it in the following).	
1897	14. *Töö, käsitöö, talitus, amet ehk teenistus* a) *Pää amet, see on see, mis annab pää ülalpidamise* b) 1. *Kõrwaline ehk abi amet,* 2. *Seisukord sõja wäe teenistuses* 14. *Занятие, ремесло, промысел, должность или служба* а) *Главное, т.е. то, которое доставляет главные средства для существования* б) 1. *Побочное или вспомогательное.* 2. *Положение по воинской повинности* 14. *Beruf, Beschäftigung, Handwerk, Gewerbe, Amt oder Dienststellung* a) *Haupberuf, d.h. der, welcher die Mittel zum Lebenunterhalt liefert.* b) 1. *Neben- oder Hülfsbeschäftigung.* 2. *In welcher Beziehung, steht die Person zur allgem. Wehrpflicht*	6. *Seisus ja amet* 6. *Сословие, состояние или звание* 6. *Stand, Beruf oder Titel*
	A family or household form was used. The population was divided into people with income and people without income. The occupation of those without income was that of the income provider, i.e. the head of household's occupation/income. The publishing principles were the same across Russia – in tables 20–22, there were 65 groups of occupations published and 217 in table 23. For Russia as a whole, also the data of the 389 groups of the levels under these 65 groups were published.	
1922	11. *Tööala* 1) *Peatööala* a) *Kas on peatööalaks põllumajandus (jaa, ei)* *Kui peatööala mitte põllumajandus – missugusel tööalal tegev* b) *Kuidas töötab (peremees alaliste palgatud töölistega, peremees ilma alaliselt palgatud töölisteta, kui osanik, kui perekonnaliige, töötab palgalisena)* d) *Kui praegu tööl – asutuse, ettevõtte, peremehe nimetus ja aadress, kus tööl* e) *Mis ametis (tööl) on seal* 2) *Kõrvalised tööalad* a) *Kui peale peatööala ka mõnel kõrvalisel tööalal tegev – siis missugusel* b) *Kui ka praegu sel tööalal tööl – siis kus* 12. *Kui pole tulutoovat tööala – mis on ülespidamisallikas* 13. *Kui eriala tööalale ei vasta – mida peab oma erialaks*	Did not exist
	A personal form was used. Independent income was phrased as being the owner, and the division between active and passive in terms of independent income and consumption known from German statistics was used again. The 3rd book "*Rahva tööala ja ühiskondlik kihistus*", which includes tables mainly by groups of branches of activity, was published separately. The books by county do not include occupation/income tables.	
1934	12. *PEATÖÖHARU* a) *Millisel alal töötades saavutab ülalpidamise peaosas (näit. põllupidamine, paberitööstus, riidekauplus, rätsep jne.)* b) *Kus praegu töötab sel alal (nimetada ettevõte, kus töötab või töötas viimati)* d) *Kellana töötab (peremees alaliselt palgatud töölistega või õpilastega, peremees ainult oma peakonnaliikmetega, peremees üksik, palgata pereliige, kodutööline)* e) *Mis tööd teeb* 13. *KÕRVALTÖÖHARU* *Kui peale peatööharu saavutab ülalpidamist veel kõrvaltööga, siis missugusega* *Kas kõrvaltöö asub kodu piirkonnas või nõuab kodust lahkumist* *Kui praegu kõrvaltöö ala tegev, siis kus, kellena, mis tööl*	14) *Kui praegu ei tööta, siis a) mis ajast peale … aastast … kuust … päevast* b) *mitu kuud üldse töötas 1933 a. jooksul … kuud* d) *kas on töötegemist takistavaid kehalisi vigu või parandamata haigusi?* 15) *Kui pole ülalpidamist andvat tööd, mis on ülalpidamise allikas* *Kui saab ülalpidamist teiselt isikult, siis ülalpidaja: mis tööharus töötab … ; kellena töötab … ; mis tööd teeb …*
	A personal form was used. The division of social strata has been inferred from employment relationships. The first book "*Valdade rahvastik: 1. III 1934 rahvaloenduse andmed*" was published, which included table 6 "*Rahva jaotus aktiivsete tööharu järgi*" and table 7 "*Suhe tööga tööharude järgi*". The third book "*Tööharud ja leibkonnad: 1. III 1934 rahvaloenduse andmed*" included 12 tables on occupations.	
1941	9. *Gelernter Beruf* 10. *Beschäftigung – [Im Juni 1941 | Derzeitige]* a) *Auf welchen Arbeitsgebiet wird der grösste Teil des Lebensunterhalts Erwoben,* b) *Wo geschäfigt (Gesinde, Betreib, Anstalt usw.),* c) *Arbeitet als (Unternehmer, unbezahltes Familienmitglied, Lohnarbeiter),* d) *In welcher Arbeit beschäftig,* e) *Arbeitslos?* f) *Benötigt bezahlte Arbeit?* 9. *Õpitud kutse* 10. *Tööala* a) *Millises tööharus saavutab ülalpidamise peaosa (põllupidamine, kalandus, tekstiil-, metalli-, puutööstus, kaubandus, transport, side, ühiskondlik*	Did not exist

Census	Occupation and income question	Related questions
	tegevus, majateenistus jne.), b) *Kus töötab (talu, käitise, asutise jne täielik nimetus),* c) *Kellena töötab (peremees palgata perekonnaliige, tööline, kodutööline),* d) *Mis ametialal töötab,* e) *Kas praegu tööta (jaa, ei),* f) *Kas vajab tasulist tööd? (jaa, ei)*	
	The list form included question 10 "*Tööala*" ("Occupation"). In the monthly bulletin of Estonian statistics 1942 no 3–4, tables were published on branches of activity, but not on occupation / area of work.	
1959	12. *Töökoht (ettevõtte, kolhoosi, asutuse nimetus) või töötab oma majandis* 13. *Tegevusala selles töökohas (amet või teostatav töö)* 14. *Kui ei oma tulu andvat tegevusala, näidata muu elatusvahendite saamise allikas* 12. *Место работы (название предприятия, колхоза, учреждения) или работает в своём хозяйстве.* 13. *Занятие по этому месту работы (должность или выполняемая работа)* 14. *Если не имеет занятия, являющегося источником дохода, указать другой источник средств существования*	15. *Millisesse ühiskondlikusse gruppi kuulub (tööline, teenistuja, koopereerunud käsitööline, üksiktalupoeg, koopereerumata käsitööline, vabakutseline, vaimulik)* 15. *К какой общественной группе принадлежит (рабочий, служащий, колхозник, кооперированный кустарь, крестьянин-единоличник, некооперированный кустарь, лицо свободной профессии, служитель культа)*
	A family or household form was used (3 persons on form), which was in Russian and Estonian language. For the Soviet socialist republic, table 27 "*Rahvastiku jaotus ühiskondlike gruppide kaupa*" and tables 30, 32–33 "*Jaotus elatusallikate kaupa*" were published. For the whole Soviet Union was published "*Итоги Всесоюзной переписи населения 1959 года СССР: сводный том*".	
1970	11. *Elatusallikas (töö ettevõttes, töö kolhoosis, töö oma majandis; töö eraisikute juures, isiklik põllumajanduslik abimajand, pension, stipendium, muu elatusallikas)* 12. *Töökoht (ettevõtte, kolhoosi, asutuse nimetus või oma majand)* 13. *Tegevusala selles töökohas (amet või tehtav töö); pensionäridel – endine põhitegevusala* 14. *Isikutel, kes 1969. a. ei ole tervet aastat töötanud, kriipsutada alla: töötas alatiselt, hooajaliselt või ajutiselt ja märkida ka mitu kuud 1969. aastal töötas* 11. *Источник средств существования (работа на предприятии, в учреждении, в колхозе, в своём хозяйстве, у частных лиц, личное подсобное сельское хозяйство, пенсия, стипендия, на иждивении № __, иной источник)* 12. *Место работы (название предприятия, колхоза, учреждения или своё хозяйство)* 13. *Занятие по этому месту работы (должность или выполняемая работа); для пенсионеров — прежнее основное занятие* 14. *Для работавшего в 1969 неполный год подчеркнуть: работал постоянно, сезонно или временно и указать продолжительность работы в месяцах в 1969*	15. *Ühiskondlik grupp (tööline, tööline (kolhoosi liige), teenistuja, teenistuja (kolhoosi liige), kolhoosnik, Üksiktalupidaja, käsitööline, vaimulik)* 15. *Общественная группа [рабочий(ая), служащий(ая), колхозник (ца), кустарь, рабочий (член колхоза), служащий (член колхоза), крестьянин-единоличник, служитель культа]*
	A family or household form was used (3 persons on form), which was in Russian and Estonian language. Questions 12–18 were asked in a sample census (25% of the population). The processing form was graphic and usable on the computer (for 4 to 8 persons). For the Soviet Union was published "*Итоги всесоюзной переписи населения 1970 года*". *Том VI: распределение населения СССР и союзных республик по занятиям* (1973).	
1979	11. *Elatusallikas (töö ettevõttes, asutuses; töö kolhoosis; töö oma majandis (käsitöölised ja üksiktalunikud); töö eraisikute juures; vabakutseline; isiklik põllumajanduslik abimajand; pension; stipendium; muu riikliku hoolduse viis; ülalpidamisel; muu elatusallikas)* 12. [Cannot find or does not exist in Estonian] 13. [Cannot find or does not exist in Estonian] 11. *Источник средств существования [работа на предприятии, в учреждении,работа в колхозе, работа в своём хозяйстве (для кустарей и крестьян единоличников), работа у частных лиц, лицо свободной профессии, личное подсобное сельское хозяйство, пенсия, стипендия, другой вид государственного обеспечения, на иждивении №, иной источник]* 12. *Место работы (название предприятия, колхоза, учреждения или своё хозяйство).* 13. *Занятие по этому месту работы (должность или выполняемая работа)*	14. [Cannot find or does not exist in Estonian] 14. *Общественная группа [рабочий(ая), служащий(ая), колхозник(ца), кустарь, крестьянин-единоличник, служитель культа]*
	A form allowing graphic processing on the computer was used (in the census for 2 persons; in the sample coverage, a personal form). The form was in Russian only. The initial processing of data took place in Tallinn at the computing centre of the statistical authority, where data were entered on a computer (magnetic tape). For the union was published "*Итоги всесоюзной переписи населения 1979 года*". *Том V: распределение населения СССР, союзных и автономных республик, краев и областей по источникам средств существования* (1990). *Том IX, часть I: распределение населения СССР и союзных республик по занятиям* (1990). *Том IX, часть II: распределение населения СССР и союзных республик по занятиям* (1990).	
1989	13. *Elatusallikad (töö ettevõttes, asutuses; töö kolhoosis; töö kooperatiivis; töö eraisikute juures; individuaaltöö; isiklik abimajapidamine; pension, toetus; stipendium; muu riikliku hoolduse viis; ülalpidamisel; muu elatusallikas)* 14. *Töökoht (ettevõtte, asutuse kolhoosi täielik nimetus)* 15. *Tegevusala selles töökohas (amet või tehtav töö)* 13. *Источник средств существования (указать один или два источника) (работа на предприятии, в учреждении; работа в колхозе; работа в кооперативе; работа у отдельных граждан; индивидуальная трудовая*	16. *Ühiskondlik grupp (tööline, teenistuja, individuaaltööd tegev isik)* 16. *Общественная группа [рабочий(ая), служащий(ая), колхозник(ца), лицо, занятое индивидуальной трудовой деятельностью, служитель культа]*

Census	Occupation and income question	Related questions
	деятельность; личное подсобное хозяйстве; пенсия, пособие, стипендия; другой вид государственного обеспечения; на иждивении; иной источник) 14. *Место работы (полное название предприятия, учреждения, колхоза)* 15. *Занятие по этому месту работы (должность или выполняемая работа)*	
	A form allowing graphic processing on the computer was used (in the census for 2 persons; in the sample coverage, a personal form). The initial processing of data took place in Tallinn again and the data were sent to Moscow for publication. A copy of the data remained in Tallinn. Questions 14–16 were asked only from permanent residents. A publication "*Eesti Vabariigi maakondade, linnade ja alevite tööjõuressursid 1989. a. rahvaloenduse andmed*" was published in Estonia in 1990. It does not include data on occupations.	
2000	24. *Kas Te töötasite nimetatud nädalal ühe tunni või rohkem [vastake „jah" ka siis, kui Te olite töölt eemal haiguse, puhkuse vms tõttu]?* 28. *Millisel aadressil Te põhiliselt töötate? [valikud]* 29. *Milline on Teie tööalane staatus põhitöökohal või põhitööandja juures? [valik]* 30. *Mis on Teie amet põhitöökohal? / Milles seisneb Teie töö? Palun kirjeldage lühidalt oma tööülesandeid (täidetakse juhul, kui ametinimetus ei kirjelda piisavalt tööülesandeid)* 31. *Mitu tundi Te harilikult töötate? Kokku | Mitu tundi sellest põhitöökohal?*	25. *Millisesse järgmistest rühmadest Te kuulusite [vastata, kui eelmisele küsimusele oli vastus „ei"] Ajateenija, (üli-)õpilane, kodune, ei tööta aga otsib aktiivselt tööd, valmis tööle asuma, pensionär, muudel põhjustel mittetöötav* 26. *Mis on Teie põhitöökoha nimetus või põhitööandja nimi?* 27. *Mis on Teie põhitöökoha/põhitööandja põhitegevusala?*
	A personal form was used, which was suitable for computer processing. Publications "*2000. aasta rahva ja eluruumide loendus. VIII. Elatusallikad. Tööalane ja sotsiaal-majanduslik staatus. 2000 Population and Housing Census. VIII. Sources of Subsistence. Employment and Socio-economic Status*" and "*2000. aasta rahva ja eluruumide loendus. IX. Majanduslikult aktiivne rahvastik. 2000 Population and Housing Census. IX. Economically Active Population*" were published.	
2011	A34 *Mis oli Teie/tema peamine elatusallikas 2011. aastal? (valik 8 elatusallika vahel)* A42 A *Palun öelge oma/tema põhitöökoha täielik nimi.* B *Kui Te töötasite / ta töötas selle asutuse allüksuses, siis öelge allüksuse nimi. (Allüksus on ettevõtte või asutuse koosseisus olev üksus, millel on erinev tegevusala või aadress võrreldes peakontoriga.)* A44 A *Mis on Teie amet põhitöökohal?* B *Palun kirjeldage lühidalt oma tööülesandeid* A46 *Kas Te olete (olite) / ta on (oli) oma põhitöökohal ... (valik 8 staatuse vahel) 1 palgatöötaja (k.a avalik teenistus), kelle töösuhe kestab vähemalt aasta; 2 palgatöötaja, kelle töösuhe kestab alla aasta; 3 palgatöötaja(te)ga ettevõtja, palgatööjõuga talupidaja; 4 üksikettevõtja, palgatööjõuta talupidaja, vabakutseline; 5 muu (palgata töötaja pereettevõttes või talus; tulundusühistu liige)?*	A36 *Kas Te tegite / ta tegi nimetatud nädalal (19.–25. detsembril 2011) vähemalt ühe tunni tasustatavat tööd? (valik jah/ei)* A37 up to A40 reasons for not working A41 *Millisesse järgmistest rühmadest Te kuulusite / ta kuulus ajavahemikul 19.–25. detsembrini 2011?* A43 A *Millega see ettevõte/asutus peamiselt tegeleb (tegeles)?* B *Millega see allüksus, kus Te töötasite / Ta töötas, peamiselt tegeleb (tegeles)?* A45 *Mitu töötajat on (oli) Teie/tema otseses alluvuses?*
	There were three questionnaire formats: web-based, laptop-based and paper questionnaire, which were identical in content. "Only employed persons and those unemployed persons who had worked before had to answer the questions about their employment status, occupation and the economic activity of the main place of work. The questions concerning occupation and the economic activity of the main place of work were significantly different from output indicators. Respondents had to mark down the full name of their main place of work, and – if necessary – of the subordinate unit (essentially only an ancillary characteristic). In order to determine the particular economic activity of the main place of work, the respondents were asked to describe it (in addition to naming the economic activity). The same applied to occupation – in addition to naming the occupation, the respondents had to describe their work-related duties. If the description of the occupation suggested that the respondent might have subordinates, the number of subordinates had to be specified as well." (Tiit 2014: 18) The occupational tables were published electronically, some at the level of ISCO sub-major group and some at the level of sub-group.	

Asking the question of occupation/income in the censuses held on the territory of Estonia can be divided into five stages:

1. stage of Baltic provincial statistics;
2. 1897 all-Russian census;
3. Estonian censuses in 1922 and 1934, to which 1941 census can also be added;
4. Soviet period censuses in 1959, 1970, 1979, 1989;
5. Estonian censuses in 2000 and 2011 for which the International Standard Classification of Occupations (ISCO) was used.

Stage 1. Occupation in Baltic provincial statistics

Modern statistics emerged in the Baltic area with the establishment of governorate statistical committees. The first data on occupations were published by Friedrich von Jung-Stilling in 1864, presented as a mixed system of general statuses (noblemen, clergy, city dwellers / citizens, peasants) and tax brackets (*оклад*) to which army was also added (Jung-Stilling 1864: 3). This system created with one's best understanding was in use in the census of cities in 1867. The international efforts to harmonize the occupation issue did not have an impact on local statistics.

The more bureaucratic line of German occupational statistics dominated. It was based on the approach of its outstanding representative Ernst Engel. The occupations or rather the social standing of the population was divided between production (*Production*) and consumption (*Consumtion*), and consumption in turn was divided into productive and unproductive

consumption (*productive und unproductive Consumtion*). The basis for this distribution was Adam Smith's treatment of consumption and production, which had become dominant in the 19th century German and British political economy. Engel developed this method for budget surveys, in which he adopted economic categories (consumption and production) and applied these in systematising the work and activities of the whole population.

Governorate statistics did not have major methodological impact on census and occupation issues afterwards. It seems that at the time when the provinces and universities had the strongest connections with Germany, the application areas where population data were used were not related to the economic or social demography (*ökonomische Bevölkerungslehre*) (Mackensen 2006: 188–189) influential in Germany, and demographic policy was a policy of national awakening.

Stage 2. International knowledge and Russian mess (1897)

The first census questionnaire was drafted in Russia after a successful international statistics congress in 1872. In this 1874 draft, the question on occupation was already included. Georgi Schwittau (Швиттау 1909: 230) stated later that classifying by material dominated in Russian statistics. This means a political economic, not a sociological treatment, where the main categories were based on production. The question on occupation has been considered unanimously the most unsuccessful by the users of the data of this census. The issue is not as much the fact that five essentially different terms were listed one after another. The question on occupation had not even been methodologically developed, although it was certainly the most complex among the census questions. (Berendsen 1999: 134)

The official explanation of the statistical conference of 1872 was that, "profession [...] should be understood as status (*l'état*) or activity (*le metier*), which is the respondent's main source of income or which takes up the largest portion of one's activies". (Compte-Rendu 1874: 426)

In the treatment of occupation in Russian statistics a peculiar situation could be observed. On the one hand, the old tradition dominated, which was amplified by the influential textbook of Julius Janson and was close to German statistics with regards to this issue. On the other hand, in practical factory statistics (a specific part of statistics in czarist era which differed from "*zemstvo*" statistics), a classification was used that linked income and occupation, but did not describe other associations – called "purely occupational" (with an English term *sic*!). The first international classification of occupations which by then had been enforced had an impact primarily on the criticism of post-enumeration processing. It relied on Jacques Bertillon's division and was approved at the 1893 statistical congress. (Bertillon 1895: 226–262) On the one hand, it was considered better than the one used in the census, and on the other hand, it caused heated detabes, especially in the case of industry, as early industry and industry were placed together. For the Baltic governorates and more broadly for Eastern Europe, an alternative that better considered social relations was offered by Austro-Hungarian statistician Josef Körösi. This pertained especially to the so-called cottage industrial middle layers and day workers, who constituted a significant share of workers and were a very dynamic group. (Körösi 1893: 301–316)

For recording occupations in the census, the concept of source of income was used as a basis. (Pawlik 1991: 430–488) In processing census data, two types of calculations should have been made: first, which activity provided income, and secondly, it was clearly expressed even in the Estonian instructions that "the line of work and the status when performing the occupation, job or activity had to be recorded for each person". This should have been calculated separately. (Berendsen 1999: 137) It was not done for lack of money.

However, occupational statistics did not continue to develop independently, and during the Soviet period preference was again first given to dividing into occupations by material, which started to be referred to as preferring production, in order to have a more powerful country of workers. (Волков 2014: 201–208) To this was added a construct of social class: workers and office personnel.

Stage 3. Bringing back the social dimension

In the censuses of independent Estonia, there was a return from the so-called purely occupational division to a more social one. The reason for this could be that in 1922 a very large share of the population was still active in agriculture. Occupation as a profession did not exist there. The important question was whether a person was an owner or not and whether a person got paid or not. The author does not know of any source that would confirm this, but supposing that Estonian statisticians were aware of international debates on occupation question, they had to have known of the importance of presenting associations. However, it could be that at least in the 1922 census there was no desire to experiment with innovations.

The census results were published separately in book III "*Rahva tööala ja ühiskondline kihistus*". In the explanatory part, the authors acknowledge that when asking questions and processing results they faced problems similar to others with regards to branch of activity (*tööharu*), area of work (*tööala*), occupation (*ametiala*) and profession (*kutse*). They admit that, "the division by branches of activity should be considered from an objective viewpoint, while occupation and profession could be subjective. From these two viewpoints, professional recording should in the broader sense (industrial-professional) give the distribution of the population. From the subjective perspective, the social structure of the population becomes apparent, as much the person's profession and activity enable this, while the objective perspective presents the ratios of the active forces of the national economy and labour force". (Riigi … 1925: 11) It appears from this that occupation is shadowed both by branch of activity and social stratum. It has been directly expressed that, "the concept of occupation and profession had no significant impact on the task at hand. Profession records as a separate part were left out of processing and the dataset was compiled based on belonging to a branch of activity". The difficulties that arose were of the traditional kind but telling, "people often move from profession to occupation and from branch of activity to occupation and profession, e.g. four persons who are all iron lathe workers and do the same job at the time of enumeration have given the following record of themselves: first –

iron lathe work (*rauatreimine*), second – metal worker (*lukksepp*), third – iron work (*rauatöö*) and fourth – making guns (*laskeriistade tegemine*); based on only these features it is difficult to implement a detailed coherent grouping." (*ibid*.: 11) The authors have given an evaluation and it can be agreed to, "such cases where occupation and branch of activity do not coincide professionally constitute in our conditions a small percentage of the total number." (*ibid*.: 35) The construction of social strata is especially characteristic of the time period.

The publication covering occupation in the 1934 census is titled "*Tööharud ja leibkonnad*", but it includes few explanations. Occupation and income have not been analysed under problems in book IV. Hans Reiman's article "*Rahvastik töötajana ja tarbijana*" (Riigi … 1937: 29–61) has again a political economy perspective due to the division. While the author admits that there has not been much professionalization (of the total number of 665,954 employees, 67% are employed in agriculture), social change might actually be important, which is shown by the abundant use of the phrase "achieved independent income".

The 1934 census again reflects the time period; Estonia was looking for cohesion in the society, and the interpretation through employment relationship groups and social strata pointed to this. The following social strata were observed: owners, workers and office personnel, officials, freelancers, without a stratum. Employment relationship groups were the following: active persons, unpaid family workers, family members active in the household, dependents. (Riigi … 1935: 13)

The 1941 census was different, because the war and the prior occupation made the situation incomparable. Besides the number of persons to be mobilized, the German occupation powers were interested in how many persons could be used in working in the home front. In this census, the branch of activity and area of work have almost been tied together and the social dimension has almost been lost. It is also not completely clear whether the questions were provided or whether Albert Pullerits, the long-time leader of Estonian statistics, came up with them himself. The speed of printing the questionnaire forms (October 1941) seems to point to the first, but the content of the questions seems to point to the second option; however, a synthesis is also not out of the question. The censuses had been planned already before the country's occupation. (Roth 1993: 216)

Stage 4. Calculating labour force resources

In the Soviet period censuses, occupation was methodologically tied to the question of resources in a planned economy. This is obvious in the methodological material for coding occupations. The question was asked in the sample censuses of 1970, 1979 and 1989 (25% of the population). (Волков 2014: 83)

The central concept in the census questionnaires was the source of income (1970, 1979, 1989) or the source of obtaining means of subsistence (1959) and economic activity (1959, 1970, 1989). The occupational title or the description of work done had to be filled in, and this was then coded. Even when only a questionnaire allowing graphic computer processing was used (1979, 1989), the occupation had to be written out. In general, it can be said that the issue of occupation remained unchanged throughout the censuses. In parallel with censuses, occupational titles were under consideration for other purposes, for example, for determining tariffs on wages. The basis was the Soviet standard of occupational classifications, the compilation of which started in the 1960s. This was published for each census as an alphabetical and systematic dictionary. (Лабутова 1984: 183–184) The occupation classification standard had three levels in 1970 and 1979. The first level was divided into 49–50 groups, of which 17 groups consisted of those mainly doing mental work and 31 of those mainly doing physical work (Mereste 1988: 177). The following group had 257–260 divisions and then there was a distribution into 21,000–23,000 occupational titles. A classification existed for the whole Soviet Union with the title "*Общесоюзный классификатор профессий рабочих, должностей служащих и тарифных разрядов*", which was published in a systematic and alphabetical form in separate books. The classification was updated about once in a decade, most recently in 1986.

In 1970, computers were adopted in the Soviet Union for use in processing census data. A graphic questionnaire was designed. In 1970, data were re-entered on it; in 1979, the same form was filled in and it included a part to be coded at the statistical office in which the occupation had to be coded. The 1989 questionnaire does not include a part to be coded. In any case, coding occupations was an enormous task. The output tables were too general and the analysis results took waiting. The occupational tables for 1979 were published in 1990.

There was a differentiation between persons doing mental work and those doing physical work. In 1959, the share of people doing mental work was 18.9% and, in 1979, it was 29.5%. Occupation was related to social standing, whether a person was a worker or a member of office personnel. A cook was a worker, but a chef was a member of office personnel. In many cases, however, mental work meant mechanised work.

In the 1989 census, there was a return to the idea that people had additional incomes. Second and side jobs had become wide-spread. As far as is known today, it should be noted that the occupational data of the 1989 census have not been published.

In Estonia, the occupation question of the Soviet period censuses has been considered incomparable to the current ISCO-based one, "Employed persons were divided into those doing mental and physical work, and these were further divided by branch of economic activity. Occupations common to many different activities, were included under one economic activity, for example, metal moulders were classified, irrespective of their place of work, into the group of metal, machinery and related trades workers. Therefore the data on occupations of employed persons collected in the 1989 and 2000 censuses are not comparable." (Statistikaamet 2003: 29) However, the comparison is actually possible, as Russia has made such comparisons in the framework of ISCO-88 (CIS) and for participating in the European Social Survey (ESS) and the Survey of Health, Ageing and Retirement in Europe (SHARE). (Брюханова 2015: 73–75)

In comparing Soviet period data, different starting points for both definitions and population should be taken into account. "According to Census data, in 1989 employed persons in Estonia numbered 850,471 or 54.3% of the total population or 69.9% of the population aged 15 years or older. The 2000 Census enumerated 544,650 employed persons or 39.8% of the total population or 48.5% of the population aged 15 years or older." (Statistikaamet 2003: 25) Although during the period between the censuses, the number of employed persons had decreased by 305,821, i.e. 36%, the factor that had a considerable impact was the change in the criterion of who is considered an employed person, as students studying in vocational education institutions were no longer considered as employed persons.

A lesson to be learned from the Soviet era censuses are the difficulties that might arise in a census, if the basis used is one that is suitable for many purposes. What was suitable for developing various classifications and setting tariffs, was not best for census needs. As the classification was tremendously big, it was not good for presenting census results.

Stage 5. Treatment of occupation from an international basis

The work of international statistical congresses that had been interrupted by World War I was resumed under the League of Nations as conferences of labour statisticians, and in 1923, ICLS set the goal of an international classification. Bertillon's system was no longer used as a basis. This treatment of occupation was considered isolated from other characteristics. (ILO 1924: 10) Developing a new system did not happen quickly, though. The increasing impact of social sciences research; studying strikes, wages and salaries and unemployment, as well as the old tradition of presenting branches of the economy and social status played a part in this.

The definition of occupation was published as late as 1949: "Occupation is the trade, profession or type of work performed by the individual, irrespective of the branch of economic activity to which he is attached" (ILO 1949: 7).

The International Standard Classification of Occupations as it is used today was finalised in 1958. Initially, it was used more by social scientists, and only the next version of the classification ISCO-68 became widely used by statistical offices, incl. in censuses. (Hoffmann 2003: 137)

A continuous addition of new occupations has always been a problem all over the world (Table 2). In the Soviet Union, from 1960s to 1980s, every year 500 new job titles were added and the ISCO level 4 as an occupational title became impossible to use for international comparison purposes. A bigger structural change happened with enforcing ISCO-88. (Hoffmann 2003: 147) First it was found that the number of major groups should be kept at 10, although it was clear that such generalisation was not satisfactory for analysis. Therefore, the sub-major group level was introduced, which included 28 groups in 1999 and 43 groups in 2008.

Table 2. Comparison of occupational groups in different ISCO versions

	Major group[a]	Sub-group	Occupational group	Number of occupational titles
ISCO-58	10 (12)	73	201	1,345
ISCO-68	8	83	284	1,506
ISCO-88	10 + 28	116	390	1,506
ISCO-08	10 + 43	131	425	

[a] ISCO-58 major groups were: 0. Professional, Technical and Related Workers; 1. Administrative, Executive and Managerial Workers; 2. Clerical Workers; 3. Sales Workers; 4. Farmers, Fishermen, Hunters, Loggers and Related Workers; 5. Miners, Quarrymen and Related Workers; 6. Workers in Transport and Communication Occupations; 7/8 : Craftsmen, Production Process Workers, and Labourers Not Elsewhere Classified; 9. Service, Sport and Recreation Workers; X. Workers Not Classifiable by Occupation; Y. Members of the Armed Forces.
ISCO-08 major groups are: 0. Armed Forces Occupations; 1. Managers; 2. Professionals; 3. Technicians and Associate Professionals; 4. Clerical Support Workers; 5. Services and Sales Workers; 6. Skilled Agricultural, Forestry and Fishery Workers; 7. Craft and Related Trades Workers; 8. Plant and Machine Operators and Assemblers; 9. Elementary Occupations.

Among the ten major groups, there are two groups which seem to have experienced a major change in the last decades. First, the share of the sixth group has decreased. Secondly, it looks as if the fourth group is losing substance in its old meaning. The group name "clerks" refers to scribes (secretaries, keyboard clerks, numerical and material recording clerks), which are vanishing occupations. In the last Estonian version of the classification (2008ap), the previously used group name "*Ametnikud*" has indeed been changed. At the same time, customer services clerks have been added to this group.

As for occupational titles, many countries also use their own lists. The 1968 French version had 3,046 occupations (ILO 1987: 21). In the updated version of 1988, the focus was on structural simplification, not on differentiating between occupations. That was the cause for the adoption of the sub-major group and it has increased the number of sub-groups and unit groups. In addition, since ISCO-88, occupations have been divided into groups based on the skills needed for fulfilling the tasks and responsibilities of this occupation. (Hoffmeyer-Zlotnik, Warner 2014: 34)

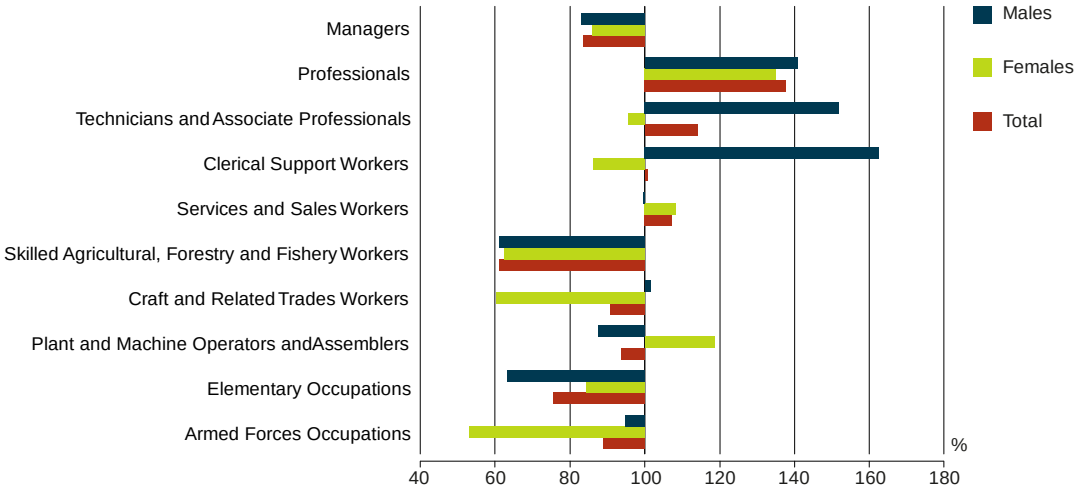
The adoption of ISCO started in Estonia in 1991, and a working group was established with the Ministry of Social Affairs in 1993. "*Ametite klassifikaator*" ("Classification of occupations") was published only in 1999. The reason for that is said to have been a change in the composition of the working group, but substantive difficulties were not emphasized. Only linguists pointed to the seemingly enduring idea of "whether to be ashamed of simplicity and put nice words one after another". A baker became the operator of a bread production line. (Sotsiaalministeerium 1999: 17) The authors call it the Estonian classification of occupations, which is only based on ISCO-88.

In Estonia, ISCO has been used in the last two censuses (2000, 2011). In the first, ISCO-88 was used, and in the latter, ISCO-08 (*Ametite klassifikaator 2008v1.5a*). In both cases, indicators from the questionnaire were coded for computer processing by hand; the data of 646,393 persons were coded in the 2011 census, using automatic coding when possible. (Tiit 2014: 51)

The distribution of workers by occupation into major groups and sub-major groups, as was the case in the 2000 and 2011 censuses according to ISCO-88 and ISCO-08, respectively, allow a comparison (Table 3) of what has essentially happened in occupations and where the changes have been due to grouping.

In the 2000 and 2011 censuses, the working (2000), or employed (2011), population was more or less in the same range. In 2011, employed persons amounted to 103.0% (males to 100.9% and females to 105.1%) compared to 2000. In Figure 1, the difference due to population number has been eliminated. The changes in the major groups are quite different by group and in some groups there is also a large difference by sex. In sub-major groups, there are even greater changes (Table 3), and in the case of some of these, it can be concluded that the change has been rather caused by altered definitions and grouping rather than the actual dynamics of working in certain occupations.

Figure 1. Relative change in occupational major groups in comparison of Estonian censuses 2000 and 2011



The 83.6% decrease in the group of managers is partially related to the fact that in 2000 the group included 20,417 managers of small enterprises who might not all have had subordinates. In the last census, however, the criterion for determining managers was whether there were subordinates. The greatest growth was seen in the groups of professionals. The growth has been largest in the major group Professionals, but this is more real than due to definitions. The greatest change is the addition of 7,725 teaching professionals and the addition of the sub-major group of Informations and Communications Technology Professionals with 7,431 persons. A trend appears here that associate professionals have become professionals. In the major group of Technicians and Associate Professionals, the increase has mainly come from business and administration associate professionals, who have been “raised” to that level from the groups of Trades workers, Operators and Elementary Occupations. At the same time, teachers have been “raised” from the third major group to the status of teaching professionals. The size of the major group of Clerks has not changed, but there has been an enormous change in its composition. The prior female secretaries have become associate professionals, and the number of males has increased considerably, as they were previously more in production (major groups 7–9), but are now active in customer service and material recording. A tendency of assigning workers from production to services appears here, i.e. an increase in service economy. The major group of Services and Sales Workers has grown not as a result of regroupings, but for the afore-mentioned reasons.

It appears that the number of people with simpler jobs has decreased. The share of females has decreased especially in the major group of Craft and Related Trades Workers. Besides substantive reasons, it is worth noting that the number of females has grown in the group of Plant and Machine Operators and Assemblers (sub-major group Assemblers). The reason for the decrease in the number of males in the latter group might be caused by their classification under Clerical Support Workers (major group 4) or Professionals (major group 3). The biggest impact on the decrease of elementary occupations came from domestic helpers and cleaners: there were 10,000 fewer women in this occupation.

Classifying occupations on an international basis definitely provides the best comparison opportunity for dynamic changes, which can be analysed also by considering changes in the classification itself and its use.

Conclusion

When observing the methodological preparations for occupation and income question, asking the question in the census mainly by means of the questionnaire, and the published output of censuses in Estonia, two main issues arise. First, the constant changes in the question meaning and in the concepts have made it difficult to compare different times. Secondly, the data of especially the earlier censuses are too general and the interpretations for the Soviet period are almost non-existent.

For a long time the problem has had to do with socioeconomic associations of occupation. The latter have been ideologised during the Soviet period: working in the family, and furthermore, hiring a farmhand, was exploitation and working for the country was supposed to free from oppression. In 1922 and 1934 censuses, the occupation question was presented and

treated successfully, but in dissemination and analysis, the branch of work perspective dominated. In all prior censuses, the huge processing workload and difficulty of presenting the occupation question became an obstacle.

The analysis in this article allows stating that, difficulties aside, it could be possible to analyse the dynamics of occupations and incomes and the related socioeconomic and professional changes in considerably more depth. It could be even said that such analysis would provide us a much deeper understanding of building Estonia with work.

In Estonian censuses, our own classification of occupations has never been used. In the interest of comparability, it is, of course, right to use an international classification (ISCO), but due to two objective criteria, also additional work is needed when using it. Firstly, ISCO is updated every 20 years and its division into 10 major groups is too general. Secondly, general defining and grouping based on work tasks is difficult because of the changing nature of many jobs.

The only sustainable solution would be if there were descriptions of people's jobs, for example according to the methodology of vocations' system, but such a detailed job description exists for only some jobs. Therefore, Statistics Estonia has added the fifth level to the classification of occupations (ISCO-08) and provided a time-series. In some form, other countries have added the fifth level, e.g. Finland and Latvia. The fifth level is the occupational title, which is added to the correct group of the classification based on job tasks. The need to add that becomes clear when collecting information on occupations through e-services. The job tasks are the basis of grouping occupational titles. But it is known from the beginning of censuses that the title does not always explain the essence of the job. This problem cannot be solved well in any other way but through a job description. A qualitative analysis of job descriptions could be the method with which the society would get a better overview of what are the changed and changing jobs people are engaged in.

Table 3. Distribution of workers by major and sub-major groups of occupations in population censuses, 2000 and 2011

		2000 ISCO-88				2011 ISCO-08		
		Total	Males	Females		Total	Males	Females
	Occupations total	**544,650**	**270,377**	**274,273**	**Occupations total**	**561,138**	**272,902**	**288,236**
1.	**Legislators, senior officials and managers**	**67,446**	**43,555**	**23,891**	**Managers**	**58,071**	**36,530**	**21,541**
	11. Legislators and senior officials	3,945	2,161	1,784	Chief Executives, Senior Officials and Legislators	3,448	1,819	1,629
	12. Corporate managers	43,080	27,431	15,649	Administrative and Commercial Managers	10,894	6,265	4,629
	13. Managers of small enterprises	20,417	13,959	6,458	Production and Specialized Services Managers	28,592	20,178	8,414
					Hospitality, Retail and Other Services Managers	15,113	8,247	6,866
	Other and unknown[a]	4	4	0	Managers, lower level unknown	24	21	3
2.	**Professionals**	**70,096**	**21,214**	**48,882**	**Professionals**	**99,487**	**30,155**	**69,332**
	21. Physical, mathematical and engineering science professionals	12,043	8,022	4,021	Science and Engineering Professionals	14,579	8,714	5,865
	22. Life science and health professionals	8,642	2,004	6,638	Health Professionals	10,899	1,586	9,313
	23. Teaching professionals	22,709	4,443	18,266	Teaching Professionals	30,434	4,796	25,638
	24. Other professionals	26,397	6,568	19,829	Business and Administration Professionals	21,607	4,541	17,066
					Information and Communications Technology Professionals	7,431	5,724	1,707
					Legal, Social and Cultural Professionals	14,477	4,755	9,722
	Other and unknown	305	177	128	Professionals, lower level unknown	60	39	21
3.	**Technicians and associate professionals**	**73,223**	**23,577**	**49,646**	**Technicians and Associate Professionals**	**85,984**	**36,154**	**49,830**
	31. Physical and engineering science associate professionals	13,338	8,093	5,245	Science and Engineering Associate Professionals	19,236	15,143	4,093
	32. Life science and health associate professionals	12,702	679	12,023	Health Associate Professionals	9,725	933	8,792
	33. Teaching associate professionals	8,135	621	7,514	Business and Administration Associate Professionals	45,631	14,612	31,019
	34. Other associate professionals	38,882	14,098	24,784	Legal, Social, Cultural and Related Associate Professionals	7,686	2,489	5,197
					Information and Communications Technicians	3,691	2,967	724
	Other and unknown	166	86	80	Technicians and Associate Professionals, lower level unknown	15	10	5

	2000 ISCO-88				2011 ISCO-08		
	Total	Males	Females		Total	Males	Females
4. Clerks	**31,522**	**5,619**	**25,903**	**Clerical Support Workers**	**32,709**	**9,225**	**23,484**
41. Office clerks	24,697	4,962	19,735	General and Keyboard Clerks	3,579	385	3,194
42. Customer services clerks	6,803	649	6,154	Customer Services Clerks	11,251	1,699	9,552
				Numerical and Material Recording Clerks	13,521	6,226	7,295
				Other Clerical Support Workers	4,351	913	3,438
Other and unknown	22	8	14	Technicians and Associate Professionals, lower level unknown	7	2	5
5. Service workers and shop and market sales workers	**66,964**	**16,323**	**50,641**	**Services and Sales Workers**	**73,960**	**16,371**	**57,589**
51. Personal and protective services workers	36,006	11,410	24,596	Personal Services Workers	20,785	4,025	16,760
52. Models, salespersons and demonstrators	30,880	4,882	25,998	Sales Workers	32,244	4,244	28,000
				Personal Care Workers	10,905	369	10,536
				Protective Services Workers	10,000	7,727	2,273
Other and unknown	78	31	47	Services and Sales Workers, lower level unknown	26	6	20
6. Skilled agricultural and fishery workers	**14,356**	**9,090**	**5,266**	**Skilled Agricultural, Forestry and Fishery Workers**	**9,054**	**5,599**	**3,455**
61. Skilled agricultural and fishery workers	14,356	9,090	5,266	Market-oriented Skilled Agricultural Workers	6,445	3,102	3,343
				Market-oriented Skilled Forestry, Fishery and Hunting Workers	2,578	2,472	106
				Subsistence Farmers, Fishers, Hunters and Gatherers	11	8	3
				Skilled Agricultural, Forestry and Fishery Workers, lower level unknown	20	17	3
7. Craft and related trades workers	**85,129**	**65,313**	**19,816**	**Craft and Related Trades Workers**	**79,507**	**66,958**	**12,549**
71. Extraction and building trades workers	25,595	24,055	1,540	Building and Related Trades Workers (excluding Electricians)	27,803	26,720	1,083
72. Metal, machinery and related trades workers	35,462	33,999	1,463	Metal, Machinery and Related Trades Workers	23,855	23,100	755
73. Precision, handicraft, craft printing and related trades workers	2,455	1,278	1,177	Handicraft and Printing Workers	2,783	1,303	1,480
74. Other craft and related trades workers	21,391	5,771	15,620	Electrical and Electronic Trades Workers	8,946	8,509	437
				Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	16,008	7,231	8,777
Other and unknown	226	210	16	Craft and Related Trades Workers, lower level unknown	112	95	17
8. Plant and machine operators and assemblers	**64,783**	**50,279**	**14,504**	**Plant and Machine Operators and Assemblers**	**62,533**	**44,447**	**18,086**
81. Stationary plant and related operators	9,340	7,348	1,992	Stationary Plant and Machine Operators	20,317	8,328	11,989
82. Machine operators and assemblers	18,162	6,809	11,353	Assemblers	8,195	3,008	5,187
83. Drivers and mobile plant operators	37,203	36,065	1,138	Drivers and Mobile Plant Operators	33,991	33,094	897
Other and unknown	78	57	21	Plant and Machine Operators and Assemblers, lower level unknown	30	17	13
9. Elementary occupations	**57,708**	**25,323**	**32,385**	**Elementary Occupations**	**44,911**	**16,185**	**28,726**
91. Sales and services elementary occupations	33,922	10,339	23,583	Cleaners and Helpers	14,816	1,342	13,474
92. Agricultural, fishery and related labourers	3,434	2,264	1,170	Agricultural, Forestry and Fishery Labourers	2,663	1,640	1,023
93. Labourers in mining, construction, manufacturing and transport	19,806	12,366	7,440	Labourers in Mining, Construction, Manufacturing and Transport	12,167	7,064	5,103
				Food Preparation Assistants	3,813	337	3,476
				Refuse Workers and Other Elementary Workers	11,228	5,692	5,536
Other and unknown	546	354	192	Elementary Occupations, lower level unknown	183	88	95

	2000 ISCO-88				2011 ISCO-08		
	Total	Males	Females		Total	Males	Females
0. Armed forces	**6,608**	**5,958**	**650**	**Armed Forces Occupations**	**6,053**	**5,691**	**362**
01. Armed forces	6,608	5,958	650	Commissioned Armed Forces Officers	765	703	62
				Non-commissioned Armed Forces Officers	1,083	947	136
				Armed Forces Occupations, Other Ranks	3,657	3,589	68
				Armed Forces Occupations, lower level unknown	548	452	96
Occupation unknown	6,815	4,126	2,689	Occupation unknown	8,869	5,587	3,282

[a] "Other and unknown" is a calculated indicator, which shows the difference between the major group and the sub-major group and is due to the specific character of presenting the published data.

Sources

Behre, O. (1905). Geschichte der Statistik in Brandenburg-Preussen bis zur Gründung des Königlichen Statistischen Bureaus. XVI. Berlin: Heymanns.

Berendsen, V. & Maiste, M. (1999). Esimene ülevenemaaline rahvaloendus Tartus 28. jaanuaril 1897. Tartu: Eesti Ajalooarhiiv.

Berttillon, J. (1895). Nomenclature des professions. Bulletain de l'Institut international du statistique. t. VIII Premiére Livrasion. Rom. 226–262.

Compte-Rendu de la Huitieme Session à St. Petersbourg etc. Deuxième partie. (1874). St. Petersbourg.

Engel, E. (1874). Die Reform der Gewerbestatistik im Deutschen Reich und in den Übrigen Staaten von Europa und Nordamerika. In Compte-Rendu de la Huitieme Session à St. Petersbourg etc. Deuxième partie. St. Petersbourg. pp. 1–42.

Hoffmann, E. (2003). International Statistical Comparisons of Occupational and Social Structures: Problems, Possibilities and the Role of ISCO-88 – Advances in Cross-National Comparison. A European Working Book for Demographie and Socio-Economic Variables. (Eds. Hoffmeyer-Zlotnik, J. H. P. & Wolf, C). New York: Springer Science+Business Media. pp. 137–158.

Hoffmeyer-Zlotnik, J. H. P., Warner, U. (2014). Harmonising Demographic and Socio-Economic Variables for Cross-National Comparative Survey Research. Dordrecht: Springer Science+Business Media.

International Labour Office (ILO). (1923). Systems of classification of industries and occupations. Studies and Reports. Series N, No. 1. Geneva.

International Labour Office (ILO). (1924). International Conference of Labour Statisticians. Studies and reports. Series N (Statistics), No. 4. Geneva.

International Labour Office (ILO). (1949). International Conference of Labour Statisticians. International Standard Classification of Occupations. Studies and reports. New Series, No. 15. Geneva.

International Labour Office (ILO). (1987). Revision of the International Standard Classification of Occupations. Part I: Background, principles and draft resolution – Fourteenth International Conference of Labour Statisticians.

International Labour Office. (2007). Resolution Concerning Updating the International Standard Classification of Occupations.

Jansen, E. (2007). Eestlane muutuvas ajas. Seisuseühiskonnast kodanikuühiskonnani. Tartu: Eesti Ajalooarhiiv.

Jung-Stilling, F. (1864). Material zu einer allgemeinen Statistik Livland's und Oesel's. Riga: Livländisches statistisches Comité.

Körösi, J. (1893). Die internationale Classificierung der Berufsarten. Bemerkungen zu den Vorschlägen Dr. Bertillon's, eine einheitlche Nomenclatur der Berufsarten betreffend. Statisticshe Monatschrift. Jg. XIX. Wien. 301–316.

Mackensen, R. (2006). Demographie, Statistik, Soziologie: Der Bedarf an empirischen Informationen und das Verhaltnis zur Politik – Bevölkerungsforschung und Politik in Deutschland im 20. Jahrhundert. Wiesbaden: Verlag für Sozialwissenschaften. pp. 181–202.

Mereste, U., Root, A. (1988). Rahvastik loenduspeeglis. 1989. aasta rahvaloendusest ja loendusandmete kasutamisest. Tallinn: Eesti Raamat.

Pawlik, C. (1991). Dokumentation: Berufe – Die Nationalitäten des Russischen Reiches in der Volkszählung von 1897. H. Bauer, A. Kappeler, B. Roth (Eds.). Bd. A. Quellenkritische Dokumentation und Datenhandbuch. Stuttgart. pp. 430–488.

Roth, K. H. (1993). Das Arbeitwissenschaftliche Institut der Deutschen Arbeitsfront und die Ostplannung. Der „Generalplan Ost". Hauptlinien der nationalsozialistischen Planungs- und Vernichtungspolitik. (Ed. Rössler, M.). Berlin: Akad.-Verl. pp. 215–225.

Riigi Statistika Keskbüroo. (1925). 1922. a. üldrahvalugemise andmed. Vihk III. Rahva tööala ja ühiskondline kihitus. Tallinn.

Riigi Statistika Keskbüroo. (1935). Tööharud ja leibkonnad. 1. III 1934 rahvaloenduse andmed. Vihk III. Tallinn.

Riigi Statistika Keskbüroo. (1937). Rahvastikuprobleeme Eestis. 1. III 1934 rahvaloenduse andmed. II rahvaloenduse tulemusi. Vihk IV. Tallinn.

Sotsiaalministeerium. (1999). Ametite klassifikaator. Tallinn.

Statistikaamet. (2003). 2000. aasta rahva- ja eluruumide loendus. Majanduslikult aktiivne rahvastik. IX. 2000 Population and Housing Census. IX. Economically Active Population. Tallinn.

Szreter, S., Sholkamy, H., Dharmalingam, A. (2004). Contextualising categories: towards a critical reflexive demography–Categories and Contexts. Anthropological and Historical Studies in Critical Demography. 3–32.

Tiit, Ene-Margit. (2014). 2011 Population and Housing Census. Methodology. Tallinn: Statistics Estonia.

Брюханова, Е. А. (2015). Кодирование исторических профессий: монография Барнаул: Изд-во АлтГУ.

Кадомцев, Б. П. (1909). Профессиональный и социальный состав насиления Европейской России по данным переписи 1897 года: Критико-статистический этюд. Спб.

Лабутова Т. С. (1984). Занятия населения СССР – Всесоюзная перепись населения 1979 года. М., pp. 182–193.

Швиттау, Г. Г. (1909). Профессия и занятия населения. Опыт критико-методологического исследования в области экономической статистики. Спб.

Волков, А. Г. (2014). Избранные демографические труды. М.: Изд. дом Высшей школы экономики.

NARVA AND OTHER CITIES ON THE EASTERN BORDER OF THE EUROPEAN UNION

Mihkel Servinski, Marika Kivilaid

The survey of European cities provides a great opportunity to compare cities in different European regions. Without the survey, this opportunity would hardly exist. Three Estonian cities participate in the City Statistics survey: Tallinn, Tartu and Narva. In this article, Narva is compared to four cities of a similar size on the eastern border of the European Union.

Statistics Estonia has published an overview of the City Statistics survey (see the City Statistics section of the article) several times in the Quarterly Bulletin after the data collection rounds have ended. The articles on City Statistics have almost always included international comparison. The focus of the present article is the EU border city Narva, which participates in the City Statistics survey since the 2012/2013 data collection period: the basis for the comparison is data collected on other cities participating in the survey.

Four cities participating in the survey were chosen for comparison with Narva: Daugavpils from Latvia, Chełm and Przemyśl from Poland and Tulcea from Romania. These cities are comparable to Narva in terms of population and are located on the EU eastern land border or in its vicinity. The latter selection criterion automatically points to the fact that the cities share a socialist past; Narva and Daugavpils having actually been a part of the Soviet Union.

Narva is situated in the northeastern part of Estonia in Ida-Viru county on the lower course of the Narva River. Narva is the easternmost city of Estonia and the third largest city after Tallinn and Tartu. Narva is located on the border with Russia which runs along the Narva River. On the opposite side of the river from Narva is Ivangorod.

Daugavpils is a city in Latvia on the Daugava River and it is a historic centre of Latgale. It is located 25 km from the border of Lithuania and 35 km from the border of Belarus. Daugavpils is the southernmost city of Latvia.

Chełm is located in the southeastern part of Poland in Lublin Voivodeship and it is the centre of Chełm county. It lies 25 km from the border of Ukraine.

Przemyśl is a city in Poland in Podkarpacie (Subcarpathian) Voivodeship. It is situated on the San River 12 km from the border of Ukraine. Przemyśl is one of the oldest cities in Poland. An international railway line connecting Berlin and Kiev passes through the city.

Tulcea is a city in eastern Romania and a seat of Tulcea county. The city lies on the western edge of the Danube Delta serving as a gate to the second largest river delta in Europe. 20 km from Tulcea is Ukrainian city Izmail.

Of course, cities can be compared only if data exists. For the purpose of this article, the data have been obtained from the city (Urban Audit) database on the website of Eurostat. Unfortunately, the data are not complete, both in terms of the cities and years. If the database data requires more attention, the data are flagged. The database tables also include a reference to metadata prepared by each country. It is presumed in this article that the data have been collected and processed based on the same methodology and problem areas have been pointed out.

Map 1. Location of Narva, Daugavpils, Chełm, Przemyśl and Tulcea

Population

The most recent population figures of the five cities are for 2014 (Figure 1). Tulcea had the largest population (90,503) and Narva had the smallest (59,049). The population of each of the cities is experiencing a decline trend (the time series allowing observation is not long), and in the case of the Baltic cities, the population decreases more rapidly.

In all the cities in question, there lived more women than men in 2014. The share of women is largest in Daugavpils, with 80 men per 100 women, and smallest in Tulcea, with 94.4 men per 100 women.

The labour pressure index, i.e. the ratio of 10–19-year-olds to 55–64-year-olds, characterises the age structure as a ratio of the population potentially entering the labour market to the population potentially leaving it for age reasons. In all the observed cities, the index was considerably lower than one, which shows that there is no demographic potential to maintain the number of persons employed in any of these cities. The labour pressure index in the five cities is in the range 0.53 (Chełm) to 0.62 (Przemyśl), which is not a significant difference in the context of this indicator.

The second indicator of population age structure is dependency ratio – the ratio of persons under 20 and over 64 to those aged 20–64, multiplied by 100. It shows how many persons who are not of working age there are per 100 persons of working age (Figure 2). In the case of this indicator, there is a considerable difference between the cities: in Narva, there are 62.5 persons who are not of working age per hundred working-age persons, while the indicator stands at 40.5 in Tulcea. Considering the indicator by component, i.e. the ratios of those not yet of working age to working-age population and of those older than working age to working-age population, the value of both components is lowest in Tulcea, which indicates that the city is facing serious problems, also indicated by the labour pressure index.

The difference in the dependency ratios of the observed cities are primarily due to a great difference in the dependency ratios of older people, which is 17 people (15.4 in Tulcea and 32.3 in Daugavpils). The difference in the dependency ratios of persons younger than the working age is 5 people (25.1 in Tulcea and 30.3 in Narva).

The median age of the population (2011 data, no data on Tulcea) is highest in Narva (45 years) and lowest in Chełm (39.7 years).

The scarce data do not allow an evaluation of the future demographic situation, but the hypothesis of a possible shortage of labour force seems likely.

Figure 1. Cities by population, 2014

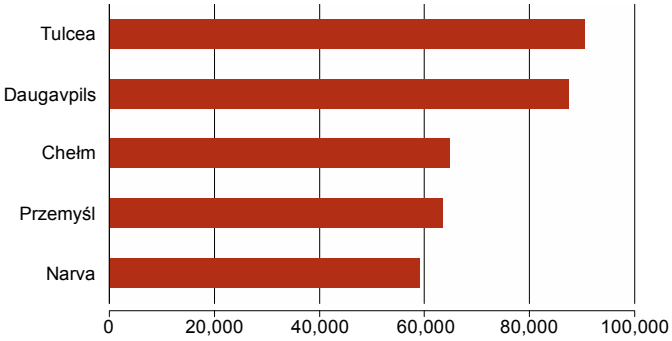
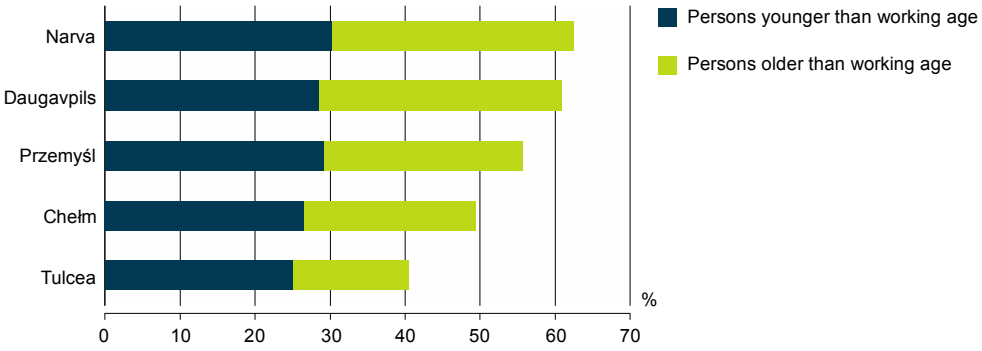


Figure 2. Dependency ratio by component, 2014



Live births

Of the observed cities, the most children are born in Daugavpils and Tulcea. The number of births is lowest in Narva. This is to be expected considering the population figures of these cities. The number of births fluctuates quite a lot by year and the time series is too short for more significant conclusions, but it is still worth mentioning that the number of births was increasing in Daugavpils in 2011–2016. In the case of Tulcea, Przemyśl and Narva, the number of births has been quite stable, while in Chełm, there has been a slight decline trend (Figure 3).

The crude birth rate (number of live births per 1,000 population in a year) is highest in Daugavpils and lowest in Tulcea (Figure 4). Is the difference in the crude birth rate of the observed cities significant or not? It should be noted that in all of the cities covered in this article, the crude birth rate is below the average for the country; the difference is greatest in Narva and smallest in Tulcea.

Figure 3. Number of births and trend, 2011–2016

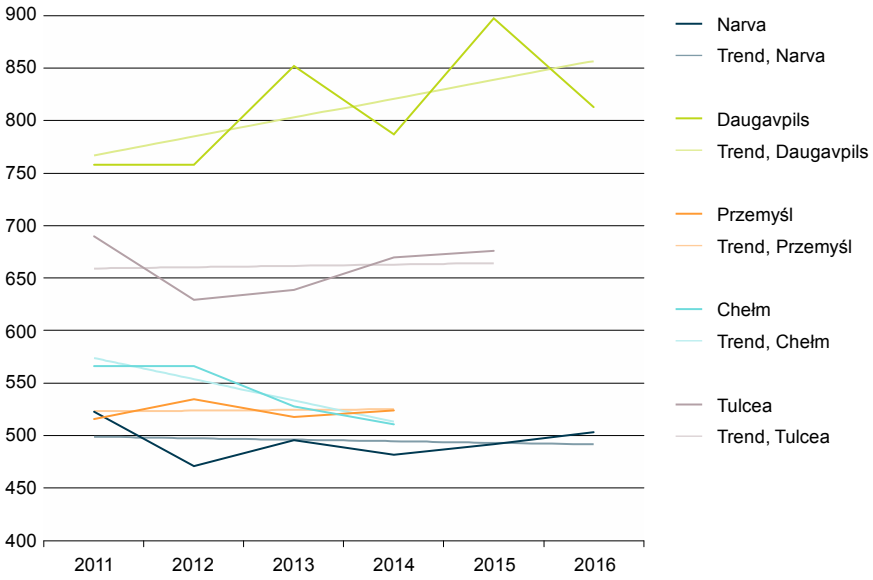
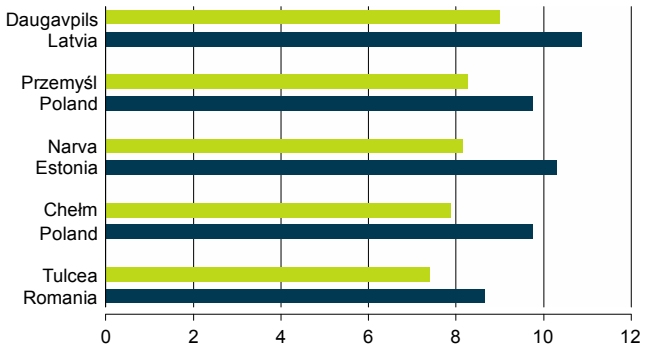


Figure 4. Crude birth rate in the cities and in the whole country, 2014



Deaths

The observed cities are not large and, therefore, the absolute number of infant deaths is not high: in the years for which data have been published, there have been under nine infant deaths in each city, meaning that there are not enough cases for statistical analysis. Data exists on each city starting with year 2014. The situation is shown in Figure 5. It appears that the number of infant deaths in 2014 per 1,000 live births was highest in Daugavpils and Narva, i.e. in the Baltic cities, and lowest in Polish cities Chełm and Przemyśl. There is a remarkable difference between Daugavpils and Przemyśl. The year before, the comparison result of these cities was the opposite: when the numbers are small, randomness plays a big part. The issue of infant deaths in Daugavpils and Narva is perhaps best characterised by the fact that the indicator compared to the average indicator of Latvia and Estonia, respectively, speaks negatively of these cities. In the case of Narva, a positive aspect is the fact that the number of infant deaths per 1,000 live births in 2015 and 2016 was smaller than in 2014. For the other observed cities, it is worth noting that Przemyśl does rather positively in comparison to the average of Poland, and Chełm is rather on the negative side. The indicator of Tulcea varies when compared to the Romanian average.

The deaths of persons aged under 65 are considered based on the data of 2011 (Figure 6). The data for Tulcea are not complete, but it can be assessed that the respective indicator for this city is analogous to the indicators of the other observed cities. In Narva, Chełm, Przemyśl and Daugavpils, the share of deaths of under 65-year-olds in the total number of deaths does not differ considerably: the indicator value is highest in Narva (34.3%) and smallest in Daugavpils (30.1%). The difference is greater by sex: of all the deaths of males, those of under 65-year-olds account for 48.8% in Narva (the highest indicator of the observed cities) and for 39.8% in Daugavpils (the lowest indicator of the cities); of all the deaths of females, the share of those of under 65-year-olds is 18% in Narva (the lowest indicator) and 24% in Przemyśl (the highest indicator).

In all the observed cities, the share of deaths of under 65-year-olds is larger for men than for women. The difference between men's and women's indicator is biggest in Narva (30.8 percentage points) and smallest in Przemyśl (16.6 percentage points). This is certainly a situation that requires more serious consideration in Narva.

Figure 5. Number of infant deaths per 1,000 live births, 2014

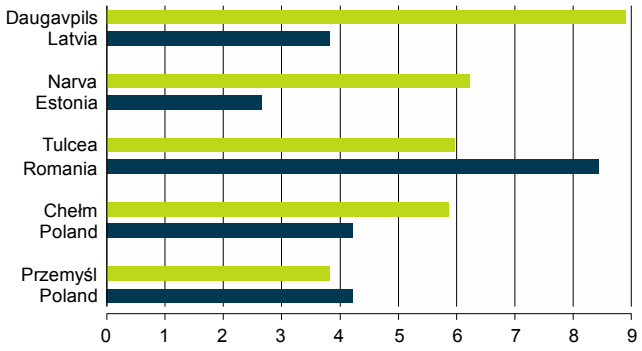
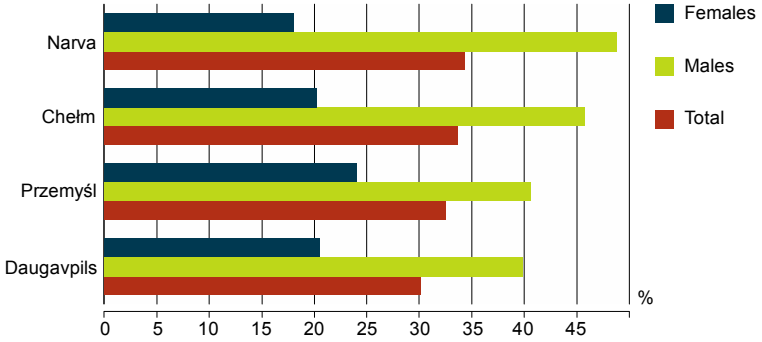


Figure 6. Share of deaths of under 65-year-olds in total number of deaths, 2011



Citizenship and country of birth

The data on citizenship and country of birth are from 2011. The cities divide into two based on the nationality and country of birth of the population: in the Baltic countries, there is a large share of people who do not have the citizenship of the country of residence and who are not native-born, whereas in the Polish cities, there are hardly any people with non-Polish citizenship and few were born outside the country of residence (there is no data on Romanian city Tulcea). There are also remarkable differences between Narva and Daugavpils: in Narva, more than half of the residents do not have Estonian citizenship, and in Daugavpils, a quarter of residents are without Latvian citizenship; in Narva, the share of persons born outside Estonia is approximately 45% of the population, whereas in Daugavpils, less than a quarter of residents were not native-born. In Narva and Daugavpils, almost all of the persons without the citizenship and born outside of the country of residence are not citizens of any other EU Member State either and were born outside the EU.

Households

There are no data on Tulcea. In the case of the other cities, the comparison is based on 2011. As expected, the majority of residents of the observed cities live in private households (which exclude institutional households). The average private household is largest in Daugavpils (3.2 persons) and smallest in Narva (2.1 persons). This is a remarkable difference. Daugavpils differs significantly also from Przemyśl and Chełm, where the average size of a private household is 2.3 and 2.4 persons, respectively.

The comparison of the structure of private households shows that it differs significantly between the Baltic and Polish cities (Table 1). For example, the share of one person households in the total number of private households is significantly larger in Narva and Daugavpils compared to Polish cities Przemyśl and Chełm. Also, the share of lone parent private households with children aged under 18 of all private households is bigger in the Baltic cities than in the Polish cities. As for the share of households with children aged under 18, the situation is the opposite: in the observed Polish cities the share is larger than in the Baltic cities.

Table 1. Structure of private households, 2011
(percent)

	Narva	Daugavpils	Przemyśl	Chełm
Private households	100.0	100.0	100.0	100.0
One person households	38.5	34.3	26.0	25.9
Lone parent private households with children aged 0 to under 18	7.0	7.9	3.8	3.5
Lone pensioner older than retirement age	18.6	15.4	12.2	11.3
Households with children aged 0 to under 18	24.0	24.7	29.8	28.7

Economic activity, labour market, transport

Economic activity is very different in the considered cities (Figure 7). The cities form obvious groups in Poland, the Baltics and Romania, which can point to a very different economic environment in the countries. This, of course, presuming that economic activity, primarily determining the number of companies has been done methodologically in a similar way and that in the observed cities, the economic environment is not extremely different from the overall environment of the country (region).

Based on the data available from the survey, it is not possible to check the hypothesis of considerably different economic environment in the Baltics, Poland and Romania: there is not enough data. The hypothesis is supported by data on 2011–2012 unemployment rate, in which case the observed cities form analogous groups to the economic activity indicator (Figure 8). The hypothesis of considerably different economic environment is also confirmed by the fact that in 2011 the share of persons employed in industry was 31.8% in Narva, 22.8% in Daugavpils, 19.1% in Chełm and 17.3% in Przemyśl (no data is available for Tulcea). The unemployment rate of 2013–2014, however, does not provide such strong support to the hypothesis: there is no data on Tulcea, and Narva's position in the ranking has considerably changed compared to 2011 – for the better.

Figure 7. Number of enterprises per 1,000 inhabitants, 2011

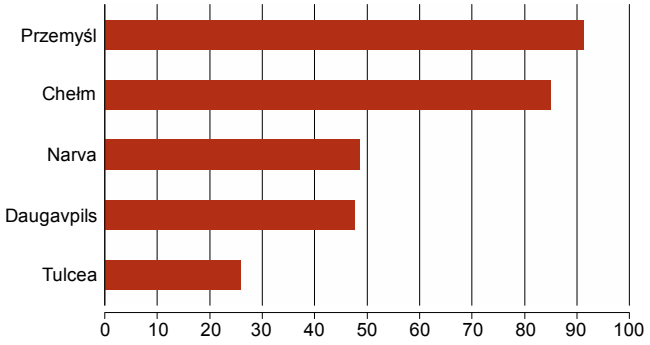
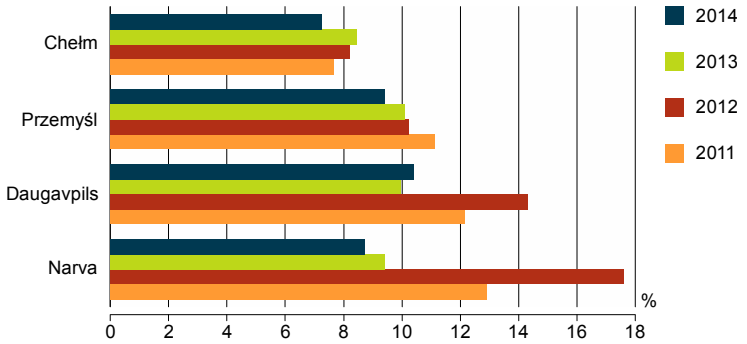


Figure 8. Unemployment rate of 15–74-year-olds, 2011–2014



The data of Eurostat characterise transport mainly from the aspect of public transport (Table 2). It is definitely worth noting that the price of public transport is significantly higher in Tulcea, Romania. The price difference is so significant that it raises a question whether there is no error. Secondly, the length of bicycle network in Narva compared to the other cities stands out. The reason might be that quite a lot of attention has been paid to bicycle paths in Estonia. Thirdly, there is a big difference in the number of private cars registered per inhabitant in the Baltic and Polish cities. This is yet another topic where lacking data do not allow a deeper analysis of the reasons.

Table 2. Transport, 2011

	Narva	Daugavpils	Przemyśl	Chełm	Tulcea
Length of bicycle network, km	12.7	2.5	7.3	6.1	…
Cost of a combined monthly ticket (all modes of public transport) for 5–10 km in the central zone, euros	15.35	50.97	24.03	21.96	96.00
Cost of a taxi ride of 5 km to the centre at day time, euros	4.10	4.81	3.40	3.34	11.00
Number of private cars registered per 1,000 inhabitants	183.9	223.9	424.5	419.4	…

Tourism, or accommodation statistics

The results of the City Statistics survey on accommodation establishments are presented in Figures 9–10. In terms of trend, there has been no significant change in any of the observed cities during the period 2011–2016. In comparison of two consecutive years, there have been some notable changes (see, e.g. 2013), but these fluctuations have levelled off in a longer time series. With regards to tourism statistics, it can be said that in comparison with other observed cities there are more bed places (as an absolute number as well as percentage) in Tulcea and Przemyśl and also more nights are spent in tourist accommodation establishments in these cities.

Figure 9. Number of bed places in accommodation establishments per 1,000 inhabitants, 2011–2016

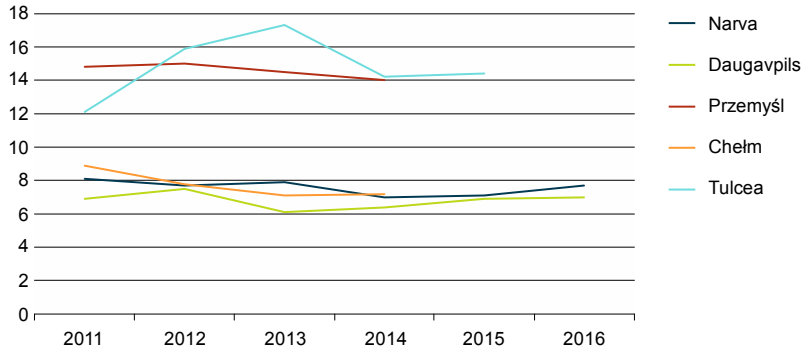
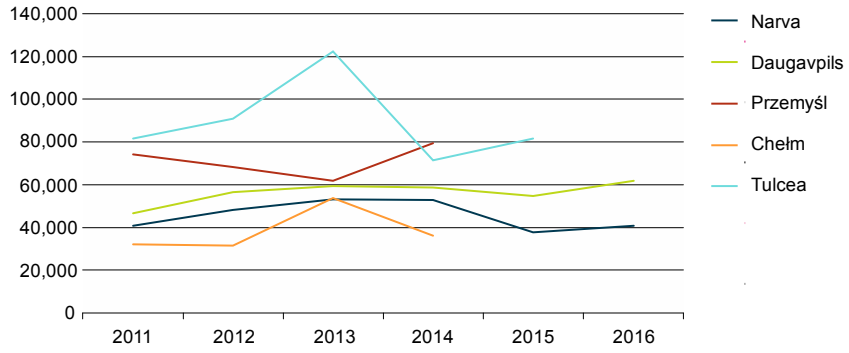


Figure 10. Nights spent in accommodation establishments, 2011–2016



Environment

As for environmental indicators, the data collected by the City Statistics survey allow discussing the price of water consumption and volumes of municipal waste generated. Again, there is no data on Tulcea.

In 2011, the price of domestic water was highest in Narva – significantly higher than in the other cities (Figure 11). For example, in comparison with Chełm, the price was twice as high. In Narva, the price of water rose in 2016 compared to 2011, but the increase was much smaller than in Daugavpils, where the price of domestic water was more expensive in 2016 compared to Narva. There is no data on water price changes in the other cities.

The dynamics of change can be observed for generation of municipal waste; here the trend is positive: the generation of municipal waste is in decline (Figure 12). Of the observed cities, the most municipal waste is generated in Daugavpils, where the indicator value fluctuates a lot by year, but a couple of years with a small volume of municipal waste cause a declining linear trend also in this city. Hopefully, this trend will be confirmed in the future. Calculating the generation of municipal waste per one inhabitant (2014 data), Daugavpils loses its lead to Przemyśl (Figure 13).

Figure 11. Price of domestic water, 2011, 2016

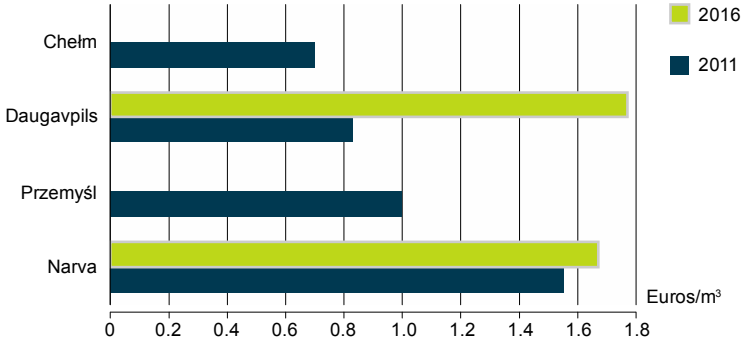


Figure 12. Municipal waste generated and trend, 2011–2016

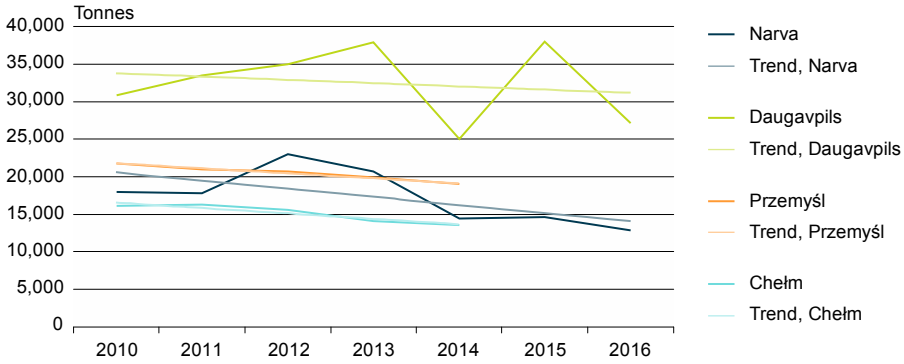
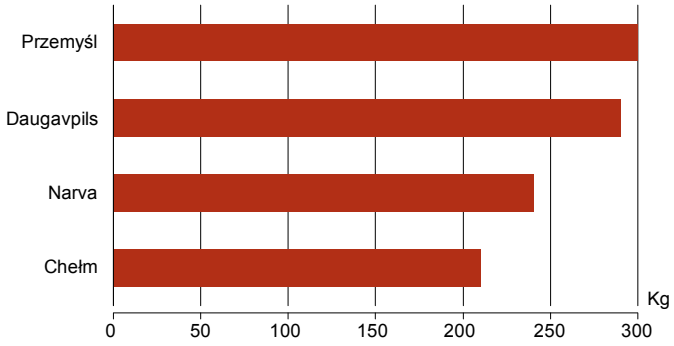


Figure 13. Municipal waste generated per inhabitant, 2014



Education

Children aged 0–4 in day care or school

The Baltic cities differ clearly from the other cities: the number of children aged 0–4 in day care or school in Narva and Daugavpils per 1,000 children of the respective age is equal to each other and higher than in the other cities, where the indicator was relatively similar in 2013 and 2014 (Figure 14). The significantly lower indicator value in Tulcea in 2011 and 2012 cannot be explained based on the available dataset.

Higher education

Of the five cities in question, there is a higher education institution in four. Chełm had the most students and Narva had the least: both in terms of the absolute number as well as per 1,000 inhabitants (Figures 15 and 16). Unfortunately, it should be noted that the number of students in each of the observed cities is declining. The student community of each of the cities is similar in the sense that in all of them there are more female than male students, but, nevertheless, the sex distribution of students is very different in the cities: in Narva, male students account for approximately 15%, but in Chełm, for almost a half of all students studying in the city (Figure 17).

The cities' population structures also differ greatly based on education: in Narva, the relative share of persons with tertiary education (ISCED 2011 codes 5–8) is noticeably larger than in the other observed cities (there is no data on Tulcea) (Figure 18). In Daugavpils, the share of persons with upper secondary education (ISCED 2011 codes 3–4) is large compared to the other cities. It is also important to note that in Daugavpils, the share of people who do not have upper secondary or tertiary level education is smallest. The difference to the other observed cities is not great, but it clearly exists.

Figure 14. Children aged 0–4 in day care or school, 2011–2016

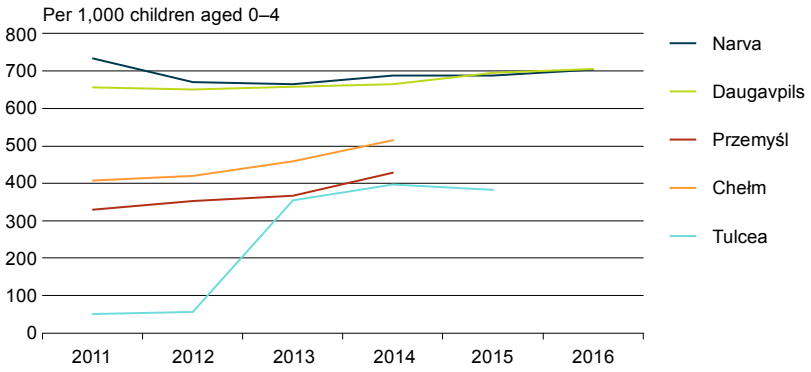


Figure 15. Number of students in higher education, 2011–2016

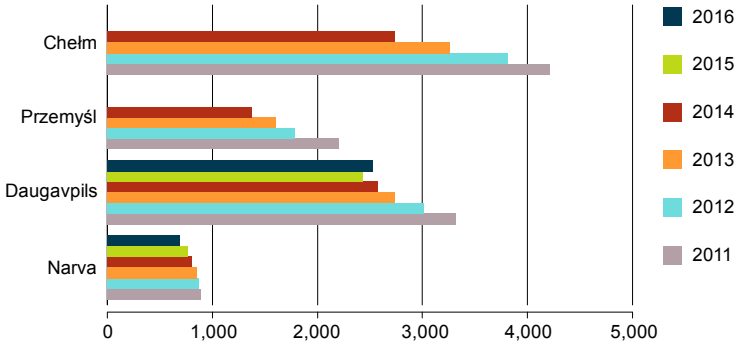


Figure 16. Number of students per 1,000 inhabitants, 2011–2014

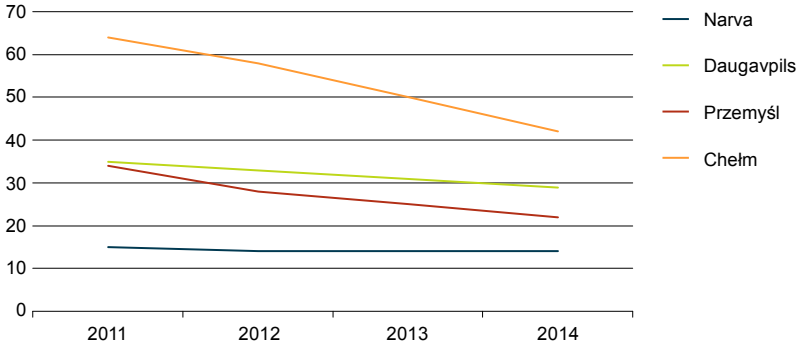


Figure 17. Students by sex, 2011

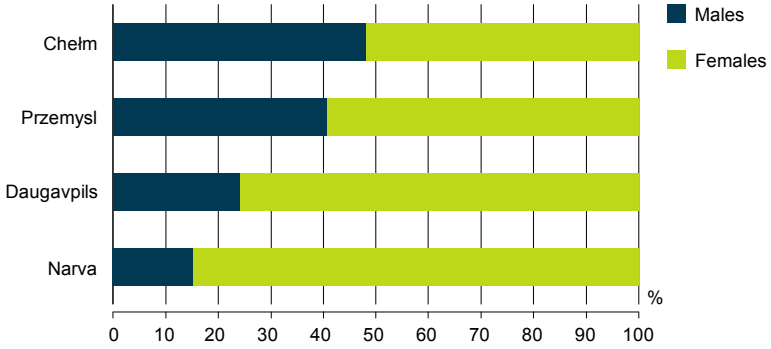
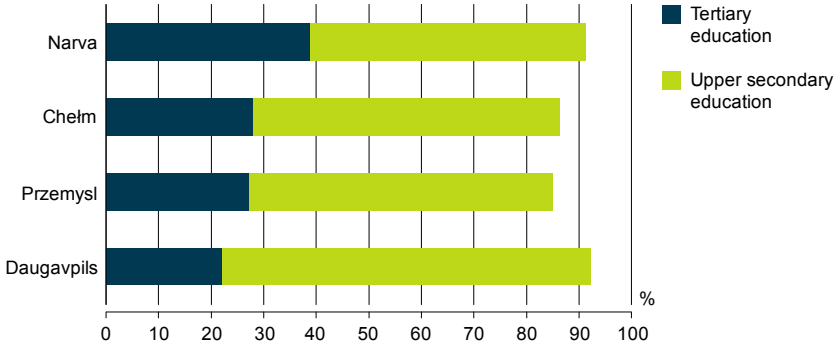


Figure 18. Share of persons with upper secondary and tertiary level education among population aged 25–64, 2011



Culture

The statistics on culture collected by the City Statistics survey are presented in Table 3. The data are on 2011, because there are gaps in the data on later years.

Cinema attendance in the Baltic cities is much greater than in the Polish cities. The difference is so significant that it makes one want to check the data. When considering the number of cinema seats, the lower cinema attendance in the Polish cities makes sense, but such a huge difference is surprising. Actually, the number of cinema seats in Daugavpils also calls for an exclamation and question mark.

The number of museum visits in Tulcea compared to the other cities is definitely noteworthy. As Narva is a very interesting tourism destination, the authors wonder what the draws of Tulcea are. Tulcea stands out also with its almost non-existent number of libraries. For clarification, it should be mentioned that the 2015 statistics show that there 27 public libraries or distribution points in the city: it seems likely that the hypothesis of erroneous data could apply here.

It should be mentioned regarding the data of the years after 2011 that the data for 2015 show that there is a theatre in Narva and a third one has been established in Tulcea. The 2015 statistics also show that the number of museum visits has risen in Tulcea, but it is below the same number in Narva, which was over 140,000 in 2015. Unfortunately, it decreased again down to 75,000 in 2016.

Table 3. Culture, 2011

	Narva	Daugavpils	Przemyśl	Chełm	Tulcea
Number of cinema seats	409	1,830	324	211	…
Cinema attendance	119,897	148,630	15,205	12,470	…
Number of museum visits	75,474	18,633	47,663	39,656	105,145
Number of theatres	0	1	0	0	2
Number of public libraries (all distribution points)	3	8	10	4	1
Number of public swimming pools	1	6	0	2	…

City Statistics

The City Statistics, a Eurostat grant project by the previous name Urban Audit, is a joint effort by DG REGIO (the Directorate-General for Regional and Urban Policy of the European Commission), the national statistical institutes and Eurostat with the purpose to collect and disseminate reliable and comparable data on the quality of life in European cities. In 1998–1999, Eurostat organised a pilot project, during which data were collected on 58 larger cities in Europe (nearly 480 indicators). After the end of the pilot project, the European Commission (DG REGIO) decided that there is a clear need to continue and improve the collection of comparable data on urban development.

The project data are collected in waves. The data collection waves have been the following:

- in 2003/2004 data were collected mainly for 2001;
- in 2006/2007 data were collected mainly for 2004;
- in 2009/2011 data were collected mainly for 2008;
- in 2012/2013 data were collected mainly for 2011;
- in 2014/2015 data were collected mainly for 2013 and 2014;
- in 2016/2018 collection wave is ongoing and data are collected mainly for 2015 and 2016.

Since 2003, Estonia participates in the project with Tallinn and Tartu cities. Eurostat expected that all European Union cities with at least 50,000 inhabitants would participate in the project and, therefore, Narva city has been included in the project since 2012/2013. Eurostat website has data available in addition to EU-28 cities on Norwegian, Swiss and Turkish cities – on over a thousand cities in total.

In Estonia, data are collected on three regional levels:

- city;
- Functional Urban Area (FUA), previously known as Larger Urban Zone. FUA consists of a city and its commuting zone. In Estonia, counties are observed at this level, which is a compromise between wishes and reality. It is obvious that neither Harju nor Tartu county is exactly the area meant under FUA, but counties are similar enough to it, and it is possible to obtain data on these. Even when reaching a compromise, Ida-Viru county cannot be considered as the commuting zone of Narva, and, therefore, FUA data are not collected for Narva.
- sub-city district (in the case of Estonia, only Tallinn districts).

In the project, data are collected on the main statistical domains:

- population (age and sex structure, nationality, births and deaths);
- social life (household structure and social status, housing, labour market, education, culture and leisure time);
- economy (business, tourism);
- environment.

In the 2016/2018 collection period, data are collected on approximately 150 indicators. The most indicators are collected on city level and less on functional urban area and sub-city district levels. The majority of indicators are obtained from the data of Statistics Estonia and a smaller share from city governments. Some of the indicators are collected centrally by Eurostat.

Conclusion

The idea to compare cities for this article was not realised to the fullest extent. The main reason was missing data. More precisely, it means that the same data does not exist for each city, and the time series have gaps. When comparing the data, methodological issues arose for which it was not possible to find answers. There were also errors in the data. Where possible, corrections were made in cooperation with colleagues from the respective countries. Despite problems, the authors want to acknowledge the organisation of the City Statistics survey, as it is a remarkable task.

When comparing the cities, the authors were hoping to find more shared traits. An impression was gained that the five cities are not markedly similar: this is a hypothesis, because the lack of data and time does not enable a detailed analysis. As for shared features, they can be found when comparing the Baltic cities Narva and Daugavpils and Polish cities Przemyśl and Chełm. The Romanian city Tulcea differed from the other observed cities the most: in the case of Tulcea, the data were missing most often.

The purpose of the article was to compare cities, but by default Narva was compared to the other cities. Narva has:

- the highest median age of the population;
- the greatest dependency ratio;
- the lowest number of births, but not the lowest crude birth rate;
- the largest share of deaths of under 65-year-olds in all deaths;
- the smallest share of deaths of under 65-year-old females in all deaths of females;
- the largest share of citizens of countries other than the country of residence;
- the most bicycle paths;
- the cheapest public transport;
- the smallest number of passenger cars registered per 1,000 inhabitants;
- the highest domestic water price;
- little municipal waste generated in absolute numbers;
- less students compared to the other cities with higher education institutions;
- the largest share of persons with tertiary education in the total population.

Sources

Data and methodology on City Statistics are available on the website of Eurostat at http://ec.europa.eu/eurostat/web/cities/background.

Kivilaid, M. & Servinski, M. (2012). Education statistics on Estonia and its neighbours according to the Urban Audit. Eesti piirkondlik areng. 2012. Regional development in Estonia. Tallinn: Statistikaamet. pp. 52–83. https://www.stat.ee/publication-2012_regional-development-in-estonia-2012. (14.03.2018).

Kivilaid, M. & Servinski, M. (2013). Quality of life in Tallinn and in the capitals of other European Union Member States. Eesti Statistika Kvartalikiri. 4/13. Quarterly Bulletin of Statistics Estonia. Tallinn: Statistikaamet. pp. 70–91. https://www.stat.ee/publication-2013_quarterly-bulletin-of-statistics-estonia-4-13. (20.03.2018)

Kivilaid, M. & Servinski, M. (2014). Millise Euroopa pealinna elanikud on elukeskkonnaga enim rahul? The blog post in Estonian titled “What are those European capitals where residents are the most satisfied with their living environment?". http://statistikaamet.wordpress.com/2014/01/02/millise-euroopa-pealinna-elanikud-on-elukeskkonnaga-enim-rahul/. (12.03.2018).

Kivilaid, M. & Servinski, M. (2014). Tallinn and its districts. Eesti Statistika Kvartalikiri. 1/14. Quarterly Bulletin of Statistics Estonia. Tallinn: Statistikaamet. pp. 6–32. https://www.stat.ee/publication-2014_quarterly-bulletin-of-statistics-estonia-1-14. (15.03.2018)

Kivilaid, M. & Servinski, M. (2014). The biggest Estonian cities in comparison with bigger cities in the neighbouring countries. Eesti Statistika Kvartalikiri. 2/14. Quarterly Bulletin of Statistics Estonia. Tallinn: Statistikaamet. pp. 34–61. https://www.stat.ee/publication-2014_quarterly-bulletin-of-statistics-estonia-2-14. (14.03.2018)

MAIN INDICATORS, 2013–2017

Table 1. Main indicators by year and quarter, 2013–2017

Period	Average monthly gross wages and salaries, euros[a]	Change of average monthly gross wages and salaries on same period of previous year, %[a]	Average monthly old-age pension, euros[b]	Employed[c]	Unemployed[c]
				thousands	
2013	949	7.0	327.4	621.3	58.7
2014	1,005	5.9	345.1	624.8	49.6
2015	1,065	6.0	365.6	640.9	42.3
2016	1,146	7.6	386.0	644.6	46.7
2017	1,221	6.5	405.4	658.6	40.3
2013					
1st quarter	900	6.3	315.9	610.1	67.5
2nd quarter	976	8.5	331.3	632.1	55.0
3rd quarter	930	8.8	331.4	627.1	53.3
4th quarter	986	7.6	331.0	616.1	58.9
2014					
1st quarter	966	7.3	330.9	605.8	56.6
2nd quarter	1,023	4.8	349.9	629.5	47.7
3rd quarter	977	5.0	350.0	633.7	51.3
4th quarter	1,039	5.3	349.6	630.3	42.7
2015					
1st quarter	1,010	4.5	349.5	623.1	44.2
2nd quarter	1,082	5.8	371.3	640.1	44.4
3rd quarter	1,045	6.9	370.9	661.0	36.5
4th quarter	1,105	6.4	370.7	639.4	43.9
2016					
1st quarter	1,091	8.1	370.6	630.0	43.6
2nd quarter	1,163	7.6	391.4	657.0	45.3
3rd quarter	1,119	7.1	390.2	653.3	52.9
4th quarter	1,182	7.0	390.3	638.2	45.1
2017					
1st quarter	1,153	5.7	390.7	646.8	38.4
2nd quarter	1,242	6.8	409.9	653.5	49.0
3rd quarter	1,201	7.4	409.1	666.6	36.5
4th quarter	1,271	7.5	409.3	667.4	37.2

[a] Since 1999, the average monthly gross wages and salaries do not include health insurance benefits.
[b] Data of the Social Insurance Board.
[c] Population aged 15–74.

Table 1. Main indicators by year and quarter, 2013–2017

Labour force participation rate[a]	Employment rate[a]	Unemployment rate[a]	Consumer price index	Producer price index of industrial output	Period
	%		change on same period of previous year, %		
68.0	62.1	8.6	2.8	4.1	2013
68.0	63.0	7.4	–0.1	–1.6	2014
69.4	65.2	6.2	–0.5	–2.0	2015
70.4	65.6	6.8	0.1	–0.7	2016
71.6	67.5	5.8	3.4	3.6	2017
					2013
67.7	61.0	10.0	3.5	4.6	1st quarter
68.7	63.2	8.0	3.4	4.7	2nd quarter
68.0	62.7	7.8	2.8	3.9	3rd quarter
67.5	61.6	8.7	1.5	3.3	4th quarter
					2014
66.8	61.1	8.5	0.6	–1.2	1st quarter
68.3	63.5	7.0	0.0	–2.0	2nd quarter
69.1	63.9	7.5	–0.6	–1.1	3rd quarter
67.9	63.6	6.3	–0.5	–2.0	4th quarter
					2015
67.8	63.3	6.6	–0.9	–1.6	1st quarter
69.6	65.1	6.5	0.0	–1.7	2nd quarter
70.9	67.2	5.2	–0.5	–2.7	3rd quarter
69.5	65.0	6.4	–0.5	–2.1	4th quarter
					2016
68.6	64.1	6.5	–0.4	–1.4	1st quarter
71.5	66.9	6.5	–0.7	–1.6	2nd quarter
71.9	66.5	7.5	0.4	–1.1	3rd quarter
69.6	65.0	6.6	1.3	1.5	4th quarter
					2017
70.2	66.3	5.6	3.0	2.8	1st quarter
72.0	66.9	7.0	3.1	3.7	2nd quarter
72.0	68.3	5.2	3.7	4.4	3rd quarter
72.2	68.4	5.3	3.8	3.2	4th quarter

[a] Population aged 15–74.

Table 1. Main indicators by year and quarter, 2013–2017

Period	Volume index of industrial production[a]	Volume index of electricity production[a]	Export price index	Import price index	Construction price index	Construction volume index[b]
	change on same period of previous year, %					
2013	4.1	10.9	–1.1	–1.6	5.2	–0.1
2014	3.9	–6.3	–2.6	–2.2	0.5	–2.1
2015	0.3	–16.6	–3.9	–3.8	0.5	–4.5
2016	3.4	18.3	–0.5	–2.3	–0.8	4.6
2017	7.7	13.2	5.5	4.5	1.5	17.7
2013						
1st quarter	3.8	21.7	–0.8	–0.1	5.6	0.8
2nd quarter	5.4	16.0	–0.9	–2.6	5.2	–0.4
3rd quarter	5.1	14.7	–1.2	–2.1	5.3	3.6
4th quarter	2.1	–4.7	–1.7	–1.5	4.7	–4.7
2014						
1st quarter	1.6	–19.2	–2.3	–2.4	2.3	–2.9
2nd quarter	2.6	–2.4	–2.2	–1.7	0.8	–3.5
3rd quarter	4.8	–7.0	–2.2	–1.1	–0.2	–7.4
4th quarter	6.7	2.7	–3.7	–3.6	–0.7	6.5
2015						
1st quarter	3.5	–0.3	–4.3	–4.7	0.1	–1.2
2nd quarter	1.3	–23.4	–3.3	–1.9	0.7	–4.2
3rd quarter	–1.2	–22.1	–4.5	–4.3	0.6	–2.7
4th quarter	–2.2	–20.5	–3.6	–4.2	0.7	–5.0
2016						
1st quarter	–1.4	–5.6	–3.0	–4.0	–0.7	5.3
2nd quarter	0.9	4.1	–2.4	–4.5	–1.3	6.2
3rd quarter	5.0	41.8	–0.1	–2.2	–0.7	2.5
4th quarter	9.0	32.9	3.6	1.7	–0.5	4.9
2017						
1st quarter	12.7	31.0	6.7	6.6	0.7	20.5
2nd quarter	10.9	42.0	5.7	4.3	1.5	17.6
3rd quarter	3.5	–13.1	5.3	3.7	1.7	17.5
4th quarter	4.3	–7.0	4.2	3.3	2.1	16.4

[a] Short-term statistics. The data for 2017 may be revised.
[b] Construction activities in Estonia and in foreign countries. The data for 2017 may be revised.
In the case of volume index of industrial production and construction volume index, statistics according to the Estonian Classification of Economic Activities (EMTAK 2008, based on NACE Rev. 2).

Table 1. Main indicators by year and quarter, 2013–2017

Agricultural output price index	Agricultural input price index	Gross domestic product (GDP) by chain-linking method[a]	Balance of current account as percentage of GDP, %[b]	Net sales of enterprises, million euros, current prices[c]	Period
change on same period of previous year, %					
6.7	3.0	1.9	0.5	50,357.2	2013
–5.7	–2.3	2.9	0.3	50,328.6	2014
–13.0	–0.8	1.7	2.0	49,065.8	2015
–2.5	–1.9	2.1	1.9	50,194.5	2016
21.9	1.5	4.9	3.2	54,973.5	2017
					2013
12.9	5.5	3.1	–0.6	12,054.1	1st quarter
27.4	4.8	1.0	0.9	12,733.1	2nd quarter
14.5	2.2	1.6	0.1	12,808.7	3rd quarter
–12.4	–0.4	2.1	1.6	12,761.3	4th quarter
					2014
4.0	–2.7	1.8	–3.8	11,798.0	1st quarter
–4.5	–2.8	3.0	0.8	12,869.6	2nd quarter
–10.0	–2.1	2.5	0.7	12,666.7	3rd quarter
–9.8	–1.4	4.1	2.9	12,994.3	4th quarter
					2015
–23.4	–1.1	1.5	–1.5	11,531.1	1st quarter
–18.6	–0.4	2.3	3.9	12,475.7	2nd quarter
–8.9	1.0	2.1	3.2	12,359.5	3rd quarter
–4.1	–0.7	0.9	2.0	12,699.5	4th quarter
					2016
–3.3	–1.0	2.2	–2.2	11,726.0	1st quarter
–7.7	–2.4	0.9	2.5	12,651.7	2nd quarter
–5.3	–2.3	2.0	5.5	12,619.2	3rd quarter
3.0	–1.8	3.1	1.4	13,197.6	4th quarter
					2017
21.6	0.1	4.4	1.5	12,686.9	1st quarter
28.5	1.3	5.7	2.0	13,969.9	2nd quarter
28.8	2.2	4.2	4.6	13,823.8	3rd quarter
14.1	2.4	5.0	4.5	14,492.9	4th quarter

[a] Reference year 2010. The data for 1st quarter – 3rd quarter 2017 have been revised.
[b] Data of Eesti Pank. The data for 1st quarter – 3rd quarter 2017 have been revised.
[c] Short-term statistics. Statistics according to the Estonian Classification of Economic Activities (EMTAK 2008, based on NACE Rev. 2).

Table 1. Main indicators by year and quarter, 2013–2017

Period	Revenue of state budget[a]	Expenditure of state budget[a]	Surplus of state budget[a]	Exports[b]	Imports[b]	Balance of trade[b]
	million euros, current prices					
2013	6,556.2	6,853.0	–296.9	12,288.2	13,902.5	–1,614.4
2014	6,677.5	6,488.4	189.1	12,006.0	13,788.1	–1,782.0
2015	6,792.7	7,157.3	–364.6	11,575.3	13,096.7	–1,521.4
2016	7,318.8	7,326.8	–8.0	11,892.0	13,521.7	–1,629.8
2017	9,309.4	9,242.1	67.2	12,784.5	14,729.5	–1,945.0
2013						
1st quarter	1,395.0	1,490.3	–95.3	3,098.1	3,405.8	–307.7
2nd quarter	1,862.9	1,593.7	269.2	3,173.3	3,611.9	–438.6
3rd quarter	1,697.3	1,763.3	–66.1	2,977.4	3,431.1	–453.7
4th quarter	1,601.0	2,005.7	–404.7	3,039.4	3,453.7	–414.3
2014						
1st quarter	1,565.0	1,506.8	58.2	2,837.8	3,276.0	–438.2
2nd quarter	1,730.4	1,537.0	193.4	3,005.3	3,492.8	–487.5
3rd quarter	1,591.6	1,546.6	45.0	3,042.7	3,470.4	–427.7
4th quarter	1,790.5	1,898.0	–107.5	3,120.3	3,549.0	–428.7
2015						
1st quarter	1,601.1	1,810.7	–209.6	2,832.7	3,187.3	–354.6
2nd quarter	1,739.1	1,692.6	46.5	2,990.6	3,339.9	–349.4
3rd quarter	1,676.3	1,709.8	–33.5	2,831.6	3,261.8	–430.3
4th quarter	1,776.2	1,944.2	–168.0	2,920.6	3,307.6	–387.2
2016						
1st quarter	1,850.6	1,874.8	–24.2	2,778.8	3,229.1	–450.5
2nd quarter	1,844.1	1,643.7	200.4	3,025.9	3,491.0	–465.0
3rd quarter	1,742.3	1,775.1	–32.8	3,017.8	3,319.5	–301.7
4th quarter	1,881.8	2,033.1	–151.3	3,069.5	3,482.2	–412.7
2017						
1st quarter	2,055.2	2,098.8	–43.6	3,090.2	3,738.9	–648.8
2nd quarter	2,328.8	2,287.7	41.1	3,261.4	3,712.2	–450.9
3rd quarter	2,191.1	2,173.6	17.5	3,136.4	3,519.7	–383.2
4th quarter	2,734.2	2,682.0	52.3	3,296.5	3,758.6	–462.1

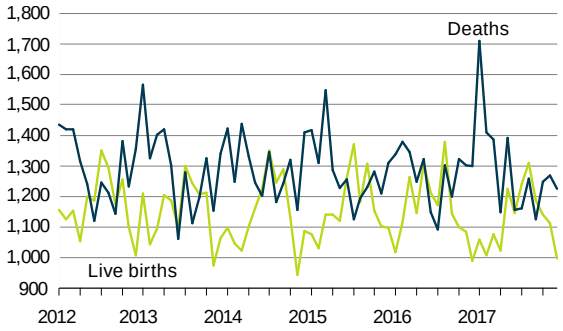
[a] Data of the Ministry of Finance. Since 2017, the accounting of state budget execution is accrual-based. Since 2017, the revenues and expenditures also include allocated tax revenues collected by the Tax and Customs Board. The data for 2017 have been revised.
[b] Data for the current year are revised monthly; data for the previous years are revised twice a year.

Table 1. Main indicators by year and quarter, 2013–2017

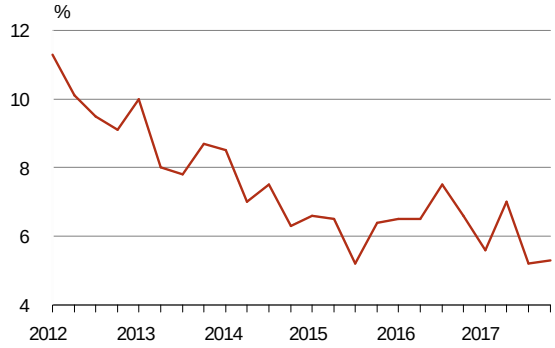
Carriage of goods, thousand tonnes[a]	Carriage of passengers, thousands[a]	Retail sales volume index[b]	Production of meat (live weight)[c]	Production of milk[c]	Production of eggs[c]	Period
		change on same period of previous year, %				
78,726	216,040.5	6	1.4	7.0	5.8	2013
75,141	211,015.1	7	1.2	4.3	5.0	2014
66,219	213,990.2	8	3.1	–2.7	2.5	2015
65,354	207,531.7	6	–4.3	0.0	–2.6	2016
55,182	208,259.8	3	–9.2	1.1	1.8	2017
						2013
21,040	55,234.3	5	3.3	2.8	–0.9	1st quarter
19,463	53,601.1	6	0.0	6.9	–2.7	2nd quarter
18,749	53,297.5	5	1.7	8.7	18.1	3rd quarter
19,474	53,907.6	6	0.6	9.7	9.9	4th quarter
						2014
19,220	54,844.4	6	5.3	10.1	18.1	1st quarter
17,376	52,806.9	6	0.0	4.7	2.6	2nd quarter
18,559	51,113.9	7	0.0	4.2	–6.7	3rd quarter
19,986	52,249.9	7	–0.3	–1.4	7.4	4th quarter
						2015
18,063	57,669.1	9	2.7	–4.6	–8.6	1st quarter
15,958	54,095.2	7	4.9	–4.2	0.8	2nd quarter
15,954	50,425.1	8	–0.3	–2.9	6.5	3rd quarter
16,245	51,800.7	8	5.1	0.9	11.9	4th quarter
						2016
16,177	52,968.6	7	–7.8	4.0	15.1	1st quarter
15,352	53,418.5	7	–0.7	2.9	5.0	2nd quarter
16,763	49,779.6	4	0.0	–2.3	–10.7	3rd quarter
17,062	51,365.0	5	–8.3	–4.4	–17.1	4th quarter
						2017
13,830	53,889.4	5	–8.1	–1.7	–10.1	1st quarter
12,741	53,478.9	4	–9.2	–0.7	–1.2	2nd quarter
13,786	50,457.4	3	–12.4	1.7	10.8	3rd quarter
14,824	50,434.1	1	–7.0	5.4	10.3	4th quarter

[a] Carriage data of Estonian transport enterprises. The data for the 1st quarter 2017 – 3rd quarter 2017 have been revised.
[b] Short-term statistics. The data for 2017 may be revised. Statistics according to the Estonian Classification of Economic Activities (EMTAK 2008, based on NACE Rev. 2).
[c] Preliminary data for 2017.

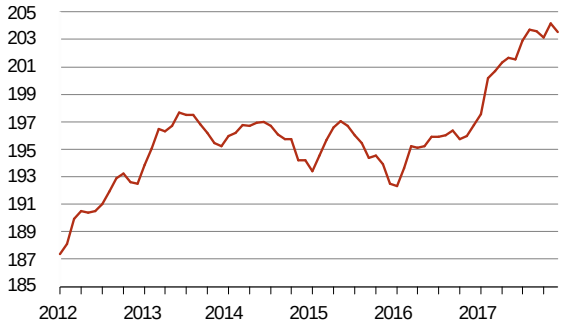
Natural change of population



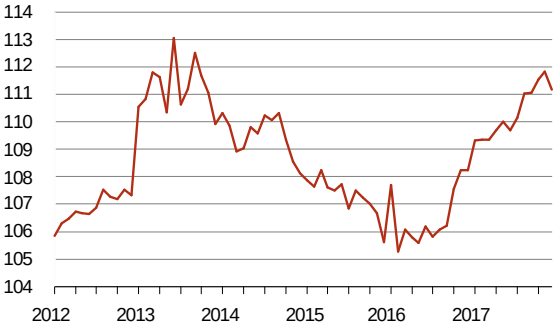
Unemployment rate of population aged 15–74



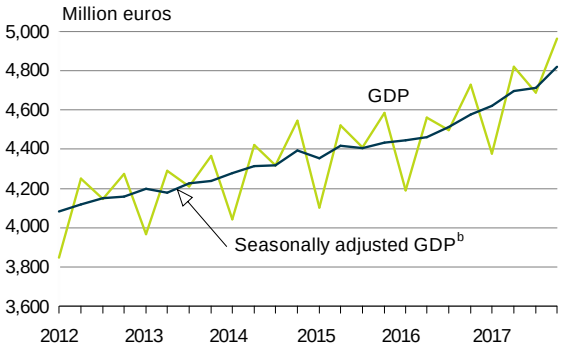
Consumer price index, 1997 = 100



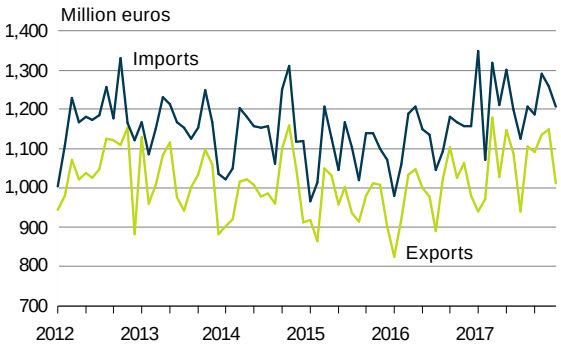
Producer price index of industrial output, 2010 = 100



Gross domestic product at chain-linked volume (reference year 2010)[a]



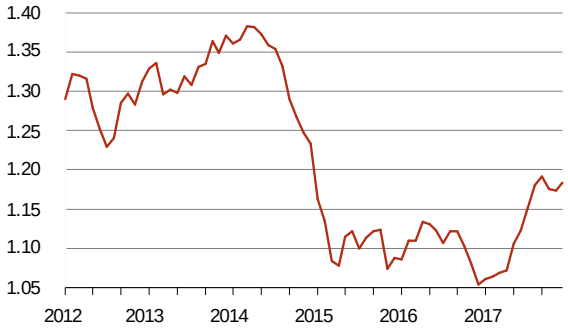
Foreign trade



[a] Values calculated by chain-linked index of reference year (values at reference year are multiplied by chain-linked index of the calculated period). Reference year is a conditional year for calculating chain-linked data and starting point of the series of chain-linked indices. Chain-linked index is a cumulative index for chain-linking sequential periods and it expresses the growth rate of a component compared to the reference year. The data for 1st quarter 2017 – 3rd quarter 2017 have been revised.

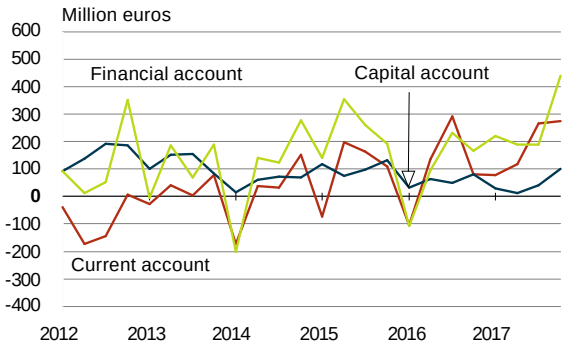
[b] Seasonal adjustment of time series means identifying and eliminating regular within-a-year influences to highlight the underlying trends and short-run movements of economic processes. GDP is seasonally and working-day adjusted.

Average monthly exchange rate of the US dollar against the euro



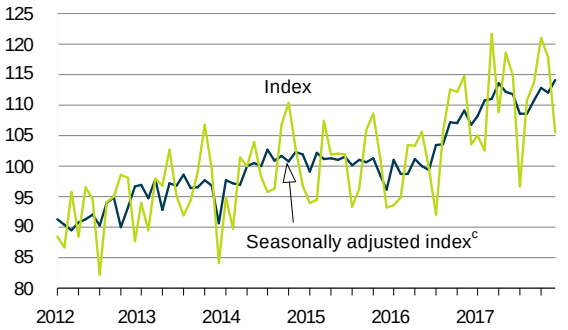
Source: European Central Bank

Balance of payments



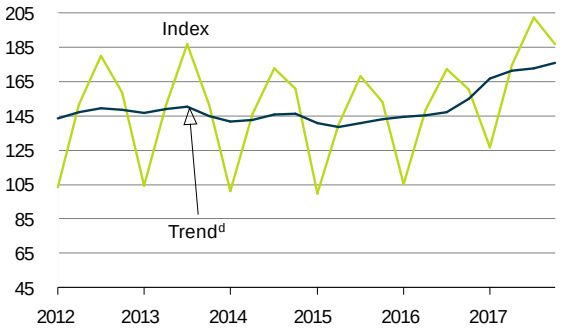
Source: Eesti Pank

Volume index of industrial production, 2015 = 100[a]



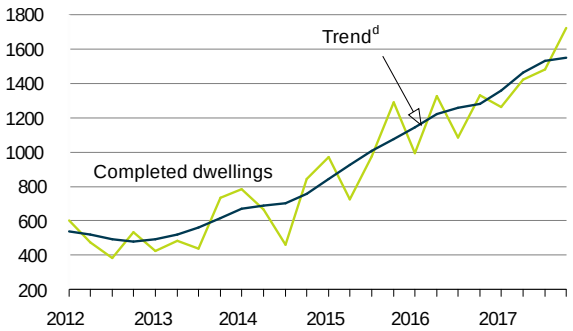
[a] Statistics according to the Estonian Classification of Economic Activities (EMTAK 2008, based on NACE Rev. 2).
[c] Seasonal adjustment of time series means identifying and eliminating regular within-a-year influences to highlight the underlying trends and short-run movements of economic processes.

Construction volume index, 2010 = 100[b]



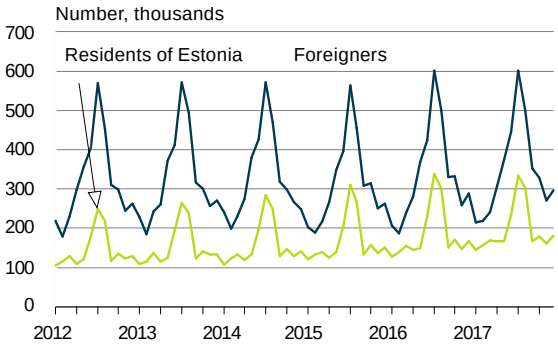
[b] Construction activities in Estonia and in foreign countries. Statistics according to the Estonian Classification of Economic Activities (EMTAK 2008, based on NACE Rev. 2).
[d] Trend – the long-term general development of the time series.

Completed dwellings



[d] Trend – the long-term general development of the time series.

Nights spent by accommodated persons



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