

**UNITED NATIONS  
ECONOMIC COMMISSION FOR EUROPE**

**CONFERENCE OF EUROPEAN STATISTICIANS**

**Work Session on Statistical Data Editing**  
(The Hague, Netherlands, 24-26 April 2017)

**Improving the Census Core Topic Occupation by Using New Administrative  
Data Sources**

Prepared by Sophie Koenig, Statistics Austria

**I. Introduction**

Austria has been conducting a register-based census since 2011. In the last traditional Census in 2001 people were asked about their occupation, for 2011 the attribute had to be derived from administrative data sources for the first time. Until now there was only little access to direct information on occupation out of administrative registers. For that reason a great portion had to be estimated in 2011 thus the quality suffered and the topic was disseminated with restrictions on cross-tabulation.

With the 2021 census ahead, Statistics Austria wants to enhance the quality of the topic occupation by using new data sources that were not available before and building a new estimation model for the remaining missing values. This will be tested during the yearly register-based labour market statistics. For approximately 4.5 million economically active persons in Austria an occupation has to be found.

According to the CES Recommendations for the 2020 Census Round of Population and Housing, occupation is a core-topic and should be provided using ISCO-08. The goal for 2021 is to disseminate the topic in as much detail as possible and most of all with accuracy and validity, while keeping the percentage of estimation as low as possible. Hitherto not used data sources will be included. For the majority of the data holders occupation is not a core attribute. As these new sources do not provide codes which could be used directly but free text fields, data editing is a great challenge. Every data source has its own characteristics and has to be treated differently.

In the Austrian register-based census information on several topics is collected from various registers. Since these may contain differing data about one and the same person, rules on validity were defined. The redundancy principle ensures high-quality results and will apply for the attribute occupation as well. Thanks to the eGovernment Act, the data from the different registers can be linked while guaranteeing full data protection, by using the branch-specific personal identification number for official statistics (bPIN OS), which is generated by the Data Protection Commission.

Which ISCO-08-code will actually be assigned to a person at the reference date (31<sup>st</sup> October) will be decided using a hierarchy of the data sources by actuality and quality. Socio-demographic attributes and information about the company a person works in are also integrated into the decision process. All this has to be carried out under constant quality assessment.

This paper gives a first insight in the concepts planned. After a short overview about the legal framework and the basis on which the new attempts start, the new data sources and their use will be described. The work for this project is in an early stage, at the moment it is unknown for how many persons information on occupation will be available for the reference date and how many missing values will be left for estimation.

## A. Legal Framework

According to the Conference of European Statisticians (CES) Recommendations for the 2020 Censuses of Population and Housing, occupation is a core-topic and should be provided using the International Standard Classification of Occupations (ISCO-08)<sup>1</sup>.

The national legislation (Register Census Act, Federal Law Gazette I No. 33/2006) allows the use of administrative data for the census and binds the data holders to providing information on the attribute occupation.

The CES Recommendations define the topic as such: ‘Occupation’ refers to the type of work done in the main job by the person employed (or in the last job held if the person is unemployed) as defined by the main tasks and duties performed in the job, irrespective of the industry in which the person’s job is classified or the status in employment.

## B. Starting Point – Occupation in the Register-based Census 2011

Up to the last traditional census in 2001 people were asked to fill out a questionnaire that contained a question about their current occupation. The answers were coded and after plausibility was checked and missing values were imputed, the topic was ready for dissemination. With the change of method in 2011, when the first register-based census was carried out in Austria, new data sources for occupation had to be found.

The problems delivering the topic in fair quality are very specific in Austria. There is no register for occupation in Austria like in other countries such as Sweden<sup>2</sup> or Norway<sup>3</sup>. Other countries like the Netherlands<sup>4</sup> and Iceland<sup>5</sup> obtained information about occupation from Labour Force Survey sample data and used it to estimate population totals. This, however, was not the preferred way, as Austria wanted to stay strictly register-based. There may be no central register for occupation, but there is some information scattered over different administrative sources, kept for different purposes and the overall situation fortunately is getting better since 2011.

Countries which carry out a traditional census are concentrating on coding and imputation. Coding is also a big issue when using administrative data. The challenge is to process the existing sources and making them usable for the census.

For the 2011 census administrative data for the topic occupation was mostly obtained from the unemployment register (AMS) and public employers. Specific groups were therefore covered fairly well, but a large share had to be estimated. The estimation model was largely based on information about the field of education, highest education and branch of economic activity due to absence of other available data. Because of that, the topic was published at major ISCO-08-groups and for NUTS 2 only, with restriction to reliability and cross-tabulation.<sup>6</sup>

<sup>1</sup> <http://www.unece.org/publications/2020recomm.html>

<sup>2</sup> The Swedish Occupational Register with statistics (see Statistics Sweden, 2016)

<sup>3</sup> Occupation is a part of the national register of employees (see Andersen, Utne, 2011)

<sup>4</sup> Occupation was one of two variables not included in registers and had to be estimated from the LFS for the census 2011 (see Statistics Netherlands, 2014)

<sup>5</sup> In the 2011 census occupation was incomplete in the registers and therefore imputed (see Harðarson, 2009)

<sup>6</sup> A documentation about employment in the census 2011 in Austria is available in German language: [http://www.statistik.at/wcm/idc/idcplg?IdcService=GET\\_PDF\\_FILE&RevisionSelectionMethod=LatestReleased&DocName=040231](http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&DocName=040231)

## C. Sources used in 2011

In 2011, some information about the occupation of self-employed persons was gained from the Austrian Social Insurance Authority for Business (SVA). In the meantime this information has improved and became much more detailed. Another source for this group in 2011 has been tax data, but this had very low quality, because it came from a free text field, that was neither obligatory nor maintained. With the greatly improved information from the SVA, this source will no longer be used. Data from the chambers of free occupations (Kammern der freien Berufe), that was used in 2011 will still be used, as it delivers very good information about their members.

A more difficult group to cover than the self-employed is the large group of employees. In the old estimation model in 2011, the most important source beside the public employers was the unemployment register. It contains information about the job a person held before he or she became unemployed, as well as the occupation a person aims at when getting a new job. This information is of very high quality, because every unemployed person has to speak personally with the AMS in order to get unemployment benefits. But of course not for every occupation the probability to become unemployed is the same. Some specific groups are bound to be over-represented, while others nearly never show up in that data.

The derivation of occupation using the field of education and highest completed or current education also leads to problems. It may be very likely that a person works in the job he or she was trained in, but that need not be the case and even less so the more time has elapsed since the end of the education. A person may not have succeeded in finding a suitable job or working over- or underqualified.

## II. Preparing for the Census 2021

### D. Challenges

Finding suitable sources is difficult; adjusting the information in these sources, which is mostly text, to the international ISCO-08-classification is another big challenge. Even when the information seems relatively clear, and one thinks to know what the occupation should be, the classification can be difficult. For example, a secretary could be in ISCO group 3 or 4 depending on additional information, which is not available in the register. A decision for one or the other ISCO-4-digit-code has therefore consequences even at the highest level. Systematic “wrong”-classification could bias the results or be contradictory with other surveys.

The attribute occupation is not of great importance for most of the data holders (with exception of the AMS). Mostly it is not maintained regularly, because the effort would be very high. Also sometimes giving correct information is even difficult for employers or employees, when it is not a “classic” job. Often they then refer to vague phrases like “technical employee” or “team-leader”, which cannot or can only with difficulty be classified, because there is no information about the tasks or necessary education the job requires.

### E. Old and New Administrative Data Sources

Like for other topics of the register-based census, multiple sources are used for deriving the attribute occupation. This paper describes the planned proceeding, which is still work in progress. Therefore it is possible that not all of the mentioned sources can be used in the future or that some other source may turn up until 2021.

1. ELDA: Insurance Application for Employees (Elektronischer Datenaustausch mit den österreichischen Sozialversicherungsträgern):

This data contains a field “occupation” which every employer has to fill out when registering a new employee with the social insurance. The registration is electronic. So long only test-data could be

analysed, but a first real-life delivery will take place this or the next year with data for the register-based labour market statistics 2016.

The data will have to be coded – the test showed 160,000 different rows with occupations, which at a first glance seem promising and exploitable. How many of them can be successfully matched with persons is yet unknown, because we have not received a test delivery with bPIN yet.

ELDA is probably the most important of the new data sources, as the very large group of employees was not covered before, except for people, who had been unemployed at some point or working for the state. The vast majority of this group had to be estimated or derived from information about the field of education and branch of economic activity. This was the main reason for the quality-restrictions of the topic in the last census.

We hope that with using this new data source, we will get information about the occupation of nearly every employed person. Of course, there are some restrictions to this source too, for example if there has not been an update for a long time (e.g. a person has been working for the same company for a lot of years), the occupation could have changed (e.g. the person began in production and is now a manager). There is no way of knowing that, if the employer did not update the form. Nevertheless this will not apply to the majority as occupation in general is thought of as rather enduring. This problem could also be solved by using the second new source, the ANV, which is described in the following. Any information that is more up-to-date will get a higher rank.

## 2. ANV: Tax assessment (Arbeitnehmerveranlagung):

Every employee in Austria who wants to receive refunds from the taxes has to fill in a form, which is called “Arbeitnehmerveranlagung”. Occupation is a mandatory free text field in this form, which is being maintained by the tax authority. The first real delivery of this data will take place for the register-based labour market statistics 2016 (which will be published in 2018), but a test-delivery with bPIN could already be analysed. So far the data shows promising results for many people, though there is a lot of unusable text too. The test-delivery covered data of five years and had about 493,000 different entries. This large number is due to typing errors and the import from handwritten forms by machine. Because of this big amount of coding it is not yet completed. However, after having coded the text and storing it in look-up tables for the first time, the amount of new codes turning up every year should be considerably smaller. Under the assumption that other sources are more accurate this source will be lower in the hierarchy.

## 3. AMS: Unemployment register (Arbeitsmarktservice)

The Public Employment Service Austria (AMS) enquires the occupation of the last job as well as the aspired job of every person who registers for unemployment. This source has complete information on all registered persons and is already available in ISCO-08. Unemployed persons, who do not register themselves because they are not entitled to unemployment benefit, are not included. When using information from this register, actuality is of great importance. For unemployed persons, the occupation of the last job is taken, but it can also be used as a source for employed persons. If the period of unemployment precedes the reference date and a person was employed in the reference week, the aspired occupation can be assigned, because it is the job the person was applying for. If the period of unemployment follows the reference date, the occupation of the last job counts. Any information given by another source that is more up-to-date will of course be given priority.

## 4. KFA Health Insurance of Public Servants (Krankenfürsorgeanstalten)

The health insurances of public servants (KFA) give some information on the occupation of their members. Naturally specific occupations are over-represented here like occupations in healthcare, law and administration. At the moment sufficient information only is available for Upper Austria; the other federal states do not provide this detailed information about occupation.

- (a) Upper Austrian Public Servants in Communities (KFA KFG Oberösterreichische Gemeindebeamte)
- (b) Upper Austrian Health and Accident Insurance for Teachers (KFA LKUF Oberösterreichische Lehrer-Kranken- und Unfallfürsorge)
- (c) Upper Austrian Health and Accident Insurance for Public Servants of the Federal State (KFA KFL Kranken- und Unfallfürsorge für oberösterreichische Landesbeamte)

#### 5. DGBL Public Servants of the Nation and the Federal States (Dienstgeber Bund und Länder)

The Nation and the federal states are of course employers. Information on the occupation of their employees is delivered to Statistics Austria in various qualities – it differs from state to state.

- (a) Nation of Austria
- (b) Federal State Burgenland
- (c) Federal State Carinthia (Kärnten)
- (d) Federal State Lower Austria (Niederösterreich)
- (e) Federal State Upper Austria (Oberösterreich)
- (f) Federal State Salzburg
- (g) Federal State Styria (Steiermark)
- (h) Federal State Tyrol (Tirol)
- (i) Federal State Vorarlberg
- (j) Federal State Vienna (Wien)
- (k) Vienna School District (Wiener Stadtschulrat)

#### 6. Chambers of free trades (Kammern der freien Berufe)

Some professionals have to register with the chamber of free trades when practising, for example medical doctors, apothecaries and lawyers. Members of these chambers can be assigned to ISCO-08-codes very easily and accurate.

- (a) Chamber of Apothecaries (Apothekerkammer)
- (b) Chamber of Architects and Engineers (Kammer der Architekten und Ingenieurkonsulenten)
- (d) Chamber of Economic Trustees (Kammer der Wirtschaftstreuhänder)
- (e) Chartered Institute of Patent Agents (Patentanwaltskammer)
- (f) Bar Association Chamber of Lawyers (Rechtsanwaltskammer)

#### 7. SVA Social Insurance Authority for Business (Sozialversicherungsanstalt der gewerblichen Wirtschaft)

Every self-employed person in Austria has to register within the Social Insurance Authority for Business (SVA). For every business the SVA registers a so called “Unterberufskennzeichen”, a code for the occupation of the self-employed person. This data is already processed into the work-flow of the register-based labour market statistics and is delivered regularly.

A part of the data has codes, a part is free text. The SVA-codes were transferred to ISCO-08-codes by hand where it was possible, as were the texts. New codes and texts are coded and added to the lookup-tables monthly. We believe that this new data will improve the quality of the occupation for the self-employed a lot, as it is in much more detail and the coding will be more accurate.

#### 8. BMI IFA Federal Ministry of Internal Affairs- Integrated Foreigners Application

The Ministry of Internal Affairs keeps records on foreigners and their professions. For foreigners of non-EU-countries the profession can be the key to get residence and work permit (Red-White-Red-Card). Standardised text from this source can be coded into ISCO-08.

#### 9. AUVA Austrian Workers' Compensation Board (Allgemeine Unfallversicherungsanstalt)

The Workers Compensation Board is the social insurance for occupational risks for employees, pupils and students. As the occupation of a person is important for the acknowledgement of an occupational accident, it is collected and stored in ISCO-08. So far only test data was analysed, but an annual delivery is envisaged.

The AUVA takes care for about 170,000 victims of occupational accidents and diseases every year. Information about the occupation will be available for approximately 80,000 persons in the census-database. The number of occupational accidents has been decreasing significantly over the years, which is very good news, but this decreases the available information too.

## F. Coding

The goal is to provide the attribute at the second ISCO-08-level (sub-major groups), where a group for rests could be necessary. If that can be achieved (or published) is not yet sure; a more detailed publication is highly unlikely. In principle we are trying to always code as precisely as possible (preferable unit groups).

Most of the sources deliver free text fields, only some have codes or standardised text. This leads to a great amount of coding. Typing errors and slightly different notations make it necessary to do text-editing in order to standardise the text. This includes the deletion of special characters (e.g. “\$”, ”\$”, “&”, etc.) and replacing umlauts (for example “ö” to “oe”) as well as the use of small letters only. Even after all these measures there are many rows left, which all have to be coded separately.

Categorizing the huge amount of different texts to the categories of the ISCO-08 is a lot of work. The software *casco*<sup>7</sup>, which is a computer program designed exactly for the purpose of occupational coding to standard classifications, is used for sources that contain many different rows like ELDA. Smaller lists of texts and texts that were not suitable for automatic coding (like SVA) were matched by hand.

The *casco* software was not used for the SVA-data, because of the special form of texts, which are mainly trades and crafts and differ from the occupations as they are found in the ISCO-Alphabetikum. For example the text of the trade “offering fruits and vegetables in different places“ (German: “Feilbieten im Umherziehen mit Obst und Gemüse“) would lead to the occupation “market salesperson” (German: “Marktverkäufer”). If a person with this information has a big company with many employees, the occupation should change to a managing job. The description in the example clearly states what the person is doing for a living, but it cannot easily be machine-matched with the right occupation code. Therefore a lot of work was necessary for the coding of about 15,000 different texts and another 1,300 SVA-Codes, which had a text-description and were also matched to ISCO-08-codes. Only a few texts could not be assigned to at least a major ISCO-08-group.

When all the information from the different sources is coded, these codes are stored in look-up tables, which are frequently checked for new texts and can be used for the final assignment of a code to a person. The effort will decrease once the texts of all sources have been coded for the first time. New texts will come with every data delivery, but the amount of regular coding will be much smaller once the implementation is finished.

The following table contains an overview about the data sources and their contents, as well as the quantity of different texts and valid ISCO-08-codes that can be put into look-up tables in that source. How many persons will get a valid ISCO-08-code out of these sources is not yet clear. Such a number however would not represent the amount of persons that will have an occupation in the end. Persons can be included in more than one data source and the data sources may include cases that will not be counted as population for the reference date of 31<sup>st</sup> October.

*Table: Data sources (planned) for the topic occupation and their content (as at February 2017)*

Source	Content (brief description)	Type of information	Quantity of different texts	Quantity of valid ISCO-08 codes <sup>1</sup>
AMS	Unemployed Persons: Occupation of the last job and the aspired job (coded)	ISCO-08 codes	5,673	5,671
ELDA	Information from businesses about the occupation of their employees (free text)	free text	157,860	X
ANV	Self-declaration of employees within the tax assessment (free text)	free text	493,949	X

<sup>7</sup> <http://www2.warwick.ac.uk/fac/soc/ier/software/cascot/>

<i>KFA</i>	<i>Health Insurances of Public Servants</i>			
KFA KFG	Upper Austrian Public Servants in Communities	standardised text	8	1
KFA LKUF	Upper Austrian Health and Accident Insurance for Teachers	standardised text		1
KFA KFL	Upper Austrian Health and Accident Insurance for Public Servants of the Federal State	standardised text	47	3
<i>DGBL</i>	<i>Public Servants of the Nation and the federal States</i>			
Austria (State)	Government employees like clerks, teachers, doctors, nurses, soldiers etc.	codes with standardised description	59	33
Burgenland	Available information: mostly teachers	codes with standardised description	86	21
Carinthia	Available information: mostly teachers, politicians	codes with standardised description	27	8
Lower Austria	Available information: mostly teachers, occupations in healthcare	codes with standardised description	96	57
Upper Austria	Available information: clerks, teachers, occupations in healthcare a.o.	standardised text	574	556
Salzburg	Available information: clerks, teachers, occupations in healthcare a.o.	standardised text	1,196	1,193
Styria	Available information: mostly teachers, politicians	codes with standardised description	31	10
Tyrol	Available information: mostly teachers, politicians	codes with standardised description	111	34
Vorarlberg	Standardised codes for this data exist, but unfortunately no code that leads to an ISCO-code is in the data files, so this source will be observed, but is useless at the moment	codes with standardised description	20	6
Vienna	Available information: clerks, teachers, occupations in healthcare, etc.	standardised text	661	642
Vienna School District	Teachers of the city of Vienna	codes with standardised description	17	9
<i>Chambers of free trades</i>				
Chamber of Apothecaries	This data includes no occupation, but as it only includes apothecaries, all of them can get the ISCO-code 2262	source	1	1
Chamber of Architects and Engineers	Includes detailed information on the occupation of its members	standardised text	130	130
Chamber of Economic Trustees	This data includes no occupation, but as it only includes Economic Trustees, all active members can get the ISCO-code 2411	source	1	1
Chartered Institute of Patent Agents	This data includes no occupation, but as it only includes Patent Agents, all active members can get the ISCO-code 2619	source	1	1
Bar Association Chamber of Lawyers	This data includes no occupation, but as it only includes lawyers, all active members can get the ISCO-code 2611	source	2	2

SVA	SVA-codes for self-employed that have a standardised text description of the profession, trade or craft as well as free text with trades and crafts of self-employed	codes with standardised description / free text	16,250	16,218
BMI IFA	Federal Ministry of Internal Affairs- Integrated Foreigners Application, profession of foreigners	standardised text	594	439
AUVA <sup>2</sup>	Austrian Workers' Compensation Board, occupational accidents	ISCO-08 codes	130,005	122,791

- 1 In addition to that number more than one code can apply for some cases, because the classification depends on the size of the company (managing jobs) and the highest completed education.
- 2 The AUVA test data is from 2011. Because of the decrease of occupational accidents, it can be assumed, that the amount of valid ISCO-08-codes will be around 80,000 for the next year.
- X Unknown, first coding not yet finished

## G. Combining the Sources

Depending on the current activity status or the status in employment, different sources are available for employed or unemployed persons. As there can be more than one information available for a person's occupation in different registers, some rules have to be followed as to which source is given priority. In general the best (most detailed) and newest information (closest to the reference date) is always being used; *only* when two or more sources are of the same date, a hierarchy is applied (see figure below).

Given that there was information available about the occupation of a person on a reference date in one year and there is no new information in the following year, the occupation is being held constant. An exception would be if the job and the highest completed education had changed, in which case the occupation would be estimated.

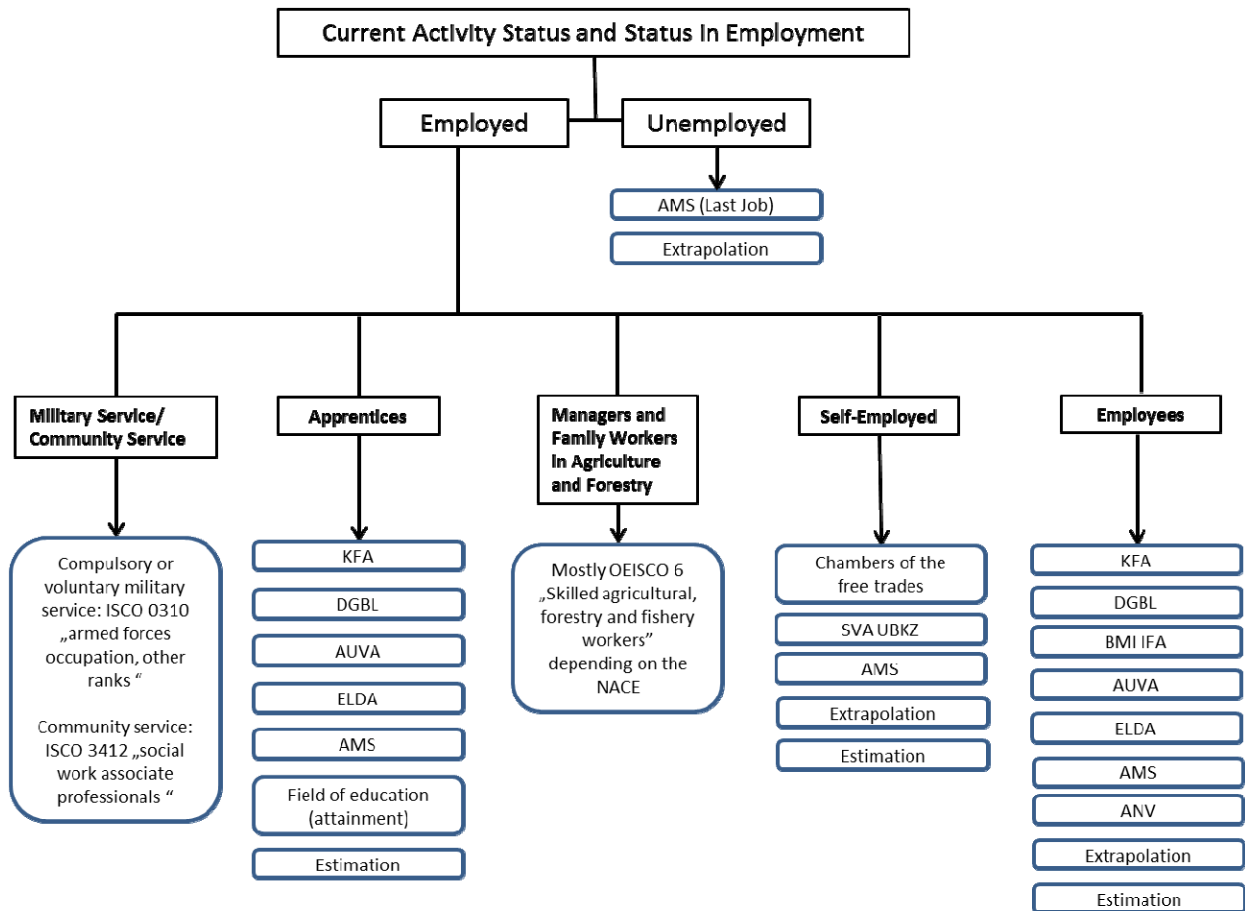
According to the current activity status and the status in employment, the following procedures are being designated:

1. *Unemployed Persons (Registered Unemployment)*: For people who are registered as unemployed within the Austrian unemployment agency (AMS), the information about the occupation of their last job is delivered by the AMS. It is an obligatory field and therefore always available.
2. *Compulsory military service, voluntary military service, compulsory community service*: The current activity status leads directly to an occupation. People who serve in compulsory or voluntary military service get the ISCO-08 Code 0310 "armed forces occupation, other ranks". People, who serve in compulsory community service, get the ISCO-08 Code 3412 "social work associate professionals".
3. *Apprentices, master training, specific training in healthcare*: Apprentices get the occupation they are training for. If there is no information from one of the big sources like ELDA or DGBL/KFA, the field of education is being used. If there is only information about the time-period of the education, but not for the reference date and a person is still working for the same employer, it can be assumed, that the occupation is still the same.
4. *Managers and family workers in agriculture and forestry*: this status in employment leads directly to an occupation. Depending on the branch of economic activity (NACE) an ISCO-08 code is assigned (either in 6 "Skilled agricultural, forestry and fishery workers" or if they own a big company with many employees in 1 "Managers").
5. *Self-employed*: A number of sources give information about the occupation of self-employed people:
  - a. *Chambers of the free trades*
  - b. *Social Insurance Authority for Business (SVA)*
  - c. *Other sources e.g. the unemployment register (AMS) should only be used if no other information is available*
  - d. *Estimation*



6. *Employees*: A number of sources give information about the occupation of employees:
- KFA (health insurance of public servants)*
  - DGBL (employers nation and federal states)*
  - BMI IFA (Federal Ministry of Internal Affairs- Integrated Foreigners Application)*
  - ELDA (Insurance Application for Employees)*
  - AMS (Unemployment register)*
  - ANV “Arbeitnehmerveranlagung” (tax assessment)*
  - Estimation*

Figure: Sources of the topic occupation and their hierarchy (planned)



AMS	Unemployment Register (Arbeitsmarktservice)
ANV	Tax Assessment (Arbeitnehmerveranlagung)
AUVA	Austrian Workers' Compensation Board (Allgemeine Unfallversicherungsanstalt)
BMI IFA	Federal Ministry of Internal Affairs- Integrated Foreigners Application
DGBL	Employers nation and federal states (Dienstgeber Bund und Länder)
ELDA	Insurance Application for Employees – (Elektronischer Datenaustausch mit den österreichischen Sozialversicherungsträgern)
KFA	Health Insurance of Public Servants (Krankenfürsorgeanstalten)
SVA UBKZ	Social Insurance Authority for Business (Sozialversicherungsanstalt der gewerblichen Wirtschaft – Unterberufskennzeichen)

## H. Plausibility & Quality

Checks for plausibility should eliminate completely unlikely cases. In the context of occupation, many things are possible, so not many rules can be made.

1. *Age*: Managers should be 18 years old and above, because according to the definitions they have extensive powers and should be authorised to sign documents. Persons under the age of 25 should have an academic degree to be assigned to a job where this is needed for qualification.
2. *Skill level*: The skill level can only be a guideline during the coding, it does not suffice as a plausibility rule, as in reality especially over-qualification can be the case.
3. *Apprentices*: They cannot be managers nor academics and cannot be in elementary occupations
4. *Income*: Persons with a very high income (limit is yet to be defined) should not be classified in ISCO-08 major group 9 (Elementary Occupations).

Constant quality assessment is of high importance for the register-based census in Austria. Every source is checked for quality problems and monitored over time. The attribute occupation is of course integrated into the existing monitoring.<sup>8</sup>

## I. Estimation

After all the efforts of getting information from the various data sources, there will still be cases left. The missing values will have to be estimated in order to fully cover the working population. At this point only a rough plan exists, as the data collection is not yet completed. The estimation model will probably include information on education (highest completed education, current education and field of occupation), branch of economic activity (NACE), size of the company, sex, age and income. A decision on the estimation method will be taken at a later stage.

The occupation of a person will be held constant over the years, if no major changes occur (like change of job and/or a new educational attainment) and no new information is available, as we assume that occupation is a rather stable characteristic.

## III. Future Plans

There is still a lot of work to do before the attribute occupation is finally completed and can be analysed. The new sources will certainly improve the quality in comparison with 2011. Much more detailed and accurate information is used and there will be a smaller amount of remaining missing values left for estimation once all the new sources are in use. It is not sure yet, if all of the sources will be available for statistics in the long run, especially the ANV may become obsolete depending on decisions lying outside Statistics Austria.

An estimation model for the missing data has yet to be developed. In 2011 this was solved with a hot-deck imputation. When finally every economically active person has an occupation, it is intended to compare the results with other surveys like the labour force survey.

A first implementation test is planned for 2018 as a part of the register-based labour market statistics 2016 with the reference date 31<sup>st</sup> October. So there will be plenty of time to adjust and optimise the proceedings until the census in 2021, when with a bit of luck a time-series of five years will be available for the attribute occupation in much better quality.

---

<sup>8</sup> For more information on the quality assessment of the register-based census in Austria see: [http://www.statistik.at/wcm/idc/idcplg?IdcService=GET\\_PDF\\_FILE&RevisionSelectionMethod=LatestReleased&DocName=079140](http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&DocName=079140)

## References

Andersen, Espen; Utne, Harald (2011), Statistics Norway, Department of Social Statistics, Censuses in a register-based statistical system: Norwegian experiences, Int. Statistical Inst.: Proc. 58th World Statistical Congress, Dublin (Session IPS064)

[www.2011.isiproceedings.org/papers/450094.pdf](http://www.2011.isiproceedings.org/papers/450094.pdf)

Conference of European Statisticians (2015), Recommendations for the 2020 Censuses of Population and Housing, United Nations, New York and Geneva <http://www.unece.org/publications/2020recomm.html>

Harðarson, Ómar S, Statistics Iceland (2009), Demography and census, Census in Iceland 2011, Paper presented at the Nordic address meeting in Myvatn 10-11 June 2009

<http://www1.unece.org/stat/platform/download/attachments/64881183/Iceland%20Paper%202009.pdf?version=1&modificationDate=1330589192882&api=v2>

Statistics Austria (2014), Quality assessment of administrative data, Documentation of Methods

[http://www.statistik.at/wcm/idc/idcplg?IdcService=GET\\_PDF\\_FILE&RevisionSelectionMethod=LatestReleased&dDocName=079140](http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=079140)

Statistics Austria (2015), Standard-Dokumentation zur Abgestimmten Erwerbsstatistik und Erwerbsstatistik der Registerzählung 2011 (German)

[http://www.statistik.at/wcm/idc/idcplg?IdcService=GET\\_PDF\\_FILE&RevisionSelectionMethod=LatestReleased&dDocName=040231](http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=040231)

Statistics Netherlands (2014), Dutch Census 2011, Analysis and Methodology

<http://www1.unece.org/stat/platform/download/attachments/128451678/Dutch%20Census%202011.pdf?version=1&modificationDate=1481889381528&api=v2>

Statistics Sweden (2016), The Swedish Occupational Register with statistics 2014

[http://www.scb.se/Statistik/AM/AM0208/2014A01/AM0208\\_2014A01\\_SM\\_AM33SM1601.pdf](http://www.scb.se/Statistik/AM/AM0208/2014A01/AM0208_2014A01_SM_AM33SM1601.pdf)