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HRSM project “Graduate Tracking”: project report

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In addition to the explanations in the glossary, you can find methodical details in the publications of STATISTICS AUSTRIA or on the website www.statistik.at.

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1 Introduction

High-quality, reliable and up-to-date data on how graduates are integrated into the labour market have increased in importance for designing curricula. A structured collection and analysis of data of graduates' employment biographies is also helpful for evaluating degree programmes. Graduate Tracking (ATRACK) was a project funded within the framework of Higher Education Area Structural Funds (HRSM). Spearheaded by the University of Vienna, it was realised in a cooperation between Statistics Austria and 21 public universities between 1 August 2017 and 31 December 2021. In the course of ATRACK, the career paths of graduates of all Austrian higher education institutions were surveyed based on administrative registers for the first time. ATRACK was funded by the Austrian Federal Ministry of Education, Science and Research (BMBWF), and the project partners contributed further funds. In addition to the twelve universities which had originally submitted the project application, nine further universities became associated project partners in 2018.

Project lead:

- University of Vienna

Cooperation partner:

- Statistics Austria

Project partners:

- University of Graz
- Vienna University of Economics and Business
- University of Natural Resources and Life Sciences, Vienna
- Johannes Kepler University Linz
- University of Salzburg
- Medical University of Vienna
- Medical University of Graz
- Vienna University of Technology
- Graz University of Technology
- Mozarteum University Salzburg
- University of Art and Design Linz

Associated project partners:

- University of Innsbruck
- Medical University of Innsbruck
- Montanuniversität Leoben
- University of Veterinary Medicine, Vienna
- University of Klagenfurt
- University of Applied Arts Vienna
- University of Music and Performing Arts Vienna
- University of Music and Performing Arts Graz
- Academy of Fine Arts Vienna

1.1 Project overview

The aim of the Graduate Tracking project was to depict graduates' labour market integration and career paths through a register-based analysis of their professional entry, employment and income opportunities. To this end, data of various registers that were anonymised, consolidated and prepared by Statistics Austria were analysed. The project focused on gathering information about occupational careers of people resident in Austria after they left an Austrian higher education institution (having either graduated or dropped out). For each participating university a data cube was created, containing information about their own graduates and dropouts as well as comparative information for all Austrian higher education institutions combined. Thereby, they gained access to important comparative information about their graduates' labour market entry and their first career years (especially regarding job search durations, labour market status, labour market integration, income and economic sectors in which graduates work).

1.1.1 Project phases

In the first stage, the universities cooperated with Statistics Austria to select a study design based on tracking models that had been developed by the University of Vienna and the University of Graz. On this basis, Statistics Austria compiled a data body containing all data and produced university-specific data cubes. All participating universities received such a data cube containing their own data and comparative data. Outcomes were further processed in a standardised way and graphically depicted in the form of fact sheets.

1.1.2 Project governance

The University of Vienna managed the project. It was responsible for coordinating the whole project and reporting to the BMBWF. In particular, the project lead was responsible for the following tasks: direct award of contracts with prior notification, clearance of

contracts with external service providers (particularly Statistics Austria), monitoring project progress and attainment of goals, approval of changes in the project plan (adaptations of content or budget and resource allocation).

Each partner university appointed a main contact person to represent their interests in the project and communicated their appointment to the project lead. These contact persons formed the project team. The project lead convened a meeting with the project team to discuss the project's overall progress at least once a year. The project lead appointed a work package (WP) lead for every WP. In cooperation with the project lead, the WP lead appointed a work group to implement the respective work steps. All work groups included representatives of various types of higher education institutions. The WP leads regularly reported to the project lead and the project team about the progress made in the respective WPs.

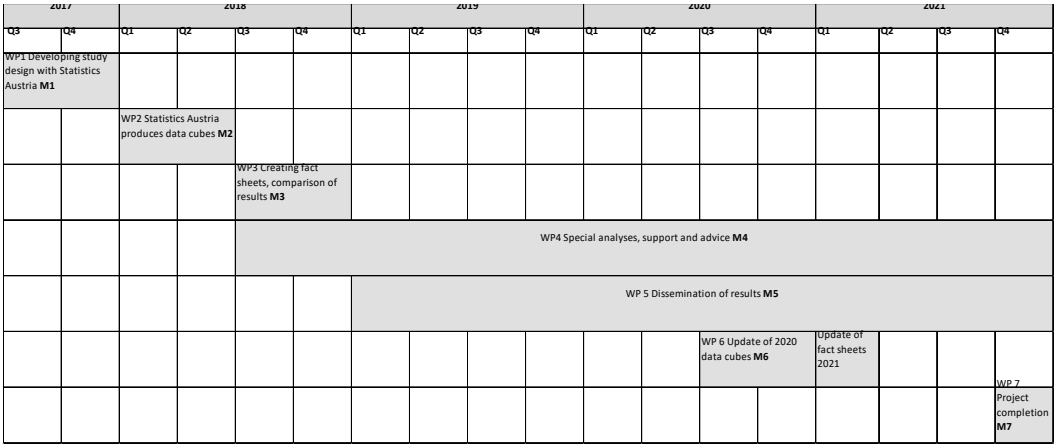
1.1.3 Direct award of contract with prior notification

On 5 September 2017, the University of Vienna published tender documents regarding a direct award of contract with prior notification (pursuant to the Austrian Federal Procurement Act 2006, as amended) with a submission deadline of 22 September 2017. In the process to follow, Statistics Austria submitted a tender. The tender was reviewed and it was found that it met all formal and content-specific requirements of the direct award. On 28 September 2017, the University of Vienna commissioned Statistics Austria to carry out the work according to the conditions outlined in the tender documents.

1.1.4 Project implementation

The work packages and milestones were completed and met as depicted in Figure 1:

Figure 1: Project work packages and milestones



Source: University of Vienna, Graduate Tracking

Work package 1 (lead: University of Vienna): developing a study design in cooperation with Statistics Austria

The partner universities and Statistics Austria consolidated their many years of experience to come up with a study design and a shared data base. In addition to graduates, university dropouts were also considered in the project. The data stream was exclusively handled by Statistics Austria; the universities did not provide further data. In the course of developing the study design, the project partners agreed on all necessary definitions (such as subject-specific clustering) and on which data the data cubes would contain. In addition to all graduations ("Graz model"), the "Vienna model" was implemented: this made it possible to filter all graduates below the age of 35 who had a first degree at the respective level of studies and did not enrol in another degree programme in the year following their graduation. This project is the first of this kind to incorporate a distinction between full-time and part-time employment, comparative data for all Austrian higher education institutions and dropouts.

M1 The study design has been defined (Q4 2017).

Work package 2 (Statistics Austria following assignment by project lead): compilation of data body and data cubes

According to the study design agreed on in WP1, Statistics Austria prepared the data body and implemented data cubes for all participating universities (see chapter 2.5.1). The data cubes were designed to include analysis and export functionalities. Statistics Austria

carried out training sessions on how to work with the data cubes in Vienna, Graz and Salzburg. It also made a respective manual available.

M2 Every university has received access to its own data cube (Q2 2018).

Work package 3 (lead: Vienna University of Economics and Business): preparation of fact sheets and comparison of results

Selected data were visualised in a standardised way in uniform fact sheets. The fact sheets included results for the following labour market outcomes: labour market status, duration until first employment after graduation, top five sectors, gross monthly income from employment. They enable a comparison of a university's own data with data for all Austrian public universities combined. Overall, five fact sheet versions were created (see chapter 2.5.2).

M3 Every university has received its fact sheet (Q4 2018).

Work package 4 (lead: University of Graz): special analyses, support and advice

Statistics Austria was commissioned to carry out special analyses for Austria, namely regression analyses and analyses of regional incomes and relocations (see chapter 4). Some universities commissioned further special analyses.

M4 Special analyses have been made available (Q4 2021).

Work package 5 (lead: each university for its own sphere): dissemination of results

Every university was in charge of internally disseminating the results itself. Regarding the publication of results, the project participants agreed on fact sheets including graduates below the age of 35 years who did not enrol in a further degree programme ("Vienna model", fact sheet versions F1, F2).

Project outcomes are also considered in the European graduate tracking initiative (see chapter 5.1).

M5 The results have been published within the universities and are put to use for controlling and consulting purposes (Q4 2021).

Work package 6 (Statistics Austria following assignment by project lead): update of data cubes

Statistics Austria was commissioned to include further graduation years in the data body and update the data cubes accordingly.

M6 The data cubes have been updated (Q4 2020).

Work package 7 (lead: University of Vienna with support of all universities): project completion

The project lead commissioned the final report. Lessons learned in the project were put into words and shared with other universities and higher education institutions. Statistics Austria is obliged to publish aggregated data pursuant to legal requirements once the project has been completed.

M7 The final report has been submitted to the ministry (Q4 2021).

1.1.5 Goals of Graduate Tracking

All of the project's intended goals were met:

1. synthesis and further development of existing approaches for a data-based tracking of graduates' career paths and inclusion of data on dropouts
2. using an appropriate, register-based data infrastructure to define the position of the respective university in a nationwide comparison
3. comparative analysis of career paths of graduates and dropouts of the participating universities
4. strengthening inter-university cooperation
5. standardised processing and visualisation of the results in a way that is appropriate for strategic decisions, for purposes of curriculum development, planning of degree programmes and as information for prospective students and career services
6. guaranteeing the study design's sustainability regarding feasibility and affordability after the project's completion, possibility of including more universities in the project, as well as the potential for a larger data base.

1.1.6 Application of the results

The information gleaned in the course of the project can generate added value for a wide array of stakeholders. Particularly, it can be used for the purposes described below.

Basis for steering decisions in university bodies:

ATRACK results are a valuable resource when universities have to make decisions on how to further develop their educational offers. They can, for instance, be used to adapt existing curricula or develop entirely new degree programmes in an evidenced-based way.

Aid for prospective students when deciding on a degree programme:

The results will help prospective students gain insights into the opportunities for graduates of different disciplines and degree programmes on the labour market.

Basis for career counselling for graduates:

ATRACK information will be particularly useful for universities' career services to further develop their counselling services for students. It can be used to objectively depict and communicate trends and perspectives for new graduates who want to gain a foothold on the labour market.

General information for the public:

The participating universities can use ATRACK data to communicate successes, opportunities and challenges their graduates face on the labour market to society at large. What is more, the data body created through ATRACK can be further extended in future. This means that the data set can be adapted to the universities' needs and used to answer research questions dealing with the economics of education.

2 Data basis and preparation

The data body created in the course of the ATRACK project contains information on the formal education, labour market careers and income of graduates of Austrian higher education institutions. The respective characteristics were not collected via surveys but extracted from existing administrative registers (chapter 2.1). More specifically, Statistics Austria accessed and linked data from various data sources for the Graduate Tracking project (chapter 2.2). In doing so, it identified the information relevant for the participating universities and summarised it to form informative characteristics (chapter 2.3). To protect personal data, the record swapping method was used for a fixed share of the data (chapter 2.4). The data were made available to the participating universities in the form of data cubes, fact sheets in which the information was visualised and CSV files (chapter 2.5).

2.1 Register-based statistics in Austria as a basis

Public administration has always collected information on citizens to enable the state to fulfil its responsibilities. This information is increasingly available in a digital format. Provided that data protection requirements are met, such administrative data can be processed for various (secondary) purposes, such as research. In most cases, register data must be transformed in extensive work steps, and various data sources must be linked to produce a data set fit for further use (König & Schmoigl, 2020). This requires respective legal framework conditions, a federal identification system based on which data can be linked and high-quality administrative data. Altogether, these factors form the backbone of a country's statistics infrastructure.

Establishing register-based statistics comes with various advantages. Quantitative assessments based on registers are much more cost-efficient than direct surveys. What's more, there is no additional burden for the respondents (e.g. the census used to be very time-intensive). The entire population can be covered, and the collected data can be disaggregated and aggregated in more ways.

The entry into force of the Austrian E-Government Act on 1 March 2004 established the necessary foundation to link administrative register data while fully meeting data protection provisions. This became possible because branch-specific personal identification numbers (bPINs) were introduced as part of a federal identification system. An bPIN identifies a natural person throughout various administrative processes while keeping them anonymous. Cryptographic one-way functions adapted to the respective administrative sectors are used to compute the bPINs. In this process, data are specifically

pseudonymised for the various sectors[1]. This means that several bPINs can be computed for a person if several administrative sectors work with the data (e.g. bPIN health, bPIN taxes or bPIN official statistics) (Hackl, 2009). The Austrian Federal Ministry for Digital and Economic Affairs is the country's SourcePIN Register Authority. It is authorised to administer SourcePINs, bPINs and respective registers to unambiguously identify people and their representation mandates (E-Government-Gesetz, bPK-Konzept und Register, 2021). Public authorities can thus only exchange data if the SourcePIN Register Authority decrypts the data and subsequently makes them available again in a recipient-specific encrypted format.

The principle of redundancy is a key feature of the register-based census in Austria. Whenever possible, data and characteristics on research targets are not drawn from only a single data source. Instead, all available administrative registers and further administrative data sources and statistical registers are searched. Through the use of several registers and dominance rules based on an assessment of the various sources' quality, potential data inconsistencies can be resolved. An example is "sex": typically, it is saved in several registers. If a person is listed as "male" in one register and as "female" in another, a decision about which attribute is correct can be made based on a consultation of several registers[2].

Statistics Austria links information from 15 administrative registers, which include both base registers and comparison registers, to generate register-based statistics. Comparison registers enable quality-assurance checks of base data, which, in turn, are used to check the accuracy and completeness of survey characteristics.

Base registers:

- Central Population Register (ZMR)
- Central Social Security Register (DV)
- Tax Register
- Unemployment Register (AMS)
- Register of Educational Attainment (BSR)
- Register of Enrolled Pupils & Students
- Housing Register of Buildings and Dwellings
- Business, Agricultural and Forestry Register

[1] For further information (in German), see the SourcePIN Register Authority's website: https://www.bmdw.gv.at/Ministerium/DasBMDW/Stammzahlenregisterbehoerde/Bereichsspezifische_Personenkennzeichen.html.

[2] For further information (in German) see "Statistische Nachrichten 11/2013": http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=103749.

Comparison registers:

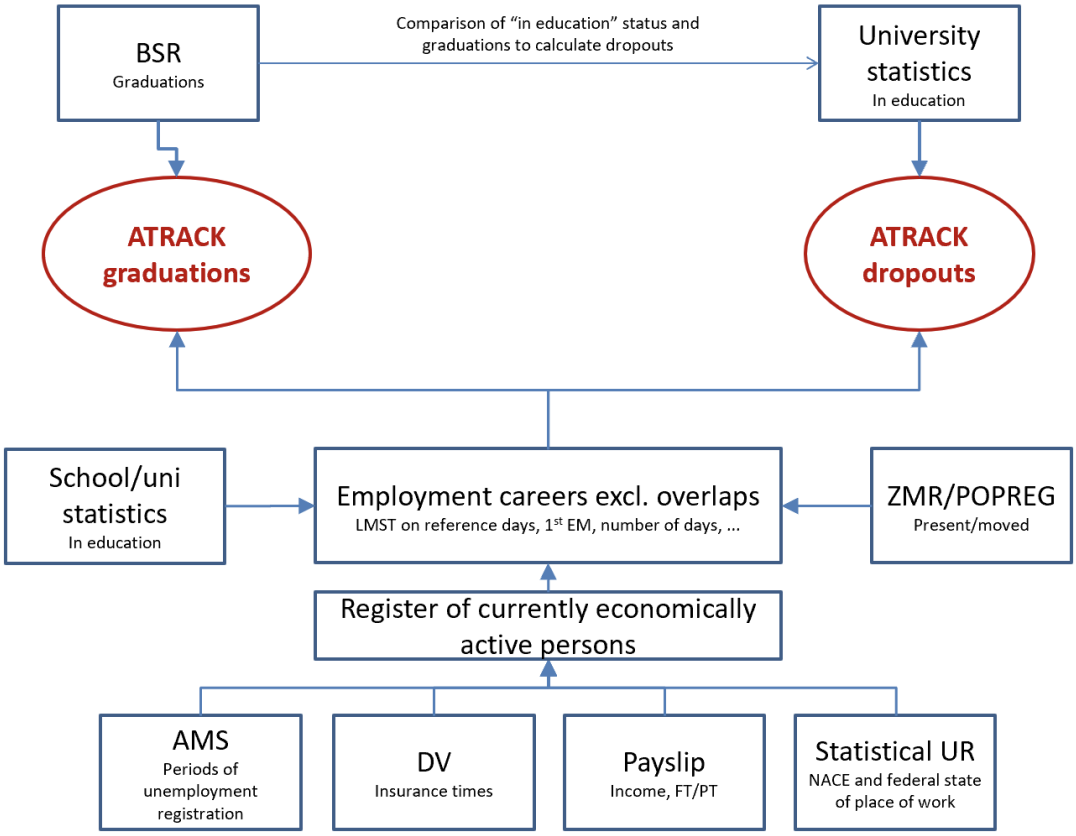
- Central Foreigner Register
- Registers of public servants of the federation and the federal states
- Register of Social Welfare Recipients
- Child Allowance Register
- Register of Alternative Civilian Service
- Conscription Register
- Register of car owners

The redundancy of the data sources regarding some characteristics and attributes can compensate for potential quality issues of individual data sources. As a result, the quality of the data is very high. All data from the registers can be anonymously linked with each other and used for statistical analyses based on official statistics bPINs.

2.2 Data sources of ATRACK

Data from several registers were linked to form the data body used for ATRACK. Figure 2 is a data model that visualises the data sources used and the steps taken to link the data in a simplified way.

Figure 2: ATRACK data model



Source: STATISTICS AUSTRIA, Graduate Tracking; abbreviations: AMS: Public Employment Service, DV: Main Association of Austrian Social Security Institutions; FT/PT: full-time/part-time; Statistical UR: business register; NACE: Statistical Classification of Economic Activities in the European Community; LMST: labour market status; 1st EM: first employment, ZMR: Central Population Register; POPREG: Population statistics of Statistics Austria; BSR: Register of Educational Attainment

The data of the Austrian Public Employment Service (AMS) cover all people who are unemployed, looking for an apprenticeship or job or are engaged in continuous education measures and have registered with the Service or receive unemployment insurance benefits. The Main Association of Austrian Social Security Institutions (DV) provides data on insurance coverage and periods. This enables various insights into people's labour market status. Data from DV's file of insured people are highly reliable as these data are continuously maintained and subjected to plausibility checks. Payroll data from the payroll tax database are searched for information on gross income and working hours. With regard to the working hours of employees, it is only possible to distinguish between full-time and part-time; more detailed information on working hours can not be provided. The business register contributes data regarding the classification of economic activities, the federal state and the location of the local unit of employment. Statistics Austria merges the mentioned data with data from the Register of Currently Economically Active Persons.

To depict career paths without overlaps (chapter 2.3.2), data from the Register of Currently Economically Active Persons are linked with information on current educational enrolment derived from the Register of Enrolled Pupils & Students. This is complemented with presence and absence data from the Central Population Register or from population statistics of Statistics Austria. Career paths without overlaps can be used within the labour market status data set to analyse the labour market status on given reference days, information on the first employment or the number of days in employment within a given period.

To compute the number of graduations relevant for ATRACK, information on formal graduations is collected from the Register of Educational Attainment. The number of dropouts is identified based on current educational enrolment and successful graduations. To be able to distinguish actual dropouts from just changes in students' educational paths, data must be analysed after a certain time lag. For ATRACK, this time lag is two years (see chapter 2.3.1). This means that, as opposed to graduations, dropouts can only be identified a while after the fact.

2.3 Data preparation

The data collected from the aforementioned registers are linked and processed to meet the project requirements. ATRACK particularly focuses on the career paths of graduates. All graduations or dropouts from Austrian higher education institutions thus form the basis for analysis. This basis is extended by information on degree programmes and personal data as well as data regarding labour market status, income or local unit of employment.

2.3.1 Population

The population of the data consists of all graduations and dropouts from public universities, universities of applied sciences, university colleges of teacher education and private universities throughout Austria regardless of the subjects' age. More specifically, it encompasses all bachelor's, master's, diploma, doctoral or PhD as well as continuing education and training programmes. It is possible for one person to graduate from several programmes. People who died within five years of graduation and data sets for which no official statistics bPINs can be provided are excluded. As of 2020, graduations in the academic years of 2008/2009 to 2018/2019 have been considered.

Dropouts are defined as studies that were discontinued before graduation. Only people who did not enrol in a formal education offer within two years after the academic year in which they dropped out of a degree programme are considered dropouts in the data body. This way, changes in the educational paths can be filtered out so that only actual dropouts are considered. A leave of absence is considered a continuation of a degree programme.

Depending on the semester in which a student was last enrolled, the dropout date is always 31 January or 30 June of the respective academic year. If a dropout occurs in a winter semester, the dropout date is 31 January; for a dropout in a summer semester, it is 30 June. Incoming students are not included in the number of dropouts. Dropouts of people who died within five years of discontinuation are also excluded.

Based on the graduation or dropout date, all included subjects' individual career paths at a given day before, at or after graduation or dropout can be stated.

2.3.2 Determination of the labour market status without overlaps

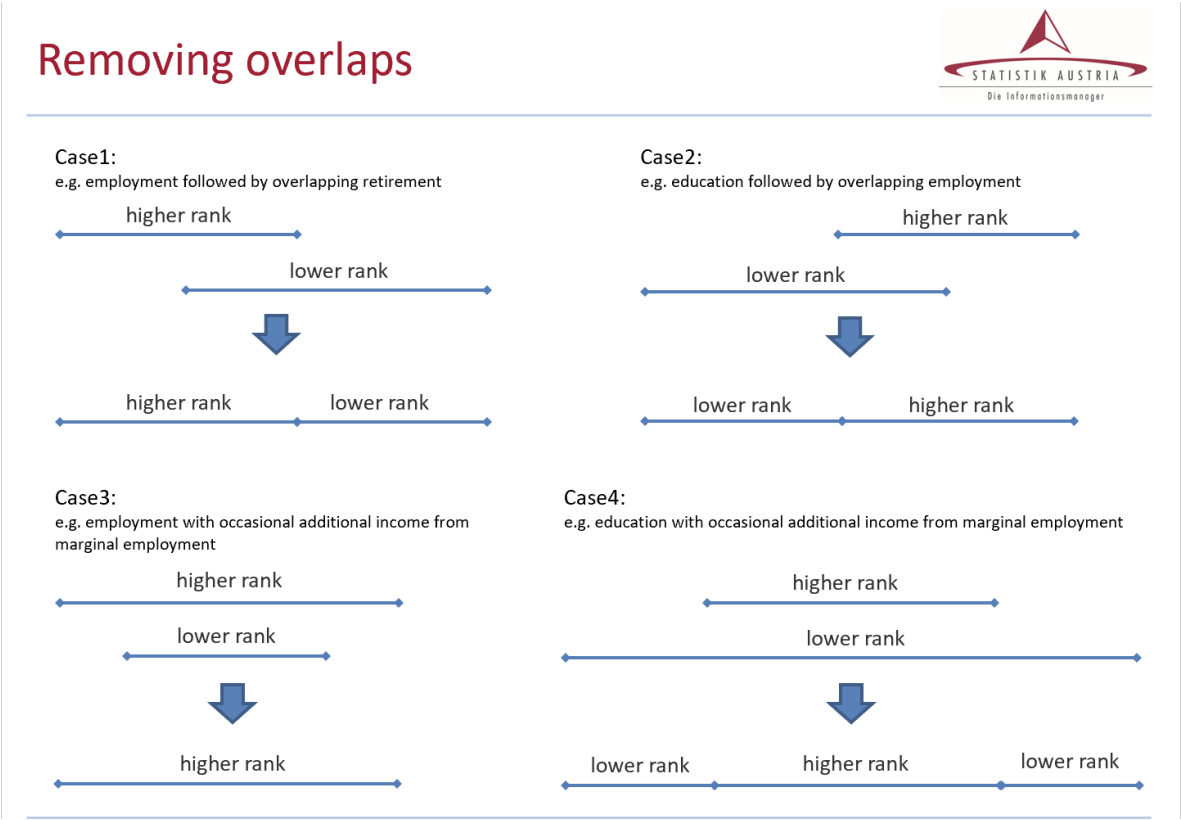
An unambiguous labour market status is assigned to every person for every day. This status is determined by merging labour market status data from various sources (e.g. DV, AMS) and resolving overlaps. To this end, the following hierarchies are used:

1. Military service/civilian service in lieu of military service
2. At work (Employement/Self-employment)
3. Temporarily not at work (including other absences without formal job attachment)
4. Marginal employment
5. Unemployment
6. In education/training
7. Others

This hierarchy was set to resolve potential overlaps of different statuses. ATRACK is most interested in the career paths of graduates. This is why the "in education/training" status is on a low and the "at work" status on a high level in this hierarchy.

The following schematic figure visualises the resolution of overlaps based on examples:

Figure 3: Examples of the resolution of labour market status overlaps



Source: STATISTICS AUSTRIA, Graduate Tracking

In the event of several employment relationships of the same hierarchy level, the following dominance rules were used to determine primary employment:

1. Full-time employment dominates over part-time employment.
2. In the event of similar employment conditions, the one with the highest income dominates.
3. In all other cases, the employment started at the earliest date dominates.

If equivalent episodes overlap, the episode that started earlier has priority as a general rule.

The following labour market status attributes were considered in ATRACK:

Table 1: Attributes of the "Labour market status" characteristic

Characteristic: "Labour market status"	
Employment (not including marginal employments)	Employees (excl. employees with independent service contracts) Employees with a non-standard contract Self-employed in commerce, trade and industry Self-employed (freelance) Self-employed (professionals)Self-employed in agriculture and forestry
Unemployed	Unemployed
Other	Compulsory and voluntary military service, compulsory community service Parental leave, with formal job attachment Parental leave, without formal job attachment/unknown Continuing education allowance/educational leave Other (temporary) absence Marginally employed Pupils, apprentices, university students Other economically inactive persons Only main residence Main residence not in Austria
No data available for the reference date	No data available for the reference date

Source: STATISTICS AUSTRIA, Graduate Tracking

The data cubes made available to the participating universities can generate career path information of graduates on the following reference dates:

- 36, 24 or 12 months BEFORE graduation/dropout,
- at the time of graduation/dropout,
- 6, 12, 18, 24, 36 or 60 months AFTER graduation/dropout.

Please refer to the annex for more detailed information regarding the determination of graduates' and dropouts' labour market status and on the characteristics discussed in the following (e.g. data availability, attributes).

The data set includes further work-related characteristics in addition to the labour market status on the depicted reference dates:

Number of days in employment in the relevant reference period:

This characteristic categorises the graduations/dropouts examined according to the number of days in employment during the relevant reference period according to the subjects' labour market status without overlaps.

Duration until first employment:

The duration between graduation and the start of the first employment is calculated to the day. In the analysis, the first employment is the first employment with an end date after the reference date of “six months after graduation/dropout”. The analysis only considers employments with a duration of more than 91 days as a first employment. Also first employments that were started while still studying, i.e. before graduation, are considered.

Number of employers within the first three years after graduation/dropout:

This characteristic summarises all (different) companies with which a subject was employed within three years after graduation/dropout according to the labour market status without overlaps.

Total number of employments on the reference date:

This characteristic specifies whether the subjects who were employed according to their labour market status had more than one employment on the reference date.

Full-time/part-time on the reference date:

This characteristic specifies whether the employment was full-time or part-time on the reference date (according to the annual payslip of the year into which the reference date falls).

2.3.3 Inflation-adjusted gross income for employees

The data cubes depict the gross income of the subjects who were employed on the mentioned reference dates according to their labour market status.

This income is calculated from the gross annual income from employment according to the annual payslip of the year into which the reference date falls, after deduction of any special payments. For people who work for several employers, the employments are ranked according to the aforementioned dominance rules and the amount of income. Based on the days actually worked, the daily income is calculated. The daily income is then multiplied by 365/12 to project the monthly income. To correct for inflation, income data is weighted using the price level of 2019 (as of 2020) of the consumer price index (CPI) of 2005. If the payslips do not provide sufficient information, the analysis uses the amount of income upon which social security contributions are based (not including special payments) to calculate the income. If the labour market status does not specify an employment, the category “not applicable” is assigned to the subject.

2.3.4 Classification of the local unit of employment

The data set contains information on the industry of the employment according to the subject's labour market status on the respective reference date. This distinction is made based on the Austrian classification of economic activities (ÖNACE 2008[3]) of local unit of employment. If no information about the local unit of employment is available, the ÖNACE of the enterprise is used. For places of work at which several economic activities are carried out (e.g. companies including an in-house kindergarten at the same address), the classification is made based on the main economic activity.

Particularly in the field of public administration, the ÖNACE classification can be ambiguous. Hospitals managed by the federal states, for instance, are sometimes assigned to "Public Administration <O>" according to ÖNACE. The same applies to public schools. It is thus not possible to clearly distinguish the ÖNACE sectors "Public Administration <O>", "Education <P>" and "Human Health and Social Work Activities <Q>".

2.3.5 Characteristics relating to degree programmes and personal information

Graduations and dropouts can be analysed according to academic year (2008/2009 to 2018/2019), type of programme (bachelor's, master's, diploma, doctoral/PhD, continuing education and training programmes) and degree programme code. A breakdown according to degree programme code in the various data cubes can only be accessed by the respective higher education institution. A comparison with other universities can be realised based on the "ISCED Fields of Education and Training" (ISCED-F 2013) classification. This international standardised classification of the education system breaks down fields of education into three hierarchy levels[4].

Several filters can be used to mark graduations or dropouts or exclude them from the analysis:

Vienna model: Only first-time graduations of people below the age of 35 years who did not enrol in another programme in the academic year of their graduation are considered.

[3] For further information on the ÖNACE classification, see https://www.statistik.at/web_en/classifications/implementation_of_the_onace2008/index.html.

[4] For further information (in German) on the ISCED classification and a detailed description of its fields of education see: https://www.statistik.at/web_de/klassifikationen/klassifikationsdatenbank/weitere_klassifikationen/bildungsklassifikation/index.html.

Joint studies: This filter includes international joint studies offered by the participating universities, provided that they have shared the respective degree programme codes.

First degree: The earliest first degree obtained per person and level (i.e. the first bachelor's, master's/diploma, doctoral/PhD degree) is marked. This filter considers graduations from public and private universities, universities of applied sciences and university colleges of teacher education.

Duration of studies: This operation computes the difference between the standard and the subjects' actual duration of studies and filters graduations achieved within the standard duration of studies plus tolerance semesters and longer study durations, respectively.

Stays abroad: Graduations of persons who completed a stay abroad during their degree programme are marked. Information on stays abroad is imported into the data set from the students' survey on study-related stays abroad (UStat2).

Multiple degrees: Persons who have graduated from more than one degree programme per level (bachelor's, master's/diploma, doctoral/PhD) in the period examined are marked, regardless of the period between the different graduations. This filter considers graduations from public and private universities, universities of applied sciences and university colleges of teacher education.

Further education or training completed after graduation: Graduations by persons who were enrolled in another formal education or training programme in Austria (including school education/apprenticeship training) within one year after the graduation examined are marked. In the hierarchy, doctoral/PhD degrees are ranked over master's/diploma degrees, which, in turn, rank higher than bachelor's degrees.

Graduation from an equivalent degree programme in the case of dropouts: Dropouts by persons who have obtained an (at least) equivalent degree by the end of the academic year during which they discontinued their studies are marked.

Personal characteristics: The data set also provides filters based on sex, age and citizenship at the time of graduation/dropout. The highest level of education of the parents is also included.

See the annex for an overview of all characteristics and respective attributes that make up the data cubes.

2.4 Data protection

Also when pseudonymised or anonymised data are processed or when aggregated data are published, it is crucial to ensure that individuals cannot be identified based on this information. This could be the case if certain attributes or combinations of characteristics are so rare that they could be used to identify concrete individuals. To prevent such an identification, the method of record swapping was used in ATRACK.

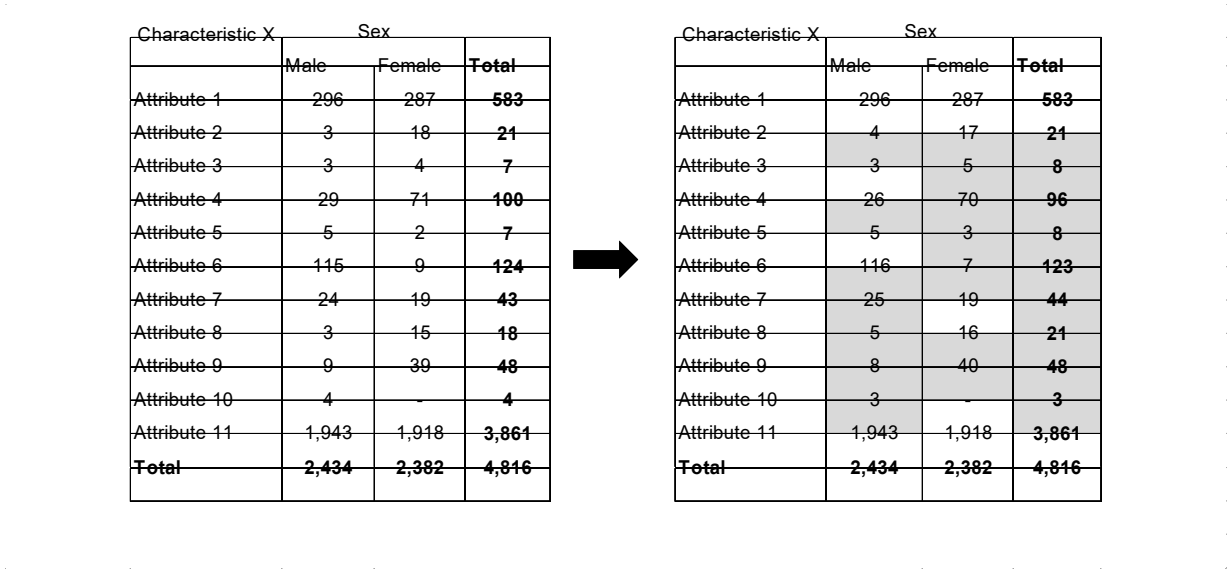
Record swapping, as the name implies, exchanges individual characteristics between two observations. First, the observations to be swapped are selected (swapping partner A). Then observations with similar characteristics (swapping partner B) are identified in the remaining data, and some characteristics are swapped. In this way, a certain percentage share (referred to as the swapping rate) of the population is swapped. This percentage share is determined in advance. It is selected in a way that sensitive data are protected while ensuring that the data body's consistency is not compromised. The precise swapping rate must not be revealed for data protection reasons. Typically, it is a value between 1 % and 15 % of all observations. It is also defined which characteristics of the individual cases or persons will be swapped and which won't. The concrete characteristics that are swapped are again not published for reasons of data protection. If individual characteristics are analysed across the entire population after record swapping, the results are identical to before swapping.

To be able to keep the cases in which records are swapped low, a focus is put on so-called risky records. These are observations with unique or very rare combinations of characteristics that could make it easy to identify a person. To identify risky cases, potential "attacker tables" containing particularly sensitive data, such as citizenship, labour market status, the highest level of education and all combinations thereof, are checked.

Record swapping examples:

For an example data set, it is decided to deem observations with characteristic "X" in combination with the "sex" characteristic as sensitive and thus a risky record. To contaminate parts of the data using the recording swapping method, for instance characteristic "X" can be swapped within the attributes of the "sex" characteristic. "Sex" remains unswapped, and the sums of the attributes "female" and "male" do not change. Record swapping minimally changes the row sums, i.e. the sums of attributes one to eleven of characteristic "X", however. The total number of observations stays the same.

Figure 4: Record swapping examples:



Characteristic X	Sex		
	Male	Female	Total
Attribute 1	296	287	**583**
Attribute 2	3	18	**21**
Attribute 3	3	4	**7**
Attribute 4	29	71	**100**
Attribute 5	5	2	**7**
Attribute 6	115	9	**124**
Attribute 7	24	19	**43**
Attribute 8	3	15	**18**
Attribute 9	9	39	**48**
Attribute 10	4	-	**4**
Attribute 11	1,943	1,918	**3,861**
Total	**2,434**	**2,382**	**4,816**

Characteristic X	Sex		
	Male	Female	Total
Attribute 1	296	287	**583**
Attribute 2	4	17	**21**
Attribute 3	3	5	**8**
Attribute 4	26	70	**96**
Attribute 5	5	3	**8**
Attribute 6	116	7	**123**
Attribute 7	25	19	**44**
Attribute 8	5	16	**21**
Attribute 9	8	40	**48**
Attribute 10	3	-	**3**
Attribute 11	1,943	1,918	**3,861**
Total	**2,434**	**2,382**	**4,816**

Source: STATISTICS AUSTRIA

Swapping the “sex” characteristic within the attributes of characteristic “X” would also have been a possibility. In this case, the row sums would have remained the same while the column sums would have slightly changed due to the record swapping. When analysing the results, it is important to keep in mind that no reliable findings can be gained for small case numbers due to the contamination of the data.

Using record swapping to anonymise microdata sets offers various advantages. Observations that have the potential to identify people or contain rare combinations of characteristics do not have to be excluded from an analysis, which would result in a loss of information. What is more, this method allows for a relatively large degree of flexibility as the swapping rate can be freely chosen. Additionally, the data set’s consistency and marginal distributions basically remain unchanged.

In the Graduate Tracking project, particular attention was paid to ensuring that no problematic bias would arise for analyses with resulting cell values larger than 30 for important key figures. For cell values below 31, the note “SW” was added in the data cubes to point out that due to a potential swap of attributes an unambiguous analysis is not possible. In the aggregate, the data set’s characteristics basically remain the same also after record swapping.

2.5 Making data available

The prepared and anonymised data on graduates were made available to the universities in the form of data cubes and fact sheets visualising the information. The participating universities were able to carry out further analyses based on these materials.

2.5.1 Data cubes

A data cube is generally defined as a way of presenting data in a logical way. Multidimensional data are viewed as elements of a cube that can be accessed from various faces or perspectives (e.g. columns, rows, strata).

As one of the central outputs of ATRACK, Statistics Austria made available such data cubes containing the respective university's and Austria-wide data to all participating universities. The universities can use the data for Austria to compare their university-specific data to those of all other public and private universities, universities of applied sciences and university colleges of teacher education. The aggregated data shared with the universities were broken down as far as possible, abiding by all applicable data protection stipulations and confidentiality provisions (pursuant to § 17 of the Austrian Federal Statistics Act 2000, as amended). The cubes can be used for independent analyses and comparisons by selecting combinations of characteristics and/or filters. The data cubes also offer export functionalities (e.g. tables or figures) to enable further analyses and various data visualisation options. For data protection reasons, case numbers below 31 can only be accessed by the respective university, which, however, is not allowed to publish these data. Access to the data is provided via the "STATcube – Statistical Database" application of Statistics Austria[5].

2.5.2 Fact sheets

Key information on graduates' and dropouts' labour market status and labour market integration was visualised and made available in the form of fact sheets. These fact sheets graphically show relevant labour market information of graduates/dropouts in the first five years after leaving university and contain selected results on the following topics:

- status on the Austrian labour market per reference date and employment rate
- time period until the first employment
- top five sectors three years after graduating
- labour market status in the third year
- gross monthly income for full-time employees

[5] For further information on STATcube see: https://www.statistik.at/web_en/publications_services/statcube/index.html

Five fact sheet versions in German and English based on different populations were made available to the universities:

F1 – fact sheets with the population “graduations according to Vienna model”. This fact sheet version was structured into university, type of degree programme and degree programme group.

F2 – fact sheets with the population “graduations according to Vienna model”. This fact sheet version was structured based on:

- university, type of degree and ISCED-F 2013 (2-digit)
- university and type of degree programme
- type of degree programme and ISCED-F 2013 (2-digit).

F3 – fact sheets containing all graduations. This fact sheet version was structured into university, type of degree programme and degree programme group.

F4 – fact sheets containing all dropouts. This fact sheet version was structured into university, type of degree programme and degree programme group.

F5 – fact sheets containing all dropouts. This fact sheet version was structured based on:

- university, type of degree and ISCED-F 2013 (2-digit)
- university and type of degree programme
- type of degree programme and ISCED-F 2013 (2-digit).

All participating universities received fact sheets for their degree programmes and degree programme types in PDF format. The data the fact sheets are based on were also made available to the universities as CSV files. Figures were shared as SVG files. Based on these data, the universities can carry out further analyses[6]. Please see the annex of this report for a fact sheet example of version F2.

[6] The fact sheets structured according to type of degree programme and field of education according to ISCED 2013 can be accessed at “Monitoring of Education-related Employment Behaviour”: https://www.statistik.at/web_en/statistics/PeopleSociety/education/monitoring_education_related_employment_behaviour/index.html.

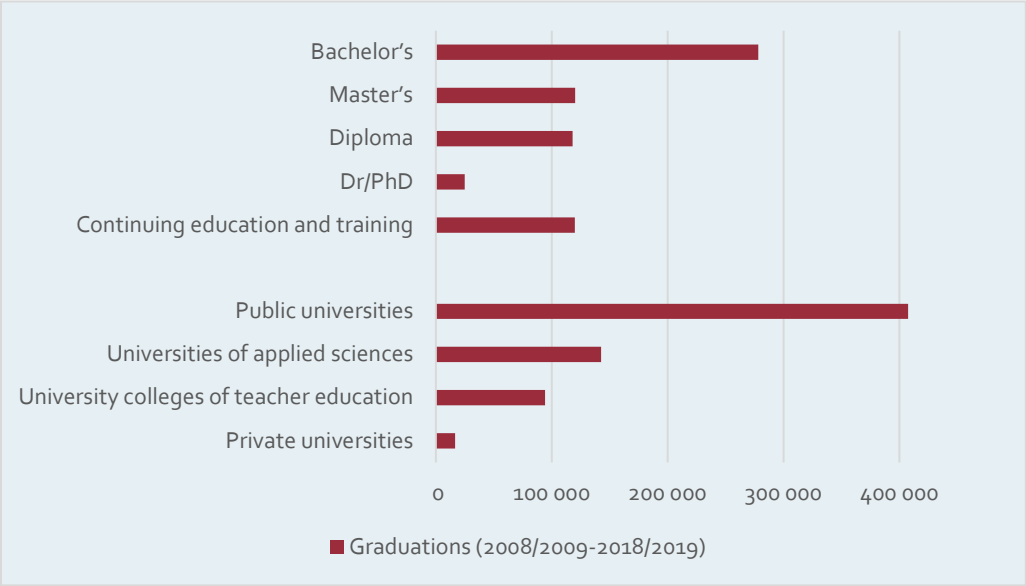
3 Overview of results

In chapter 3.1, the data body used for ATRACK will be presented and graduations based on university, type of degree programme, sex and field of education will be discussed. In the chapters to follow, the focus lies on graduations from public universities as characteristics related to degree programmes and personal data (chapter 3.2), entry into the labour market (chapter 3.3), labour market status (chapter 3.4), gross income (chapter 3.5) and local unit of employment (chapter 3.6) are explored. Chapter 3.7 will offer a short summary of the results.

3.1 Graduations and dropouts

ATRACK's data set contains a total of 660 944 graduations in the academic years of 2008/2009 to 2018/2019 and a total of 278 240 dropouts between 2008/2009 and 2016/2017 from all Austrian public and private universities, universities of applied sciences and university colleges of teacher education. In these figures, graduations or dropouts from bachelor's, master's, diploma, doctoral, PhD as well as continuing education and training programmes are considered.

Figure 5: Graduations between 2008/2009 and 2018/2019 per university and degree programme type



Source: STATISTICS AUSTRIA, Graduate Tracking

Sixty-two percent of all graduates had completed programmes at public universities, 22 % at universities of applied sciences, 14 % at university colleges of teacher education and 3 % at private universities. At 42 %, bachelor's degrees made up the largest share of graduations in the data set. Master's and diploma degrees accounted for 18 % each, doctoral and PhD graduations made up 4 % and graduations from continuing education and training programmes another 18 %. The Bologna process's effects were clearly visible in the data: the number of annual bachelor's and master's degrees increased from 17 538 in the academic year of 2008/2009 to 45 579 in 2018/2019. In the same period, annual diploma degrees dropped from 18 085 to 5 601, and doctoral/PhD degrees fluctuated between 2 103 and 2 654 per year. The number of graduations from university-level continuing education and training programmes increased from 4 301 in 2008/2009 to 14 520 in 2018/2019. This increase was particularly due to rising graduation numbers in continuing education and training programmes at university colleges of teacher education: they surged from 1 127 in the academic year of 2008/2009 to 8 059 in 2018/2019.

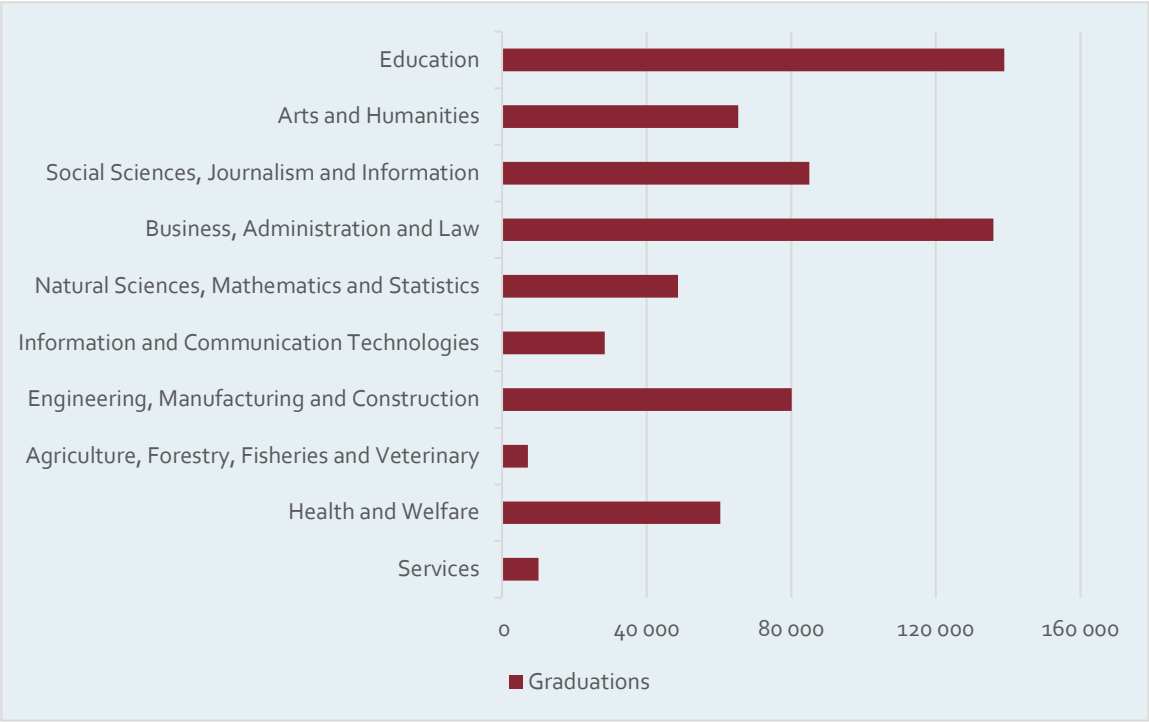
An analysis of the dropouts in the data revealed that 84 % concerned public universities, 7 % university colleges of teacher education, 7 % universities of applied sciences and 2 % private universities. Fifty-two percent were dropouts from bachelor's programmes, 17 % from diploma studies, 11 % from master's programmes and 10 % each from doctoral/PhD and continuing education and training programmes.

An analysis of graduations based on sex[7] shows that 58 % of graduates in the data set were female and 42 % male. Broken down to degree programme type, bachelor's degrees reflected this average gender distribution with 42 % of male and 58 % of female students. Particularly continuing education and training programmes (68 %) and diploma studies (60 %) were more frequently completed by women. Doctoral/PhD programmes, in turn, had more male graduates (57 %). The master's level was close to gender parity (51 % female and 49 % male graduates).

In an analysis of the fields of education according to ISCED 2013, the fields of "Education" (138 898) and "Business, Administration and Law" (135 949) counted the most graduations. Taken together, they made up about 42 % of all graduations. The lowest number of graduations were obtained in "Services" (10 106) and "Agriculture, Forestry, Fisheries and Veterinary" (7 109).

[7] Sex excluding "unknown".

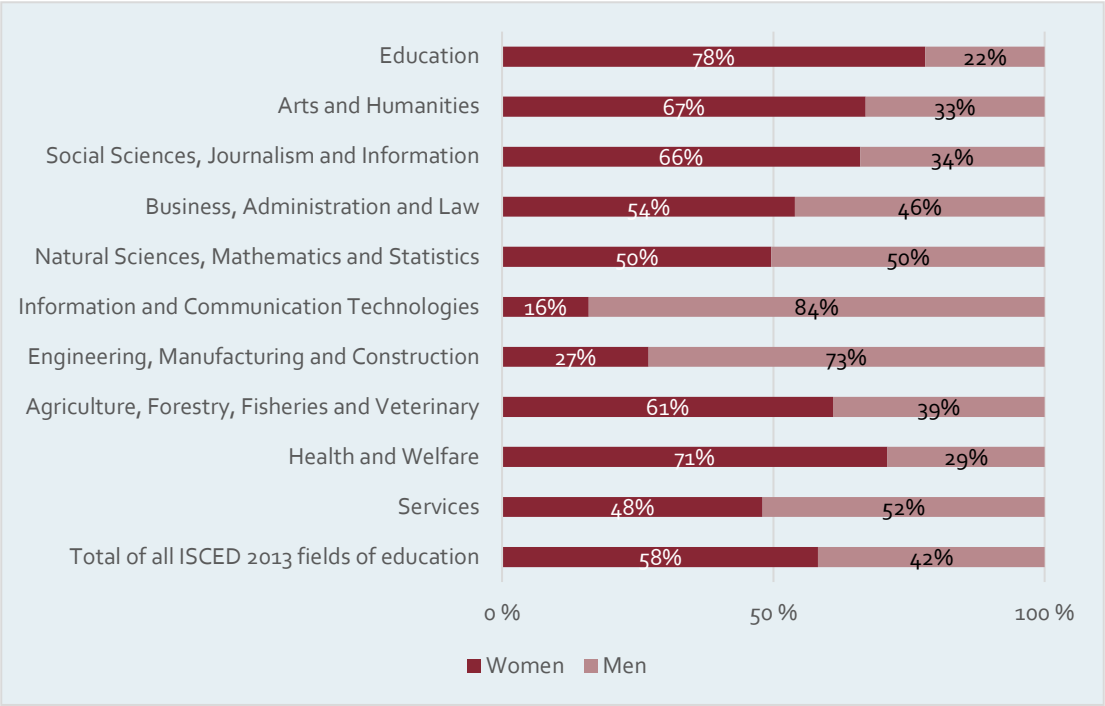
Figure 6: Graduations in absolute figures between 2008/2009 and 2018/2019 per ISCED 2013 field of education



Source: STATISTICS AUSTRIA, Graduate Tracking

A further analysis by sex revealed that men and women choose different fields of education:

Figure 7: Graduations between 2008/2009 and 2018/2019 per ISCED 2013 field of education and sex



Source: STATISTICS AUSTRIA, Graduate Tracking; sex excluding “unknown”.

While mostly male students completed degree programmes in “Information and Communication Technologies” (84 %) and “Engineering, Manufacturing and Construction” (73 %), degree programmes in the fields of “Education” (78 %) and “Health and Welfare” (71 %) had an overwhelming majority of female graduates. In “Natural Sciences, Mathematics and Statistics”, “Services” and “Business, Administration and Law”, there was almost gender parity among the graduates.

3.2 Characteristics relating to degree programmes and personal information

Following this brief overview of the full data set of ATRACK, the following chapters will exclusively focus on graduates from Austrian public universities. These make up the bulk of all cases in the data body: a total of 407 538 graduations and 235 733 dropouts between 2008/2009 and 2018/2019 or 2016/17, respectively, concern public universities.

3.2.1 Duration of studies and age at graduation

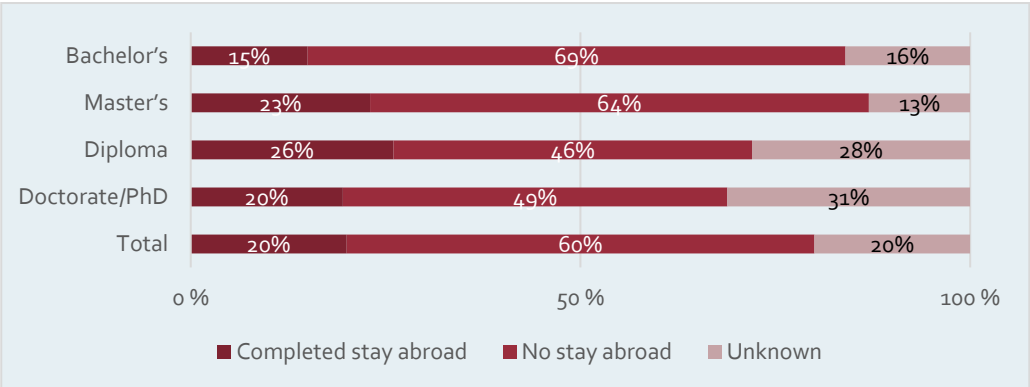
On average, about a third of the 337 939 bachelor's, master's and diploma graduations at public universities in the reference period was completed in the standard duration plus tolerance semesters. Particularly students in diploma programmes tended to take longer: they completed their studies in a median duration of 13 semesters; only 19 % of students graduated within the standard duration plus tolerance semesters. The median duration was eight semesters for bachelor's (33 % completed their studies in the standard duration) and 5.5 semesters for master's programmes (40 % of graduations in the standard duration). Doctoral/PhD programmes took a median of 8.5 semesters, and only 20 % graduated within the standard duration. Continuing education and training programmes were completed in the standard duration plus tolerance semesters most frequently (about 81 %). The median duration was 3.5 semesters.

The median age of graduates of public universities between 2008/2009 and 2018/2019 was 24 years for graduates of bachelor's, 27 for master's or diploma, 31 for doctoral/PhD and 35 for continuing education and training programmes. Ninety-three percent of all graduates from bachelor's, master's and diploma programmes were below the age of 35 at the time of graduation. This share was 72 % for doctoral/PhD graduates and 47 % for graduates from continuing education and training programmes.

3.2.2 Stays abroad

A fifth of all graduates from bachelor's, master's, diploma and doctoral/PhD programmes at a public university completed a stay abroad during the reference period; 60 % did not go abroad; and for 20 %, no data were available. Figure 8 depicts these shares per degree programme type.

Figure 8: Stays abroad of graduates of public universities per degree programme type



Source: STATISTICS AUSTRIA, Graduate Tracking

Especially diploma programme students completed a stay abroad. Master's programme graduates came in second. The share was lowest among bachelor's students. At 22 %, women went abroad slightly more often than men (19 %).

3.2.3 Further education or training completed after graduation

Eighty-two percent of graduates of a bachelor's programme at a public university completed a further formal education programme in Austria within one year following graduation. More specifically, about 62 % of them enrolled in a master's (or diploma) programme in the same field of education at the same university, and 29 % transferred to another university or field of education for the next higher degree. The rest completed a programme on the same or a lower level. With regard to the master's and diploma level, a respectable 42 % of graduates continued their education on the next higher, the same or a lower level.

The following table depicts further training per degree programme type and ISCED 2013 field of education:

Table 2: Further education or training completed by graduates of public universities per degree programme type and ISCED 2013 field of education

ISCED 2013 field of education	BA – further education after graduation	BA – no further education after graduation	MA/dipl – further education after graduation	MA/dipl – no further education after graduation	PhD/Dr – further education after graduation	PhD/Dr – no further education after graduation
Education	74 %	26 %	62 %	38 %	21 %	79 %
Arts and Humanities	80 %	20 %	46 %	54 %	20 %	80 %
Social Sciences, Journalism and Information	76 %	24 %	41 %	59 %	20 %	80 %
Business, Administration and Law	78 %	22 %	43 %	57 %	23 %	77 %
Natural Sciences, Mathematics and Statistics	90 %	10 %	48 %	52 %	12 %	88 %
Information and Communication Technologies	88 %	12 %	43 %	57 %	16 %	84 %
Engineering, Manufacturing and Construction	93 %	7 %	35 %	65 %	12 %	88 %
Agriculture, Forestry, Fisheries and Veterinary	82 %	18 %	29 %	71 %	10 %	90 %
Health and Welfare	86 %	14 %	17 %	83 %	8 %	92 %
Services	81 %	19 %	43 %	57 %	18 %	82 %
Total of all ISCED 2013 fields of education	82 %	18 %	42 %	58 %	15 %	85 %

Source: STATISTICS AUSTRIA, Graduate Tracking; abbreviations: BA: bachelor's, MA: master's; dipl: diploma

3.2.4 Highest level of education of graduates' parents

An analysis of the highest level of education of the parents of graduates of bachelor's, master's, diploma or doctoral/PhD programmes at Austrian public universities showed that at least one parent of 40 % of all graduates has graduated from a university or academy. Four percent grew up in a household where parents had completed compulsory school, in 27 % apprenticeship/medium-level secondary technical and vocational college (BMS) and in 18 % a secondary-school leaving certificate was the highest completed level. For 11 % of graduates, the education background of their parents was unknown. Table 3 depicts the highest level of education of graduates' parents per degree programme type:

Table 3: Highest level of education of the parents of graduates of public universities per degree programme type

Degree programme type	Compulsory school	Apprenticeship/Intermediate technical and vocational school	Secondary-school leaving certificate	Academy/ university	Unknown
Bachelor's	4 %	29 %	20 %	40 %	6 %
Master's	4 %	28 %	19 %	40 %	9 %
Diploma	5 %	26 %	16 %	39 %	14 %
Doctorate/PhD	4 %	20 %	12 %	36 %	28 %
Total of bachelor's, master's, diploma or doctoral/PhD degrees	4 %	27 %	18 %	40 %	11 %

Source: STATISTICS AUSTRIA, Graduate Tracking; population: graduates of bachelor's, master's, diploma or doctoral/PhD programmes at public universities.

Table 4 depicts the highest level of education of graduates' parents per ISCED 2013 field of education. For this table, only bachelor's, master's, diploma or doctoral/PhD programmes were considered.

Table 4: Highest level of education of parents of graduates of public universities per ISCED 2013 field of education

ISCED 2013 field of education	Compulsory school	Apprenticeship/Intermediate technical and vocational school	Secondary-school leaving certificate	Academy/ university	Unknown
Education	5 %	35 %	19 %	32 %	10 %
Arts and Humanities	4 %	22 %	16 %	43 %	15 %
Social Sciences, Journalism and Information	5 %	29 %	18 %	39 %	9 %
Business, Administration and Law	5 %	27 %	19 %	39 %	10 %
Natural Sciences, Mathematics and Statistics	4 %	27 %	19 %	42 %	8 %
Information and Communication Technologies	5 %	27 %	20 %	36 %	12 %
Engineering, Manufacturing and Construction	4 %	28 %	19 %	38 %	10 %
Agriculture, Forestry, Fisheries and Veterinary	4 %	33 %	17 %	39 %	8 %
Health and Welfare	4 %	20 %	14 %	48 %	15 %
Services	6 %	32 %	20 %	33 %	10 %
Total of all ISCED 2013 fields of education	4 %	27 %	18 %	40 %	11 %

Source: STATISTICS AUSTRIA, Graduate Tracking; population: graduates of bachelor's, master's, diploma or doctoral/PhD programmes at public universities.

3.2.5 Further characteristics related to degree programme type

An analysis of the share of graduates with multiple degrees from bachelor's, master's, diploma or doctoral/PhD programmes at public universities shows that multiple degrees are rare at only about 9 %. This figure only considers graduates who have completed multiple programmes on the same level (e.g. two bachelor's programmes).

As an overwhelming majority of graduates continued their education after obtaining a bachelor's degree (see chapter 3.2.3), the share of bachelor's degrees was rather low (16 %) according to the Vienna model[8]. Master's and diploma degrees met the Vienna

[8] The Vienna model only considers first-time graduates below the age of 35 years who did not enrol in another programme in the academic year following their graduation.

model criteria much more often. According to the Vienna model, a total of 132 097 degrees were completed at public universities in the reference period.

Table 5: Graduations in absolute figures and percent at public universities between 2008/2009 and 2018/2019 according to the Vienna model

Degree	Bachelor's (absolute)	Bachelor's (%)	Master's (absolute)	Master's (%)	Diploma (absolute)	Diploma (%)	Dr/PhD (absolute)	Dr/PhD (%)
Graduations according to Vienna model	24 131	16 %	41 283	55 %	51 962	47 %	14 721	60 %
All other degrees	128 801	84 %	33 742	45 %	58 020	53 %	9 684	40 %
Total	152 932	100 %	75 025	100 %	109 982	100 %	24 405	100 %

Source: STATISTICS AUSTRIA, Graduate Tracking

The Vienna model (see chapter 2.3.5) aimed to approximate the number of graduates who are likely to join the labour market for the first time. For this reason, graduations from university-level continuing education and training programmes were excluded. The following chapters discuss graduates' entry into the labour market and the first years of their professional careers. The analysis will solely focus on graduates from public universities according to the Vienna model.

3.3 Entry into the labour market and job stability

It takes about two months until graduates of bachelor's, master's, diploma and doctoral/PhD programmes at public universities find their first job. About a third of all graduates started to work already before graduating. At 34 %, the share of men who did so was slightly higher than that of women (31 %). Differences for the various degree programme types, with doctoral/PhD graduates finding work most quickly, were also observed.

Table 6 depicts graduates' start of employment per degree programme type. Only graduates who actually took up employment in Austria within two years of graduating were considered.

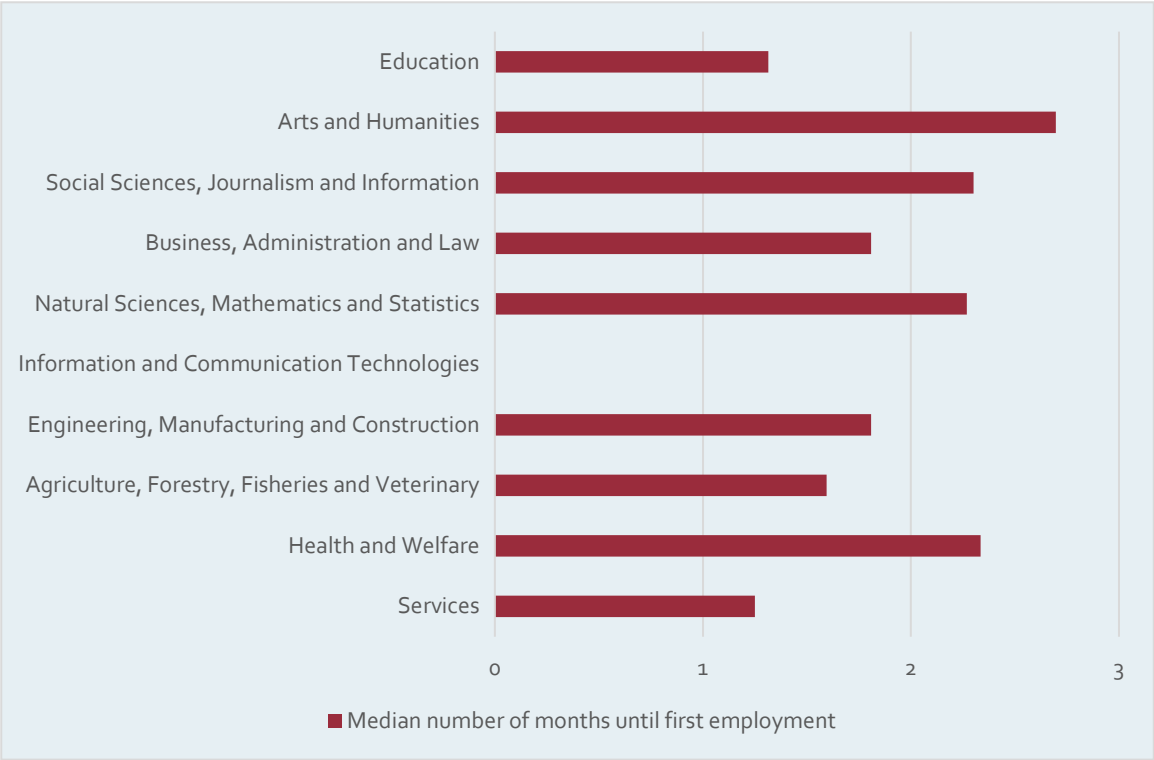
Table 6: Duration until the first employment of graduates of public universities according to the Vienna model per degree programme type

	Bachelor's	Master's	Diploma	Dr/PhD	Total
Start of first employment before graduation	37 %	37 %	23 %	53 %	32 %
1 to less than 3 months	20 %	25 %	34 %	18 %	27 %
3 to less than 6 months	18 %	19 %	23 %	14 %	20 %
6 to less than 9 months	8 %	8 %	9 %	6 %	8 %
9 to less than 12 months	5 %	4 %	5 %	3 %	4 %
12 to less than 24 months	12 %	6 %	8 %	6 %	8 %
Total	100 %	100 %	100 %	100 %	100 %

Source: STATISTICS AUSTRIA, Graduate Tracking; excluding graduates who did not start to work in Austria within two years of graduating and cases in which the reference period lies partly or fully in the future.

An analysis of the fields of education as depicted in Figure 9 showed that particularly graduates from the fields of "Information and Communication Technologies" were quick to find jobs. In this group, 54 % of all graduates according to the Vienna model started their first employment already before graduating. This can be compared to a median duration of zero days. On the other side of the spectrum, graduates of the "Arts and Humanities" field showed a tendency to search for jobs over longer periods of time. Their median duration was about 2.7 months.

Figure 9: Median duration until the first employment of graduates of public universities according to the Vienna model per ISCED 2013 field of education



Source: STATISTICS AUSTRIA, Graduate Tracking; a median duration of zero months means that the majority of graduates in this field started their first job already before graduation.

To measure job stability at the beginning of graduates' career paths, the data can be aggregated according to the number of employers in the first three years following graduation. Among the graduates according to the Vienna model who took up work in Austria within three years, filtering revealed the following distribution: 46 % remained with their first employer, 33 % changed employers once, 14 % changed twice, and 7 % changed at least three times.

The following table depicts the number of employers three years after graduation per degree programme type:

Table 7: Number of employers of graduates of public universities according to the Vienna model three years after graduation per degree programme type

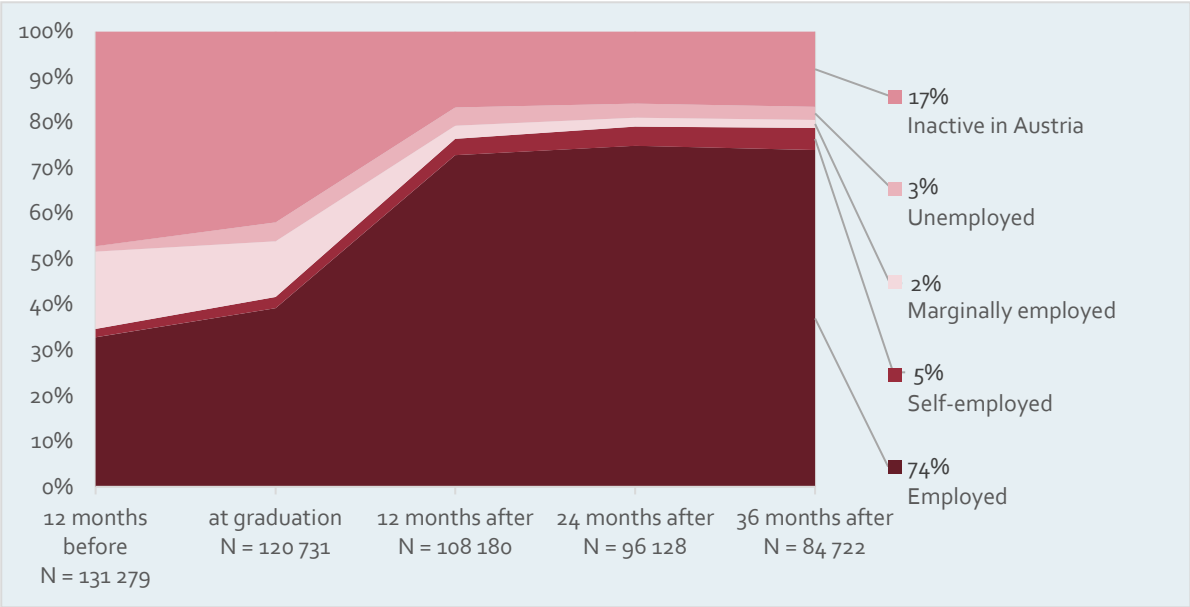
Number of employers	Bachelor's	Master's	Diploma	Dr/PhD	Total
1 employer	49 %	49 %	41 %	55 %	46 %
2 employers	31 %	33 %	33 %	32 %	33 %
3 employers	14 %	13 %	17 %	10 %	14 %
4 or more employers	7 %	5 %	9 %	3 %	7 %
Column total	100 %	100 %	100 %	100 %	100 %

Source: STATISTICS AUSTRIA, Graduate Tracking; population: all graduates of public universities according to the Vienna model who started employment within three years of graduating.

3.4 Employment, unemployment and inactivity

The process of graduates' labour market integration can be explored in the data set by, for instance, observing the employment rate's development. This rate depicts the share of graduates who are in employment or self-employment. Marginally employed graduates are stated separately. Graduates whose main residence was no longer in Austria at the reference date were excluded. Figure 10 depicts the labour market status, which is the basis for calculating the employment rate, of graduates of public universities according to the Vienna model.

Figure 10: Labour market status of graduates of public universities according to the Vienna model over time



Source: STATISTICS AUSTRIA, Graduate Tracking; graduates who were not employed, unemployed, in education/training or insured in another way in Austria and did not have their main residence in the country were assigned the labour market status "Main residence not in Austria"; their labour market status outside of Austria is unknown. They were excluded from this analysis. Furthermore, in some cases, data for the reference days of 24 or 36 months after graduation were not yet available for the academic years of 2017/2018 and 2018/2019. For this reason, the population (N) somewhat shrinks over the reference period.

The employment rate was 35 % twelve months before graduation, rose to 42 % at the time of and had climbed to 79 % by three years after graduation. In the same period, the share of graduates who were marginally employed shrank. While almost a fifth (17 %) of graduates were marginally employed twelve months prior to graduation, this share had dropped to 2 % by 36 months after completing their studies. Forty-two percent of graduates were considered economically inactive when they finished their studies. This share dropped to 16 % by 24 months after graduation. It then slightly increased again, reaching 17 % at the reference date of 36 months after graduation. At the time of graduation, 4 % of graduates were registered as unemployed. Thirty-six months after graduation, this was still the case for 3 %.

The following table shows an analysis of graduates' labour market status 36 months after graduation per ISCED 2013 field of education:

Table 8: Labour market status of graduates of public universities according to the Vienna model 36 months after graduation per ISCED 2013 field of education

ISCED 2013 field of education	Employed	Self-employed	Un-employed	Marginally employed	Economically inactive
Education	75 %	3 %	2 %	2 %	18 %
Arts and Humanities	57 %	11 %	6 %	4 %	22 %
Social Sciences, Journalism and Information	71 %	4 %	4 %	2 %	19 %
Business, Administration and Law	81 %	3 %	3 %	1 %	12 %
Natural Sciences, Mathematics and Statistics	71 %	3 %	3 %	2 %	21 %
Information and Communication Technologies	81 %	7 %	1 %	1 %	10 %
Engineering, Manufacturing and Construction	80 %	4 %	2 %	1 %	13 %
Agriculture, Forestry, Fisheries and Veterinary	61 %	15 %	3 %	2 %	20 %
Health and Welfare	79 %	3 %	1 %	0 %	16 %
Services	64 %	15 %	2 %	3 %	16 %
Total of all ISCED 2013 fields of education	74 %	5 %	3 %	2 %	17 %

Source: STATISTICS AUSTRIA, Graduate Tracking; the population is restricted to graduates who were employed, unemployed, in education/training or insured in another way in Austria or whose main residence was in Austria 36 months after graduation provided that data were available for the reference date.

Particularly the fields of education of “Information and Communication Technologies” and “Health and Welfare” were interesting with regard to unemployment rates: at 1 % or 2 %, depending on the reference date, the rates were very low. Graduates of the field of “Arts and Humanities”, on the other hand, had a higher risk of not finding work: unemployment rates were highest in this field on all three reference days.

Apart from fluctuations based on the field of education, also men and women fared differently. Across the population, men had a higher employment rate than women (six months after graduation, for instance, 74 % of men and 70 % of women were employed; after 36 months, the rate was 84 % for men and 75 % for women). Women were also less likely to be self-employed (about 5 % of men and 3 % of women across the reference period after graduation), and with regard to unemployment, women’s share was about 0.5 % higher than men’s.

As Figure 11 shows, the share of women whose labour market status was “parental leave” was significantly higher than men’s. Also for this graph, only graduates whose main

residence was in Austria at the reference date were considered. This gender gap got larger the more time passed since graduation. Thirty-six months after completing university, 8.5 % of women but only 0.4 % of men in the data set were on parental leave. The general increase of graduates in the “parental leave” category (the “total” line in Figure 11) was almost exclusively due to the cohort’s women.

Figure 11: Share of graduates of public universities according to the Vienna model with the labour market status “parental leave” by sex

Source: STATISTICS AUSTRIA, Graduate Tracking; sex excluding “unknown”.

Table 9 shows the share of employed graduates working full-time. For students who were employed twelve months before graduating, this figure amounted to about 41 %. The remaining graduates in employment worked part-time at this reference date. In absolute figures, about 16 500 graduates worked full-time and about 23 000 part-time. Already at this reference date, men were more likely to have a full-time job. Three years after graduation, this share increased to about 88 % among men and about 75 % among women.

Table 9: Share of graduates of public universities according to the Vienna model who worked full-time by sex

Share of full-time jobs of employed graduates	Men	Women	Total
12 months before graduating	45.4 %	37.8 %	41.3 %
at graduation	63.1 %	53.3 %	57.7 %
6 months after graduating	83.7 %	72.4 %	77.4 %
12 months after graduating	86.9 %	76.1 %	80.9 %
18 months after graduating	88.1 %	76.4 %	81.6 %
24 months after graduating	88.2 %	76.4 %	81.7 %
36 months after graduating	88.3 %	75.4 %	81.2 %

Source: STATISTICS AUSTRIA, Graduate Tracking; sex excluding “unknown”. The population is made up of graduates of public universities according to the Vienna model who were employed at the respective reference dates and for whom information about full-time/part-time was available.

The following table depicts the share of full-time jobs per ISCED 2013 field of education:

Table 10: Share of full-time jobs of graduates of public universities according to the Vienna model 36 months after graduation per ISCED 2013 field of education

ISCED 2013 field of education	Full-time	Part-time	Total
Education	63 %	37 %	100 %
Arts and Humanities	65 %	35 %	100 %
Social Sciences, Journalism and Information	73 %	27 %	100 %
Business, Administration and Law	92 %	8 %	100 %
Natural Sciences, Mathematics and Statistics	81 %	19 %	100 %
Information and Communication Technologies	91 %	9 %	100 %
Engineering, Manufacturing and Construction	91 %	9 %	100 %
Agriculture, Forestry, Fisheries and Veterinary	71 %	29 %	100 %
Health and Welfare	84 %	16 %	100 %
Services	70 %	30 %	100 %
Total of all ISCED 2013 fields of education	81 %	19 %	100 %

Source: STATISTICS AUSTRIA, Graduate Tracking; the population is made up of graduates of public universities according to the Vienna model who were employed at the respective reference dates and for whom information about full-time/part-time and their field of education was available.

The graduate groups did not only differ with regard to their labour market status. The analyses also revealed discrepancies regarding income from employment.

3.5 Income

Six months after leaving university, graduates of public universities[9] according to the Vienna model who worked full-time earned a median gross monthly income[10] of € 2 949. A year and a half after graduation, this figure rose to € 3 123; after three years, it was about € 3 413.

An analysis of gross monthly income per degree programme type showed that income differs greatly for bachelor's, master's, diploma and doctoral/PhD graduates. This is depicted in Table 11 for several reference dates.

Table 11: Median gross income from employment of graduates of public universities according to the Vienna model per degree programme type

Median income on reference date after graduation per degree programme type	after 6 months	after 12 months	after 18 months	after 24 months	after 36 months
Total	**€ 2 949**	**€ 3 016**	**€ 3 123**	**€ 3 218**	**€ 3 413**
Bachelor's	€ 2 427	€ 2 519	€ 2 610	€ 2 691	€ 2 852
Master's	€ 2 849	€ 2 940	€ 3 029	€ 3 119	€ 3 322
Diploma	€ 3 003	€ 3 036	€ 3 171	€ 3 259	€ 3 420
Doctorate/PhD	€ 3 751	€ 3 797	€ 3 863	€ 3 924	€ 4 107

Source: STATISTICS AUSTRIA, Graduate Tracking

This comparison shows that bachelor's graduates had the lowest median income six months after graduating at € 2 427. Three years after leaving university, they earned € 2 852, which was the smallest pay cheque among all degree programme types. Master's graduates had a gross income of € 2 849 and doctoral/PhD graduates earned € 3 751 six months after completing their studies. At this reference date, diploma programme

[9] Also this chapter will focus on graduations as defined by the Vienna model in order to make meaningful observations regarding entry-level salaries of graduates. Graduations from university-level continuing education and training programmes were thus excluded.

[10] This income is calculated from the gross annual income from employment according to the annual payslip of the year into which the reference date falls, after deduction of any special payments. To correct for inflation, income data were weighted to match the price level of 2019 using the annual average of the 2005 consumer price index (see chapter 2.3.3).

graduates earned about € 3 003. Three years later, they received € 3 420, just barely surpassing the income of master's graduates. Doctoral/PhD graduates received the largest pay cheque at this reference date.

Income did not only differ for the various degree programme types, also the disciplines graduates had selected played a role. The highest median income was reported for graduates of the fields of education of "Information and Communication Technologies", "Engineering, Manufacturing and Construction" and "Health and Welfare". It was also found that graduates who earned large pay cheques soon after completing their studies on average also had a high salary three years later. With regard to median income, other fields of education did not catch up. Particularly graduates of the field of education of "Health and Welfare" (which includes medical education) had a high median income. Three years after completing their studies, their median pay cheque was € 4 908. With average monthly salaries of less than € 2 500 six months after graduating, graduates of the fields of "Arts and Humanities", "Services" and "Social Sciences, Journalism and Information" made the least money.

Table 12: Median gross income from employment of graduates of public universities according to the Vienna model per ISCED 2013 field of education

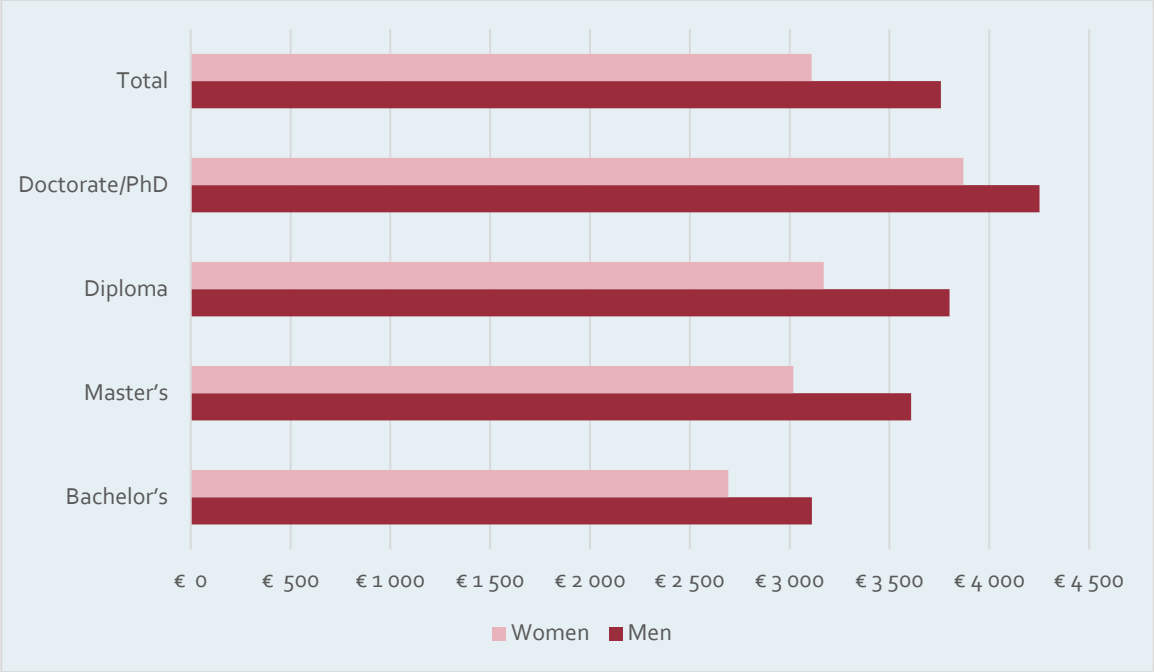
ISCED 2013 field of education	after 6 months	after 12 months	after 18 months	after 24 months	after 36 months
Total of all ISCED 2013 fields of education	**€ 2 949**	**€ 3 016**	**€ 3 123**	**€ 3 218**	**€ 3 413**
Education	€ 2 557	€ 2 649	€ 2 707	€ 2 765	€ 2 876
Arts and Humanities	€ 2 272	€ 2 338	€ 2 397	€ 2 462	€ 2 593
Social Sciences, Journalism and Information	€ 2 495	€ 2 584	€ 2 684	€ 2 777	€ 2 965
Business, Administration and Law	€ 2 864	€ 2 879	€ 2 958	€ 3 040	€ 3 263
Natural Sciences, Mathematics and Statistics	€ 2 948	€ 3 001	€ 3 086	€ 3 150	€ 3 324
Information and Communication Technologies	€ 3 304	€ 3 417	€ 3 520	€ 3 613	€ 3 801
Engineering, Manufacturing and Construction	€ 3 252	€ 3 362	€ 3 440	€ 3 556	€ 3 753
Agriculture, Forestry, Fisheries and Veterinary	€ 2 634	€ 2 737	€ 2 828	€ 2 949	€ 3 179
Health and Welfare	€ 4 315	€ 4 467	€ 4 713	€ 4 780	€ 4 908
Services	€ 2 439	€ 2 566	€ 2 645	€ 2 715	€ 2 820

Source: STATISTICS AUSTRIA, Graduate Tracking

Employed female graduates earned a gross income of € 2 678 six months after graduating. At this reference date, their male counterparts made € 3 257. This means that there was a gender pay gap among the graduates: at this reference date, women's median

income was about 82 % of what men earned. As is shown in Figure 12, the gender pay gap persisted also 36 months after graduation and applied to all degree programme types.

Figure 12: Inflation-adjusted median gross income from employment of graduates of public universities according to the Vienna model 36 months after graduating per degree programme type and sex

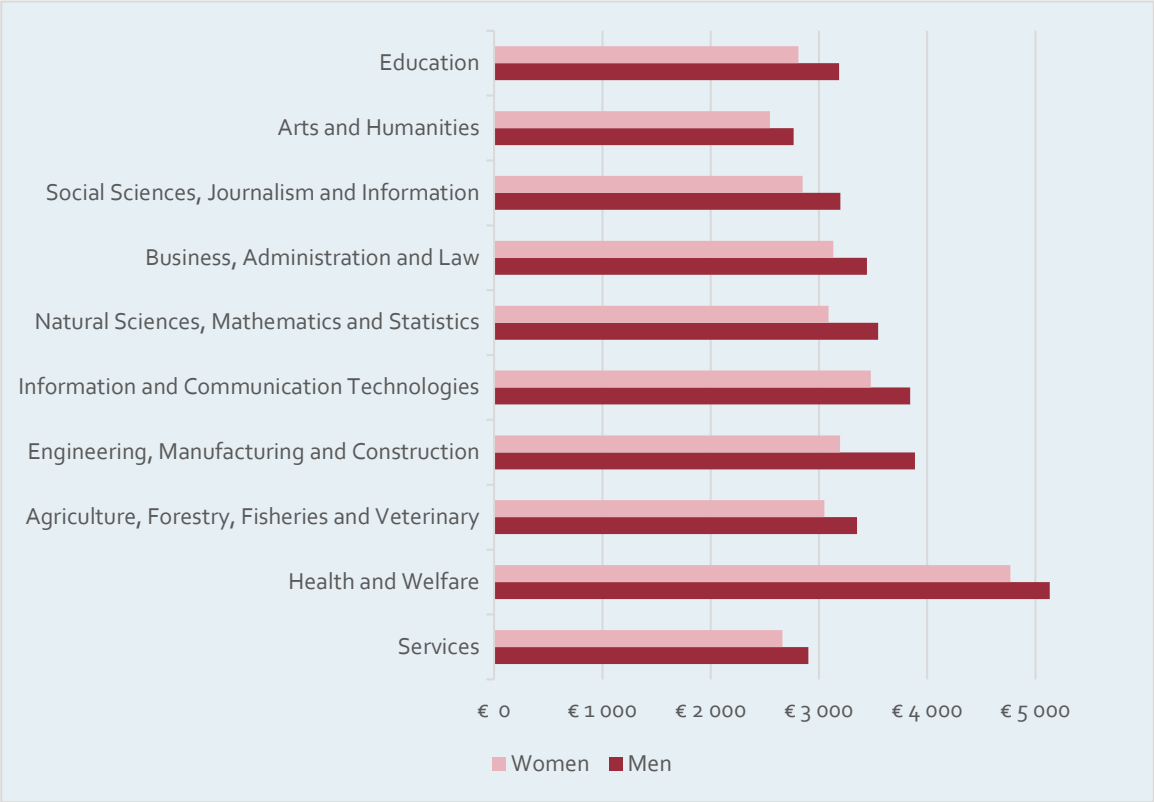


Source: STATISTICS AUSTRIA, Graduate Tracking; sex excluding "unknown".

The gender pay gap was narrowest among doctoral/PhD graduates (9 %). The largest gap was observed for graduates of diploma (17 %) and, on the second place, master's programmes (16 %).

Also an analysis based on ISCED 2013 fields of education revealed a gender pay gap in median gross income:

Figure 13: Inflation-adjusted median gross income from employment of graduates of public universities according to the Vienna model 36 months after graduating per ISCED 2013 field of education



Source: STATISTICS AUSTRIA, Graduate Tracking; sex excluding “unknown”.

The field of education of “Engineering, Manufacturing and Construction” with its overwhelming majority of male students (see chapter 3.1) had the widest gender pay gap amounting to about € 700. But also the median income of graduates of “Natural Sciences, Mathematics and Statistics” with almost equal numbers of male and female graduates showed a gap of about € 450. The narrowest gap (about € 200) was observed in the field of “Arts and Humanities”, which was also the field where graduates’ median income was the lowest (see Table 12).

3.6 Information on local unit of employment

The data body also contains information on graduates’ places of work. The classification of the main economic activity based on ÖNACE 2008 is available for the reference dates, as a result of which the top industries in which graduates work can be identified.

An analysis of the top-twenty industries of graduates of public universities according to the Vienna model 36 months after graduating per main economic activity of the local unit of employment or enterprise based on ÖNACE 2008 produced the following results:

1. 10.0 % Public administration <O84>
2. 6.8 % Higher education <P854>
3. 5.6 % Human health activities <Q86>
4. 5.0 % Architectural and engineering activities <M711>
5. 4.5 % Education <P851, P852, P853, P855, P856>
6. 4.5 % Activities of head offices; management consultancy <M70>
7. 4.4 % Retail trade <G47>
8. 4.3 % Social work <Q88>
9. 3.8 % Wholesale trade <G46>
10. 3.5 % Computer programming and related activities <J62>
11. 2.9 % Auditing activities and tax consultancy <M692>
12. 2.6 % Scientific research and development <M72>
13. 2.6 % Financial service activities <K64>
14. 2.6 % Legal activities <M691>
15. 2.4 % Activities of membership organisations <S94>
16. 1.8 % Advertising and market research <M73>
17. 1.5 % Manufacture of machinery <C28>
18. 1.3 % Manufacture of computer products <C26>
19. 1.2 % Employment activities <N78>
20. 1.2 % Information service activities <J63>

This distribution shows that three years after completing their studies, graduates were frequently employed in the fields of public administration and secondary and tertiary education. “Human health activities”, “Architectural and engineering activities” and “Education” were also among the top five. Table 13 further breaks down the top industries based on ISCED 2013 field of education.

Table 13: Industries graduates of public universities according to the Vienna model are most frequently employed in per ISCED 2013 field of education

ISCED 2013 field of education	Top industries (ÖNACE 2008) 36 months after graduating
Education	24 % Education excl. higher education <P851, P852, P853, P855, P856> 19 % Social work <Q88> 18 % Public administration <O84>
Arts and Humanities	7 % Higher education <P854> 7 % Education excl. higher education <P851, P852, P853, P855, P856> 6 % Arts <R90>
Social Sciences, Journalism and Information	11 % Social work <Q88> 7 % Public administration <O84> 7 % Activities of head offices; management consultancy <M70>
Business, Administration and Law	13 % Public administration <O84> 12 % Legal activities <M691> 10 % Auditing activities and tax consultancy <M692>
Natural Sciences, Mathematics and Statistics	14 % Higher education <P854> 10 % Scientific research and development <M72> 6 % Manufacture of pharmaceutical products <C21>
Information and Communication Technologies	36 % Computer programming and related activities <J62> 7 % Higher education <P854> 6 % Activities of head offices; management consultancy <M70>
Engineering, Manufacturing and Construction	28 % Architectural and engineering activities <M711> 7 % Higher education <P854> 5 % Manufacture of machinery <C28>
Agriculture, Forestry, Fisheries and Veterinary	31 % Veterinary activities <M75> 9 % Higher education <P854> 8 % Wholesale trade <G46>
Health and Welfare	31 % Human health activities <Q86> 23 % Public administration <O84> 14 % Retail trade <G47>
Services	15 % Sports activities/amusement <R93> 13 % Human health activities <Q86> 6 % Higher education <P854>

Source: STATISTICS AUSTRIA, Graduate Tracking

The analyses revealed that there are disproportionately popular industries in some fields of education. This was, for instance, the case in the field of education of “Information and Communication Technologies”, where 36 % of graduates work in “Computer programming and related activities”, in the field of “Agriculture, Forestry, Fisheries and Veterinary”, where 31 % of graduates pursue “Veterinary activities”, and in the field of “Health and Welfare”, where 31 % of graduates work in “Human health activities”. In these examples, about a third of graduates work in a specific ÖNACE industry. On the other hand, there were also fields of education, such as “Social Sciences, Journalism and Information” and “Arts and Humanities”, where graduates pursued very different activities and found employment in a wide variety of industries. Table 13 clearly depicts the limitations of the ÖNACE classification, which were already mentioned in chapter 2.3.4. Particularly for the fields of education of “Education” and “Health and Welfare”, the most important industries

cannot always be unambiguously identified, and in some cases, industries have to be merged in the analysis.

3.7 Summary of results

A little more than two months after completing their studies, more than half of the graduates of public universities according to the Vienna model had found work. Three years after graduating, an average of 79 % were either employed or self-employed. The data also showed that a university degree is an effective protection against unemployment. With slight variations across the reference dates, the unemployment rate of graduates with their main residence in Austria was about three percent and thus significantly lower than that for all of Austria.[11].

Six months after completing their degree programme, graduates according to the Vienna model earned a gross median income from employment of € 2 949. By 36 months after graduating, the median income had risen to € 3 413. This means that the graduates reach the average annual gross income of full-time, year-round employment in Austria very early in their careers. In 2019, the median of this income was € 43 719[12].

The analysis revealed differences in graduates' career paths linked to the field of education, degree programme type or sex. Gender gaps were most frequently observed with regard to income and labour market integration following graduation. If only full-time employees three years after graduating are considered, women's median income from employment is only about 82 % of the median income of men in the same field of education. With regard to fields of education, particularly "Information and Communication Technologies" and "Health and Welfare" were conspicuous: graduates in these fields earned large monthly pay cheques and their labour market integration was very quick.

[11] More specifically, the unemployment rate as defined in Austria fluctuated between six and nine percent in the period between 2008 and 2019: https://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/arbeitsmarkt/arbeitslose_arbeitssuchende/arbeitslose_nationale_definition/index.html.

[12] See "Gross annual income of employees 1997-2020" https://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=029112.

4 Special analyses

The public universities also commissioned more detailed analyses of the data body concerning income, income development, labour market integration and regional income differences. With regard to these analyses, every participating university received their specific results as well as the overall results for Austria.

4.1 Regression analyses

To be able to discern how individual factors influence gross income and/or labour market opportunities, the special analyses included several regression analyses related to income, income development and the duration until graduates found their first job. Statistics Austria made the results available to the project partners in a report and regression tables. The following chapters present a short overview of these special analyses.

4.1.1 Income from full-time employment

A log-linear regression model was used to study the effects of a large number of explanatory variables, such as sex, degree programme type, field of education, professional experience and enterprise size, on the income of employed graduates working full-time. The model was based on data of 36 618 graduates of public universities according to the Vienna model between the academic years of 2008/2009 and 2014/2015 who were employed full-time 36 months after graduation and whose income at this reference date was known.

The following factors influenced income the most:

Parameter	Cumulative adjusted R^2
ISCED 2013 field of education	0.27
Days of full-time employment up to 36 months after graduating	0.34
Enterprise size 36 months after graduating	0.36
Degree programme type	0.38
ÖNACE of the local unit of employment 36 months after graduating	0.40

Source: STATISTICS AUSTRIA, Graduate Tracking

Adjusted R^2 represents the proportion of the variance for a dependent variable that is explained by the model adjusted for the number of predictors in the model and the number

of observations. For instance, an adjusted R^2 of 0.27 means that the “ISCED 2013 field of education” variable can account for 27 % of the variance. The “Days of full-time employment until 36 months after graduating” variable explains a further 7 % of the variance, and so on.

4.1.2 Income development

The most important factors influencing the income development of graduates in full-time employment were also investigated. Income development was measured as the relation between graduates’ income six months and 60 months after completing their studies. Also in this analysis, a log-linear regression model for a total of 14 507 graduations was estimated.

The following factors influenced income development the most:

Parameter	Cumulative adjusted R^2
Income of graduates in full-time employment six months after graduating	0.24
ISCED field of education	0.30
Days of full-time employment six and 60 months after graduating	0.33
Sex	0.34
ÖNACE of the local unit of employment 60 months after graduating	0.35

Source: STATISTICS AUSTRIA, Graduate Tracking

4.1.3 Duration until first employment after graduating

Furthermore, a Cox regression model (which is a type of survival analysis) was used to investigate the factors which particularly influenced the duration until graduates started their first job.

A survival analysis investigates the time that passes before a given event occurs and which covariates may be associated with that quantity of time. In our case, the event is the start of the first job. A total of 57 312 graduations from public universities according to the Vienna model of the academic years from 2008/2009 to 2014/2015 were considered in the analysis. Cases in which graduates did not take up a first employment in the reference period were excluded.

The following factors influenced the duration until the first job the most:

Parameter	Cumulative Harrell's C
Labour market status (employment) combined with full-time/part-time twelve months before graduating	0.62
ISCED 2013 field of education	0.63
University graduated from	0.63
Labour market status 24 months before graduating	0.63
Highest level of education of graduates' parents	0.64

Source: STATISTICS AUSTRIA, Graduate Tracking

Harrell's concordance index (Harrell's C) is commonly used as a goodness of fit measure for survival models (similar to adjusted R^2 in the previous two log-linear models). A value of 0.64 means that the predicted value corresponds to the actual value in about 64 % of cases.

4.2 Relocations and regional income differences

In a further special analysis, graduates' places of residence before and after graduating were analysed. Furthermore, regional income differences following graduation were explored.

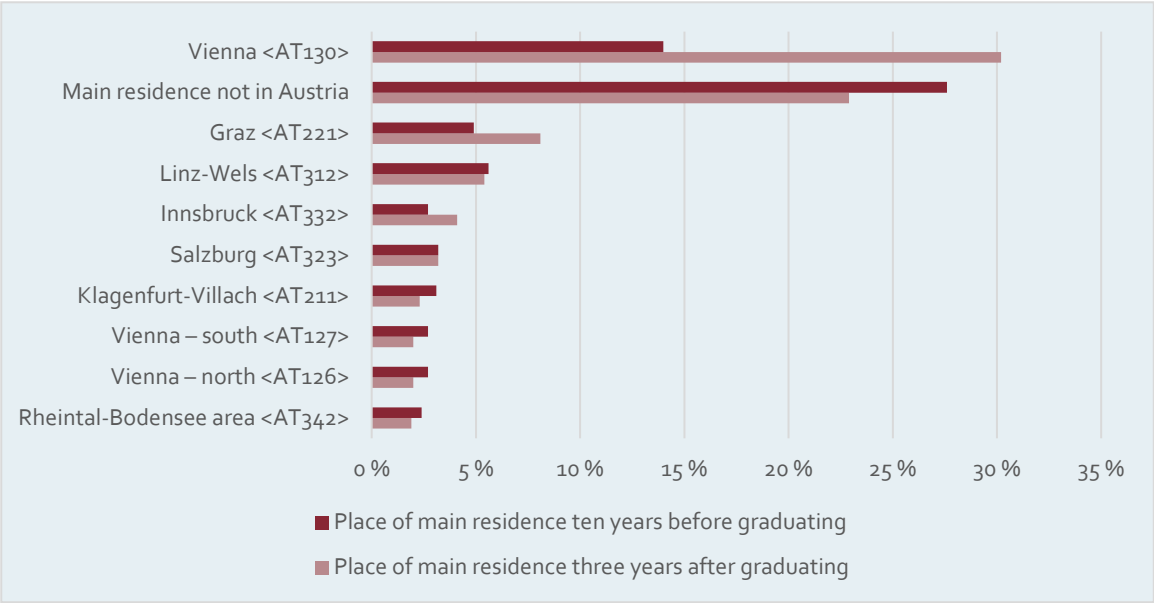
4.2.1 Relocations

This analysis explored how graduating from a public university influenced graduates' places of residence. To this end, graduates' registered places of residence ten years before and three years after graduating were analysed.

The population was made up of all graduates from public universities according to the Vienna model between 2012/2013 and 2016/2017. Results were differentiated based on university, main residence (NUTS 3[13]) ten years before and main residence (NUTS 3) three years after graduating. The following figure shows selected regions and relocations within them:

[13] For further information on NUTS units, see https://www.statistik.at/web_en/classifications/regional_breakdown/nuts_units/index.html.

Figure 14: Relocations of graduates of public universities according to the Vienna model between 2012/2013 and 2016/2017 (selection)



Source: STATISTICS AUSTRIA, Graduate Tracking; share of graduates with place of residence in the respective NUTS 3 region before and after graduating.

The data set further showed that the main residence of about 42 % of graduates was in the same political district ten years before and three years after graduating. About 28 % of graduates did not have their main residence in Austria ten years before graduating. Approximately two thirds (68 %) of this group did not have their main residence in Austria three years after graduating either.

4.2.2 Regional income differences

This analysis was carried out to explore if and how the incomes of graduates differ regionally. To this end, the local unit of employment was analysed on NUTS 3 level and per federal state.

The population was made up of all graduates of public universities according to the Vienna model between 2008/2009 and 2016/2017. Results were differentiated based on university, ISCED 2013 field of education and local unit of employment 36 months after graduation. The following table shows the highest and lowest median gross monthly income from full-time employment:

Table 14: Gross monthly income from full-time employment 36 months after graduating for graduates according to the Vienna model between 2008/2009 and 2016/2017 per ISCED 2013 field of education and local unit of employment (selection)

ISCED 2013 field of education	Federal state with highest median income	Federal state with lowest median income
Education	Vorarlberg (€ 3 094)	Carinthia (€ 2 603)
Arts and Humanities	Vorarlberg (€ 3 020)	Carinthia (€ 2 309)
Social Sciences, Journalism and Information	Upper Austria (€ 3 130)	Carinthia (€ 2 637)
Business, Administration and Law	Vorarlberg (€ 3 417)	Carinthia (€ 2 933)
Natural Sciences, Mathematics and Statistics	Upper Austria (€ 3 502)	Burgenland (€ 2 866)
Information and Communication Technologies	Vorarlberg (€ 4 123)	Tyrol (€ 3 512)
Engineering, Manufacturing and Construction	Upper Austria (€ 4 043)	Tyrol (€ 3 457)
Health and Welfare	Vorarlberg (€ 5 891)	Styria (€ 4 530)
Services	Vienna (€ 3 016)	Styria (€ 2 552)

Source: STATISTICS AUSTRIA, Graduate Tracking; the ISCED field of education of “Agriculture, Forestry, Fisheries and Veterinary” was not included as case numbers were too low.

4.3 Summary of analyses

The regression models described in chapter 4.1 confirm the conclusions drawn from the descriptive statistics described in chapter 3 in many ways. The choice of degree programme had a significant impact on graduates’ future job opportunities and prospective income. Particularly graduates in the field of “Health and Welfare” did not take long to be integrated into the labour market, and their median income was very high.

The regression models further indicated that graduates’ labour market status twelve and 24 months before graduation greatly influenced the duration until they started their first employment. In general, the “employed” status shortened this duration. This means that professional experience gained before graduating significantly increases graduates’ opportunities on the labour market. Furthermore, the employer’s industry and enterprise size (based on employee numbers) significantly determined gross income three years after graduating. As a tendency, the larger the enterprise, the higher incomes were.

The analysis of graduates' places of residence showed that they tended to flock to the urban regions of Vienna, Graz and Innsbruck. Furthermore, the data indicate a migration to Austria of graduates whose main residence was outside of the country ten years before completing their studies. The analysis of regional income differences showed that pay cheques varied largely across federal states. The highest median income was earned by graduates in the field of "Health and Welfare" working in Vorarlberg. Graduates in the field of "Arts and Humanities" working in Carinthia received the smallest pay cheques.

5 Summary and outlook

The ATRACK project was jointly developed by Austria's public universities and Statistics Austria as an alternative to graduate surveys, which are more expensive and time-consuming. The Austrian Federal Ministry of Education, Science and Research provided initial funding within the framework of Higher Education Area Structural Funds. The project was implemented in the period of 2017 to 2021. From 2022, a consortium headed by the University of Vienna has been in charge of continuing it.

A total of 661 000 graduations in the academic years from 2008/2009 to 2018/2019 and 278 000 dropouts in the period from 2008/2009 to 2016/2017 can be analysed in ATRACK's data body. Based on this data set, the participating universities received a total of 21 data cubes (one per university) to use for further analyses. Statistics Austria furthermore produced more than 6 000 individualised fact sheets in German and English for the project partners. These fact sheets contained information on the labour market integration of the respective universities' graduates.

As a major contribution of ATRACK, various definitions of and approaches to graduate tracking at different universities in Austria were harmonised. As a result, every university can use ATRACK and its standardised information offer to compare its performance to other Austrian higher education institutions. In addition to graduations, also dropouts can be analysed. The close collaboration of the participating universities in the planning stage strengthened inter-university cooperation and ensured that all universities received the information regarding the labour market integration of their graduates they had been looking for. All project partners now have access to the existing register-based data.

ATRACK was successfully completed, and its system could be further extended in the future. It is designed as such that the data body can be continuously updated. ATRACK already contains the data of all graduates of all Austrian universities. In the future, further higher education institutions (such as universities of applied sciences) could be added. The existing data structure allows for analyses of further data aggregations. It is, for example, possible to carry out an analysis based on graduation years or other cohorts of graduates. This might enable the universities to track changes that take place over time. The valuable experiences gained in ATRACK can furthermore be used to inform future projects with similar goals.

5.1 European Graduate Tracking

A shortcoming of ATRACK is the lack of data regarding graduates who give up their main residence in Austria and move abroad after completing their studies. Their career paths cannot be depicted as no data about them are stored in Austrian registers. The European Union has addressed the question of collecting comparable information on all graduates across Europe. In a 2017 Recommendation of the European Council, the EU member states agreed to collect and gradually harmonise information on higher education graduates at EU level[14].

A 2020 report by the European Commission's Directorate-General Education, Youth, Sport and Culture (DG EAC) analysed member states' established systems for tracking higher education and vocational education and training graduates[15]. The report found that two thirds of the member states already have tracking systems in place, data collection methods, however, vary widely. The ongoing reforms seem to indicate a rise in the use of administrative data and a tendency to combine these with survey data (such as from graduate surveys). DG EAC assigned Austria to the category of countries that already meet most of the Commission's benchmark criteria.

The 2018 EUROGRADUATE survey, which was a pilot transnational graduate survey, collected data of graduates from eight member states. They were surveyed on study duration, labour market entry and civic engagement. DG EAC published a further report detailing its research design, implementation and outcomes[16].

There are plans for a "EUROGRADUATE survey 2022" based on the two reports mentioned. It will cover the graduate cohorts of 2020/2021 and 2016/2017 to survey graduates one and five years after they have completed their studies. According to the European Commission, already 18 member states, among them Austria, have expressed interest in being included. There are plans to implement an EU-wide graduate tracking system based on administrative data by 2030.

Thanks to the cooperation of Austrian universities and Statistics Austria, Austria is excellently prepared for participating in this future European graduate tracking system.

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H1209(01)&from=EN
[15] https://op.europa.eu/en/publication-detail/-/publication/93231582-a66c-11ea-bb7a-01aa75ed71a1
[16] https://op.europa.eu/en/publication-detail/-/publication/51f88c2e-a671-11ea-bb7a-01aa75ed71a1/language-en

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Abbreviations

AMS	Public Employment Service
ATRACK	Graduate Tracking
BSR	Register of Educational Attainment
DG EAC	Directorate-General Education, Youth, Sport and Culture of the European Commission
DV	Main Association of Austrian Social Security Institutions
EM	Employment
EU	European Union
FH	University of applied sciences
ISCED	International Standard Classification of Education
LMST	Labour market status
ÖNACE	Austrian classification of economic activities
PH	University college of teacher education
POPREG	Population statistics of Statistics Austria
bPIN official statistics	branch-specific personal identification number
UR	Business register
WP	Work package
ZMR	Central Population Register

Appendix

Particularities regarding data preparation

The following explanations detail further particularities regarding data preparation (also see chapter 2.3 on this topic):

Main Association of Austrian Social Security Institutions

The Main Association of Austrian Social Security Institutions' insurance history data contain insurance information such as employments, pensions, etc.

In these data, cadre training is sometimes saved as time served in the framework of compulsory military service. This is why compulsory military service with a duration of a maximum of 31 days is re-coded to "weapons/cadre training". If the duration exceeds 190 days, it is coded as employment.

The labour market status of active employees is adjusted based on the working time stated on their payslips. The categories used are full-time, part-time and unknown.

According to the International Labour Organization's criteria, persons who are not economically active may still be classified as employed but temporarily absent. Periods of temporary absence are determined based on whether the person was employed before the respective episode. Moreover, different limits apply to the maximum duration of the absence. It is based on the maximum duration for which emoluments are paid out and/or, if applicable, the maximum duration of protection against dismissal. If a person was employed directly before receiving sickness benefits and received these benefits for a maximum of 91 days, the entire episode counts as temporary absence. If a person received sickness benefits for more than 91 days, the episode is divided and only the first 91 days count as temporary absence. From day 92, the respective person's labour market status is "sickness benefits/sick leave no employment and/or uncertain" for the remaining period. To distinguish temporary absences from other absences without employment, the following rules apply:

- **Maternity benefits/maternity leave**: If a person was not employed on the day before receiving the first maternity benefit, their labour market status is "maternity leave, parental leave no employment and/or uncertain". If a person receives maternity benefits for more than 350 days, the episode is divided: the labour market status for

the episode as of day 351 is “maternity leave, parental leave no employment and/or uncertain”.

- **Childcare benefits/parental leave**: Successive episodes during which a person receives maternity and childcare benefits are combined. If a person was not employed on the day before the relevant episode started, their labour market status is “maternity leave, parental leave no employment and/or uncertain”. If the episode lasts longer than 730 days after the birth of the (last) child, the episode is divided: their labour market status for the episode as of day 731 is “maternity leave, parental leave no employment and/or uncertain”.

- **Family leave**: If a person was not employed on the day before the relevant episode started, their labour market status is “maternity leave, parental leave no employment and/or uncertain”.

- **Rehabilitation leave**: If a person was not employed on the day before going on rehabilitation leave, their labour market status is “rehabilitation leave no employment and/or uncertain”.

- **Weapons/cadre training**: If a person was not employed on the day before starting weapons/cadre training, their labour market status is “weapons/cadre training no employment and/or uncertain”.

- **Sickness benefits/sick leave**: If a person was not employed on the day before receiving sickness benefits, their labour market status is “sickness benefits/sick leave no employment and/or uncertain”. If the person receives sickness benefits for more than 91 days, the episode is divided: their labour market status for the period as of day 92 is “sickness benefits/sick leave no employment and/or uncertain”.

- **Continuing education allowance/educational leave**: If a person was not employed on the day before receiving the first continuing education allowance, their labour market status is “continuing education allowance/educational leave no employment and/or uncertain”. If they receive continuing education allowance for more than 365 days, the episode is divided: their labour market status for the episode as of day 366 is “continuing education allowance/educational leave no employment and/or uncertain”.

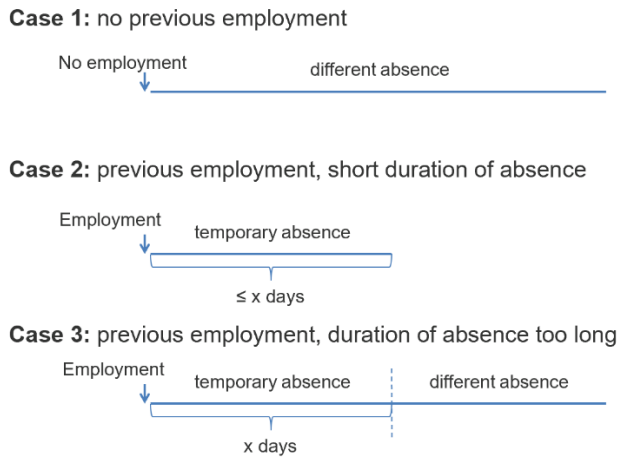
- **Family hospice leave**: If a person was not employed on the day before going on family hospice leave, their labour market status is “family hospice leave/care leave no employment and/or uncertain”. If the family hospice leave lasts longer than 182 days, the episode is divided: their labour market status for the episode as of day 183 is then “family hospice leave/care leave no employment and/or uncertain”.

- **Care leave**: If a person was not employed on the day before going on care leave, their labour market status is “family hospice leave/care leave no employment and/or uncertain”. If the person is on care leave for more than 91 days, the episode is divided: their labour market status for the period as of day 92 is then “family hospice leave/care leave no employment and/or uncertain”.

- **Type of leave unknown (e.g. leaves taken by civil servants)**: If a person was not employed on the day before going on leave, their labour market status is “other absences no employment and/or uncertain”. If the leave lasts longer than 365 days, the episode is divided: their labour market status for the episode as of day 366 is “other absences no employment and/or uncertain”.

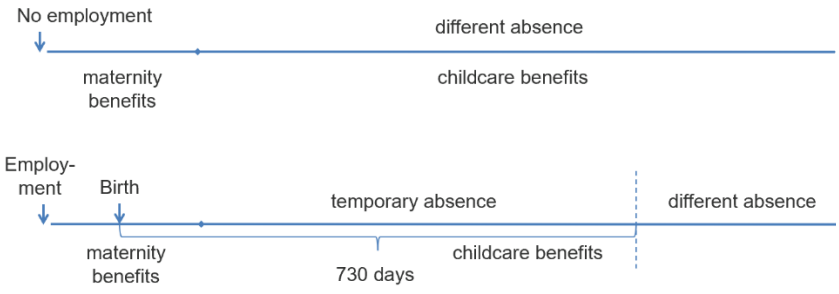
Schematic overview of the rules:

Figure 15: Schematic overview of rules for distinguishing temporary absences from other absences without employment



Source: STATISTICS AUSTRIA, Graduate Tracking

Figure 16: Schematic representation of the special case of parental leave



Source: STATISTICS AUSTRIA, Graduate Tracking

Public Employment Service (AMS)

The groups of people registered as unemployed with the AMS include unemployed people, people looking for apprenticeship positions or work and people enrolled in training measures offered by the AMS.

The labour market status of episodes is set to “Other AMS registration” if the apprenticeship search is not readily available. An automatic check is carried out to verify whether a person registered as unemployed is simultaneously entitled to pension benefits or a respective advancement according to their insurance history data. If periods of unemployment do not fully coincide with the entitlement to parallel pension benefits or advance pension benefits, they are re-coded to “Other AMS registration”.

Central Population Register (ZMR)

The ZMR includes all times for which a main residence was registered. Gaps between registrations of up to seven days are deleted. If there are larger gaps between two registrations, artificial absence episodes are created.

In education

Information on enrolment in a formal educational institution is available for the academic years of 2008/2009 up to winter semester 2019/2020. To output the period in which a person attended school or university, the start date is set to 1 September and the end date to 31 January in the case of winter semesters and to 1 January and 30 June for summer semesters. As soon as there are data regarding an ongoing education in the following winter semester (also applies to degree programme or university changes), the end date of the summer semester is extended to 31 August. This is done because students keep their student status also throughout the summer break. If a graduation is registered in the course of a semester, the graduation date is used as the end date. If students take a break from their studies due to important reasons (such as the birth of a child) but stay enrolled, they are not considered as “in education” during the time they are on leave.

Characteristics' attributes

Duration until first employment

The duration until a graduate finds their first job is only displayed once the data allow for an observation period of a full two years. The current data cubes contain data on employment up to late October 2020. For graduations and dropouts in the academic year of 2018/2019, the duration until the subjects found their first job is not yet displayed.

The attributes are classified as follows:

Start of first employment before graduation/dropout
up to 1 month
1 to less than 2 months
2 to less than 3 months
3 to less than 4 months
4 to less than 5 months
5 to less than 6 months
6 to less than 7 months
7 to less than 8 months
8 to less than 9 months
9 to less than 10 months
10 to less than 11 months
11 to less than 12 months
12 to less than 24 months
No first employment in Austria within 2 years after graduation/dropout
Observation period partly or fully in the future

Number of employers within the first three years after graduation/dropout

The number of employers is only displayed once the data allow for an observation period of a full three years. The current data cube contains data on employment up to late October 2020. The number of employers for graduates and dropouts in the academic years of 2017/2018 and 2018/2019 are not displayed yet.

The attributes are classified as follows:

No employment in Austria within 3 years after graduation/dropout
1 employer within 3 years after graduation/dropout
2 employers within 3 years after graduation/dropout
3 employers within 3 years after graduation/dropout
4 or more employers within 3 years after graduation/dropout
Observation period partly or fully in the future

Parallel status in education on the reference date

Not all reference dates are available for all graduate cohorts. In the current data cubes, information on education is available for the academic years from 2008/2009 up to winter semester 2019/2020. The following figure shows on which reference dates information regarding education is available.

Figure 17: Availability of information on education per academic year

Overview of reference dates for which information on "parallel status in education" is available

Academic year of graduations/dropouts ↓	Education information available for academic years: 2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
	reference days											
2008/2009	36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT			
2009/2010		36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT		
2010/2011			36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT	
2011/2012				36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT
2012/2013					36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT	
2013/2014						36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT
2014/2015							36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT
2015/2016								36M BEF	24M BEF	12M BEF	0M	12M AFT
2016/2017									36M BEF	24M BEF	12M BEF	0M
2017/2018										36M BEF	24M BEF	12M BEF
2018/2019											36M BEF	24M BEF

Academic year of graduations/dropouts ↓	Education information available for academic years: 2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
	reference days											
2008/2009												
2009/2010												
2010/2011												
2011/2012												
2012/2013												
2013/2014												
2014/2015												60M AFT
2015/2016												60M AFT
2016/2017												36M AFT
2017/2018												24M AFT
2018/2019												12M AFT

Academic year of graduations/dropouts ↓	Education information available for academic years: 2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
	reference days											
2008/2009												
2009/2010												
2010/2011												
2011/2012												
2012/2013												
2013/2014												
2014/2015												
2015/2016												60M AFT
2016/2017												60M AFT
2017/2018												60M AFT
2018/2019												60M AFT

Explanation of colours:

36M BEF... no information on the reference date of 36 months before graduation/dropout is available for any graduations/dropouts of the respective academic year

36M AFT ... information on the reference date of 36 months before graduation/dropout is available for some graduations/dropouts of the respective academic year

36M BEF ... information on the reference date of 36 months before graduation/dropout is available for all graduations/dropouts of the respective academic year

Source: STATISTICS AUSTRIA, Graduate Tracking

The attributes are classified as follows:

In education or training	**Doctorate/PhD**	**Doctorate/PhD**
	Master's/diploma programme	**Master's/diploma programme uni**
		Master's/diploma programme PH
		Master's/diploma programme FH
	Bachelor's programme	**Bachelor's programme uni**
		Bachelor's programme PH
		Bachelor's programme FH
	University continuing education and training programme/other education or training	**University continuing education and training programme**
		Other education or training
No information on education available	**No information on education available**	**No information on education available**

Total number of employments on the reference date

Not all reference dates are available for all graduate cohorts. The current data cubes contain data on employment up to late October 2020.

The attributes are classified as follows:

No employment information on the reference date
1 employment on the reference date
2 parallel employments on the reference date
At least 3 parallel employments on the reference date
No data available for the reference date

Full-time/part-time on the reference date

Not all reference dates are available for all graduate cohorts. The current data cubes contain payslip data from 2006 to 2019. The following figure shows an overview of the reference dates for which payslip data are available:

Figure 18: Availability of payslip information per year

Overview of reference dates for which information on "full-time/part-time" is available

Academic year of analysed graduations/dropouts	Payslip information available for years: 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	reference days													
2008/2009	36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT					
2009/2010		36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT				
2010/2011			36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT			
2011/2012				36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT		
2012/2013					36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT	
2013/2014						36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT		60M AFT
2014/2015							36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT	
2015/2016								36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT	36M AFT
2016/2017									36M BEF	24M BEF	12M BEF	0M	12M AFT	24M AFT
2017/2018										36M BEF	24M BEF	12M BEF	0M	12M AFT
2018/2019											36M BEF	24M BEF	12M BEF	0M

Explanation of colours:

36M BEF... no information on the reference date of 36 months before graduation/dropout is available for any graduations/dropouts of the respective academic year

36M AFT ... information on the reference date of 36 months before graduation/dropout is available for some graduations/dropouts of the respective academic year

36M BEF ... information on the reference date of 36 months before graduation/dropout is available for all graduations/dropouts of the respective academic year

Source: STATISTICS AUSTRIA, Graduate Tracking

For close to 5 % of employees, there is no payslip information: they are assigned to the "unknown" category. If the labour market status does not specify an employment, the category "not applicable" is assigned to the person.

The attributes are classified as follows:

Full-time
Part-time
Unknown
No data available for the reference date
Not applicable

Inflation-adjusted gross income from employment on the reference date

Not all reference dates are available for all graduate cohorts. The current data cubes contain payslip data from 2006 to 2019 and data on the amount of income upon which social security contributions are based up to late October 2020.

The attributes are classified as follows:

less than € 2 300	**less than € 1 700**
	€ 1 700 to less than € 2 000
	€ 2 000 to less than € 2 300
€ 2 300 to less than € 3 000	**€ 2 300 to less than € 2 600**
	€ 2 600 to less than € 2 800
	€ 2 800 to less than € 3 000
€ 3 000 to less than € 3 700	**€ 3 000 to less than € 3 200**
	€ 3 200 to less than € 3 400
	€ 3 400 to less than € 3 700
€ 3 700 and more	**€ 3 700 to less than € 4 000**
	€ 4 000 and more
Unknown	**Unknown**
No data available for the reference date	**No data available for the reference date**
Not applicable	**Not applicable**

Design of data cubes

Attribute Group	Attributes
Values	Graduations Volume of days in employment in the 2nd year BEFORE graduation Volume of days in employment in the 1st year BEFORE graduation Volume of days in employment in the 1st year AFTER graduation Volume of days in employment in the 3rd year AFTER graduation Volume of days in employment in the 5th year AFTER graduation Dropouts Volume of days in employment in the 2nd year BEFORE dropout Volume of days in employment in the 1st year BEFORE dropout Volume of days in employment in the 1st year AFTER dropout Volume of days in employment in the 3rd year AFTER dropout Volume of days in employment in the 5th year AFTER dropout
Personal/ academic characteristics	University of graduation or dropout Academic year of graduation or dropout Degree type of graduation or dropout Study index of completed or non-completed studies ISCED Field 2013 (training field) of completed or non-completed studies Filter joint studies Filter first degree Filter multiple degrees Filter further education after graduation Filter equivalent graduation at dropout Filter study duration Filter study abroad Entitlement to study Highest level of education in the parental household Gender Age at date of graduation or dropout Citizenship at the time of the graduation or dropout
Volume of work days	Number of days in employment in the 2nd year BEFORE graduation/dropout Number of days in employment in the 1st year BEFORE graduation/dropout Number of days in employment in the 1st year AFTER graduation/dropout Number of days in employment in the 3rd year AFTER graduation/dropout Number of days in employment in the 5th year AFTER graduation/dropout
Additional attributes on employment	Duration until 1st employment Number of employers within 3 years of graduation/dropout
Characteristics at 36 months BEFORE graduation/dropout	Labour market status 36 months BEFORE graduation/dropout Parallel status in education 36 months BEFORE graduation/dropout Total number of employments 36 months BEFORE graduation/dropout Full-time/part-time 36 months BEFORE graduation/dropout ÖNACE of the local unit of employment 36 months BEFORE graduation/dropout Inflation adjusted gross income from employment 36 months BEFORE graduation/dropout
Characteristics at 24 months BEFORE graduation/dropout	Labour market status 24 months BEFORE graduation/dropout Parallel status in education 24 months BEFORE graduation/dropout Total number of employments 24 months BEFORE graduation/dropout Full-time/part-time 24 months BEFORE graduation/dropout ÖNACE of the local unit of employment 24 months BEFORE graduation/dropout Inflation adjusted gross income from employment 24 months BEFORE completion/dropout

Characteristics at 12 months BEFORE graduation/dropout	Labour market status 12 months BEFORE graduation/dropout Parallel status in education 12 months BEFORE graduation/dropout Total number of employments 12 months BEFORE graduation/dropout Full time/part time 12 months BEFORE graduation/dropout ÖNACE of the local unit of employment 12 months BEFORE graduation/dropout Inflation adjusted gross income from employment 12 months BEFORE completion/dropout
Characteristics at the time of graduation/dropout	Labour market status at the time of graduation/dropout Parallel status in education at the time of graduation/dropout Total number of jobs at the time of graduation/dropout Full-time/part-time at the time of graduation/dropout ÖNACE of the local unit of employment at date of graduation/dropout Inflation adjusted gross income from employment at the time of graduation/dropout
Characteristics at 6 months AFTER graduation/dropout	Labour market status 6 months AFTER graduation/dropout Parallel status in education 6 months AFTER completion/dropout Total number of jobs 6 months AFTER graduation/dropout Full-time/part-time 6 months AFTER graduation/dropout ÖNACE of the local unit of employment 6 months AFTER graduation/dropout Inflation adjusted gross income from employment 6 months AFTER graduation/dropout
Characteristics at 12 months AFTER graduation/dropout	Labour market status 12 months AFTER graduation/dropout Parallel status in education 12 months AFTER completion/dropout Total number of jobs 12 months AFTER graduation/dropout Full-time/part-time 12 months AFTER graduation/dropout ÖNACE of the local unit of employment 12 months AFTER graduation/dropout Inflation adjusted gross income from employment 12 months AFTER graduation/dropout
Characteristics at 18 months AFTER graduation/dropout	Labour market status 18 months AFTER graduation/dropout Parallel status in education 18 months AFTER completion/dropout Total number of jobs 18 months AFTER graduation/dropout Full-time/part-time 18 months AFTER graduation/dropout ÖNACE of the local unit of employment 18 months AFTER graduation/dropout Inflation adjusted gross income from employment 18 months AFTER graduation/dropout
Characteristics at 24 months AFTER graduation/dropout	Labour market status 24 months AFTER graduation/dropout Parallel status in education 24 months AFTER completion/dropout Total number of jobs 24 months AFTER graduation/dropout Full-time/part-time 24 months AFTER graduation/dropout ÖNACE of the local unit of employment 24 months AFTER graduation/dropout Inflation adjusted gross income from employment 24 months AFTER graduation/dropout
Characteristics at 36 months AFTER graduation/dropout	Labour market status 36 months AFTER graduation/dropout Parallel status in education 36 months AFTER completion/dropout Total number of jobs 36 months AFTER graduation/dropout Full-time/part-time 36 months AFTER graduation/dropout ÖNACE of the local unit of employment 36 months AFTER graduation/dropout Inflation adjusted gross income from employment 36 months AFTER graduation/dropout
Characteristics at 60 months AFTER graduation/dropout	Labour market status 60 months AFTER graduation/dropout Parallel status in education 60 months AFTER completion/early termination Total number of jobs 60 months AFTER graduation/dropout Full-time/part-time 60 months AFTER graduation/dropout ÖNACE of the local unit of employment 60 months AFTER graduation/dropout Inflation adjusted gross income from employment 60 months AFTER graduation/dropout

Fact sheet example

Graduates in the Labour Market

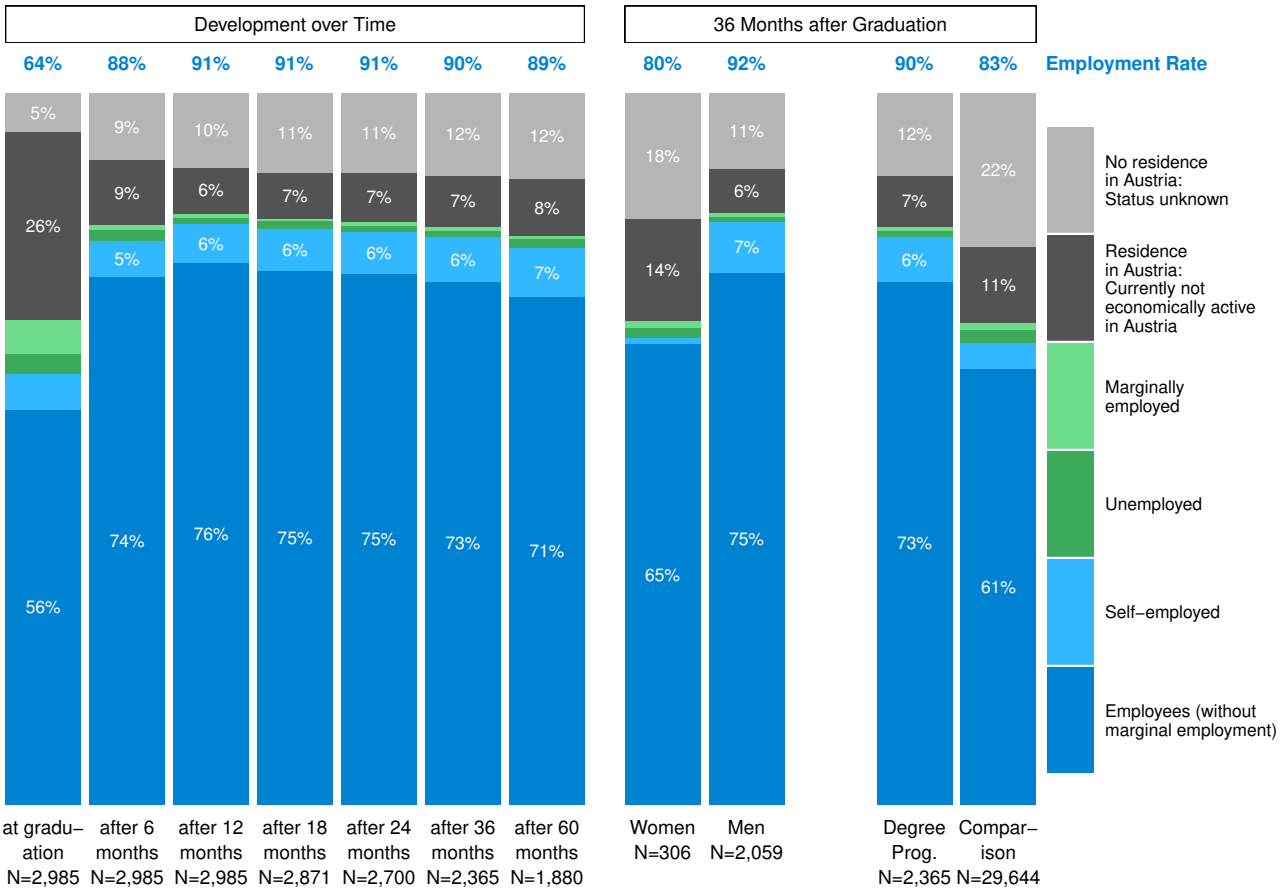
Master's Programmes **ISCED-Field of Education 'Information and Communication Technologies'**

The Fact Sheet 2021 provides systematic information about the employment status and labour market integration of graduates. The analyses focus on the professional careers of graduates up to 5 years after graduation. The underlying information is provided by register-based data from Statistics Austria. **For further information (including definitions of terms and data protection), please see page 4.**

The subsequent diagrams show results from the following sub-areas:

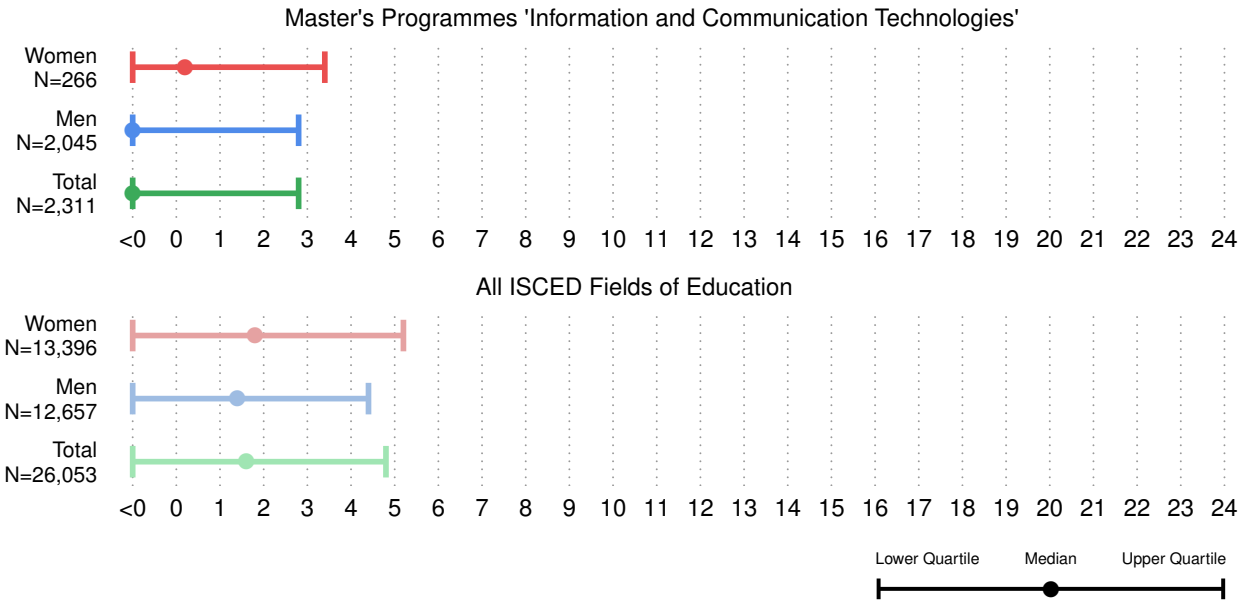
- Labour market status
- Time period until the first employment
- Top-5-sectors
- Gross monthly income for full-time employees

Status at the Austrian Labour Market



73% of the 2,365 graduates are employees 36 months after graduating. 6% are self-employed. The employment rate amounts to 90%, it is calculated as the share of employees and persons in self-employment in the entire cohort of graduates, not including the group 'No residence in Austria' (it is unknown if they are economically active outside of Austria). The comparison group consists of all persons who graduate from a Master's programme at a public Austrian university.

Time Period until the First Employment in Months

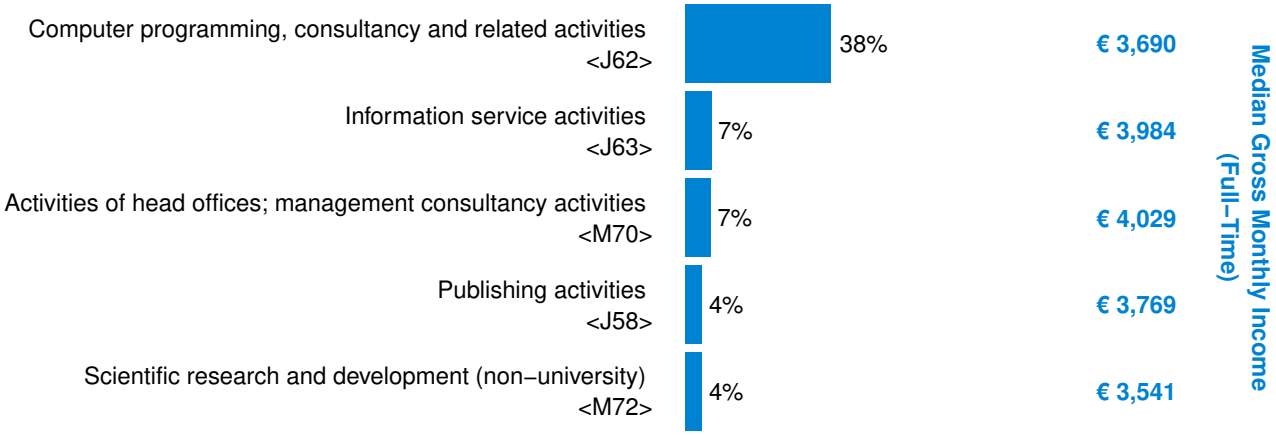


On average (median), the 2,311 graduates take up their first employment already before graduation (median = '<0'). Therefore, the lower quartile also falls in the time before graduation. The upper quartile is 3 month(s). Hence, 75% of graduates take up their first employment within this time after graduation.

An employment is counted as the first employment if it is still valid on the reference day 6 months after graduation (or begins after that day but within 2 years) and if it lasts for at least 3 months.

Within the first 3 years after graduation, the graduates are employed by on average 1.3 employers in Austria (Women: 1.2, Men: 1.3).

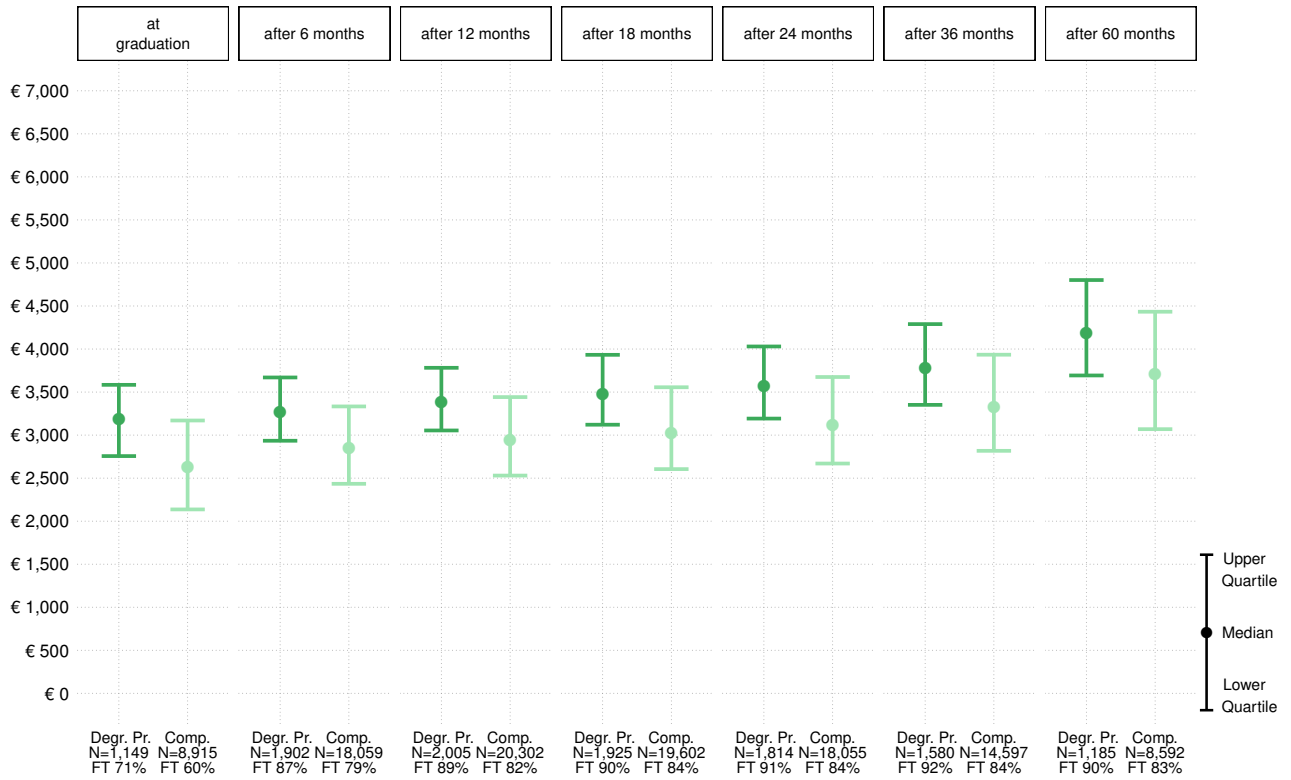
Top–5–Sectors 3 Years after Graduation



In total, 1,887 graduates are employed 3 years after graduating. 38% of the graduates work in the sector 'Computer programming, consultancy and related activities' - their average (median) gross monthly income (in full-time employment) is €3,690. The classification is based on ÖNACE 2008 and refers to the main economic activity of the local unit of employment, or of the enterprise.

Gross Monthly Income for Full–Time Employees

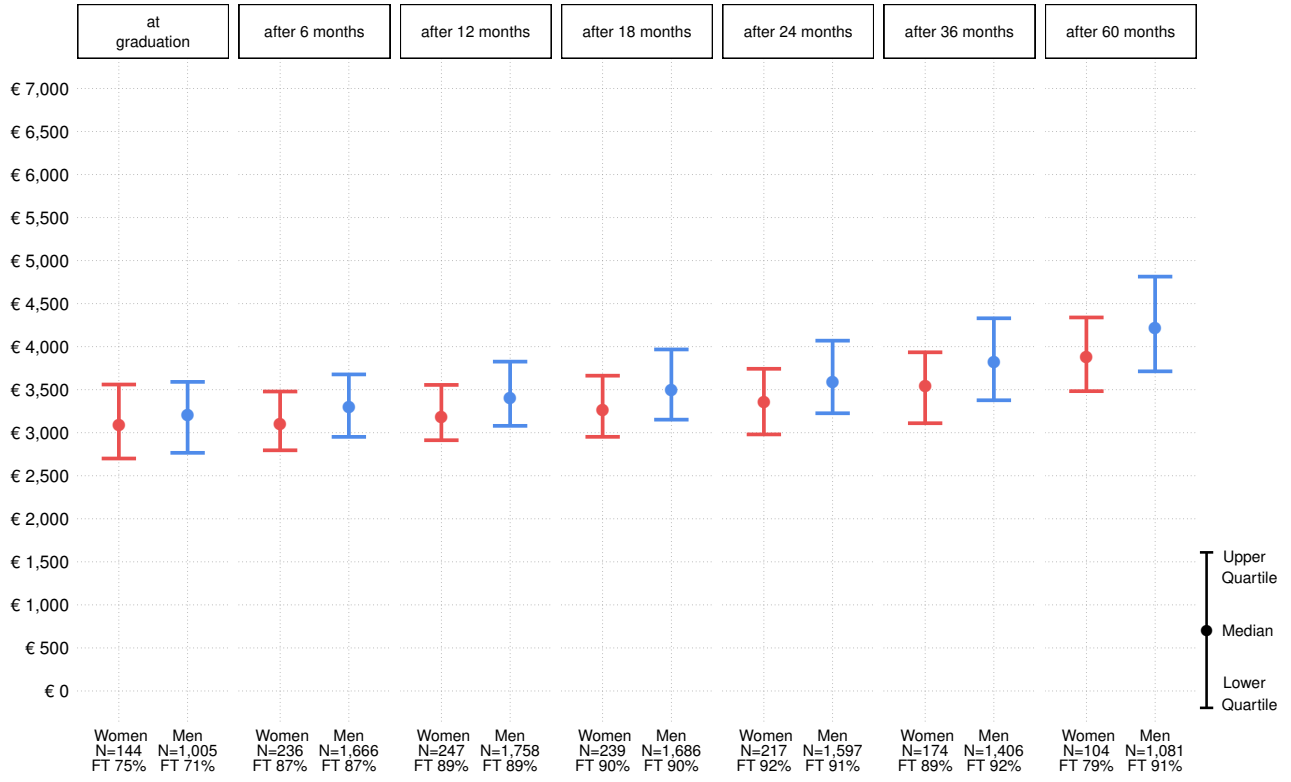
Austrian–wide comparison



36 months after graduation, 1,580 graduates are full-time (FT) employees (group 'Degree Programme') - that is 92% of all employees at that reference date. Their gross monthly income is €3,781 on average (median). The comparison group consists of all persons who graduate from a Master's programme at a public Austrian university.

Gross Monthly Income for Full–Time Employees

by gender



36 months after graduation, 174 female graduates are full-time (FT) employees - those are 89% of all female graduates who are employees at that reference date. The gross monthly income of the female graduates is €3,542 on average (median). In comparison, the gross income of the male graduates is €3,825 on average.

Explanations

The **population** includes graduates of a Master's programme relating to the ISCED field of education 'Information and Communication Technologies' at a public Austrian university in the academic years from 2008/09 to 2018/19. Please note that some reference dates for the most recent graduation years still lie ahead. Therefore, the number of graduations covered may vary. The analyses only consider graduates who are under 35 years at the time of graduation. Persons who have already obtained an equivalent or higher-level degree or who are enrolled in another degree after graduation are excluded. The comparison group consists of the graduates of a Master's programme at a public Austrian university.

The **data body** comprises data on formal education, labour market career and income. The data is derived from the register of currently economically active persons, the database for the Register-based Census and the Register-based Labour Market Statistics of Statistics Austria. When linking the registers, full compliance with data protection is ensured. By using the branch-specific personal identification number for official statistics (bPIN-OS), it is not possible to identify individual persons.

Labour Market Status: For building the labour market status, the processed data is linked and rendered free from any overlapping. For each day, an unambiguous labour market status is assigned to each person. Active employment dominates over temporary absences (e.g. maternity, parental or educational leave), followed by marginal employment, unemployment and additional education and training periods. If employments overlap, full-time employment is higher up in the hierarchy than part-time, and if there are several equivalent employments at the same time, the employment with the highest income is considered in the analyses. Compulsory/voluntary military service, temporary absences and marginal employment are not counted as active employments in this project. Persons who are registered at the Public Employment Service Austria (AMS) (i.e. persons registered as unemployed (AL), apprenticeship-seekers (LS), persons in training (SC)) count as unemployed. All persons who are neither employed, nor marginally employed, nor unemployed are considered as 'Currently not economically active persons', that includes compulsory/voluntary military service, temporary absences, persons in education or persons receiving a pension. Persons who are neither employed, unemployed, nor in education or who are not otherwise insured for social security and do not have their main residence in Austria, are assigned the labour market status 'No residence in Austria'. The reference day for the labour market status is calculated from the exact graduation day by adding the correspondent number of months (e.g. labour market status 6 months after graduation: day of graduation 2010/06/30 + 6 months = 2010/12/30).

Income: The income from employment is calculated from the gross income, not including special payments (such as holiday and Christmas bonuses). This is used to calculate a daily income, which is then multiplied by 365/12 to project the monthly income. To ensure comparability of the income between the years, the income data is weighted using the price level of 2019 of the consumer price index (CPI).

Full-Time: The annual payslip of the year, in which the reference date falls, determines whether an employment was full-time or part-time.

ISCED Fields of Education: The International Standard Classification of Education (ISCED) of the UNESCO classifies different fields of education (ISCED-F 2013). All degree programmes are allocated to one of these fields of education. For further information, please visit the website of STATISTICS AUSTRIA: http://www.statistik.at/web_en/classifications/index.html

ÖNACE 2008: The top-5-sectors in this analysis are based on the ÖNACE 2008 - the Austrian version of the international NACE classification of economic activities. For employed persons, the allocation is made according to the local unit of employment, or of the enterprise. For further information, please visit the website of STATISTICS AUSTRIA: http://www.statistik.at/web_en/classifications/index.html

Quartiles divide ordered data sets into four equal parts. The median is the value in the middle. In the case of income data, for example, 50% of the persons lie above this median value and 50% below. The lower quartile means that a quarter of the values lies below the quartile value and that three quarters lie above it. Vice versa, three quarters of the values lie below the upper quartile and one quarter lies above it. The median is more resistant to extreme scores that can occur in the case of very uneven spreads.

For data privacy protection reasons, the statistical disclosure control method of 'Target Swapping' has been used. Therefore, in particular for cell values <= 30, no reliable assertions can be made. For sample sizes <=30, the analysis does not list any values (**n.a.**).