

The *Human Resources in Research Flanders*. Unique population data on researchers and academic careers at Flemish universities since 1991

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THE HUMAN RESOURCES IN RESEARCH FLANDERS: WHAT DATA ARE COLLECTED AND ABOUT WHO?

The *Human Resources in Research Flanders (HRRF)* is one of the databases through which ECOOM HR in R&D supports the Flemish Government in terms of optimizing its science policy. More specifically, the *HRRF* is an administrative database that monitors career-related indicators for all researchers who have been affiliated with at least one of the five Flemish universities since 1991: the University of Antwerp, Vrije Universiteit Brussel, Ghent University, Hasselt University and KU Leuven. Every researcher with an appointment at a university and/or an enrolment as a doctoral (PhD) researcher is included in the *HRRF*. At present, the *HRRF* contains data on more than 90,000 individual researchers. The *HRRF* is a database covering the entire population of researchers at Flemish universities since 1991 and, therefore, does not represent a sample.

In addition to socio-demographic information, the *HRRF* contains information about the university with which the researcher is affiliated, the scientific discipline in which the researcher carries out research, as well as various career characteristics such as employment contract, annual doctoral enrolments as a doctoral researcher and date of defense of the PhD. Such information not only facilitates the monitoring of the population of researchers at Flemish universities at a particular point in time, but also to track this population over time. This tracking enables the identification of trends at population level or within specific groups of researchers (e.g., an increasing number of international researchers or changes in the gender composition of the population of researchers with professorial status), as well as the mapping of researchers' career trajectories, even when researchers move between Flemish universities during their careers. When analyzing career trajectories, the focus may, for example, be on the duration of doctoral trajectories (*time-to-degree*) or the period between the doctoral defense and the first appointment as a professor (*time-to-promotion*). In addition to trends and career trajectories, the *HRRF* also makes it possible to determine when a researcher leaves

the Flemish academic sector. However, the *HRRF* database does not provide information on the next career step of the researcher, as it contains no information on the organization, sector or country to which the researcher moves after leaving the Flemish academic sector.

HOW DOES THE HRRF DIFFER FROM VLIR STAFF STATISTICS AND THE HIGHER EDUCATION DATABASE?

Information on researchers in Flanders is provided not only by the *HRRF*, but also by the Flemish Interuniversity Council (VLIR) and the Flemish Ministry of Education and Training (Vlaams Ministerie van Onderwijs en Vorming). The coverage of and the analytical possibilities offered by these databases differ substantially from those of the *HRRF*.

The data on staff employed at Flemish universities collected by VLIR, from now on referred to as *VLIR Staff Statistics*, provide a snapshot of the situation on February 1st of a given year. These data only concern staff being appointed by at least one Flemish university. Doctoral researchers without such appointment are therefore not included in the *HRRF*. The most recent *HRRF* data show that approximately three out of ten doctoral researchers in Flanders are not appointed by a Flemish university. Many of these doctoral researchers without such appointments are international researchers. In addition to differences in coverage, the *VLIR Staff Statistics* and the *HRRF* also differ in their ability to follow individual researchers over time. The *VLIR Staff Statistics* do not allow information on an individual in year X to be linked to information on the same individual in year X+1. In contrast, the *HRRF* makes such linkages at the individual level, making it possible to follow the career of a researcher over time, even when that researcher moves between Flemish universities. Apart from the *HRRF* and the *VLIR Staff Statistics*, the Flemish Ministry of Education and Training also collects data through the *Higher Education Database* (DHO). This database collects information on students in higher education, including doctoral researchers. Unlike the *HRRF*, the *DHO* contains no information allowing to distinguish between doctoral researchers with an appointment at a university and doctoral researchers without

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such an appointment. Furthermore, the DHO also does not contain information on senior researchers (unless these individuals are also registered as students).

DATA COLLECTION: A COMPLEX ENVIRONMENT WITH MANY RULES AND STAKEHOLDERS

The development and maintenance of the *HRRF* database are entrusted by the Flemish Government to ECOOM HR in R&D and formalized with successive five-year ECOOM agreements. The current ECOOM agreement ("ECOOM covenant") covers the period from January 1st 2024 until December 31st 2028.

Data collection involves numerous stakeholders, each with a specific role and operating within the limits imposed by current privacy legislation. Since 2018, this legislation has been the General Data Protection Regulation (GDPR; in Dutch: 'Algemene Verordening Gegevensbescherming, AVG'), which also specifies sanctions in cases of non-compliance. Because both the rules and, occasionally also the stakeholders involved have changed since the start of the *HRRF*, the legal and administrative procedures, the underlying documents and agreements between parties involved have also changed over time. Every new *HRRF* update and every new ECOOM agreement requires new applications, approvals and agreements. Each update therefore implies substantial administrative work, as well as ongoing monitoring and adaptation to legal, institutional and procedural changes. This requires considerable processing time. The *HRRF* privacy statement is available on the [ECOOM website](#).

Currently, complementing ECOOM HR in R&D, the following stakeholders are involved in *HRRF* data collection: the Flemish Department of Work, Economy, Science, Innovation and Social Economy ('Departement Werk, Economie, Wetenschap, Innovatie en Sociale Economie, WEWIS'), the five Flemish universities, Statistics Belgium (Statbel/ADS), and the Service for Access to the National Register ('Dienst Toegang tot het Rijksregister'). From a legal perspective, Ghent University (to which ECOOM HR in R&D belongs) and WEWIS act as joint data controllers. Statistics Belgium acts as the Trusted Third Party (TTP).

DATA COLLECTION: TWO PHASES OF DATA TRANSFER

The construction and updating of the *HRRF* always takes place in two phases. In the first phase, data are transferred from the five Flemish universities (first sender of data) to Statbel/ADS (first recipient of data). In the second phase, data are transferred from Statbel/ADS (second sender of data) to ECOOM HR in R&D (second recipient of data). Appendix 1 provides a visual representation of the *HRRF* data flow.

The first phase starts with a (biennial) request from ECOOM HR in R&D to the Flemish universities to provide specific data to Statbel/ADS. These data concern: (1) all employed researchers; and (2) all doctoral researchers enrolled in one or both consecutive academic years. Table 1 provides an overview of data requested.

Table 1. Data requested by ECOOM HR in R&D for an *HRRF* update, to be provided by the Flemish universities to STATBEL/ADS

All employed researchers	All enrolled doctoral researchers in one or both consecutive academic years
national Register (RR-) number and/or BIS number personnel number and/or student number year and month of birth place of birth nationality sex	
start and end date of appointment	enrolment dates
funding type	
research discipline	research discipline
position and grade	date of PhD defense
organizational unit/department	whether the doctorate is interdisciplinary and/or a joint doctorate
appointment percentage	
whether the researcher is member of the integration framework (since 2013)	

All data requested are encrypted before being transferred to Statbel/ADS. Encryption means that only the sender and recipient possess 'the key' required to lock and unlock the transmitted data. Data is unreadable to anyone who doesn't possess this key.

Upon receipt of the data supplied by the universities, Statbel/ADS performs validation checks and, if necessary, error corrections. Statbel/ADS validates all data supplied by the universities by comparing the National Register (RR) numbers and BIS numbers contained in those data with the numbers in the National Register. Statbel/ADS obtains access to the National Register only after a separate request submitted by ECOOM HR in R&D has been approved by the Service for Access to the National Register. If errors are detected in the data supplied by the universities, the correct National Register number or BIS number is retrieved on the basis of the supplied name, date of birth and place of birth. Following error correction by Statbel/ADS ECOOM HR in R&D may develop a database in which the data for each individual is stored in a single data record. Subsequently, each individual is assigned a unique alphanumeric identification code: the so-called *RandomID*. Normally (that is, if no error occurs, see text above), the *RandomID* remains permanently assigned to an individual and makes it possible to link information collected about that same individual at different moments in time. The *RandomID* also facilitates the correction of errors which may occur because a National Register number or BIS number has changed since the previous data delivery, for example in the case of gender reassignment or naturalization of the individual. Finally, the *RandomID* also makes it possible to modify situations in which (doctoral) researchers at a university become, at a given point in time, members of staff. As a consequence, the student number is replaced by a personnel number.

After linking and correcting the individual-level data, Statbel/ADS prepares the data transfer to ECOOM HR in R&D. In practice, this means that

Statbel/ADS creates two databases. In the first database, all supplied and corrected data relating to the researchers is stored, including all information allowing for identification, such as a person's surname, first name, personnel number, student number, National Register (RR) number and/or BIS number. ECOOM HR in R&D never gets access to this first database. In the second database, Statbel/ADS ensures that all information allowing for identification is made 'unreadable' for ECOOM HR in R&D, more specifically such information is replaced by meaningless, pseudonymized code. Only Statbel/ADS possesses the key required to convert these pseudonymized codes back into the original information allowing for identification. ECOOM HR in R&D therefore has access only to the pseudonymized data and the *RandomIDs*. The most important difference between pseudonymization and anonymization lies in reversibility. Under pseudonymization, direct identifiers (for example, a person's name) are replaced by a code. Anyone who possesses the key to that code can retrieve the original identifiers. Under anonymization, identifiers are not replaced by a code but are permanently removed from the dataset. Because the *HRRF* monitors individual researchers over time, only pseudonymization is possible.

DATA PROCESSING: THREE PHASES BETWEEN DATA COLLECTION AND ANALYSIS

After receiving the pseudonymized data, ECOOM HR in R&D goes through three phases of data processing.

The first phase of data processing is the linking phase. The aim of this first phase is to ensure that newly supplied data (provided by the universities via StatBEL/ADS) are added to the existing *HRRF* database and that newly supplied data relating to an individual are linked to information already available on that same individual. To complete this linking process, use is made of the *RandomIDs* and the pseudonymized National Register (RR) numbers, BIS numbers, personnel numbers and/or student numbers. Linking on the basis of *RandomIDs* and pseudonymized data is not without difficulties and may require corrections. Errors arise because each university uses its own registration system and because the data relating to one and the same individual researcher are not static and may change over time (for example, when an individual moves to another university and receives a different personnel number). As a result, the addition of newly supplied data to the existing *HRRF* database may sometimes lead to impossible combinations or errors. ECOOM HR in R&D identifies these impossible combinations or errors and carries out the necessary corrections. Illustrative situations that require particular attention in this respect are: multiple *RandomIDs* for one and the same individual researcher; multiple pseudonymized personnel numbers and/or student numbers for the same researcher (who is affiliated with only one university); one *RandomID* linked to multiple pseudonymized National Registry (RR) numbers and/or BIS numbers; or, conversely, one pseudonymized RR number, BIS number, personnel number and student number linked to multiple *RandomIDs*. If ECOOM HR in R&D detects patterns in such situations (possibly: impossible combinations or errors), these patterns are reported back to Statbel/ADS. Statbel/ADS subsequently examines

whether these patterns concern legitimate situations or are the result of registration errors made by the Flemish universities.

The second phase of data processing is the data harmonization phase. The aim of this second phase is to ensure that the categorizations used in the newly supplied data (provided by the universities via Statbel/ADS) are converted into the categorizations used within the *HRRF* database. This phase is also not without difficulties. Universities use their own institution-specific categorizations to serve their own needs (for example, statutes and job titles). These needs may change over time (for example, through the introduction of new job titles). Converting institution-specific categorizations into *HRRF* categorizations is labor intensive and requires frequent interactions between ECOOM HR in R&D and the Flemish universities. An additional complexity concerns the fact that the *HRRF* is not a static database and that categorizations within the *HRRF* may, in response to policy needs, also change over time. In 2019, for example, the *Flemish Standard Research Disciplines* (VODS) were introduced. VODS replaced the various classification schemes previously used by the FW0, FRIS and VLIR and provides a single harmonized classification based on the OECD international classification scheme for fields of research and development. Since 2019, the Flemish universities have implemented VODS in their administrative systems. Changes in *HRRF* categorizations create major discontinuities in the database, making "historical analyses" such as trend analyses or analyses of career trajectories much more difficult or even impossible. During the data harmonization phase, a further check is carried out to determine to what extent the *HRRF*, after harmonization, produces aggregate information that is comparable to the information produced by the *VLIR Staff Statistics* and the *Higher Education Database* (DHO).

The third phase of data processing is the data integration phase. The objective of this phase is to include the newly supplied data into the historical *HRRF* database and, where necessary, to remove duplicate data records. Duplicate records occur whenever universities include in newly supplied datasets information that has already been supplied as part of an earlier *HRRF* data collection round. On top of the removal of duplicate data records, the data integration phase also deals with the *HRRF* data from researchers with long-term employment, made possible through multiple (extended) contracts for which the data has been supplied in successive *HRRF* data collection rounds. For these researchers, the supplied information relating to their long-term employment is reduced within the *HRRF* to one modified and comprehensive data record containing all (including the most recent) information available for these researchers.

DATA ANALYSIS: RECURRENT MONITORING AND AD HOC ANALYSES

The *HRRF* database represents the central instrument through which ECOOM HR in R&D supports the Flemish government by monitoring careers of researchers at Flemish universities. This monitoring involves the calculation of the so-called (*HRRF*) basic indicators, which are updated periodically and made publicly available.

Complementary to recurrent policy-oriented reporting using specific sets of basic indicators, ad hoc analyses are conducted at the request of a wide range of stakeholders (e.g., government authorities, universities, parliaments and study services). Findings are also disseminated through scientific publications and presentations. All publicly available findings based on the *HRRF* can be consulted on the [ECOOM website](#). All *HRRF* analyses are reported exclusively at the aggregated level.

CONCLUSION

The *HRRF* is a unique database, both within Europe and beyond. The *HRRF* contains socio-demographic and career data on all researchers who, since 1991, have at some point been affiliated with one or more Flemish universities, with or without an appointment. This includes researchers who have obtained a doctorate (such as professors or postdoctoral researchers), researchers who are enrolled in a doctoral trajectory, and researchers who do not (at least at the moment) have ambitions to obtain a doctorate. The *HRRF* is capable of tracing a researcher's career within the Flemish academic sector from the first appointment or first enrolment as a doctoral researcher until the researcher leaves the Flemish academic sector. If, after having an academic position abroad or after having a non-academic job in Flanders, the researcher rejoins a university in Flanders, his or her career information is added again to the *HRRF*. At present, the *HRRF* contains data on approximately 90 000 researchers. As a population database, the *HRRF* is representative of the research population at the five Flemish universities and contains data dating back to 1991. Changes and trends in the composition of the research population (e.g. increases or decreases in gender equality, increases in the number of international doctoral researchers) and in academic careers can therefore be monitored closely. Useful analyses over time include, among others, the success rates of doctoral trajectories, the duration of doctoral trajectories (*time-to-degree*), and the time between obtaining a doctorate and a first appointment as a professor (*time-to-promotion*). Changes and trends observed in the composition of the research population or in academic careers may concern all researchers at the Flemish universities, or specific groups of researchers (e.g., comparing careers of female and male academics). The unique insights that the *HRRF* provides to the Flemish Government and other stakeholders are generated through a labour-intensive process within a complex environment of legal and administrative rules involving a variety of stakeholders. The labour-intensive process manifests itself in the data collection and data processing phases. Over and above the fact that each new data collection requires a series of administrative procedures and the drafting of new or amended legal documents and agreements, the roles and expectations of the stakeholders involved are subject to change over time. Furthermore, part of the labour-intensive nature of the *HRRF* lies also in the fact that universities use institution-specific classifications that were developed to meet their own needs. These classifications may differ between universities and from the classifications used in the *HRRF*, but they may also change over time within the same university as a result of changing policy needs. A

standardization of classifications across universities and across organizations such as the FWO, FRIS and VLIR would (potentially) accelerate the updating of the *HRRF*. Such standardization was introduced for the classification of research disciplines in 2019.

The *HRRF* database could provide even greater support to the Flemish Government if not only the data collection and data processing phases could be accelerated, but also if additional information could be collected on the careers of researchers who have left the Flemish universities, be it temporarily or permanently. These may include non-academic careers on the Flemish labor market, but also academic and non-academic careers abroad. Information on non-academic careers in the Flemish labor market is, among other sources, available through the Crossroads Bank for Social Security ('Kruispuntbank voor Sociale Zekerheid'). Technically speaking, it is possible to link *HRRF* data with data from the *Crossroads Bank for Social Security* through the National Register (RR) number and, in doing so, unlock a very rich source of information. Whether such linkage is also legally possible remains to be examined. In the meantime, ECOOM HR in R&D has already collected initial insights into the careers of doctorate holders who left the Flemish academic sector to work in another sector in Flanders. These careers include both R&D-related jobs and jobs in which research is not part of the job anymore. The mapping of non-academic, but also academic careers of doctorate holders in Flanders was carried out through the *PhD Career Survey* in 2017. An update of this pioneering study was not included in more recent ECOOM agreements. All findings based on the *PhD Career Survey* 2017 are available on the [ECOOM website](#).

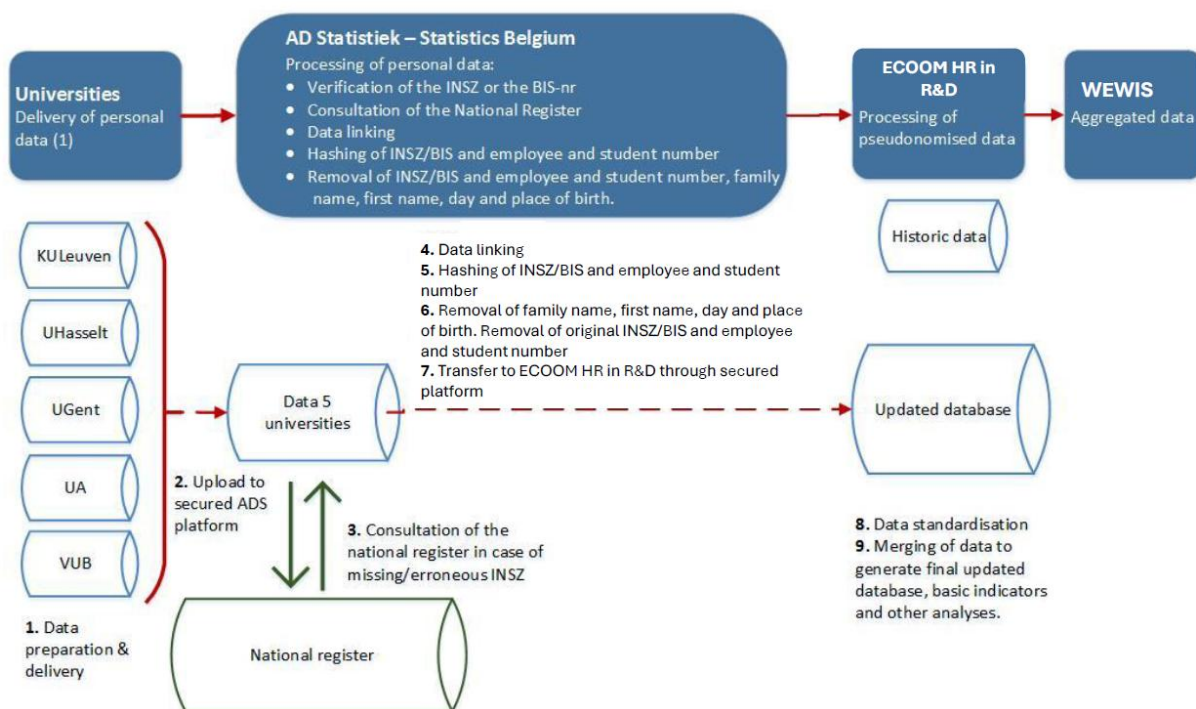
Meanwhile, at the international level interest in R&D careers outside universities has increased considerably in recent years. In 2024, for example, the European Commission and the OECD established ReICO, the [Research and Innovation Careers Observatory](#) (OECD, n.d.). Through this platform, stakeholders can access data and analyses on R&D careers in the participating countries.

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(1) Appointment data, PhD data, demographic data and data necessary for linking purposes carried out by AD Statistiek, namely first name, family name, student number, staff number, date of birth, place of birth and INSZ