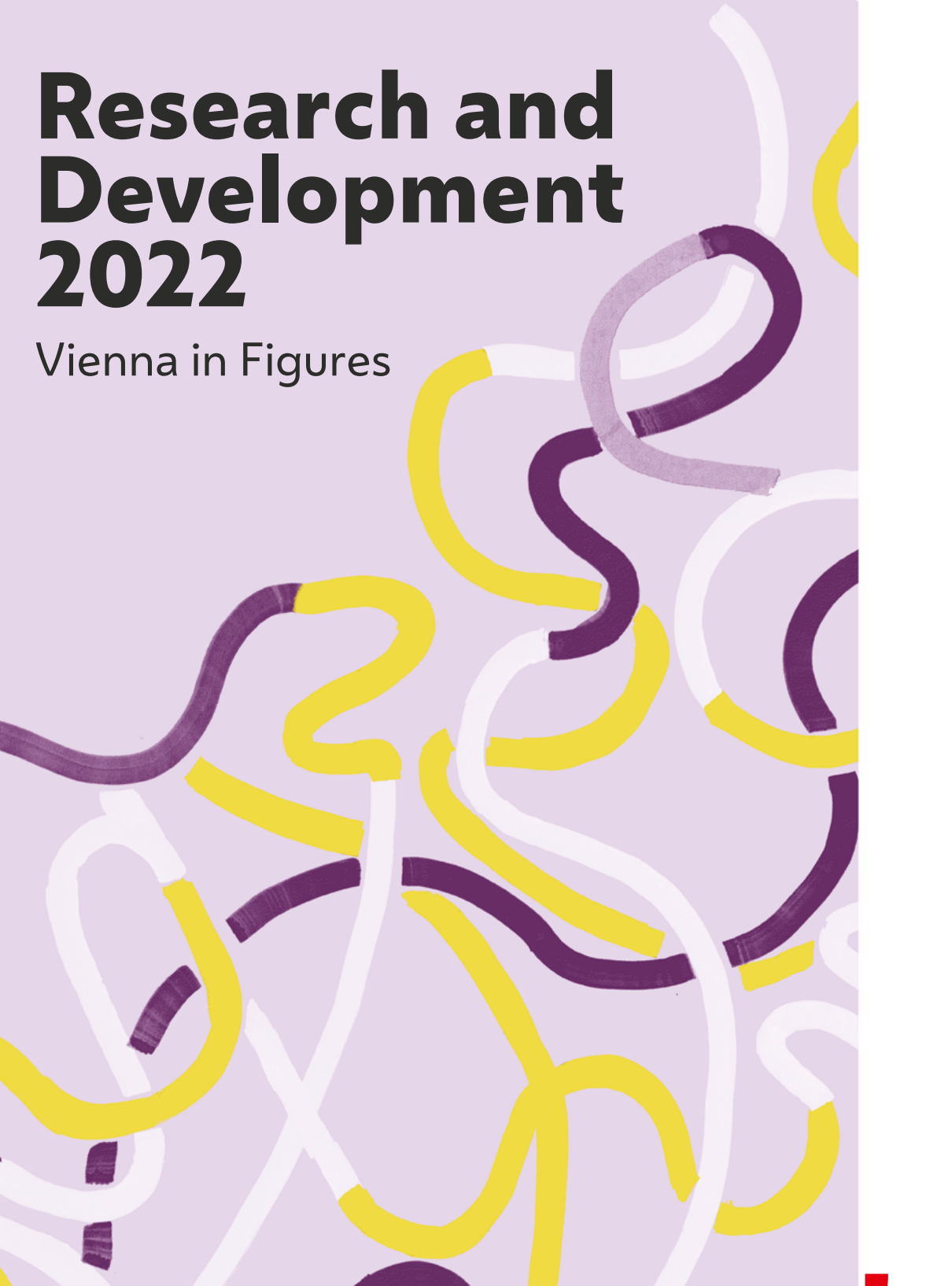


Research and Development 2022

Vienna in Figures



**City of
Vienna**

Economic Affairs,
Labour and Statistics



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Research and Development 2022

Vienna in Figures

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For further data about R&D in Vienna, visit
wien.gv.at/statistik/wirtschaft/forschung.

Foreword

Over the past 15 years, the number of workers in Vienna's research and development sector increased by more than 50%, resulting in a share of R&D personnel that places our city 3rd in Europe. The number of enterprises engaged in research has more than doubled.

Yet we can only maintain our top position in the competition with other regions if we continue to provide high quality – and this mainly equals innovation. Our quality of life, which is unique worldwide, is only possible if our companies, our research institutions and our administration continue to offer the best products and services on an international scale.

Our strategy "VIENNA 2030 – Economy and Innovation" wants to build on fields where we already today boast special competences and strengths. These areas of leadership are particularly well suited to deliver solutions for the urban challenges of the coming decade: climate change, digitalisation and urbanisation. The data outlined in this brochure are proof positive that we are well positioned in both a national and an international context. This constitutes a key advantage in the difficult economic situation following the pandemic. Therefore, Vienna's city government will continue to do its best to make the Austrian capital an even more attractive location.



Peter Hanke

Executive City Councillor of Finance, Business, Labour, International Affairs and Vienna Public Utilities

Editorial

Vienna's track record as a research and technology hub is outstanding and provides a link to a centuries-long tradition – after all, the oldest university in the German-speaking region is domiciled in the Austrian capital. Vienna today is home to numerous leading researchers, above all in such areas as IT, mathematics, physics, life sciences, the humanities and social studies.

The global economic crisis is also strongly affecting Vienna. We are aware that some figures in this brochure, which date from 2019, are by now obsolete. Despite this, we believe that the fundamental assumptions concerning the structure and attractiveness of Vienna as an R&D location remain unchanged, such as our top position with regard to the number of research workers and our above-average research quota. The actual effects of the crisis will only become evident in 2023/24, when the R&D survey (which is conducted exclusively in odd calendar years) for 2021 will be published.

In the coming months, it will be decisive – as after the 2008 crisis – that the government will not curtail, but rather step up, its research activities and subsidies. This will enable us to offset potential company closedowns and keep top talent, knowledge and innovation in Vienna – as the backbone of our economic clout and quality of life.



Peter Wieser

Head of the City of Vienna's Department for Economic Affairs, Labour and Statistics

Basic terms and concepts

What is research and development?

Research and experimental development (R&D) is defined as a **creative activity** that utilises scientific methods and is systematically conducted with the objective of **augmenting the state of knowledge**.

This leads to new information concerning humanity, culture and society as well as new to applications of existing knowledge. The element of **novelty and originality** (new findings, new knowledge, new applications) is the key criterion that distinguishes R&D from other scientific and technological activities.

Where do the data of this brochure originate?

Every other year, Statistics Austria compiles a **survey on research and experimental development (R&D)**. This is a primary (direct) survey with mandatory disclosure, conducted in alternate years since 2002 (with the exception of 2006 and 2007 due to an EU-wide changeover). Since 2007, the reporting periods equal odd calendar years. To ensure international comparability, the survey is based on the requirements and definitions of the OECD Frascati Manual, a methodological tool of global validity for guidelines, definitions and standards in the field of R&D surveys. In 2015, a new edition of the Frascati Manual was published and consequently first used in the 2017 survey. Due to methodological changes, some findings of that year can be compared with those of previous years only to a limited extent (please consult the Glossary for details).

This brochure presents the data of a special evaluation that is regularly commissioned by the City of Vienna to cover the Austrian capital; it can be downloaded free of charge from statistik.wien.gv.at. In addition, relevant key benchmarks provided by Eurostat and funding institutions as well as data relating to education statistics are included as well.

Concerning this edition

The data cited in this brochure always refer to the territorial status of the European Union as per 1 February 2020, after the exit of the United Kingdom.

What companies and organisations are considered in the R&D survey?

R&D spending involves different **sectors**, such as **universities, enterprises, the public/government sector and the private nonprofit sector** (e.g. scientific societies and institutes operated by associations or religious communities).

In all, over **7,000 enterprises take part** in this survey. With regard to the corporate sector, it comprises without exception all companies with more than 100 employees. Smaller enterprises are only included in the statistics if officially accessible information, e.g. applications for grant disbursement, indicates that they engage in R&D activities. With regard to the other sectors, the survey is complete and exhaustive.

This brochure analyses research spending according to these implementing sectors (as opposed to financing sectors).

How are research facilities allotted to the individual federal provinces?

Basically, research facilities are allotted to the individual federal provinces depending on the **main location of the survey units**. In the corporate sector, R&D spending is additionally allotted on a regional basis in accordance with the actual research site in order to account for the **"headquarters effect"**: Thus, while many company headquarters and head offices of large groups are domiciled in Vienna, the research facilities of these enterprises are partly located in other federal provinces; as a result, the research spending of these units would be allotted to Vienna. For this reason, there exist two different figures for the federal provinces regarding research spending (i.e. for the company head offices and for the respective R&D locations). Unless stated otherwise, the data listed in this brochure refer to the R&D location.

How does Vienna compare with the other federal provinces?

Due to Vienna's special position as both national capital and **sole Austrian metropolis**, comparisons of its economic and research structures, labour market as well as education and training situation with those of the other federal provinces are not always possible or useful. Vienna is not only **the biggest university city in the German-speaking region** (alongside Berlin) but also the **fifth-largest city of the European Union** (by inhabitants).

For various reasons that include historical developments, universities and extra-university research institutions occupy a particularly important position in Vienna.

At a glance: Research and development in Vienna

50,637

R&D personnel
(headcount, 2019)

= 35% of all R&D personnel in Austria

3.65%

= Vienna's research quota (2019)

1,720

research sites (2019)

= 31% of all research sites in Austria
(of which 983 enterprises)

€ **128** million

invested by City of Vienna
in research and research
promotion (2020)

31%

of Austria's R&D
spending (2019)

= € 3.9 billion
(of € 12.4 billion total)

~193,000*

students
(winter semester 2020/21)

= Berlin and Vienna are the biggest university
cities in the German-speaking region

* includes dual enrolments

*An investment in
knowledge always
pays the best interest.*

Benjamin Franklin (1706–1790)

1 R&D spending: Investment in the future

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For further data on R&D in Vienna, visit wien.gv.at/statistik/wirtschaft/forschung.

R&D quota (research quota)

The R&D quota (research quota) is the most frequently used indicator in statistics relating to research and development. It describes the share of R&D spending in percent of the gross domestic product/gross regional product of a territorial unit. For this reason, the R&D quota is also useful for international comparisons and the formulation of targets.

Types of research

Basic research is defined as investigations aiming to augment the state of knowledge, without focusing on a specific practical goal. One possible research question might thus be: What is the nature of a process that leads to a disease?

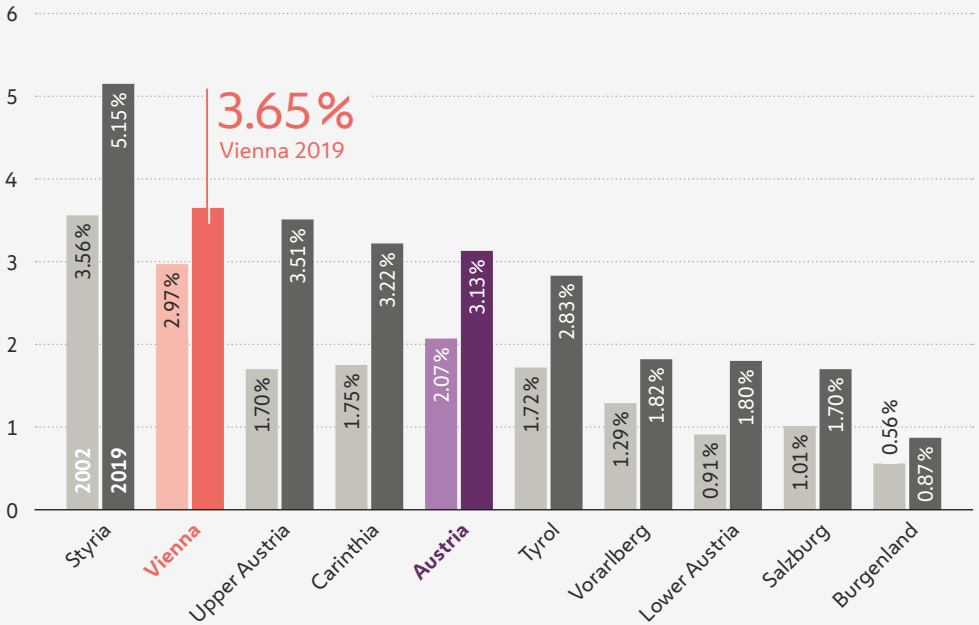
Applied research takes the form of investigations aiming to augment the state of knowledge, yet with a focus on a specific practical goal. For example: How can a specific (newly emerging) disease be treated?

In its turn, **experimental development** is defined as the systematic use of knowledge aiming to create new or significantly improved materials, mechanisms, products, procedures or systems. An example would be the development of a new type of medication.

1.1 R&D quotas in Austria

Federal provinces of Austria, 2002 and 2019

R&D spending in % of gross regional product



Source: Statistics Austria

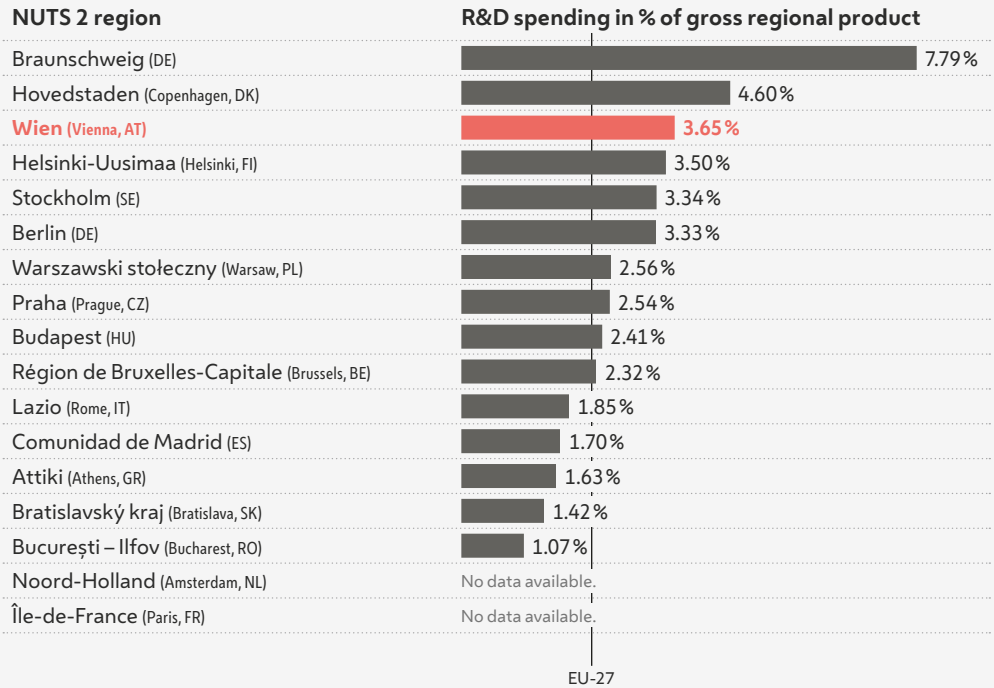
The R&D quotas of all federal provinces as well as of Austria as a whole have been rising steadily over the past few years. Despite marked growth in some other federal provinces, Vienna continues to hold second place.

For years, Styria has been the undisputed national leader in this field. This is partly due to the fact that Styria is traditionally an industrial region with numerous highly research-intensive enterprises. At the same time, the gross regional product, by which the absolute expenditure must be divided to calculate the research quota, is almost twice as high for Vienna as for Styria.

In absolute figures, though, Vienna accounts for close to one third of all national R&D spending, hence acting as the heavyweight and backbone among Austrian research locations: In 2019, the federal capital invested €3.9 billion in R&D (top rank), trailed by Styria (2nd place) at €2.4 billion.

1.2 R&D quotas in Europe

Selected cities/urban regions of the EU, 2019



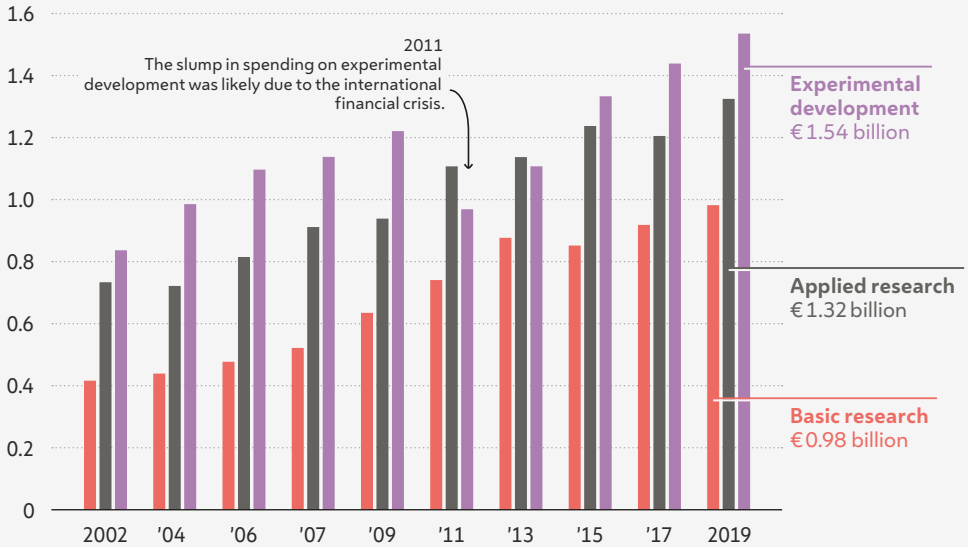
Source: Eurostat (partly OECD)

A comparison with all EU cities and regions places Vienna in a satisfactory position, in particular among EU capitals – also with a view to Austria’s neighbouring countries. Braunschweig was included in this chart because it is the urban region with the highest research quota throughout the entire European Union.

1.3 R&D spending by types of research

Vienna, 2002 to 2019

Spending in billion € (by main location, excluding provincial hospitals)



Source: Statistics Austria

Since 2002, these data are collected and published every other year. Due to an EU-wide changeover in 2006/2007, the data are now collected in odd years.

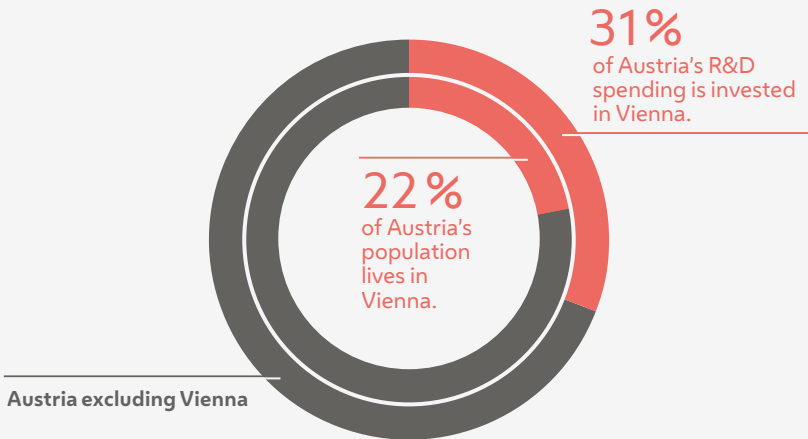
From 2002 onwards, R&D spending across Austria increased briskly for all types of research; as a result, the country now boasts the second-highest research quota in Europe (trailing only Sweden). Most of the funds go into experimental development; they are predominantly invested by the corporate sector.

Spending on experimental development in Vienna decreased between 2009 and 2013. It may be assumed that this was a consequence of the global financial and economic crisis. Since 2015, however, development spending is again on the rise.

1.4 R&D spending in Austria

Vienna and rest of Austria, 2019

Regional share in all Austrian R&D spending in relation to Austrian population

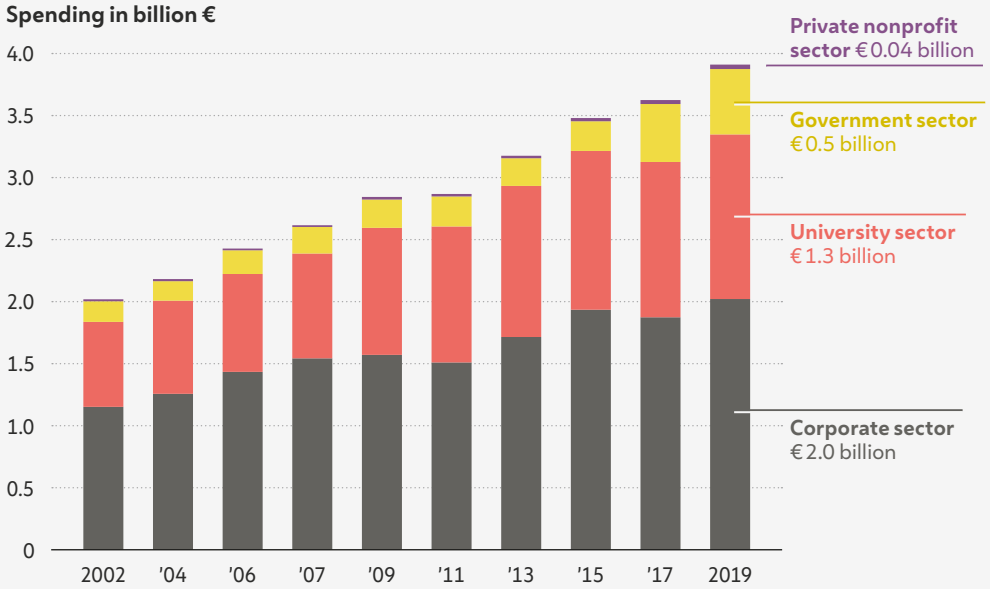


Source: Statistics Austria

Vienna is Austria's centre of research and development: 31% of all Austrian R&D spending is tied to the city vs. a 22 % population share.

1.5 R&D spending by sectors

Vienna, 2002 to 2019



Source: Statistics Austria

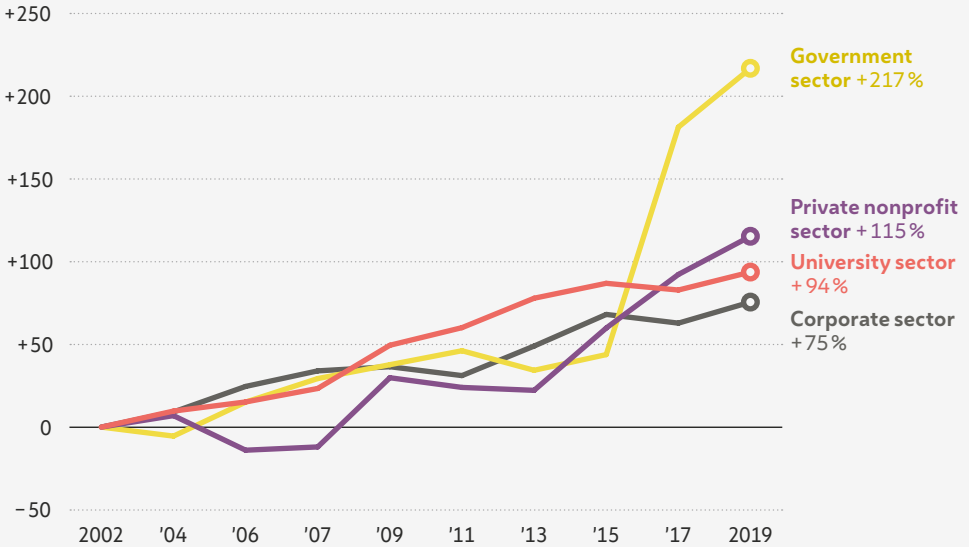
Since 2017: new Frascati Manual

The biggest R&D investments were made by the corporate and university sectors. The chart shows the effects of the new survey method (new Frascati Manual): Due to these changes, the figures for the corporate and university sectors decreased slightly for 2017 and, as a consequence, increased for public/government sector – a statistical artefact.

Development of R&D spending by sectors

Vienna, 2002 to 2019

Development in % since 2002



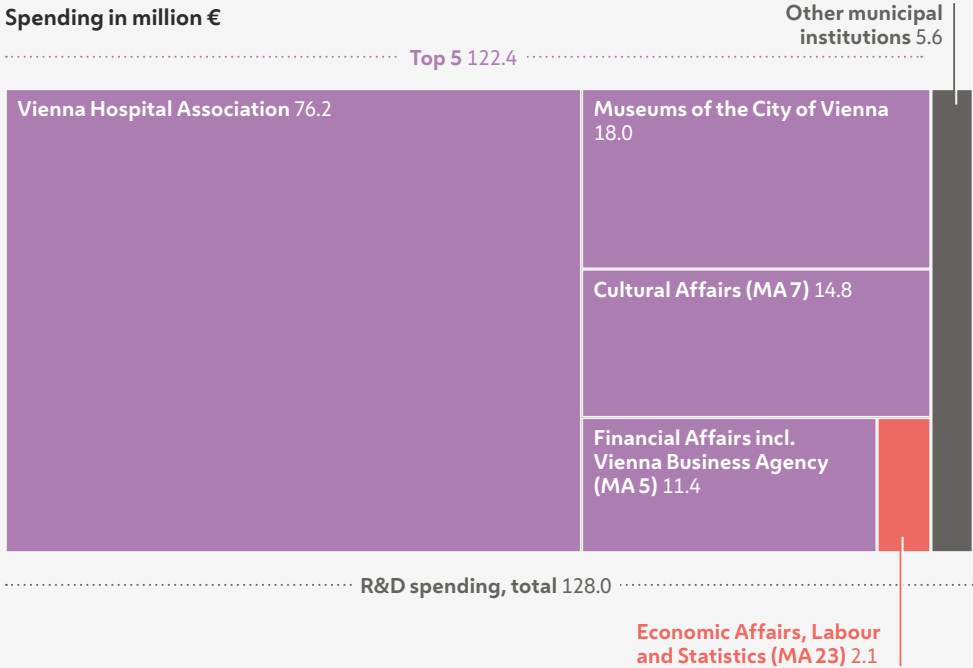
Which players conduct most research and development?

More and more enterprises in Vienna engage in research and, above all, in development. R&D is assuming an increasingly important role in the service sector, which is traditionally strong in the Austrian capital. R&D spending in 2019 was particularly pronounced in the fields of biotechnology, electrical equipment, motor vehicles, IT services and mechanical engineering.

The private sector is characterised by a high concentration of key players: 72 enterprises account for 33% of all Viennese R&D spending. Top investments in the university sector were targeted at natural sciences, human medicine, health sciences and technical sciences.

1.6 R&D spending of the City of Vienna

Top 5 among municipal funding institutions, 2020



Source: City of Vienna

In 2020, the City of Vienna invested around €128 million in research and research promotion – more than any other federal province of Austria. This total amount is disbursed jointly by approx. 40 municipal or public institutions and inter alia comprises the promotion of science and research (for enterprises, research societies, endowed chairs, universities of applied sciences); the promotion of science through funds, awards, etc.; externally commissioned studies/research projects; science and research conducted within the scope of the municipal administration as well as science and research pursued by Vienna’s museums.

The current strategy “VIENNA 2030 – Economy & Innovation” sets the course for the further development of Vienna, structured into six areas of leadership. The research investments of the City of Vienna will primarily focus on these areas.

Municipal Department 23 (MA 23) is among the municipal top 5 because it also handles Vienna’s grants for universities of applied sciences in addition to its own economic research activities.

VIENNA 2030

Economy & Innovation

The strategy “VIENNA 2030 – Economy & Innovation” builds on fields that already today constitute strengths of Vienna as a business location and are able to yield answers to the big challenges of coming years. The goal lies in generating prosperity and quality of life to benefit all inhabitants of Vienna, in particular by providing high-quality workplaces and outstanding infrastructure.

In addition to ten areas of action that ensure a basic structure for all economic and innovative activities to further evolve the city’s location qualities, VIENNA 2030 defines six fields that will be developed into internationally competitive and highly visible areas of leadership by 2030:

- Smart solutions for life in the 21st-century city
- Vienna as a metropolis of health
- Digitalisation, Vienna-style
- Smart production in the big city
- A place of international encounter
- Vienna – a metropolis of culture and creativity

For a long time, the production activities of humankind were looked down upon – if for no other reason, then because their purpose seemed merely material and the procedure itself almost trivial. This has changed. All arts and sciences vie among each other to serve business. Industry, formerly their hand-maiden, is now recognised as a sister and equal.

Christoph Bernoulli (1782–1863)

2 R&D personnel: People create knowledge

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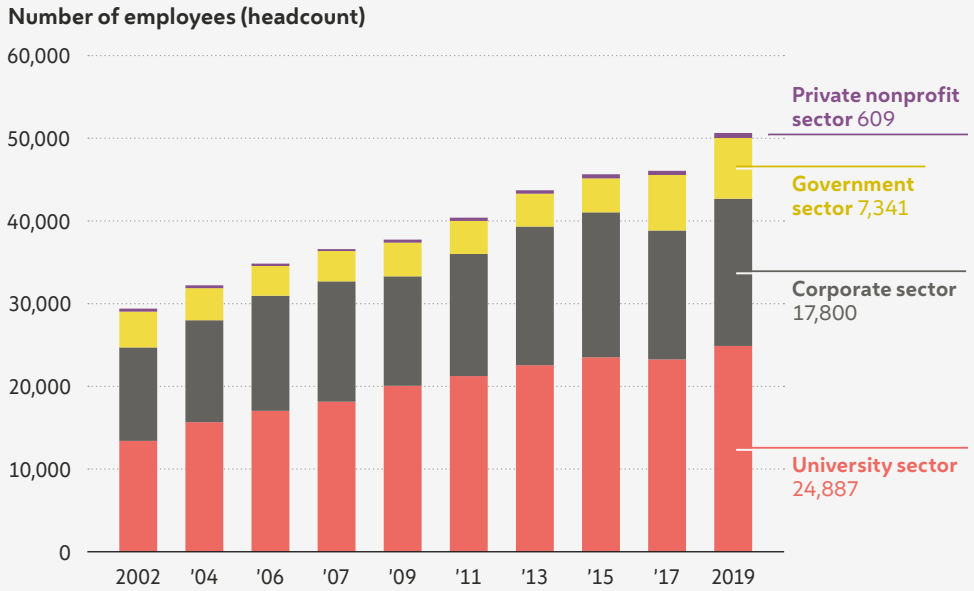
For further data on R&D in Vienna, visit wien.gv.at/statistik/wirtschaft/forschung.

Headcount vs. full-time equivalents

Research and development personnel is rendered in two ways – either by headcount, i.e. as the number of persons active in a specific area, or as full-time equivalents (FTE), which is a standardised comparative benchmark that reflects the actual time input (resource costs) for R&D. The type of employment (full-time, part-time) as well as the extent of R&D activities must be considered in this context.

2.1 R&D personnel by sectors

Vienna, 2002 to 2019



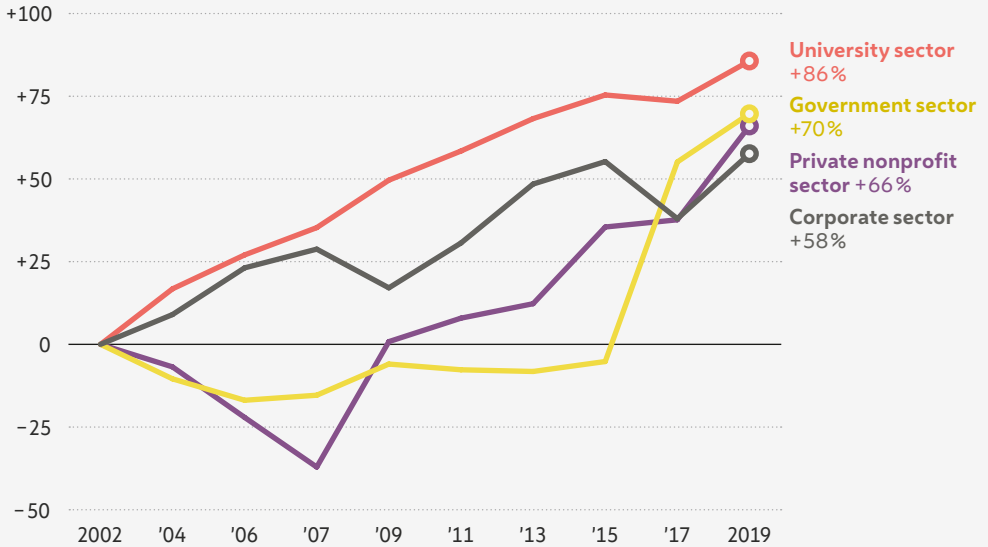
Source: Statistics Austria

More than 50,000 Viennese employees work in R&D.

Development of R&D personnel by sectors

Vienna, 2002 to 2019

Changes in workforce (headcount) in % since 2002

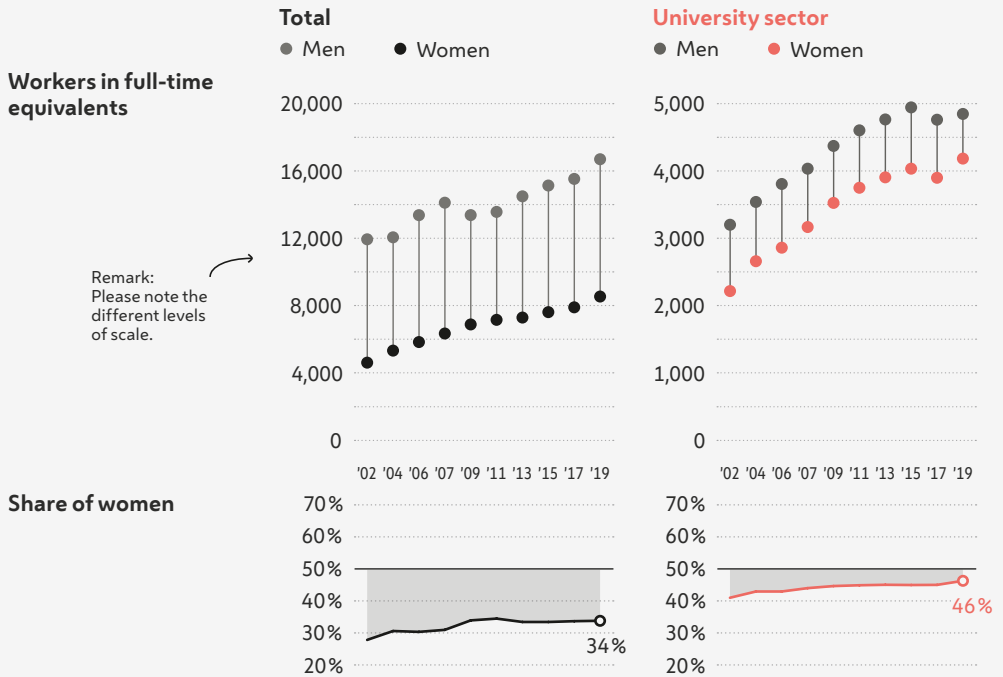


The number of R&D personnel in Vienna rose significantly from 2002 to 2019, mainly due to the activities of the corporate and university sectors. The majority of R&D personnel in Vienna is employed in these two sectors.

The chart shows two very visible kinks for 2017: Since the methodological changes (Frascati Manual) led to a re-classification of several institutions under the heading of government sector – the Austrian Academy of Sciences was moved from the university sector and AIT and Joanneum Research migrated from the corporate sector –, the number of R&D employees of government sector increased markedly, while the personnel of the corporate and university sectors decreased correspondingly.

2.2 Gender gap of R&D employees by sectors

Vienna, 2002 to 2019, in FTE



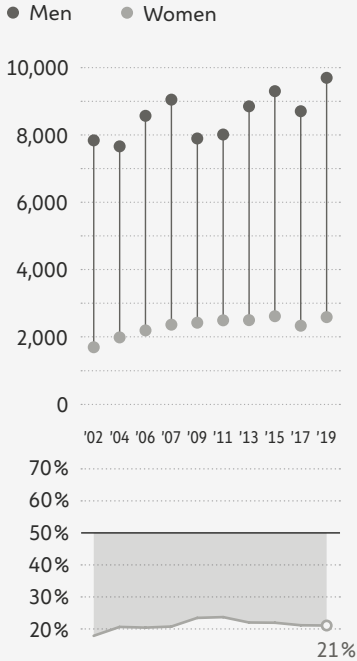
Source: Statistics Austria

In Austria (and Vienna), the share of university graduates among the workforce has increased markedly since the turn of the millennium; today, more women than men complete tertiary education. The share of female R&D workers has risen more or less continuously for all sectors.

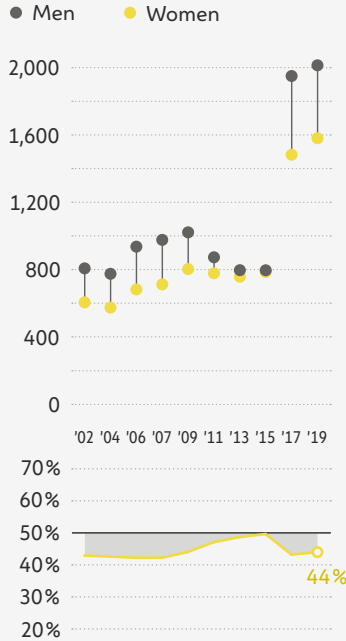
34% of Vienna's research personnel (in full-time equivalents) are women, while this figure is only 24% for Austria in general.

Nowadays, almost half of all researchers in the public sector are female. Equal treatment legislation at the national and provincial levels might be one reason for this. Due to the methodological changes in 2017, the share of women has slightly decreased in most sectors, continuing to increase only for the university sector.

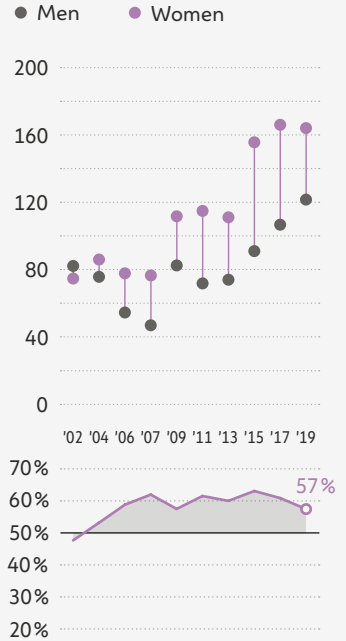
Corporate sector



Government sector



Private nonprofit sector

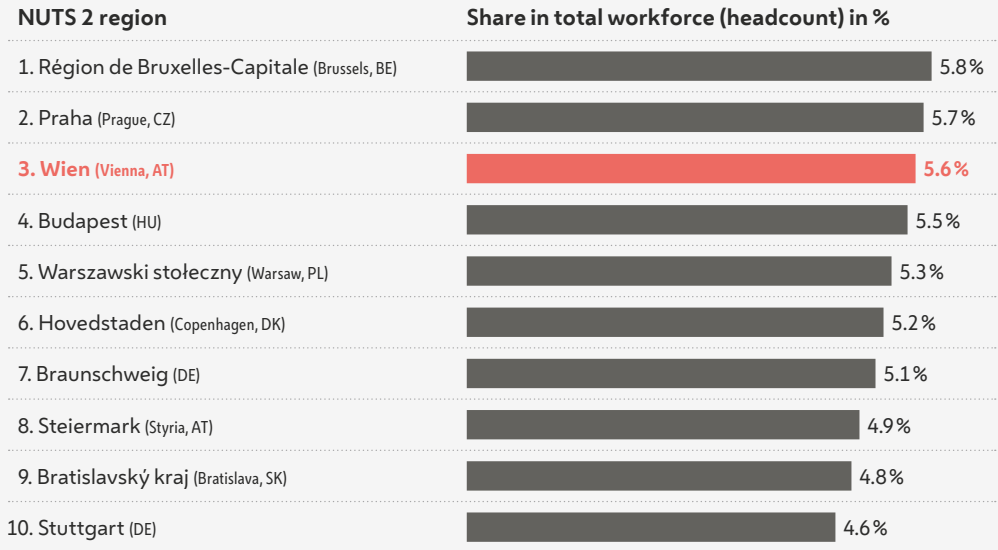


While women have caught up somewhat in the corporate sector over the course of time, their share (in full-time equivalents) is still only 21%.

On an international level, Austria is characterised by a below-average female quota (in FTE): According to the Eurostat figures for 2019, Austria's 24% share of female R&D workers is exceeded by Latvia with 52%, by Croatia with 48%, by Portugal with 43% or by Denmark with 39%, placing Austria among the laggards in Europe. The low nationwide value is mainly due to the corporate sector.

2.3 Share of R&D personnel across Europe

Top 10 cities/urban regions across the EU, 2019



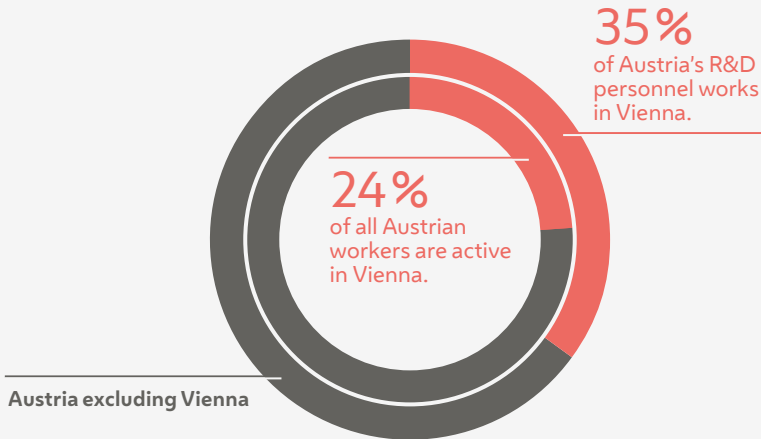
Source: Eurostat

An international comparison reveals an excellent position for Vienna, as the Austrian capital holds third place among all 242 EU regions with regard to the share of R&D personnel.

2.4 R&D personnel in Austria

Vienna and rest of Austria, 2019

Regional share among all Austrian (R&D) personnel



Source: Statistics Austria

For many years, the number of research and development workers has been on a continuous rise in both Austria and, specifically, Vienna. As already mentioned, this increase is mainly due to the university and corporate sectors.

Over one third of all Austrian R&D personnel works in Vienna.

Great discoveries and improvements invariably involve the co-operation of many minds. I may be given credit for having blazed the trail, but when I look at the subsequent developments, I feel the credit is due to others rather than to myself.

Alexander Graham Bell (1847–1922)

3 R&D units: Progress through co-operation

3.1	R&D units by sectors	28
3.2	R&D units in Austria	30
3.3	Corporate R&D sector by size, number of employees and spending volume	31

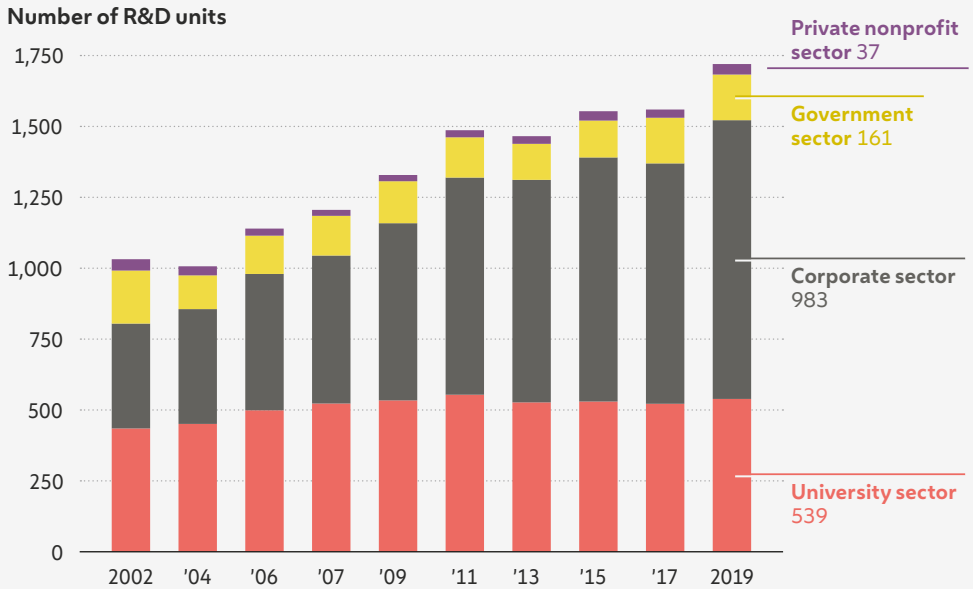
For further data on R&D in Vienna, visit wien.gv.at/statistik/wirtschaft/forschung.

Units

Research sites are units (universities, enterprises, institutes, etc.) that engage in research and development.

3.1 R&D units by sectors

Vienna, 2002 to 2019



Source: Statistics Austria

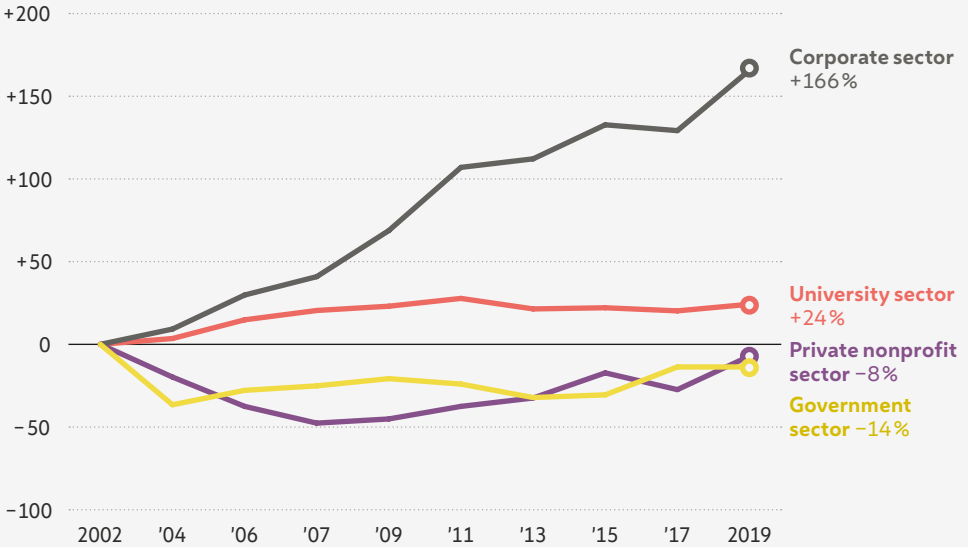
The number of units conducting R&D in Vienna has increased sharply over the past 15 years, mainly due to the corporate sector, whose share has more than doubled since 2002 – almost exclusively in services.

The university sector is the second main funder of research: Vienna is currently the second largest university city in the German-speaking region (by number of students) and, with Vienna University, home to one of Europe’s oldest institutions of higher learning. Between 2002 and 2004, the number of research units of the public sector decreased in the wake of the university reform and the reorganisation of the Ludwig Boltzmann Institutes. The downturn in the university sector between 2011 and 2013 was mainly triggered by the merging of several institutes of the Austrian Academy of Sciences. Methodological changes (Frascati Manual) have entailed the emergence of statistical artefacts (see also Chapter 2.1). Overall, the number of units engaging in R&D is constantly on the rise.

Development of R&D units by sectors

Vienna, 2002 to 2019

Development in % since 2002



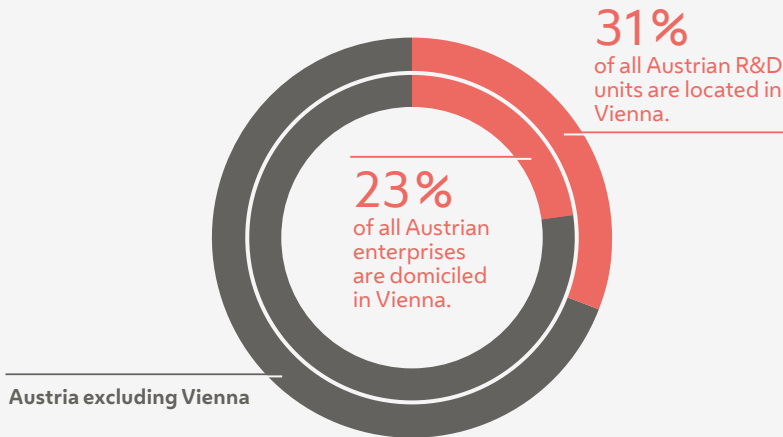
Enterprises with fewer than 100 employees are not automatically included in the survey.

Changes in the number of R&D units are mainly due to restructuring measures. This mostly concerns the publicly financed sector and, in 2017, the corporate sector as well.

3.2 R&D units in Austria

Vienna and rest of Austria, 2019

Regional share among all Austrian R&D units or enterprises

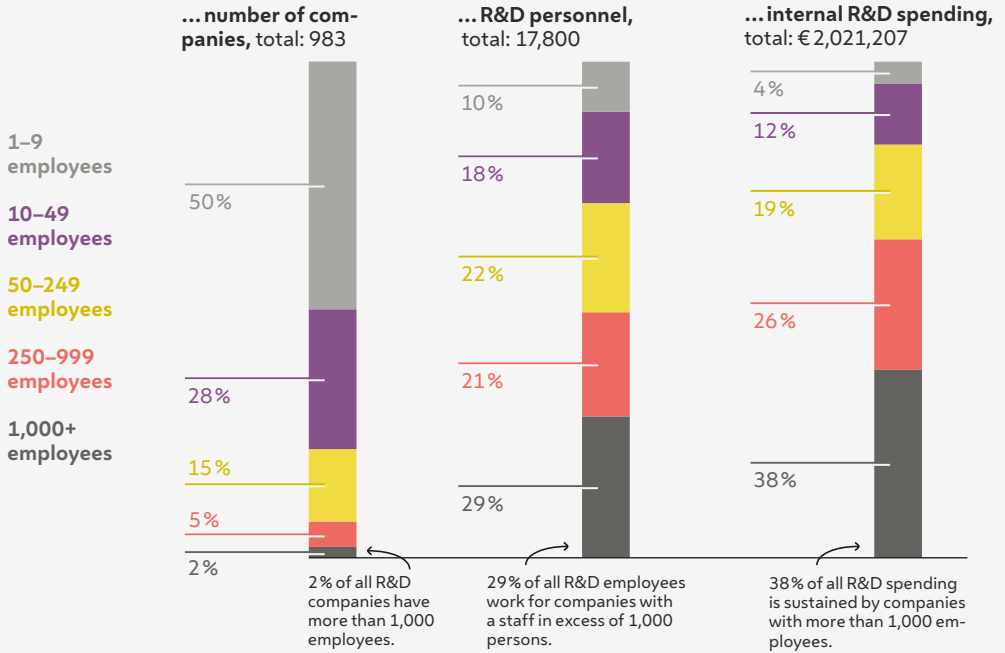


Source: Statistics Austria

Out of 5,569 research sites across the country, 1,720 – equalling 31% – are situated in the capital.

3.3 Corporate R&D sector by size, number of employees and spending volume — Vienna, 2019

Share of respective enterprise size class among all companies by ...



Source: Statistics Austria

Half of all enterprises engaged in research employ fewer than 10 persons, and three fourths have fewer than 50 employees. With regard to the number of companies, it is therefore small enterprises that play a dominant role – this applies to Vienna as a business location in general.

Conversely, the merely 2% (22) of Viennese enterprises conducting research and employing over 1,000 persons account for one third of all spending for the purposes of research and, above all, development. Large enterprises (over 250 employees), which have a total share of 7% among Viennese companies, sustain about two thirds of all R&D expenditure and employ more than half of all researchers and developers.

The industries employing the highest number of R&D workers are IT services, electrical equipment as well as mechanical engineering.

Glossary

Frascati Manual 2015

With a nearly global scope, the OECD Frascati Manual provides the methodological basis for statistics relating to research and experimental development (R&D). International manuals of this kind are regularly revised to incorporate the latest developments and practical experience. A new edition of the Frascati Manual was published in 2015.

As a result of the implementation of the revised Frascati Manual of 2015, the findings for 2017 can be compared with those of previous years only to a limited degree. With regard to Austria, important R&D institutions were thus allocated to other sectors of the economy – e.g. the Austrian Academy of Sciences (formerly: university sector) and the Austrian Institute of Technology (formerly: corporate sector) now come under the public/government sector.

Conversely, higher technical colleges that also conduct R&D activities used to be classified as units of the public/government sector but are now part of the university sector. Research grants are no longer allotted to the public/government sector but are classified as part of the resources owned by enterprises engaging in R&D (e.g. in the case of enterprises, as financing disbursed by the corporate sector).

Headcount vs. full-time equivalents

Research and development personnel is rendered in two ways – either by headcount, i.e. as the number of persons active in a specific area, or as

full-time equivalents (FTE), which is a standardised comparative benchmark that reflects the actual time input (resource costs) for R&D. The type of employment (full-time, part-time) as well as the extent of R&D-related activities must be considered in this context.

NUTS 2

NUTS is the system used for structuring Europe's regions and stands for "Nomenclature of territorial units for statistics" (Nomenclature des unités territoriales statistiques). In 2022, there existed a total of 242 regions at NUTS 2 level across Europe (NUTS 2021); in Austria, these correspond to the federal provinces.

The capital regions mentioned in this brochure often include the surrounding area (e.g. Comunidad de Madrid or Lazio).

Research and development (R&D)

Research and experimental development (R&D) is defined as a creative activity that utilises scientific methods and is systematically conducted with the objective of augmenting the state of knowledge as well as of generating new applications of this knowledge.

The element of novelty and originality (new findings, new knowledge, new applications) is the key criterion that distinguishes R&D from other scientific and technological activities.

R&D quota

The R&D quota (research quota) is the most frequently used indicator in statistics relating to research and development. It describes the share of R&D spending in % of the gross domestic/regional product of a territorial unit. For this reason, the R&D quota is also useful for international comparisons and the formulation of targets.

Types of research

Basic research is defined as investigations aiming to augment the state of knowledge, without focusing on a specific practical goal. One possible research question might thus be:

What is the nature of a process that leads to a disease?

In its turn, **applied research** is defined as investigations aiming to augment the state of knowledge, yet with a focus on a specific practical goal. For example: How can a specific (newly emerging) disease be treated?

Conversely, **experimental development** is defined as the systematic use of knowledge aiming to create new or significantly improved materials, mechanisms, products, procedures or systems. An example would be the development of a new type of medication.

Units

Research sites are units (universities, enterprises, institutes, etc.) that engage in research and development.

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