Vienna in Figures

Research and Development 2018

MA23
Economic Affairs, Labour Statistics

City of Vienna

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The cover illustration was developed by students of the University of Art and Design Linz's Department of Visual Communication during a workshop on conditional design.

Vienna
in Figures

Research and Development 2018

Further data on R&D in Vienna can be found at www.wien.at/statistik/wirtschaft/forschung.

Foreword

Over the past 15 years, the number of workers in the research and development sector increased by over 50%. The share of R&D personnel places our city 3rd amongst European metropolises. The number of enterprises engaged in research has more than doubled. This clearly documents the great importance Vienna attaches to research and development.

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

Our strategy "Innovative Vienna 2020" highlights the key focuses, i.e. optimum preconditions for innovation through co-operation and openness as well as a public administration that acts as both initiator and user of innovations.

The data outlined in this brochure are proof positive that we are well placed on both a national and an international scale. In the future as in the past, Vienna's city government will continue to do its best to make the Austrian capital an even more attractive location and to cope with the challenges, in particular those of digital change.

Peter Hanke
Executive City Councillor of Finance, Business, Digital Innovation and International Affairs

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. University-based research and academic teaching have always provided the backbone of research and development, and hence of our economic clout. Thus Vienna today is home to numerous leading researchers, above all in such areas as IT, mathematics, physics, life sciences, the humanities and social studies.

In recent years, both major companies and small or medium-sized enterprises have become a crucial factor for research and development in Vienna. The city's above-average productivity creates a significant locational advantage for them.

The fact that the private and public sectors traditionally complement each other in the fields of research and development was clearly highlighted during the worldwide economic and financial crisis. With its universities, the public sector was able to partly offset the R&D slump affecting the business community, whose performance regarding all indicators has now returned to a level that is markedly above the pre-crisis situation.

The present, revised brochure is to provide you with an overview of these and other developments relating to Vienna as an R&D location. We are looking forward to your feedback!

Klemens Himpele
Head of Municipal Department 23 – Economic Affairs, Labour and Statistics

Basic information

What is research and development?

Research and experimental development (R&D) is de fined as a **creative activity** that utilises scientific meth ods and is systematical ly conducted with the ob jective of **augmenting the state of knowledge** as well as of developing **new appli cations of this knowledge.**

The element of **novel ty and originality** (new find ings, new knowledge, new applications) is a key crite rion that distinguishes R&D from other scientific and technological activities.

Where do the data of this brochure originate?

Every other year, Statistics Aus tria compiles a **survey on re search and experimental devel opment (R&D).** This is a primary (direct) survey with mandato ry disclosure conducted in al ternate years since 2002 (with the exception of 2006 and 2007 due to an EU wide changeover). Since 2007, the reporting peri ods equal odd calendar years. To ensure international com parability, the survey is based on the requirements and defi nitions of the OECD Frascati Manual, a methodological tool of global validity for guidelines, definitions and standards in the field of R&D surveys.

The present brochure pre sents the data of a special eval uation that is regularly commis sioned by the City of Vienna to cover the Austrian capital, and which can be downloaded free of charge from **www.statistik.wien.at.** In addition, relevant key benchmarks provided by Eu rostat and funding institutions as well as data relating to ed ucation statistics are listed as well.

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

R&D spending involves different **sectors, such as universities, enterprises,** the **government** and the **private non profit sector** (e.g. scientific societies and institutes operated by associations or religious communities). In this brochure, research spending is analysed according to these implementing sectors (as opposed to financing sectors).

A total of approx. 7,000 enterprises take part in the survey. With regard to the business enterprise sector, it comprises without exception all companies with more than 100 employees. Smaller enterprises are only included in the statistics if they are listed in the Statistics Austria register of entities conducting research. With regard to the other sectors, however, the survey is complete and exhaustive.

How are research facilities assigned 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 business enterprise sector, R&D spending is additionally allotted on a regional basis in accordance with the actual research site so as 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. Therefore 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 otherwise stated, the data in this brochure refer to actual R&D locations.

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 and 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**, but also the **sixth-largest city of the European Union** (by inhabitants). For various reasons including historical developments, universities and extra university research institutions occupy a particularly important position in Vienna.

At a glance: Research and development in Vienna

3.6%

= Vienna's research quota (2015)

45,644

R&D personnel (headcount, 2015)

= 36% of all R&D personnel in Austria

1,554

research sites (2015)

= 30% of all research sites in Austria,
of which 861 enterprises

€111 million

= invested by City of Vienna
in research and research
promotion (2016)

30%

of Austria's R&D spending (2015)

out of €10.5 billion total
= €3.5 billion (Vienna head offices)
= €3.2 billion (Vienna R&D sites)

194,145

students (winter semester 2017/18)

= Vienna is the biggest university city
in the German-speaking region
(cf. Berlin: 180,000, Munich 122,000)

An investment in knowledge always pays the best interest.

Benjamin Franklin (1706 1790)

01 — R&D spending: Investment in the future

Further data on R&D in Vienna can be found at www.wien.at/statistik/wirtschaft/forschung.

The **R&D quota (research quota)** is the most frequently used indicator in statistics relating to research and development.

The quota describes the share of R&D spending in % of the gross domestic product/gross regional product of a territorial unit. For this reason, the R&D quota is also useful for internation al comparisons and the formulation of targets.

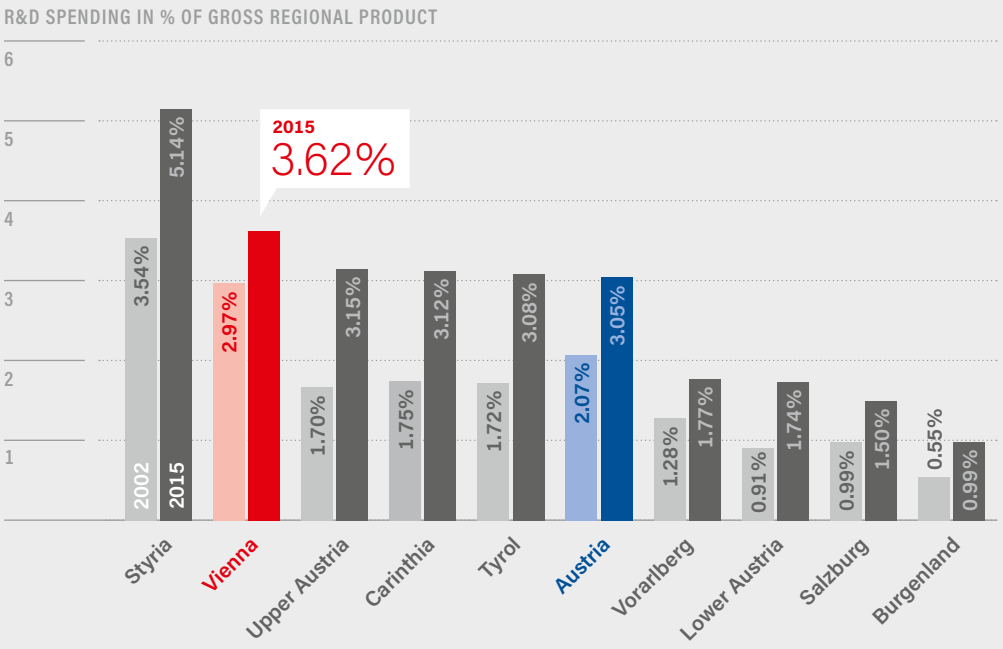
Types of research

Basic research is defined as an investigation with the objective of augmenting the state of knowledge, yet without a focus 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 likewise defined as an investiga tion with the objective of augmenting 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 sys tematic use of knowledge with the objective of creating new or significantly improved materials, mechanisms, products, proce dures or systems. An example would be the development of a new type of medication.

01.01 **R&D quotas in Austria**
Federal provinces of Austria, 2002 and 2015



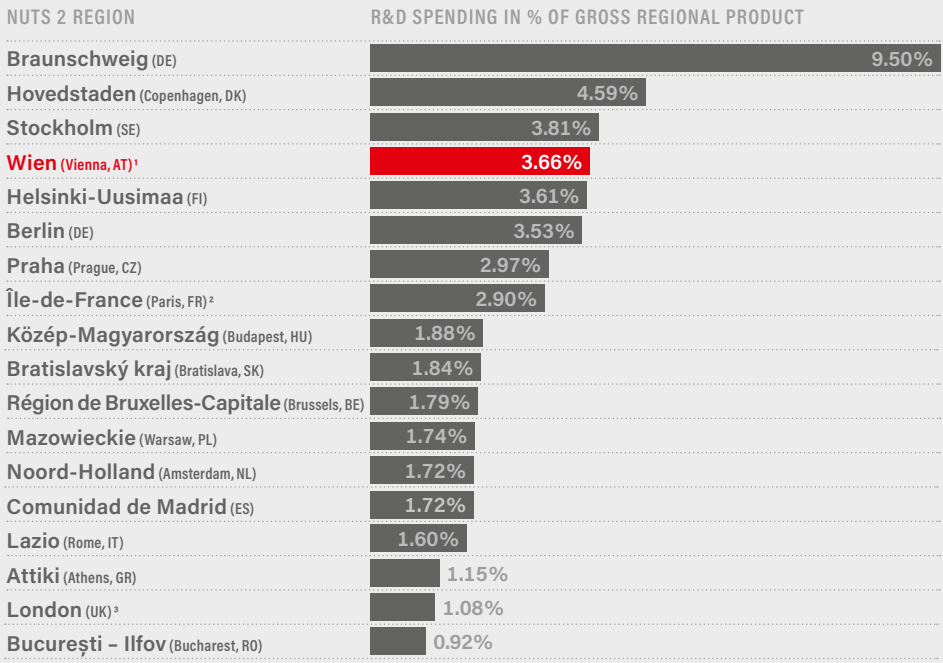
Source: Statistics Austria

The R&D quotas of all Austrian federal provinces are steadily rising. Despite strong increases in some other provinces, Vienna remains in second place in Austria.
For years, Styria has been the undisputed national leader in this respect. This is partly due to the fact that Styria is traditionally an industrial region with numerous research-intensive enterprises. In addition to its five universities and JOANNEUM RESEARCH Forschungsgesellschaft mbH, Styria also boasts a great number of centres of excellence.

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, however, 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 2015, the Austrian capital invested €3.2 billion in R&D (top rank), trailed by Styria (2nd place) at €2.2 billion.

01.02 **R&D quotas in Europe** — Selected cities/urban regions (NUTS 2) of the EU, 2015



Source: Eurostat

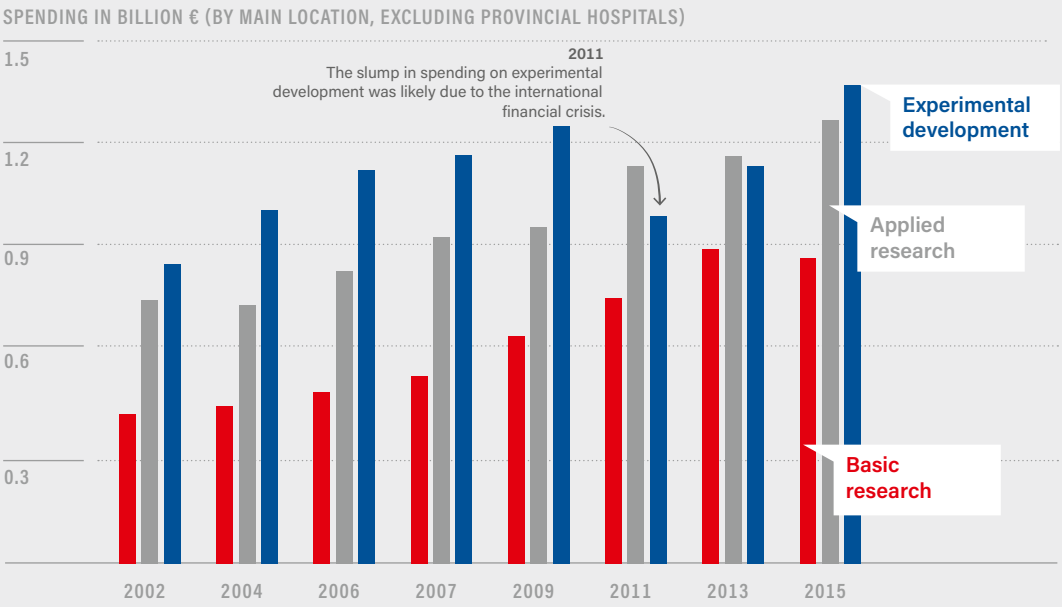
A comparison with all EU cities and regions places Vienna in a satisfactory position; in particular among EU capitals and capital regions, it performs very well, also with a view to Austria's neighbouring countries. Braunschweig was included in this chart because it is the urban region with the highest research quota throughout the entire European Union, mainly due to its high density of supra-regional or international research institutions, such as the Helmholtz Centre for Infection Research, the Physikalisch-Technische Bundesanstalt (PTB, national metrology institute), the German Aerospace Center (DLR, second-largest European research airport), Salzgitter Mannesmann Forschung GmbH, the Volkswagen corporate research division and other institutions.

[1] Vienna's above research quota of 3.66% deviates slightly from the current quota determined by Statistics Austria, since Eurostat still shows the non-revised figure.

[2] 2013 figure

[3] NUTS 1 region, comprises Greater London

01.03 R&D spending by types of research
Vienna, 2002 to 2015



Source: Statistics Austria

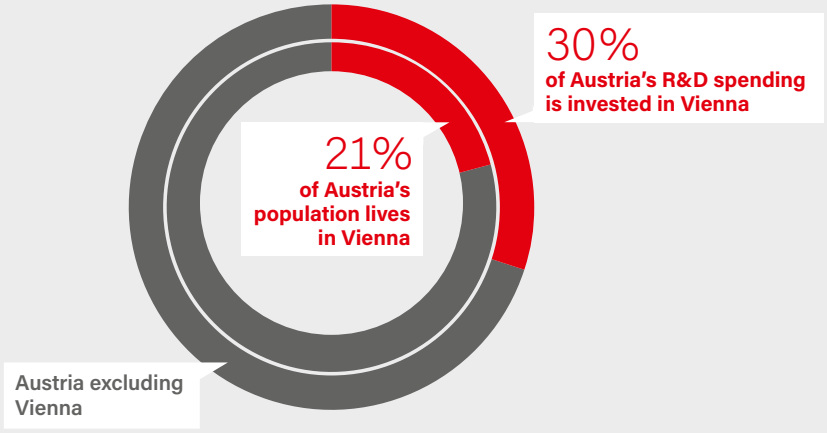
Since 2002, these data are collected and published every other year. Due to an EU-wide changeover in 2006/2007, the data are now collected in odd years.

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. Most of the funds go into experimental development, whose share, however, is decreasing slightly, while that of basic research is on the rise.

Spending on experimental development decreased in Vienna between 2009 and 2011. Since these funds are mainly invested by the business enterprise sector, it may be assumed that the drop was due to the worldwide economic and financial crisis.

01.04 **R&D spending in Austria**
Vienna and rest of Austria, 2015

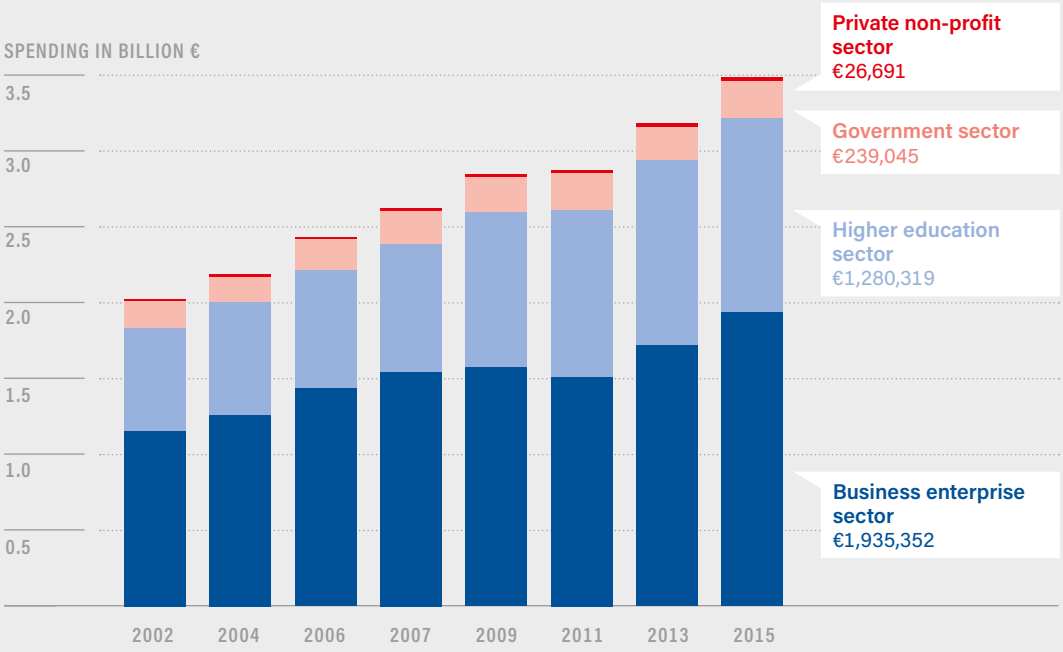
REGIONAL SHARE IN ALL AUSTRIAN R&D SPENDING / OF AUSTRIA'S TOTAL POPULATION



Source: Statistics Austria

Vienna is Austria's centre of research and development: 30% of national spending is tied to the city vs. a 21% population share.

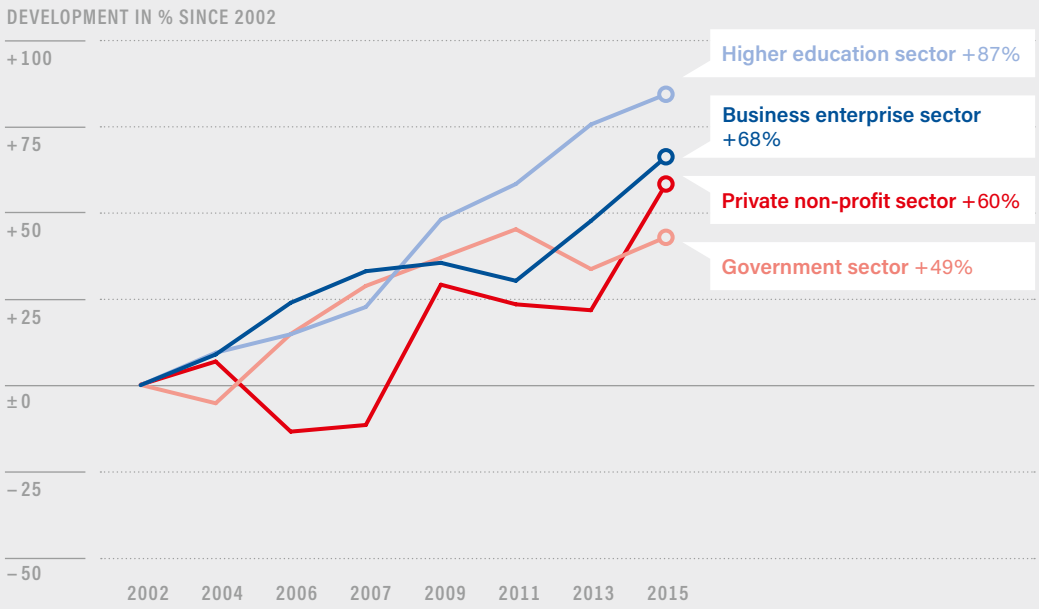
01.05 **R&D spending by sectors**
Vienna, 2002 to 2015



Source: Statistics Austria

Which actors compensated for the spending slump of the business enterprise sector during the economic crisis?

Development of R&D spending by sectors
Vienna, 2002 to 2015

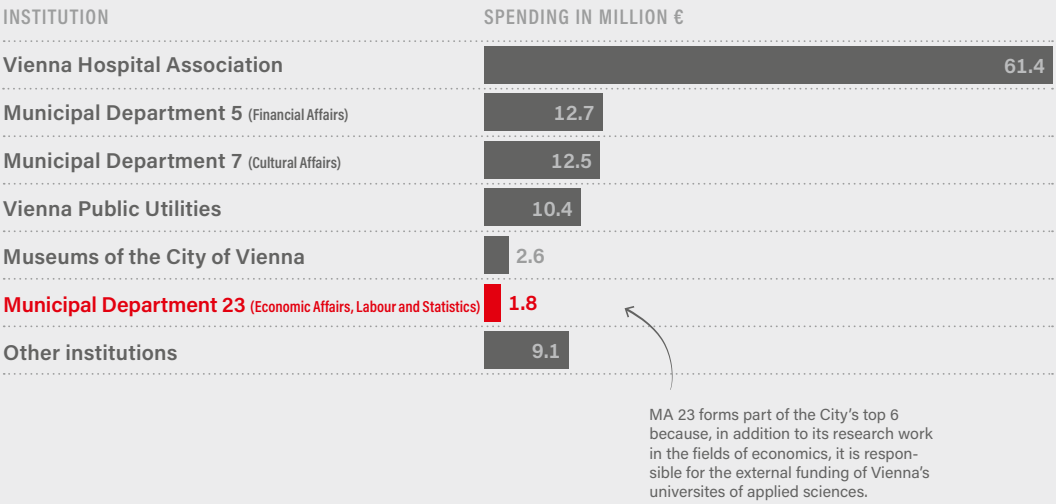


Two developments observed around 2009/2011 are remarkable in this context: While enterprises reduced their R&D spending, the public sector continued to invest during the crisis, thereby stabilising the level of research spending.

In the long term, though, more and more enterprises in Vienna are engaging in research and, above all, development. R&D is acquiring growing importance in the service sector, whose position in Vienna is traditionally strong. In 2015, R&D spending was particularly massive for the fields of biotechnology, electrical equipment, natural, engineering and agricultural sciences, medicine, motor vehicles and IT.

In the private sector, the concentration of key players is high: 77 enterprises account for close to 40% of all Viennese R&D spending.

01.06 R&D spending of the City of Vienna
Top 6 among municipal funding institutions, 2016



Source: City of Vienna

In 2016, the City of Vienna invested close to €111 million in research and research promotion, more than any other federal province of Austria. This total amount is disbursed jointly by over 40 municipal institutions and inter alia comprises the promotion of science and research (for research societies, endowed chairs, external funding of Vienna's 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.

Vienna's current research, technology and innovation strategy "Innovative Vienna 2020" (www.innovation2020.wien.at) adopted by the City Council in 2015 sets the course for the further development of Vienna as an RTI location.

Vienna's research, technology and innovation strategy

INNOVATIVES WIEN 2020

With "Innovative Vienna 2020" adopted in 2015, the City Council formulated a strategy to further boost Vienna's role as a central hub of science, research, creativity and innovation.

Vienna set itself the goal of not only creating optimum preconditions for the innovation potential to develop in the metropolitan region as well as for an innovative climate, but as an innovative municipal administration is also committed to the role of the City Administration in shaping, buying and using innovations. This is to preserve Vienna's position in the international competitive arena and prepare the city for upcoming developments and the challenges of the future.

For more information about Innovative Vienna 2020 , please visit www.innovation2020.wien.at.

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 handmaiden, is now recognised as a sister and equal.

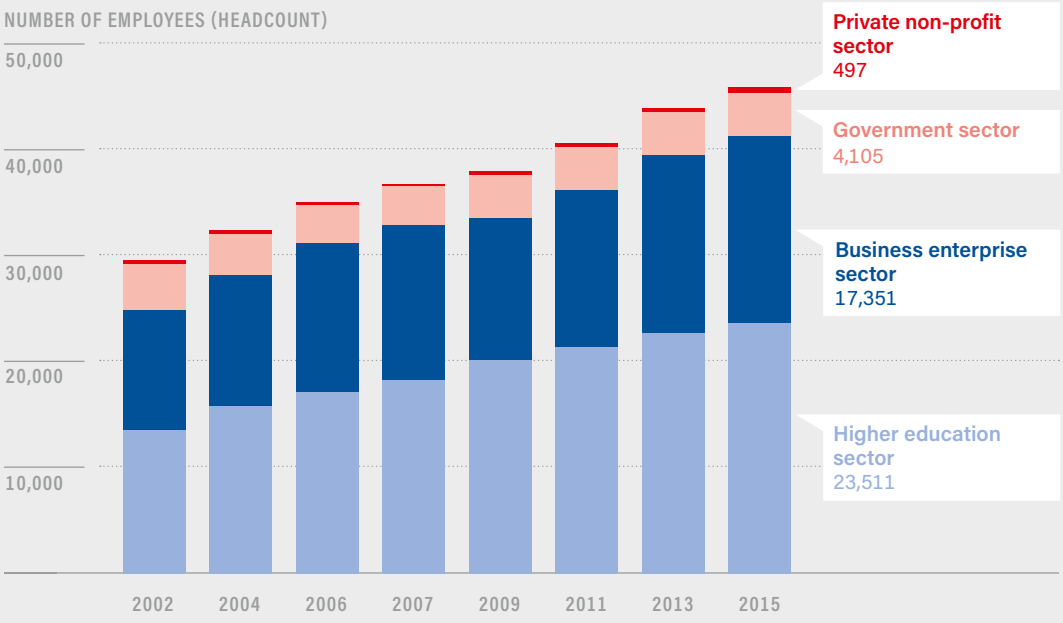
Christoph Bernoulli (1782 1863)

02 — R&D personnel: People create knowledge

Further data on R&D in Vienna can be found at www.wien.at/statistik/wirtschaft/forschung.

Headcount vs. full-time equivalents. Research and development personnel is rendered in two ways – either by head count, 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.

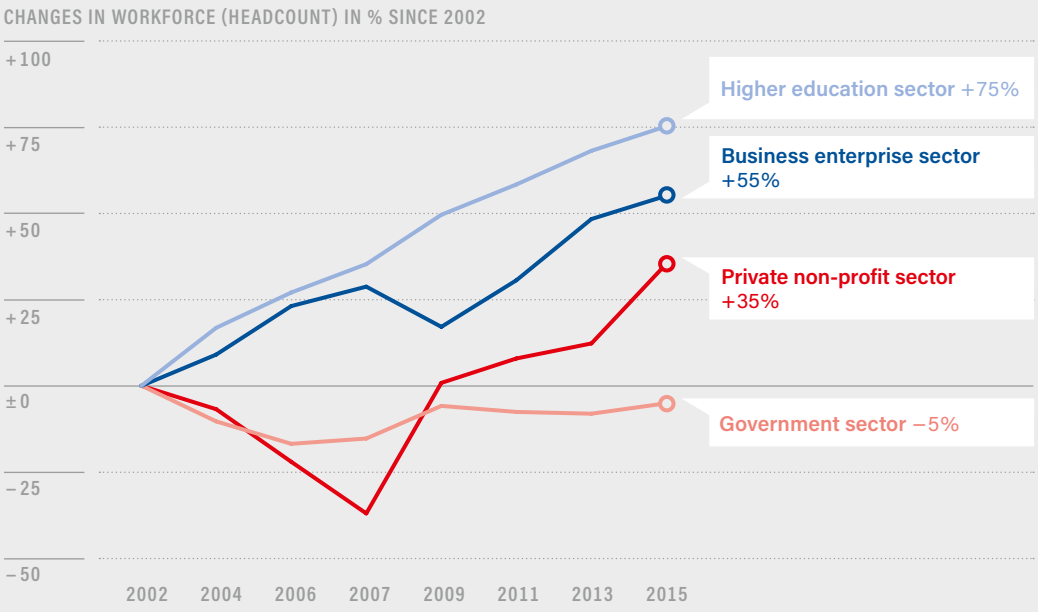
02.01 **R&D personnel by sectors**
Vienna, 2002 to 2015



Source: Statistics Austria

71% of male and 64% of female R&D workers are classified as "scientific personnel".

Development of R&D personnel by sectors
Vienna, 2002 to 2015

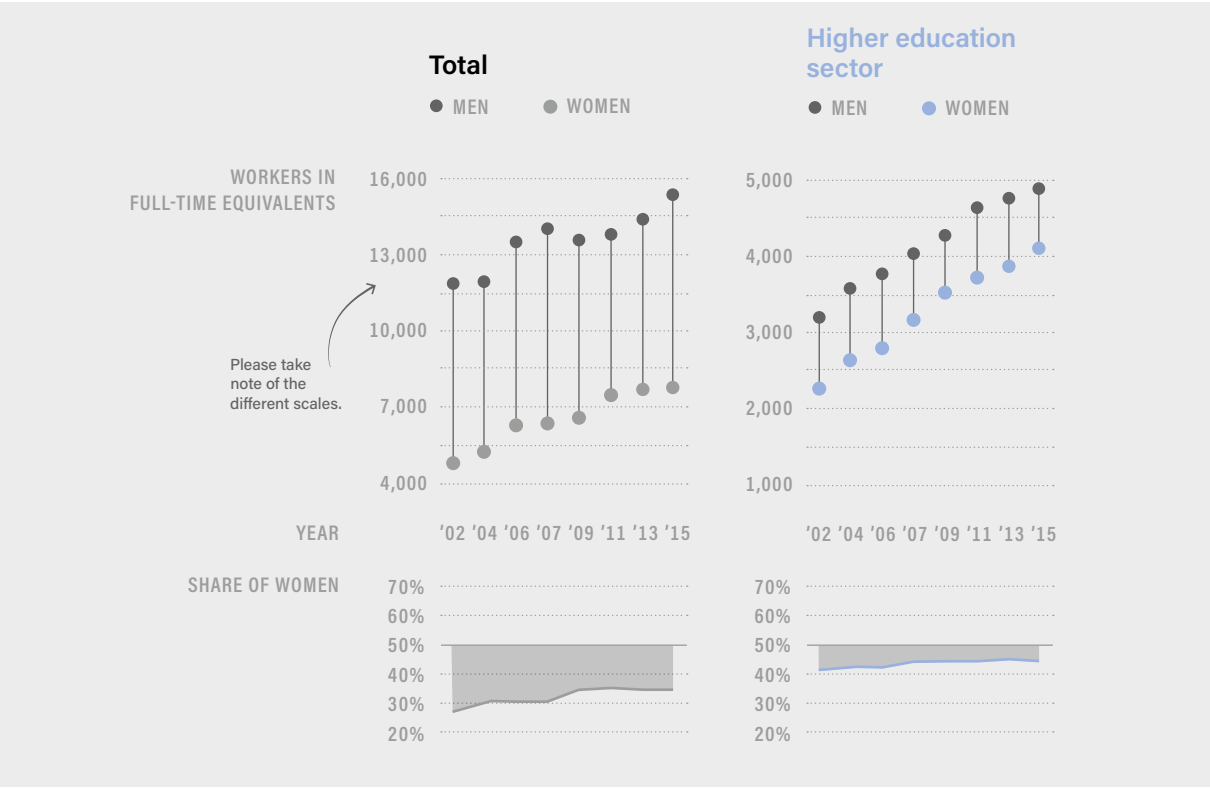


The number of R&D personnel in Vienna rose dramatically from 2002 to 2015, mainly due to the activities of the business enterprise and higher education sectors. The majority of R&D personnel in Vienna is employed in one of these two branches.

The steady increase of R&D staff in the business enterprise sector was briefly interrupted in 2009 by a minus of 9%, probably as a result of the economic crisis. In 2011, a slight increase was recorded, but enterprises only returned to genuine growth in 2013.

Conversely, the higher education sector recorded a steady growth of R&D workers also for 2009 and 2011. It may thus be assumed that the public sector exerted a compensating function.

02.02 R&D personnel gender gap by sectors
Vienna, 2002 to 2015

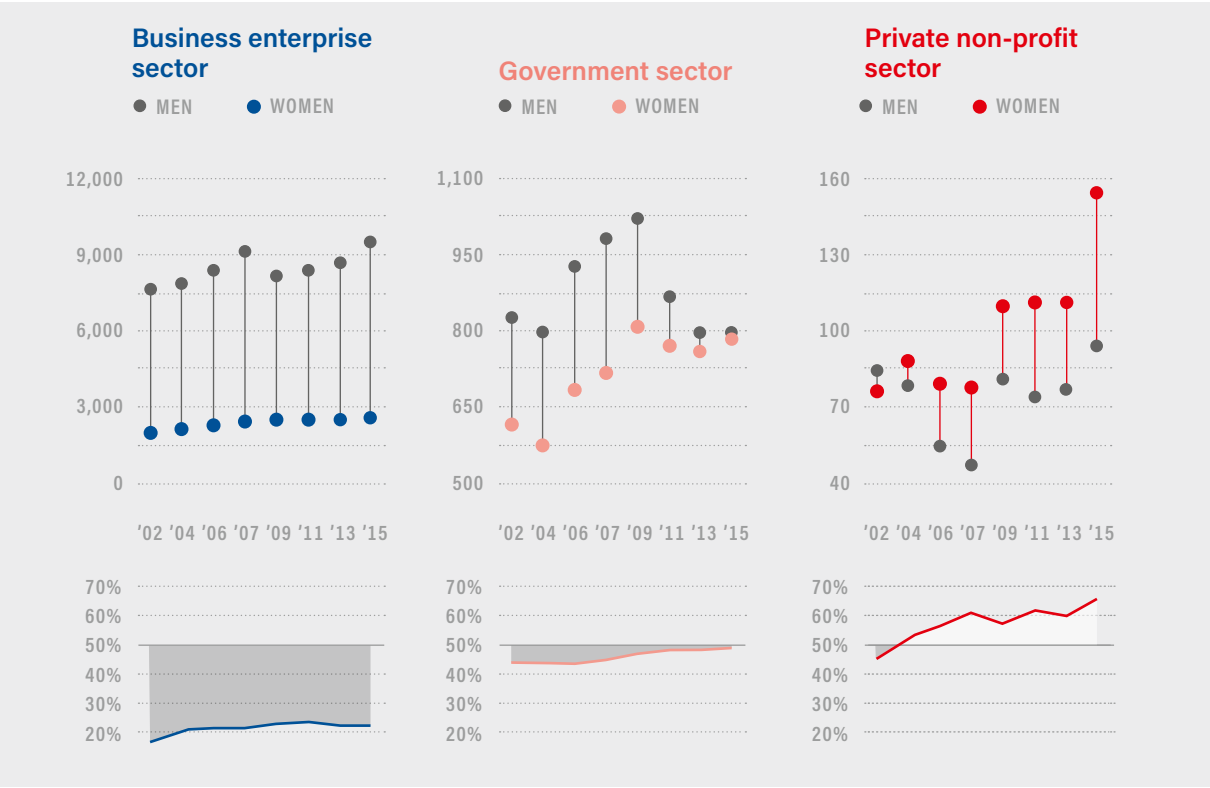


Source: Statistics Austria

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.

33% 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.

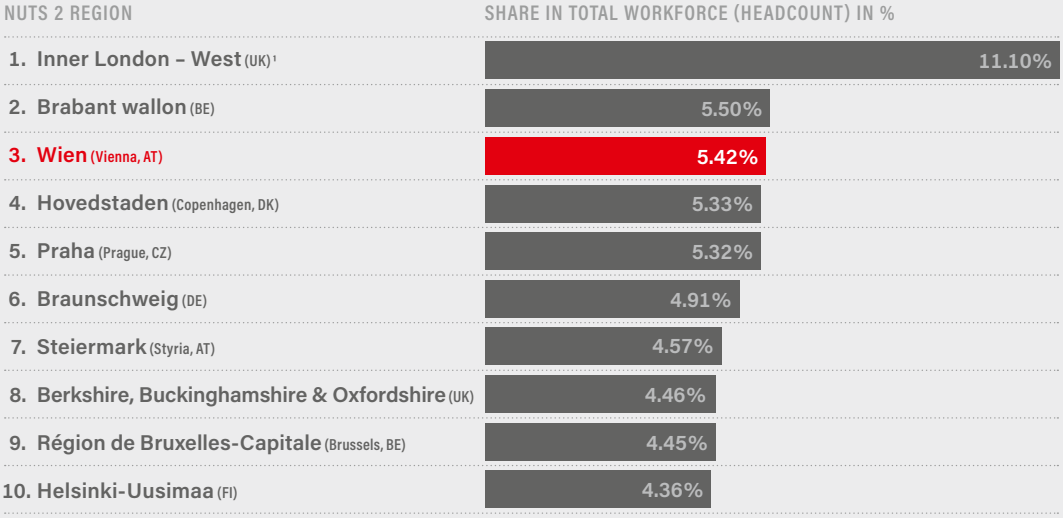
In the business enterprise sector, too, women have caught up; however, their share (in FTE) is still only 22%. The abovementioned decrease in R&D workers during the economic and financial crisis mainly affected men. As a result, the share of female R&D personnel in the business enterprise sector attained a historic peak of almost 24% in 2011 before again decreasing slightly.



On an international level, Austria is still characterised by a below-average female quota (in FTE). According to OECD figures for 2015, Austria's 24% share of female R&D workers is exceeded by Latvia with 51%, by Estonia with 47%, by Portugal with 44% or by Slovakia with 43%. The low value for Austria is mainly due to the business enterprise sector.

Which sector presents the widest gender gap?

02.03 **Share of R&D personnel in Europe**
Top 10 NUTS 2 regions of the EU, 2015



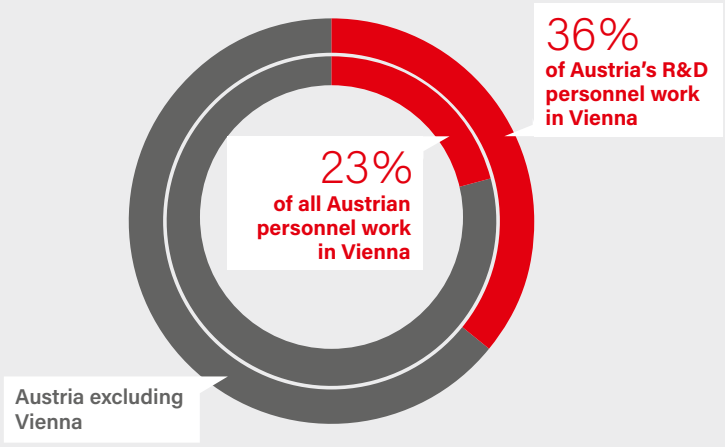
Source: Eurostat

[1] The NUTS 2 region "Inner London – West" only comprises some parts of London. The share of R&D workers was 2.38% in Greater London.

An international comparison reveals an excellent position for Vienna, as the Austrian capital holds 3rd place among all 276 EU regions with regard to the share of R&D personnel.

02.04 **R&D personnel in Austria**
Vienna and rest of Austria, 2015

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 higher education and business enterprise sectors.

Over one third of all Austrian R&D personnel work 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.

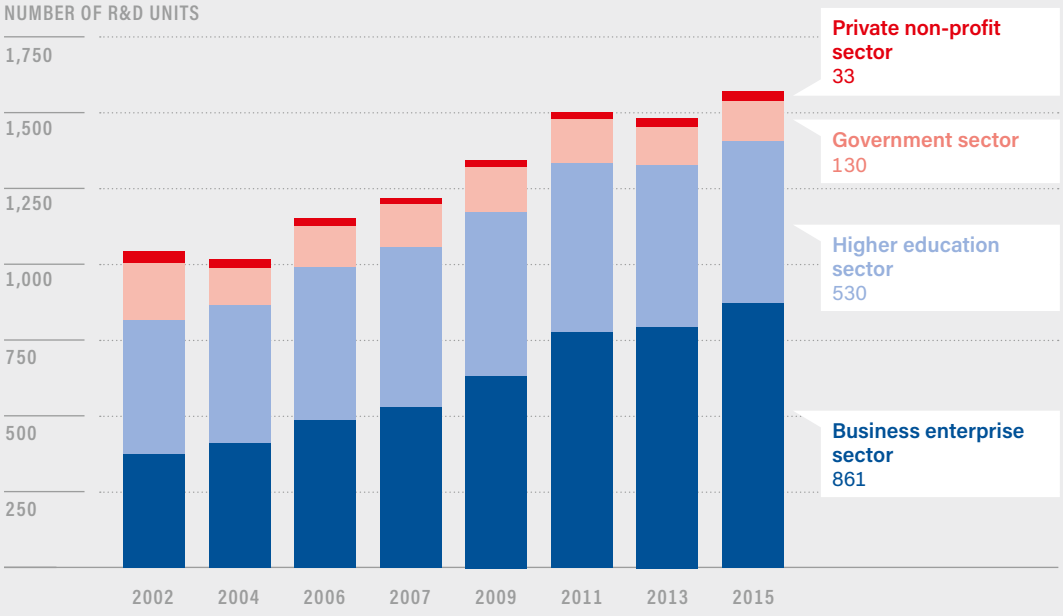
Alexander Graham Bell (1847 1922)

03 — R&D units: Progress through co-operation

Further data on R&D in Vienna can be found at www.wien.at/statistik/wirtschaft/forschung.

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

03.01 R&D units by sectors
Vienna, 2002 to 2015

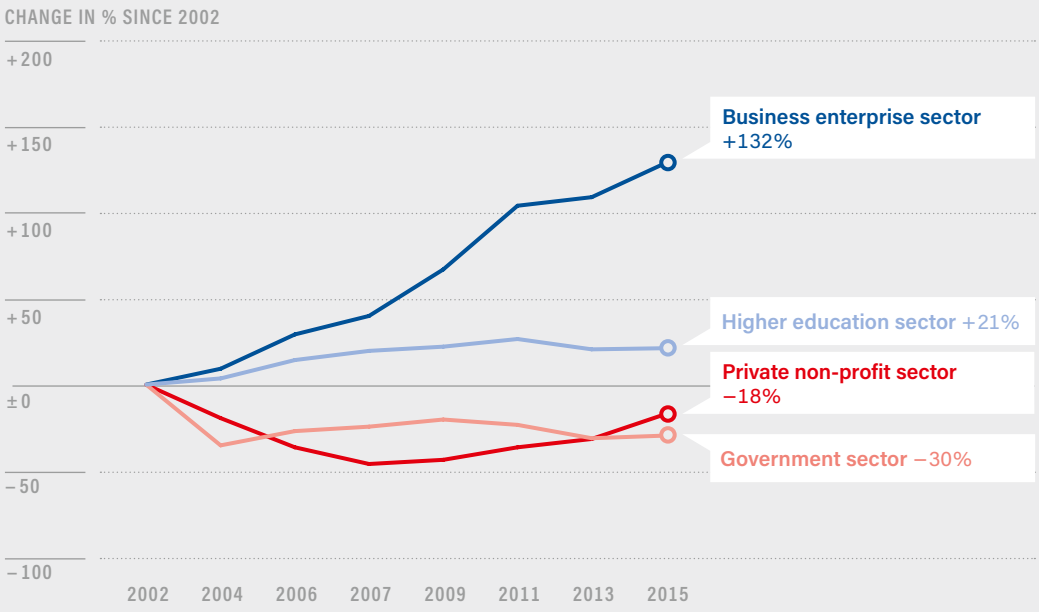


Source: Statistics Austria

The number of units conducting R&D in Vienna has increased sharply over the past 15 years, mainly due to the business enterprise sector, which more than doubled since 2002 – almost exclusively in the service sector. As late as in 1998, there were nearly as many enterprises in the material goods industries that engaged in research (115) as there were similarly active service providers (117). In 2015, this ratio was 1:4.

The higher education sector is the second main funder of research: Vienna is the biggest university city in the German-speaking region (by number of students) and, with the University of Vienna, home to one of Europe's oldest universities. 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 higher education sector between 2011 and 2013 was mainly triggered by the merging of different institutes of the Austrian Academy of Sciences.

Development of R&D units by sectors
Vienna, 2002 to 2015

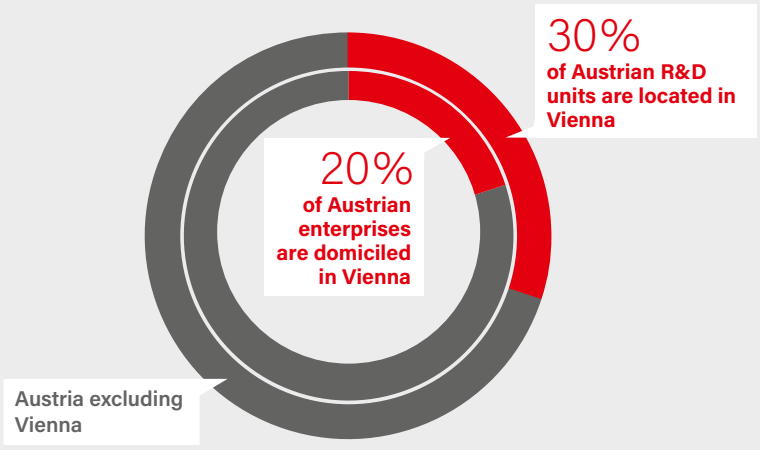


Enterprises with fewer than 100 employees are not automatically included in the survey.

Changes in the number of R&D units of the publicly financed sector are mainly due to restructuring measures.

03.02 **R&D units in Austria**
Vienna and rest of Austria, 2015

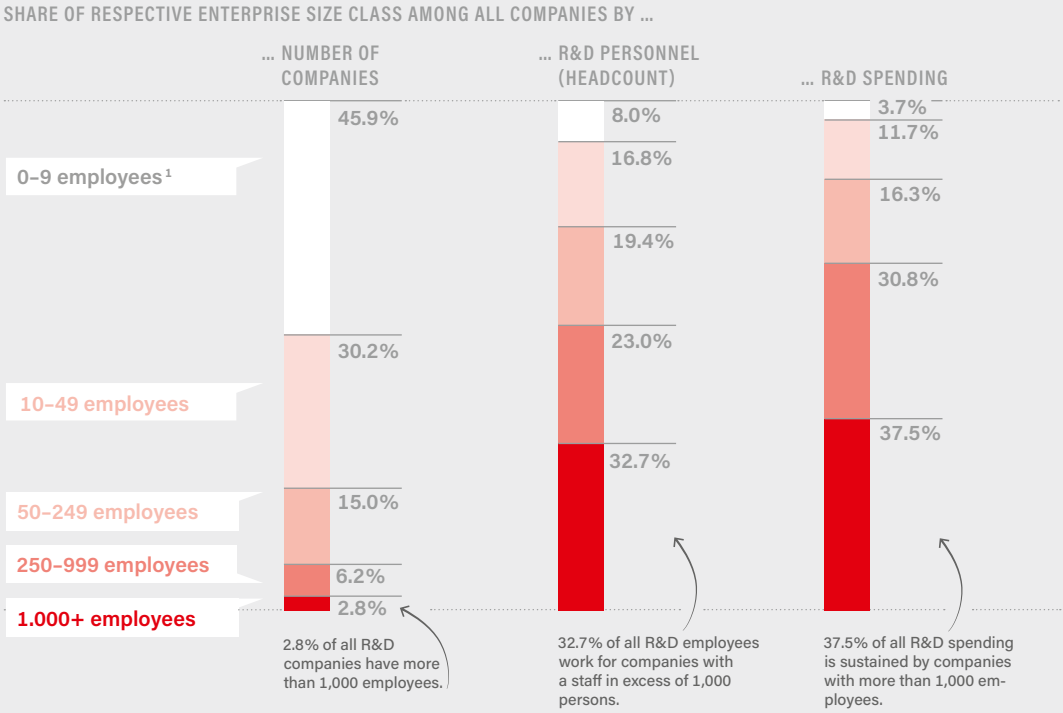
REGIONAL SHARE AMONG ALL AUSTRIAN R&D UNITS / ENTERPRISES



Source: Statistics Austria

Out of 5,181 research sites across the country, 1,554 – or 30% – are situated in the capital.

03.03 **R&D enterprises by size, number of employees and spending volume** — Vienna, 2015



Source: Statistics Austria

[1] The five enterprise size classes are based on headcount.

Almost 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 finding applies to Vienna as a business location in general.

Conversely, the merely 3% of Viennese enterprises conducting research and employing over 1,000 persons account for over 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 9% among Viennese companies, sustain about two thirds of all R&D expenditure and employ more than half of all researchers and developers.

The industry branches employing the highest number of R&D workers are IT services, natural, engineering and agricultural sciences, medicine and electrical equipment.

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Vienna, August 2018

Glossary

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

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 developing new applications of this knowledge.
The element of novelty and originality (new findings, new knowledge, new applications) is a 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.
The quota describes the share of R&D spending in % 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.

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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.

NUTS 2
NUTS is the system used for structuring Europe's regions and stands for "Nomenclature of territorial units for statistics" (in French: Nomenclature des unités territoriales statistiques). Across the EU, there existed a total of 276 regions at NUTS 2 level in 2015 (NUTS 2013); 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).

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