

## Research and development in the pharmaceutical sector

Funding for pharmaceutical research and development (R&D) is the result of a complex mix of private and public sources. Governments mainly support basic and early-stage research. Such funding is made through direct budget allocations, research grants, publicly-owned research institutions and funding of higher education institutions. The pharmaceutical industry translates and applies knowledge generated by basic research to develop products, and invests in large clinical trials required to gain market approval. The industry also receives direct R&D subsidies or tax credits in many countries.

In 2014, governments of OECD countries budgeted about USD 51 billion on health-related R&D (a broader category than pharmaceuticals). This figure understates total government support, since it excludes most tax incentive schemes or funding for higher education or publicly-owned corporations. Meanwhile, the pharmaceutical industry spent approximately USD 100 billion on R&D across OECD countries. In high-income countries, the business sector has been estimated to contribute 60% of all health-related research, while 30% comes from governments and 10% from other sources, including private not-for-profit organisations and universities' own funds (Røttingen et al., 2013).

Most pharmaceutical R&D takes place in OECD countries. However, the share of non-OECD countries in global industry R&D expenditure is increasing (Chakma et al., 2014), especially in China, where the industry spent approximately USD 11 billion on R&D in 2014 (0.05% of GDP). More than half of the spending in OECD countries (Figure 10.12) occurs in the United States, where the pharmaceutical industry spent about USD 56 billion (0.3% of GDP), and direct government budgets on health-related R&D were USD 33 billion (0.2% of GDP). Industry spent USD 26 billion (0.1% of GDP) and governments budgeted USD 11 billion (0.05% of GDP) in Europe; and USD 15 billion (0.3% of GDP) and USD 1.6 billion (0.03% of GDP) respectively in Japan. As a share of GDP, industry spending is highest in Switzerland (0.6%), Belgium (0.6%) and Slovenia (0.4%), smaller countries with relatively large pharmaceutical sectors.

The pharmaceutical industry is highly R&D intensive. On average across OECD countries, the industry spent some 14% of its gross value added on R&D. This is almost as high as in the air and spacecraft (18%) and electronics and optical products industries (17%), and considerably higher than the average across manufacturing as a whole (6%) (Figure 10.13).

Expenditure on R&D in the pharmaceutical industry in OECD countries grew by more than 50% in real terms between 2004 and 2014. However, this increase is not associated with higher output in terms of new drug approvals (NDAs). In the United States, the annual number of NDAs has remained relatively stable since the 1980s (Figure 10.14) while the number of approvals per inflation-adjusted R&D spending has declined steadily. Exceptions are the late 1990s, when a backlog of pending applications was cleared, and the years since 2010. This pattern of constant output at increasing costs despite advances in technology ("Eroom's Law") is driven by a

complex combination of factors. These include growing requirements to obtain market approval that have increased clinical trial costs and an ever-increasing "back catalogue" of effective drugs that has shifted research efforts to more complex conditions (Scannell et al., 2012). Rising R&D costs can be both a cause and a result of higher drug prices, as the acceptance of higher prices by payers can make increasingly expensive R&D financially viable. Increasing R&D costs can then in turn drive up prices.

### Definitions and comparability

Business enterprise expenditure on R&D (BERD) covers R&D carried out by corporations, regardless of the origin of funding, which can include government subsidies. BERD is recorded in the country where the R&D activity took place, not the country providing funding. National statistical agencies collect data primarily through surveys and according to the *Frascati Manual* (OECD, 2015) but there is some variation in national practices. "Pharmaceutical R&D" refers to BERD by businesses classified in the pharmaceutical industry.

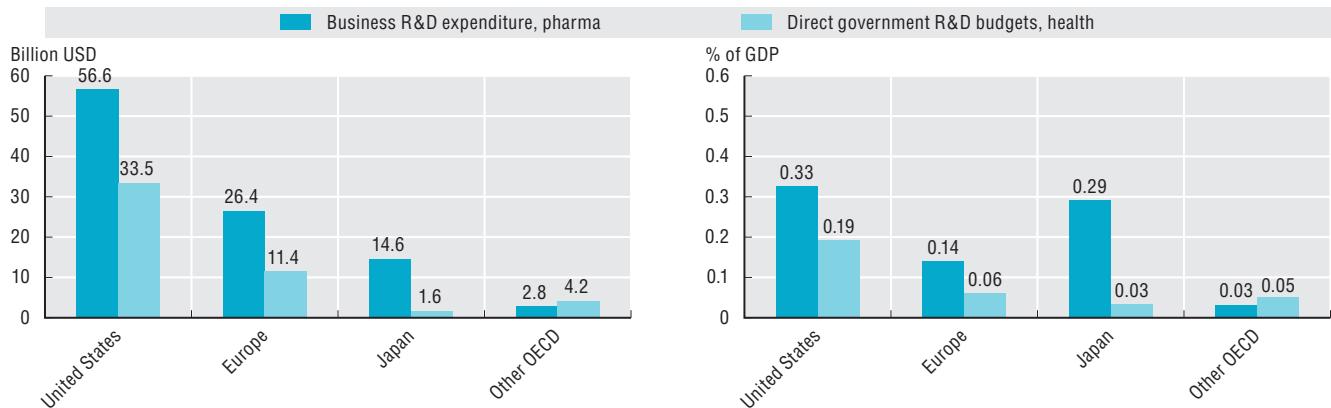
Government budgets for R&D (GBARD) capture both R&D performed directly by government and amounts paid to other institutions for R&D. "Health-related R&D" refers to GBARD aimed at protecting, promoting and restoring human health, including all aspects of medical and social care. It does not cover spending by public corporations or general university funding that is subsequently allocated to health.

The gross value added (GVA) of a sector equals gross output less intermediate consumption. It includes the cost of wages, consumption of fixed capital and taxes on production. Because GVA does not include intermediate consumption, it is less sensitive than gross output to sector-specific reliance on raw materials. OECD averages in Figure 10.13 are based on 15 countries for air and spacecraft, and 25-29 countries for all other industries.

### References

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- Scannell, J.W. et al. (2012), "Diagnosing the Decline in Pharmaceutical R&D Efficiency", *Nature Reviews Drug Discovery*, Vol. 11, No. 3, pp. 191-200.

10.12. Business enterprise expenditure for pharmaceutical R&D (BERD) and government budgets for health-related R&D (GBARD), 2014 or nearest year

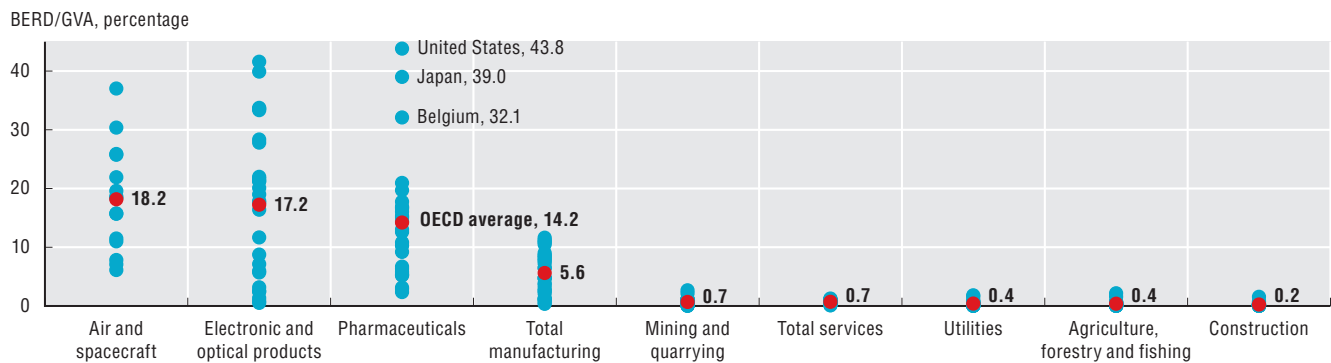


Note: 2012 BERD data for Switzerland and 2011 GBARD data for Mexico; all other countries 2014 or 2013. Europe includes 21 EU member countries that are also members of the OECD, Iceland, Norway and Switzerland; no BERD data available for Luxembourg and no GBARD data for Latvia.

Source: OECD Main Science and Technology Indicators and Research and Development Statistics Databases.

StatLink <http://dx.doi.org/10.1787/888933605597>

10.13. R&D intensity by industry: business enterprise R&D expenditure (BERD) as a proportion of gross value added (GVA), 2014 or nearest year

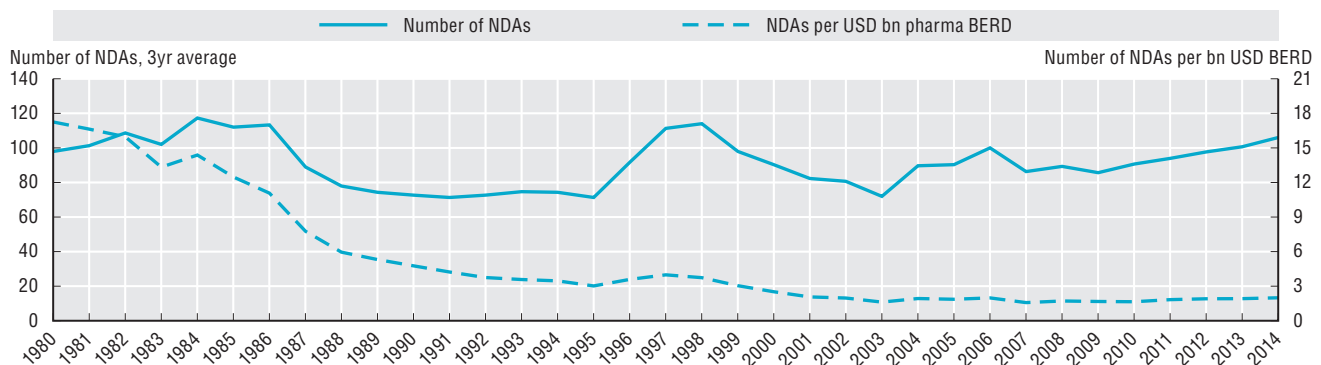


Note: The air & spacecraft, electronic & optical products and pharmaceutical industries are sub-categories of total manufacturing. All other industries are totals at the same level as total manufacturing.

Source: OECD Analytical Business Enterprise R&D (ANBERD), Structural Analysis (STAN) and System of National Accounts (SNA) Databases. National statistics offices for GVA in the pharmaceutical industry in Australia and the air & spacecraft industry in Canada.

StatLink <http://dx.doi.org/10.1787/888933605616>

10.14. Annual new drug approvals (NDAs) per billion USD pharmaceutical business expenditure on R&D in the United States, inflation-adjusted



Source: United States Food and Drug Administration (FDA); Pharmaceutical Research and Manufacturers of America (PhRMA).

StatLink <http://dx.doi.org/10.1787/888933605635>



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