

## LUXEMBOURG

Luxembourg is a small and stable high-income economy and has historically featured solid growth, low inflation and low unemployment. The economy has diversified from its roots in steel, and the value added by banks, insurance, real estate and other business services account for almost half of the economy's total value added: the financial sector alone accounts for 30% of GDP. The country's science and innovation profile demonstrates strong areas but also areas for improvement. Gross expenditure on R&D (GERD) is relatively modest, and in 2008 its 1.6% of GDP was below the OECD average. GERD per capita is quite high by comparison, and real GERD grew by 2.7% in 2008. In 2007, three-quarters of GERD were financed by industry, the second highest share after Japan. At 1.2% of GDP, however, this indicator was slightly below the average in 2007. Business expenditure was 1.3% of GDP in 2008, also below the average.

Luxembourg's innovation outcomes are, on balance, above average. While it had a small country share in triadic patent families in 2007, its 49 triadic patents per million population was above the OECD average (40.2). A very high 29% of firms introduced new-to-market product innovations and 62% introduced non-technological innovations during 2004-06; however, in 2008 the 385 scientific articles per million population was well below the average.

Luxembourg's economy depends on foreign and cross-border workers for about 60% of its labour force. Innovation linkage indicators, however, are mixed. The 6% of GERD financed from abroad is slightly above average, but the share of business-funded R&D performed in the higher education and government sectors was low.

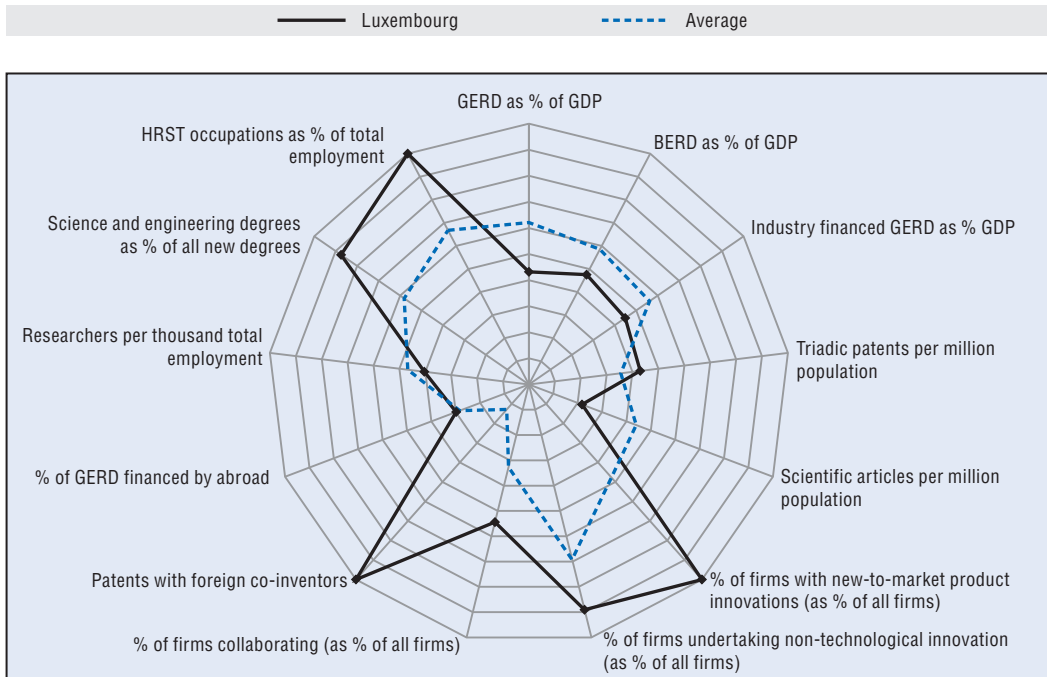
However, a high 16% of firms collaborated on innovation activities during 2004-06. The 60.3% of Patent Cooperation Treaty (PCT) patent applications with foreign co-inventors led the OECD during 2005-07, although the absolute number was small.

Luxembourg's overall performance in human resources in science and technology (HRST) has eased somewhat. In 2008, HRST occupations accounted for the largest share of total employment, with 42%. Science and engineering degrees were 31.5% of total degrees, the third highest in the OECD. However, researchers per thousand employment edged down from seven in 2005 to 6.5 in 2008.

GDP expanded by a strong average annual 4% from 2000 to 2007. Real GDP growth fell from 6.5% in 2007 to zero in 2008 and GDP contracted by 3.4% in 2009, while the unemployment rate increased modestly from 4.9% to 5.4%. Nonetheless, the country continues to enjoy an extraordinarily high standard of living and its GDP per capita is 180% relative to the United States, the highest in the OECD, although labour productivity growth has slowed in recent years.

The services sector represents more than 80% of Luxembourg's GDP and innovation in services has been a research priority. Other policy challenges include collaboration between public research and private companies and attracting and keeping highly skilled workers. One development has been to turn Luxembourg into an attractive destination for intellectual property. To reduce dependence on the banking sector, the government is accelerating the diversification of the economy into key technologies such as biotechnologies and green technologies.

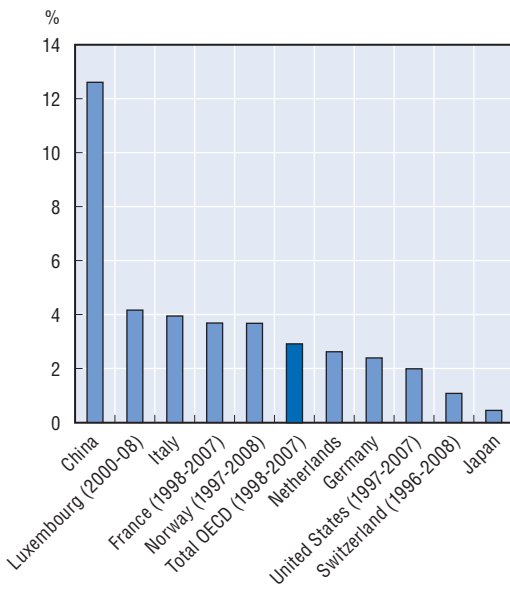
### Science and innovation profile of Luxembourg



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#### Growth in business researchers

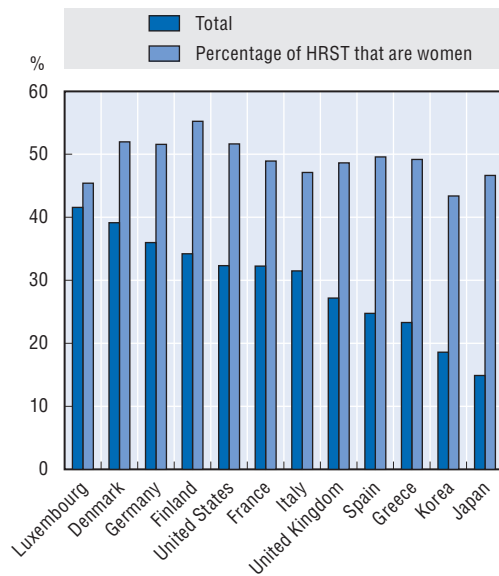
Average annual growth rate, 1998-2008



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#### HRST occupations as a share of total employment

Selected countries, 2008



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