

Executive summary

Downturns tend to accelerate structural change and create new challenges and opportunities. The *OECD Science, Technology and Industry Scoreboard 2015* shows how OECD countries and major non-OECD economies are starting to move beyond the crisis, increasingly investing in the future.

Investment in innovation is intensifying

By 2013, total R&D spending in the OECD area grew 2.7% in real terms to reach USD 1.1 trillion, while its share in GDP remained unchanged from 2012 at 2.4%. This increase was driven by business R&D, while government R&D was hit by budget consolidation measures. Innovation relies not only on investment in R&D, but also on complementary assets such as software, design and human capital, i.e. knowledge-based capital (KBC). KBC investment has proven resilient to the crisis, and 2013 data show KBC investment intensifying in every sector of the economy.

The research “mix” matters

Since the mid-1980s, OECD spending on basic research has increased faster than applied research and experimental development, reflecting many governments’ emphasis on funding scientific research. Basic research remains highly concentrated in universities and government research organisations. A significant share of R&D in such institutions is dedicated to development in Korea (35%) and China (43%). Overall in 2013, China invested relatively little (4%) in basic research compared to most OECD economies (17%), and its R&D spending is still heavily oriented towards developing S&T infrastructure, i.e. buildings and equipment.

Disruptive innovations are enabling the next production revolution

A new generation of ICT technologies, such as those related to the Internet of Things, big data, *quantum* computing, plus a wave of inventions in advanced materials and health, are laying the ground for profound transformations to how we will work and live in future. In 2010-12, the United States, Japan and Korea led invention in these domains (accounting collectively for over 65% of patent families filed in Europe and the United States), followed by Germany, France and China.

Government support for business R&D is on the rise, but demand matters

Firms investing in R&D are more likely to introduce innovations. In 2015, 28 OECD countries are using R&D tax incentives to support business R&D. This support accounted for nearly USD 50 billion in 2013. Demand also matters for innovation. Participation in procurement markets is more common among large firms than among SMEs, and is far more likely among innovative than non-innovative firms.

Scientific excellence relies on research hotspots and collaboration networks

A few centres of excellence continue to dominate the science and innovation landscape. The United States accounted for 22 of the top-30 universities with the highest relative impact over 2003-12. The top-30 high-impact, typically public, research institutions are spread over 14 different locations, including non-OECD economies. Four countries, the United States, the United Kingdom, Germany and China, accounted together for 50-70% of high-impact publications across all scientific disciplines. International collaboration has nearly doubled since 1996, reaching almost 20% of all scientific publications in 2013. The United States continues to play a central role in science networks, both as a destination and source of scientists.

Frontier innovation is highly concentrated across R&D corporations

In 2012, the 2 000 leading R&D corporations and their network of 500 000 affiliates accounted for more than 90% of global business R&D and 66% of patent families filed at the largest five intellectual property offices worldwide. Within the top-2000, 250 multinationals accounted for 70% of R&D expenditure, 70% of patents, almost 80% of ICT-related patents, and 44% of trademarks filings. Most of their headquarters (55%) and affiliates (40%) were based in the United States and Japan. Over 80% of the IP assets protected in Europe and the United States by the top-2000 R&D investors with global ultimate owners in Hong Kong, China; Bermuda; Ireland and the Cayman Islands are generated by foreign affiliates, mainly located in the United States and China.

Global value chains (GVCs) are still mostly regional in scope

International fragmentation of production has expanded rapidly, with intermediates now representing about 50% of world trade in manufactured goods. East and Southeast Asia (“Factory Asia”) has become increasingly integrated and is a major player in global production, while China is a principal supplier of intermediates to many Southeast Asian economies further downstream in the production chain. By 2014, China had surpassed Canada and Mexico to become the biggest supplier of manufactured intermediates to the United States. The geographical scope of value chains remains mostly regional, reflecting linkages within Europe, NAFTA and “Factory Asia”, with the role of regional networks varying by sector.

More workers are becoming engaged in GVCs

The number of jobs involved in GVCs increased between 2011 and 2013 for most European countries and the United States, as did the proportion of highly skilled workers employed along GVCs. In 2013, approximately 60 million business sector workers across 21 EU countries and the United States were engaged in GVCs, with about 36% of these jobs in highly skilled occupations. Meeting foreign demand requires relatively high shares of low- and highly-skilled workers, whereas domestic demand relies more on medium-skilled occupations.

The crisis and longer-term trends have changed the demand for jobs

More of the demand for manufactured goods in the OECD is being met by workers in emerging economies. Since the crisis, both large and small firms have shed jobs, particularly in manufacturing. In Europe, the crisis primarily affected routine-intensive occupations – for which workers’ tasks may be automated, outsourced and/or offshored –

while in the United States non-routine (e.g. managerial) jobs were also affected. During the 2011-12 upswing, the United States regained jobs across all occupations, while gains in Europe occurred only in non-routine jobs.

Successful businesses invest in workers' capabilities

The organisational capabilities of firms, specifically their ability to manage production across GVCs, the skills of workers and functions they accomplish, are among the most important drivers of firms' performance and ability to succeed in global markets. Estimates of investment in organisational assets range between 1.4% and 3.7% of value added. Firm-specific training enables workers to cope with change while helping them improve productivity. Estimates of investment in training reached 6-7% of value added in 2011-12, with on-the-job training alone representing 2.4%.



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