European Commission

# NEWSLETTER on STI Data and Indicators

DG RTD, A4, Analysis and monitoring of national research policies

1. Eurostat data on R&D expenditure

On 16 November 2016 *Eurostat* released provisional data on **R&D expenditure** in 2015. The data show that EU R&D intensity stagnated at 2.04% of GDP. Sweden continues to be the leading EU country in terms of R&D intensity (3.26% of GDP in 2015 compared to 3.15% in 2014). R&D intensity in Finland fell below 3% for the first time since 2000, to reach 2.9% in 2015. Austria (3.07%) now holds the second place, Denmark (3.03%) is third. R&D intensity in Germany, the largest spender in the EU in absolute terms, declined slightly from 2.89% in 2014

to 2.87% in 2015. There has been some progress in R&D intensity in countries with low spending levels, including Bulgaria (from 0.79% in 2014 to 0.96% in 2015), Greece (from 0.84% to 0.96%), Croatia (0.79% to 0.85%), Poland (0.94% to 1.0%), Romania (0.38% to 0.49%) and Slovakia (0.88% to 1.18%). The data also show that in 2014 (2015 results not yet available) China (2.05%) has overtaken the EU and that Japan (3.59%) and Korea (4.29%) were moving further ahead.

R&D intensity (Gross domestic expenditure on R&D as % of GDP)

Legend: ■ 2015 (1) ▬ 2010 ■ 2020 target (2)
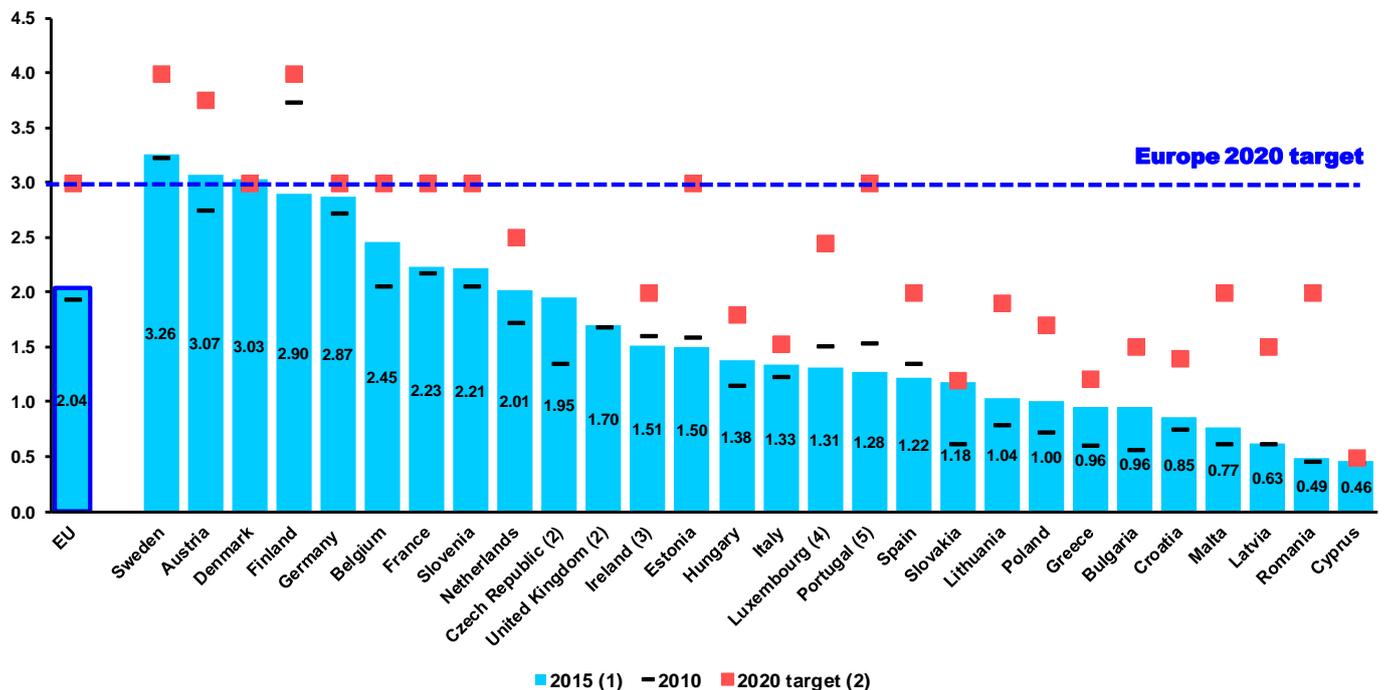
Source: DG Research and Innovation - Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, Member States
Notes: [1]IE: 2014. [2]CZ, UK: R&D intensity targets are not available. [3]IE: The R&D intensity target is 2.5% of GNP which is estimated to be equivalent to 2.0% of GDP.
[4]LU: The R&D intensity target is between 2.30% and 2.60% (2.45% was assumed). [5]PT: The R&D intensity target is between 2.70% and 3.30% (3.00% was assumed).
[6]LU, NL, RO, SI, UK: Breaks in series occur between 2010 and 2015.

More info: http://ec.europa.eu/eurostat/documents/2995521/7752010/9-30112016-BP-EN.pdf/62892517-8c7a-4f23-8380-ce33df016818

2. Commission Autumn 2016 Economic Forecast

On 9 November 2016 the *Commission* (DG ECFIN) published the **Autumn 2016 Economic Forecast**.
GDP growth in the EU as a whole is forecast at 1.8% in 2016, 1.6% in 2017 and 1.8% in 2018 (Spring forecast: 2016: 1.8%, 2017: 1.9%). The EU unemployment rate is forecast to decline from 8.6% in 2016 to 8.3% in 2017 and 7.9% in 2018.
Inflation is forecast to accelerate from 0.3% in 2016 to 1.6% in 2017 and 1.7% in 2018.

In 2016 Romania's GDP is forecast to grow the fastest (5.2%), followed by Ireland (4.1%) and Malta (4.1%). Greece (-0.3%) is forecast to be the only shrinking EU economy. In 2017 Romania is again forecast to have the fastest growth (3.9%), followed by Luxembourg (3.8%) and Malta (3.7%). Greece is expected to return to growth in 2017 (2.7%), while growth in Italy and Finland will, as in 2016, remain below 1%. Growth in the UK is expected to slow considerably in 2017.

In 2018 the UK, Finland and Portugal are forecast to be the EU countries with the slowest economic growth.
More info: http://ec.europa.eu/economy_finance/eu/forecasts/2016_autumn_forecast_en.htm


% GDP Growth 2017
≥ 3
≥ 2
≥ 1
< 1

Malta
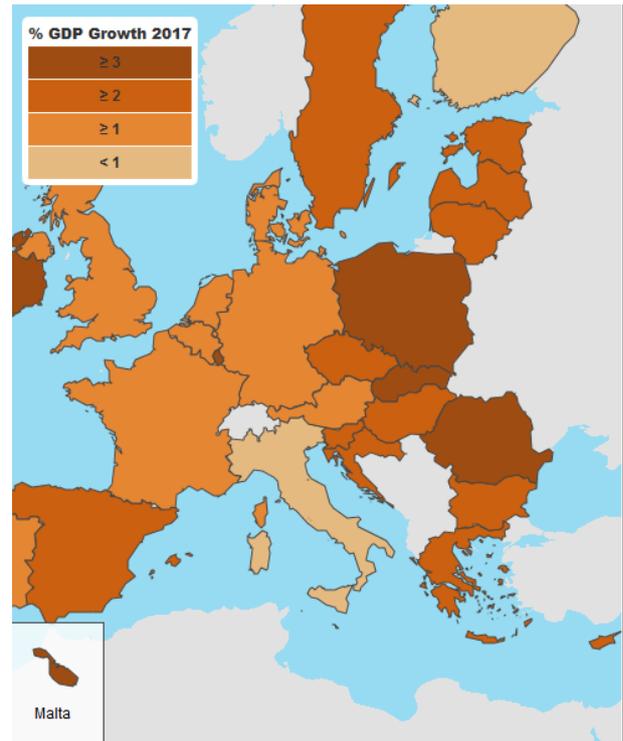
3. Commission Education and Training Monitor 2016

On 7 November the *Commission* (DG EAC) published the 2016 edition of the **Education and Training Monitor**. The report shows that as regards the EU targets for 2020 in education (which include two headline targets of the Europe 2020 Strategy) performance in early school leaving (11% in 2015, target <10%) and in tertiary educational attainment (38.7% in 2015, target 40%) is already near the target (in both indictaors women outperform men).
Participation in early childhood education and care at age 4+ (now 94.3%, target 95%) is also close to the 2020 target.
The distance to the target is bigger as regards the employment rate of recent graduates (now 76.9%, target 82%). In this respect, the employment rate of tertiary graduates is much higher than for those having only general secondary education. The share of underachievers (target < 15%) is still relatively high in maths (22.1%), but lower in reading (17.8%) and science (16.6%). Achievement data relate to the year 2012 (source PISA study 2012, the results of the PISA study 2015 will be published on 6 December 2016). Performance is also clearly below the 15% target in adult participation in learning (now 10.7%) and participation rates are more than four times higher for those with high education levels compared to those with low levels.

EU targets for 2020 in education
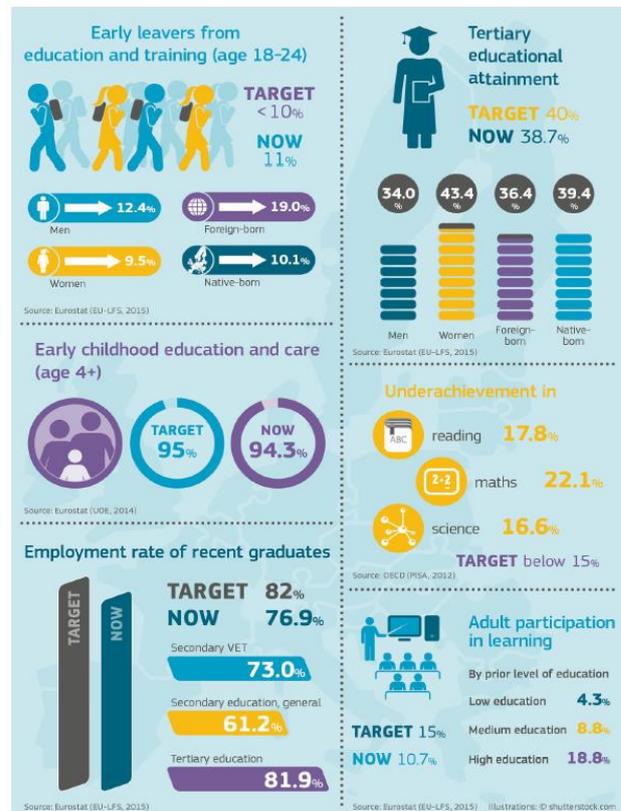
More info: http://ec.europa.eu/education/policy/strategic-framework/et-monitor_en
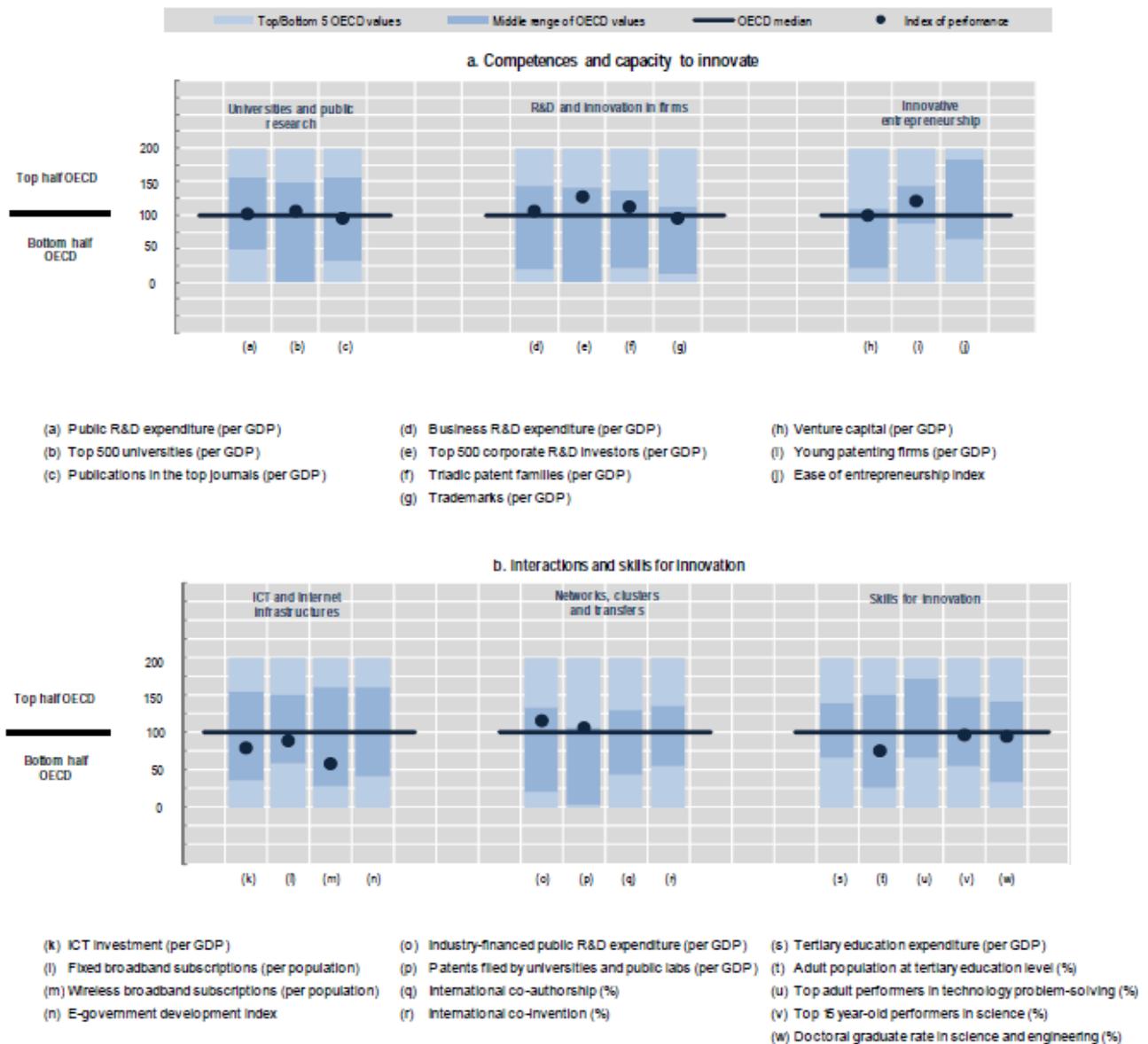
4. OECD G20 Innovation Report

On 4 November 2016 the *OECD* released its **G20 Innovation Report**, showing key innovation related data for the G20 economies. The report includes country profiles for each G20 economy (except Saudi Arabia). As regards the EU, there is a profile for the European Union as a whole and for each of the 4 EU G20 countries (Germany, France, Italy, UK). Performance relative to the OECD average is assessed according to 23 indicators. Indicators where the EU performs relatively well compared to the OECD average include Top 500 corporate R&D investors, young patenting firms and industry financed public R&D expenditure. Indicators with low EU performance include ICT infrastructure and investment, as well as adult population at tertiary education level.

The report also shows R&D expenditure targets (% of GDP) of non-EU countries, such as Russia (1.75%, 2015), Brazil (2.0%, 2019), India (2%),Turkey (3.0%, 2023), USA (3%) and Japan (4%, 2020).

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Figure 38. Science and Innovation in the European Union

Comparative performance of national science and innovation systems, 2016

Legend: Top/Bottom 5 OECD values · Middle range of OECD values · OECD median · Index of performance

a. Competences and capacity to innovate

Universities and public research · R&D and innovation in firms · Innovative entrepreneurship

(a) Public R&D expenditure (per GDP)
(b) Top 500 universities (per GDP)
(c) Publications in the top journals (per GDP)

(d) Business R&D expenditure (per GDP)
(e) Top 500 corporate R&D investors (per GDP)
(f) Triadic patent families (per GDP)
(g) Trademarks (per GDP)

(h) Venture capital (per GDP)
(i) Young patenting firms (per GDP)
(j) Ease of entrepreneurship index

b. Interactions and skills for innovation

ICT and internet infrastructures · Networks, clusters and transfers · Skills for innovation

(k) ICT investment (per GDP)
(l) Fixed broadband subscriptions (per population)
(m) Wireless broadband subscriptions (per population)
(n) E-government development index

(o) Industry-financed public R&D expenditure (per GDP)
(p) Patents filed by universities and public labs (per GDP)
(q) International co-authorship (%)
(r) International co-invention (%)

(s) Tertiary education expenditure (per GDP)
(t) Adult population at tertiary education level (%)
(u) Top adult performers in technology problem-solving (%)
(v) Top 15 year-old performers in science (%)
(w) Doctoral graduate rate in science and engineering (%)

Note: Normalised index of performance relative to the median values in the OECD area (Index median=100).

More information: https://www.oecd.org/china/G20-innovation-report-2016.pdf

5. Results of the IEA study on maths and science achievement (TIMSS 2015)

On 29 November 2016 the *International Association for the Evaluation of Educational Achievement* (IEA) published the results of the 2015 round of the **Trends in International Mathematics and Science Study** (**TIMSS 2015**). The study tests pupils' achievement at 4th and 8th grade. 21 EU countries participated in the test at the 4th grade, 8 participated at the 8th grade (more participated in the OECD PISA study, whose skills test also focused on science and which was carried out in 2015 as well). In both mathematics and science and on both grades east Asian education systems came out as top performers, with Singapore in the lead in all assessments. Countries in the middle East and Africa were the bottom performers. In the EU in maths at 4th grade Ireland, UK-England and Belgium-Flemish Community came out as top performers, while Slovakia and France were the lowest performers in the EU. In science at grade 4, Finland, Poland and Slovenia were the EU's top performers, while France and Cyprus performed worst. At 8th grade in mathematics Ireland and UK-England were the EU's top performers, Italy and Malta the lowest ones. At 8th grade in science UK-England and Ireland were the EU's top performers, Italy and Malta again the lowest ones. It should be considered, however, that the average age of pupils differs between countries, with an impact on the level of cognitive development. In Sweden and Russia 4th graders are on average 10.8 years old, in Italy only 9.7 years. In Italy and Malta 8th graders are on average 13.8 years old, compared to 14.7 years in Sweden and Russia.

MATHEMATICS–FOURTH GRADE — TIMSS 2015

International Mathematics Achievement

East Asian Countries Top Achievers at Fourth Grade in Mathematics

TIMSS 2015 Mathematics has achievement results for **49** countries at the fourth grade.

Singapore 618 Hong Kong SAR 615 Korea 608 Chinese Taipei 597 Japan 593

23 — The gap between the East Asian countries and the next highest country was 23 in 2015, unchanged from 2011.

Northern Ireland 570
Russian Federation 564
Norway 549 Ireland 547 England 546
Belgium-Flemish 546 Kazakhstan 544
Portugal 541 United States 539 Denmark 539
Lithuania 535 Finland 535 Poland 535
Netherlands 530 Hungary 529 Czech Republic 528
Bulgaria 524 Cyprus 523 Germany 522 Slovenia 520
Sweden 519 Serbia 518 Australia 517 Canada 511 Italy 507
Spain 505 Croatia 502 Slovak Republic 498 New Zealand 491
France 488 Turkey 483 Georgia 463 Chile 459 United Arab Emirates 452
Bahrain 451 Qatar 439 Iran 431 Oman 425 Indonesia 397
Jordan 388 Saudi Arabia 383 Morocco 377 South Africa 376 Kuwait 353

Please see Exhibit 1.3 for statistically significant differences.

SCIENCE–FOURTH GRADE — TIMSS 2015

International Science Achievement

Singapore and Korea the Top Achievers at Fourth Grade in Science. Japan, Russian Federation, and Hong Kong SAR also in the Top Five.

TIMSS 2015 Science has achievement results for **47** countries at the fourth grade.

Singapore 590
Korea 589 Japan 569
Russian Federation 567
Hong Kong SAR 557
Chinese Taipei 555 Finland 554
Kazakhstan 550 Poland 547
United States 546 Slovenia 543
Hungary 542 Sweden 540 Norway 538
England 536 Bulgaria 536 Czech Republic 534
Croatia 533 Ireland 529 Germany 528 Lithuania 528
Denmark 527 Canada 525 Serbia 525 Australia 524
Slovak Republic 520 Northern Ireland 520 Spain 518
Netherlands 517 Italy 516 Belgium (Flemish) 512 Portugal 508
New Zealand 506 France 487 Turkey 483 Cyprus 481 Chile 478
Bahrain 459 Georgia 451 United Arab Emirates 451 Qatar 436
Oman 431 Iran 421 Indonesia 397 Saudi Arabia 390 Morocco 352 Kuwait 337

Please see Exhibit 1.3 for statistically significant differences.

Trends at Fourth Grade Show Increases in Mathematics Achievement Around the World

Trends 2011-2015: 41 Countries

21 Countries Higher Average Achievement
Bahrain, Chinese Taipei, Croatia, Czech Republic, Georgia, Hong Kong SAR, Hungary, Ireland, Japan, Kazakhstan, Morocco, Oman, Portugal, Qatar, Russian Federation, Singapore, Slovenia, Spain, Sweden, Turkey, United Arab Emirates

15 Countries Same Average Achievement
Australia, Belgium (Flemish), Chile, Denmark, England, Iran, Italy, Korea, Lithuania, New Zealand, Northern Ireland, Norway, Serbia, Slovak Republic, the United States

5 Countries Lower Average Achievement
Finland, Germany, Kuwait, Netherlands, Saudi Arabia

Trends 1995-2015: 17 Countries

14 Countries Higher Average Achievement
Australia, Cyprus, England, Hong Kong SAR, Iran, Ireland, Japan, Korea, New Zealand, Norway, Portugal, Singapore, Slovenia, the United States

1 Country Same Average Achievement
Hungary

2 Countries Lower Average Achievement
Czech Republic, Netherlands

Trends at Fourth Grade Show Increases in Science Achievement Around the World

Trends 2011-2015: 41 Countries

17 Countries Higher Average Achievement
Australia, Bahrain, Croatia, Hong Kong SAR, Ireland, Japan, Kazakhstan, Lithuania, Morocco, New Zealand, Oman, Qatar, Russian Federation, Slovenia, Spain, Turkey, United Arab Emirates

16 Countries Same Average Achievement
Belgium (Flemish), Chile, Chinese Taipei, Czech Republic, Denmark, England, Georgia, Germany, Hungary, Korea, Northern Ireland, Norway, Serbia, Singapore, Sweden, the United States

8 Countries Lower Average Achievement
Finland, Iran, Italy, Kuwait, Netherlands, Portugal, Saudi Arabia, Slovak Republic

Trends 1995-2015: 17 Countries

11 Countries Higher Average Achievement
Cyprus, England, Hong Kong SAR, Hungary, Iran, Ireland, Japan, Korea, Portugal, Singapore, Slovenia

4 Countries Same Average Achievement
Australia, Czech Republic, New Zealand, the United States

2 Countries Lower Average Achievement
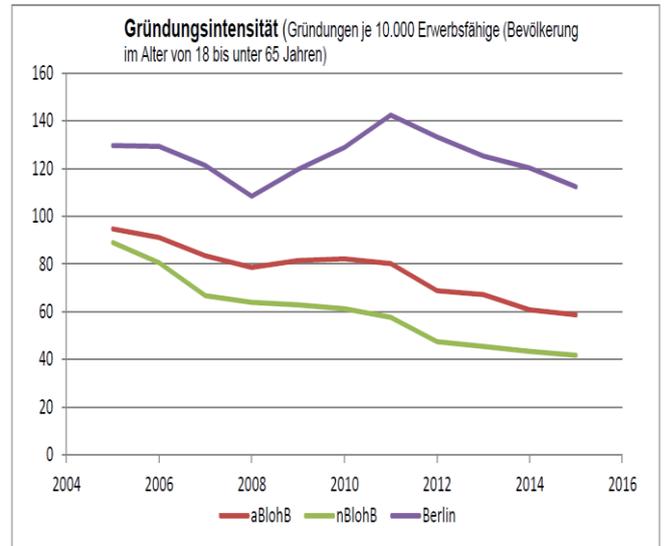Netherlands, Norway

More info: http://timss2015.org/

6. Miscellaneous results from national data sources and studies

a) Germany: study shows decline in startup rate

A recent study by the Leipzig Graduate School of Management shows a decline of the startup rate in Germany in recent years. The start-up rate (start-ups per 10 000 persons aged 18-65) is highest in Berlin and lowest in the eastern Länder (without Berlin, green curve). After increasing in the period 2008-2011, the start-up rate has declined in Berlin since 2011. In both the eastern and western Länder of Germany (without Berlin) the start-up rate is already declining since 2005.

The study also shows that since 2012 enterprise deaths surpass enterprise births in Germany. In 2015 men represented 57% of enterprise founders compared to 64% in 2005. In 2015 49% of enterprise creations were opportunity driven compared to 38% in 2010. The share of need driven enterprise creations declined from 35% to 27%. Lack of societal acceptance of entrepreneurs (79%) and lack of a culture accepting failure (58%) were seen as key features characterising the German start-up culture.

Gründungsintensität (Gründungen je 10.000 Erwerbsfähige (Bevölkerung im Alter von 18 bis unter 65 Jahren)

More info:
http://www.hhl.de/fileadmin/texte/publikationen/studien/LS_Innovation/Analyse_des_Gruendungsgeschehens_in_Deutschland.pdf

b) Greece: third quarter growth rate revised upwards

The Statistical Office of Greece (ELSTAT) on 29 November revised upwards third quarter growth rates from a 0.5% quarter on quarter growth rate to a 0.8% growth rate.The growth compared to the same quarter in 2015 was revised upwards from 1.2% to 1.6%. After a long recession from 2008-2013, GDP grew for the first time in the first quarter of 2014. However, growth was unstable and in the third quarter 2015 and in the first two quarters 2016 year on year growth was again negative. The upward revision might signal that finally a turning point has been reached, after several years where forecasted growth forecasted didn't materialise. The Commission forecast, published before the revision, expects a growth of the Greek economy of
-0.3% in 2016 and 2.7% in 2017.

Graph 1: Gross Domestic Product in Volume Terms
Seasonally and calendar adjusted figures (Reference Year: 2010)
Changes (%) by quarter (q-o-q^5) and year (y-o-y^4)
2007-2016

More info: http://www.statistics.gr/documents/20181/423ae6dc-daae-4217-a2a7-f866d296594
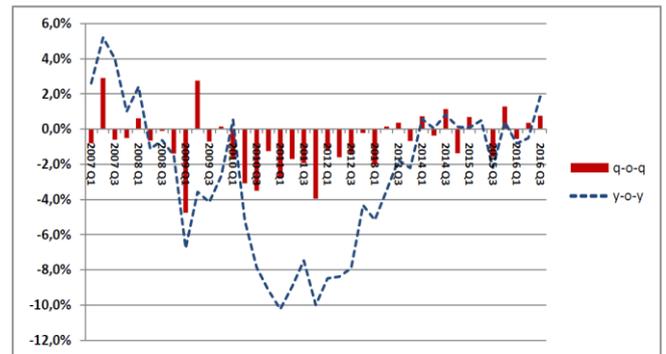
7. Quotation check

"Everything that can be invented has been invented"
(wrongly) attributed to Charles Holland Duell, Commissioner of the US Patent Office 1898-1901

This quotation seems to be an invention of the early 1980s. Samuel Sass traced it back to a 1981 book titled "The Book of Facts and Fallacies" by Chris Morgan and David Langford.
The quotation might have been inspired by a joke from an 1899 edition of the Punch magazine, which offered a look at the 'coming century' and where a genius asked "isn't there a clerk who can examine patents?" and a boy replied "Quite unnecessary, Sir. Everything that can be invented has been invented" (see Wikipedia article on Duell).
In fact Duell said in 1902:
"In my opinion, all previous advances in the various lines of invention will appear totally insignificant when compared with those which the present century will witness. I almost wish that I might live my life over again to see the wonders which are at the threshold."

Calendar of data releases and indicator based publications *Update of: 30/11/2016 (grey= already published)*			
2016	**Eurostat data updates**	**Commission indicator based reports**	**Data and indicator based reports of other organisations**
January			Transparency International Corruption Perception Index Bloomberg Innovation Index
February	Tertiary attainment (2015, prov.) High growth enterprises data (provisional, 2014) IPR (patent 2013, CTM 2014 and RCD 2014)	Winter forecast (ECFIN) DESI indicator (CNECT)	OECD R&D expenditure data Excelacom Internet Minute
March	R&D intensity (2014 update) GBAORD final (2014)	She Figures (online version; RTD) Science, Research and Innovation performance report (RTD)	European Patent Office , EPO annual results (2015) Reuters Most Innov. Institutions OICA world motor vehicle production data
April	Education headline indicators (LFS)		
May	High-tech trade (2015) Venture capital (2015) Education enrolment, graduates Knowledge-int. activities (2015)	Spring Forecast (ECFIN) Skills forecast (Cedefop)	Invest Europe 2015 European Private Equity Report Times Higher Ed. Reputations Ranking IMD World Competitiveness Yearbook
June	Education spending Employment high-tech (2015) HRST education inflows (2014)	Europe 2020 publication (ESTAT)	
July	IPR (Patents, 2013), Community Trademarks (2015), RC Designs (2015)	Innovation Union Scoreboard (GROW)	UNESCO UIS STI stats release
August			Academic Ranking of World Universities (Shanghai) WIPO/Cornell/INSEAD Global Innovation Index
September	GBAORD (2015 preliminary) Final high growth ent. data (2014) Economic data on high-tech (2015)		WEF Global Competitiveness Index OECD Education at a Glance
October			World Bank Doing Business
November	R&D intensity (2015 preliminary, 2014 final) Knowledge-int. activities (2015) Employment high-tech (2015) IPR Statistics (CTM 2015 and RCD 2015)	Autumn Forecast (ECFIN) Education Monitor (EAC) Annual Growth Survey (ECFIN)	Top500.org: Top 500 Supercomputer list
December	ICT household data (2016) ICT enterprise data (2016) HRST stocks (2015) CIS 2014	Industrial R&D Investment Scoreboard (JRC) Joint Employment Report (EMPL)	WIPO World Intellectual Property Indicators BDI/Telekom (German) Innovation Indicator OECD STI Outlook (2-yearly)

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