Chapter:

3. Public and private funding of R&I and expenditure

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Abstract
The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.
3. Public and private funding of R&I and expenditure

3.1 Introduction

The Europe 2020 target for Finland is to reach 4% expenditure to R&D as a proportion of GDP by 2020. However, GERD declined between 2009 and 2013 from 3.75% to 3.32% of GDP and is estimated to drop further to 3.13% in 2014. There are no specific targets for BERD/GERD or BERD/GDP but an overall target is to keep the share of private funding on a high level. The private sector share of GERD decreased from 70% to 69% and BERD/GDP decreased from 2.56% to 2.28% during 2011-2013 (Eurostat, 2014). The share of the governmental funding increased from 27% to 29% of GERD, respectively. The share of funding from abroad increased from 9% to 12% of GERD.

The total appropriations and outlays for research and development will increase to €2b in the government Budget in 2015. According to Statistics Finland, R&D funding will increase by close on €50m from the previous year. The share of public research funding in GDP is estimated to be 0.96%. The growth is based on increased outlays of the Academy of Finland and a new financial instrument for strategic research. From this GBAORD (€2b) 54% is allocated through the MEC, and 31% through the MEE. The public funding of private sector R&D is about 3%, which is very low compared to the 8% OECD country average1.2

R&D expenditures of the universities are still quite high (0.73% of GDP in 2014) (Statistics Finland, 2015, Research and development 20143 and Statistics Finland, Annual national accounts, 20154) but because of the dispersed university structure the use of resources is not as effective as it could be (RIC, 2014)5. The government has decided to cut funding for education and research. It seems that the government is looking for effectiveness and quality of public research in universities and research institutes, changing the focus more from cooperative applied research to basic research, and in innovation funding from knowledge building to short term commercialising of research results in innovation. The cuts are a part of fiscal consolidation aimed at reducing government deficits. Another target was that the subsidies for businesses should be decreased. According to the MEE, the subsidies for businesses are more than €4.5b, of which a great deal are harmful and almost the only beneficial subsidies were those for innovation (Renewing the business subsidy system, in Finnish).6 Still these subsidies were cut.

The total EU funding that Finland received in the 7th Framework programme 2007 – 2013 (FP7) was €883m, meaning an average of €126m per year (EC statistics). The structural funds (SF) programme 2014–2020 of Finland will distribute a total of €1,299m ERDF €733m and ESF €536m. The share allocated under RTDI priorities will be 41% of ERDF funds, meaning an indicative yearly funding of €76m. According to the Statistics Finland EU funding in 2013 was €185m.

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3 https://www.tilastokeskus.fi/ti/tkke/index_en.html
4 https://www.tilastokeskus.fi/ti/tkke/index_en.html
Table 1 Basic indicators for R&D investments (Eurostat).

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<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GERD (as % of GDP)</td>
<td>3.64</td>
<td>3.42</td>
<td>3.31</td>
<td>3.17</td>
<td>3.17</td>
<td>2.03</td>
</tr>
<tr>
<td>GERD (Euro per capita)</td>
<td>1332.7</td>
<td>1264.9</td>
<td>1231.7</td>
<td>1194.6</td>
<td>558.4</td>
<td></td>
</tr>
<tr>
<td>GBAORD (€m)</td>
<td>2071.7</td>
<td>2064.2</td>
<td>2017.9</td>
<td>1955.6</td>
<td>2002.5E1</td>
<td>92828,145</td>
</tr>
<tr>
<td>R&amp;D funded by BES (% of GDP)</td>
<td>2.44</td>
<td>2.16</td>
<td>2.01</td>
<td>1.7</td>
<td>1.12</td>
<td>1.12 (2013)</td>
</tr>
<tr>
<td>R&amp;D funded by PNP (% of GDP)</td>
<td>0.05</td>
<td>0.04</td>
<td>0.04</td>
<td>0.05</td>
<td>0.03</td>
<td>0.03 (2013)</td>
</tr>
<tr>
<td>R&amp;D funded from abroad (% of GDP)</td>
<td>0.24</td>
<td>0.3</td>
<td>0.38</td>
<td>0.55</td>
<td>0.2</td>
<td>0.2 (2013)</td>
</tr>
<tr>
<td>R&amp;D performed by HEIs (% of GERD)</td>
<td>20</td>
<td>22</td>
<td>22</td>
<td>23</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>R&amp;D performed by government sector (% of GERD)</td>
<td>9.6</td>
<td>9.7</td>
<td>9.6</td>
<td>9.4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>R&amp;D performed by business sector (% of GERD)</td>
<td>70</td>
<td>69</td>
<td>69</td>
<td>68</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>

E1 Government R&D funding in the state budget 2015
E2 The Eurostat figures include only domestic R&D funding by the private sector. The figure in brackets include also private R&D funding from abroad

3.2 Smart fiscal consolidation

3.2.1 Economic growth, fiscal context and public R&D

Finland was moderately hit by the 2008-09 economic crisis although the 2009 drop of real GDP (8.3%) is quite high. A weak global economy and loss of external demand for electronic and paper products resulted in significantly lower exports causing durable losses in output and in cost competitiveness due to wage rigidities. Changing economic conditions led to the emergence of a negative output gap, increase in unemployment, an evaporation of current account surplus, and deteriorating public finances. The Finnish economy went through a recession between 2012 and 2014. In 2015 the output remained at its 2014 level and is expected to grow at a very slow pace (0.5-0.9%) in 2016-17 as a result of some increase in the investment, stabilisation of external demand, signs of recovery in the paper and electronics industry and supportive credit conditions.

Before the crisis Finland had protracted budgetary surpluses and low levels of public debt (Figure 2). Together with the changes provoked by the crisis, public finances deteriorated both nominally and in structural terms. Government budget has shown deficits since 2009 driven by increasing expenditures along with stagnating revenues. In spite of consolidation efforts, the headline deficit was over the 3% reference value in both 2014 (3.3%) and 2015 (3.2%). In 2016-17 the Commission expects the deficit to fall to 2.8% and 2.5% respectively. As a result of the financial crisis and subdued economic activity, the debt/GDP ratio went up from the 2008 level of 32.7% to the nowadays values of around 60% (2015: 62.7%). The ratio may still grow to 65% (2016) and 66.2% (in 2017). Finland does not seem to face immediate debt sustainability challenges. However, long-term sustainability is a serious concern due to an ageing population. Savings and efficiency increases on the expenditure side are needed. For 2016-2019 the Finnish government announced a public finances consolidation program in order to contain the debt that is expected to stabilise by 2019-20.

Total GERD in Finland was 6,684 million EUR in 2013. There are three main sources of R&D funding: the business sector (4,067 MEUR), the government (1,740 MEUR), and foreign funding (771 MEUR). Direct funding from the government goes to start-ups and SMEs or big companies in business enterprises (128 MEUR), the government (443 MEUR) and the higher education sector (1,150 MEUR).

<table>
<thead>
<tr>
<th>Year</th>
<th>GBAORD, % of Gov. exp.</th>
<th>GERD, % of GDP</th>
<th>GERD to public, % of GDP</th>
<th>Funding from Gov. to, % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>1.96</td>
<td>3.35</td>
<td>0.90</td>
<td>Business: 0.08</td>
</tr>
<tr>
<td>2009</td>
<td>1.91</td>
<td>3.75</td>
<td>1.05</td>
<td>Public (GOV+HES): 0.71</td>
</tr>
<tr>
<td>2013</td>
<td>1.69</td>
<td>3.30</td>
<td>1.00</td>
<td>Total: 0.80</td>
</tr>
</tbody>
</table>

Source: Eurostat

In 2012 EU funding was 183 MEUR out of total amount of foreign funding of 602 MEUR.
3.2.2 Direct funding of R&D activities

The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the Government sector (GOV), whereas the public sector as a sector of performance is the aggregation of GOV and Higher education sector (HES). Figure 3, below shows the historical evolution of GERD financing in current prices in Finland.

The Finish total R&D intramural expenditure (GERD) was monotonously growing until 2008. At the beginning of the crisis, in 2009 total GERD temporary dropped but it recovered completely and even increased by 2011.

From 2012 GERD is decreasing due to the decline of the private R&D which is the most important source of funding for the Finish GERD.

Starting in 2009 the public R&D expenditure increased\(^\text{10}\) and it was its contribution that helped the recovery of the GERD the first years after the crisis.

3.2.2.1 Direct public funding from the government

Fluctuations in the behaviour of the GERD funded by the government are not visible due to the scale.

\(^{10}\) Fluctuations in the behaviour of the GERD funded by the government are not visible due to the scale.
Figure 4 shows a continuous increase in the total (civil) appropriations from 2005 to 2010, followed by two years of stagnation and a mild decline in the post-crisis period, 2013-2014. In 2015 there was no significant change in the total GBAORD. Given that the total government expenditure increases every year during the period 2005-2013, stagnation and drop in the GBAORD from 2010 to 2015 signifies cuts in the budget for R&D. Significant cuts have been agreed for 2016-2019 under the Government Programme.

The difference between the total and the civil appropriations remains approximately constant.

GERD funded by the government follows a very similar pattern when measured in absolute volumes, although it is significantly lower than the budgeted R&D investments. As demonstrated in the next section, the contribution from the European Commission through Framework Programmes and Structural Funds increased in the period 2010-2013, possibly due to the lifecycle of the latter.

### 3.2.2.2 Direct public funding from abroad

<table>
<thead>
<tr>
<th>Source from abroad</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>343.78</td>
<td>408.72</td>
<td>406.75</td>
<td>456.05</td>
<td>448.33</td>
<td>479.24</td>
<td>468.73</td>
<td>601.68</td>
<td>771.40</td>
<td>1128.10</td>
</tr>
<tr>
<td>BES</td>
<td>211.62</td>
<td>263.91</td>
<td>256.03</td>
<td>319.80</td>
<td>285.18</td>
<td>288.81</td>
<td>262.18</td>
<td>387.69</td>
<td>553.90</td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>113.68</td>
<td>122.21</td>
<td>124.23</td>
<td>114.77</td>
<td>140.68</td>
<td>162.69</td>
<td>181.81</td>
<td>183.41</td>
<td>185.10</td>
<td></td>
</tr>
<tr>
<td>International Organizations</td>
<td></td>
<td>9.08</td>
<td>4.76</td>
<td>5.99</td>
<td>4.05</td>
<td>5.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total as % GERD</td>
<td>6.28</td>
<td>7.09</td>
<td>6.52</td>
<td>6.64</td>
<td>6.61</td>
<td>6.87</td>
<td>6.54</td>
<td>8.81</td>
<td>11.54</td>
<td>17.32</td>
</tr>
<tr>
<td>EC as % GOVERD</td>
<td>8.10</td>
<td>8.45</td>
<td>8.27</td>
<td>7.65</td>
<td>8.64</td>
<td>9.08</td>
<td>10.14</td>
<td>10.06</td>
<td>10.64</td>
<td></td>
</tr>
</tbody>
</table>

Funding from abroad tripled between 2005 and 2014, accounting in 2014 for 17.3% of total R&D investments. Most of the funding comes from the business sector but the contribution from the European Commission (both structural funds and framework programmes for research) also increased over the years and in 2013 represented over 10.5% of the GERD funded by the government (public direct support). As shown in figure 4, EC funding compensated in a way for the losses in the public R&D between 2010 and 2013.

Based on data from DG REGIO, the allocation to core RTDI structural funds is 9.8% of the total structural funds that Finland received for 2000-2006 and 18.4% of total structural funds in the period 2007-2013, i.e. an increase in the allocated funds of about 88%. Moreover, in Finland the share of Structural Funds for Core R&D is much higher (almost double) than the corresponding share at EU28 level (Finland 18.4%; EU28 9.4%).

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11 Core R&D activities: 01 R&TD activities in research centres; 02 R&TD infrastructure and centres of competence in a specific technology; 03 Technology transfer and improvement of cooperation networks; 04 Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres); 74 Developing human potential in the field of research and innovation, in particular through post-graduate studies.
Figure 5, below shows how the distribution of public funding to sectors of performance evolved over time:

Not surprisingly, the public sector (GOV + HES) is the main recipient of government funded GERD but it is not the only one affected by the cuts from 2011 onwards. The private sector has marginally been affected too, especially in 2008 and 2013. According to the OECD, in 2012 the total government support to business R&D in Finland is 0.07 % of GDP

3.2.3 Indirect funding – tax incentives and foregone tax revenues

In Finland public R&D support to companies consists almost fully of direct subsidies. R&D tax incentive schemes did not come into force until 2013. The objective of the Corporate Research and Development (R&D) Tax Relief in 2013-2015 is to increase R&D activity in companies and to create new high added-value jobs; limited-liability companies and cooperatives are granted supplementary 100-per cent tax relief on any salary expenses for R&D activity related to their own business operations.12 A second tax subsidy scheme offers accelerated depreciation related to R&D construction investment, but the tax benefit has been small. 13

3.2.4 Fiscal consolidation and R&D

Figure 6, below shows the scatterplot of the structural balance and GBAORD as % GDP, (first panel) as well as GERD as % GDP, (second panel).14

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14 Structural balance data comes from the AMECO database the other indicators were taken from Eurostat.
It is evident that between 2010 and 2014 both R&D appropriations (GBAORD) and government funded GERD decreased as a share of GDP\(^\text{15}\). During the same period the structural balance fluctuated slightly in the positive side (between 0.2 and 0.6\% of GDP), apart from 2014 when for the first time became negative (Figure 6). There is no indication of fiscal consolidation. It seems, that the attempts of the government to preserve and improve the structural balance came at the expense of the R&D expenditure. Based on the analysis and the discussion provided in this report, we can argue that the post-crisis fiscal adjustment has come at the expense of public support for R&D in Finland.

3.3 Funding flows

3.3.1 Research funders

The Ministry of Education and Culture (MEC) and the Ministry of Employment and the Economy (MEE) play the main role in public research funding (85\% of GBAORD). MEC allocates the main part of its funding directly and through the Academy of Finland to HEIs and PROs. MEE’s R&D funding is mainly allocated through Tekes. Other ministries’ share of the funding is 15\% (Ministry of Agriculture and Forestry 5\%, and Ministry of Social Affairs and Health 4\%).

In 2014, public R&D funding amounted €1,899 million, private non-profit funding €93m, and funding from abroad €1128m including EU funding €178m. MEC’s institutional funding for universities (90 \% of HEI institutional funding) is allocated on the new performance and quality based funding model of universities (MEC 2014; Universities Core Funding\(^\text{16}\)).

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15 As we have seen on Figure 3, both R&D appropriations (GBAORD) and government funded GERD have stagnated or slightly decreased also nominally during 2010-2013.

16 [http://www.minedu.fi/export/sites/default/OPM/Koulutus/yliopistokoulutus/hallinto_ohjaus_ja_rahoitus/liitteet/uni_funding](http://www.minedu.fi/export/sites/default/OPM/Koulutus/yliopistokoulutus/hallinto_ohjaus_ja_rahoitus/liitteet/uni_funding)
Institutional funding model for polytechnics (10% of HEI institutional funding) has been revised (MEC 2014; Polytechnic reform 2011–2014\textsuperscript{17}): the governmental funding for polytechnics will be allocated in the ratio of 70:30 considering the number of degrees awarded and performance indicators.

Institutional funding of other Ministries for PROs is mainly pure block funding.

All of the funding of the Academy of Finland is competitive based on peer review, mostly international. Funding is allocated to HEIs and PROs. The traditional funding pillar of the Academy is formed by the four Research Councils. The Research Councils allocate funding for scientific research in the areas of Biosciences and Environment, Culture and Society, Natural Sciences and Engineering, and Health. As a part of the reform of the research institute and funding system, a new funding pillar was established in 2014 in the Academy: The Council for Strategic Research (CSR). Finally, the Academy is responsible for drafting the research infrastructure policy in the Finnish Research Infrastructure Committee (FIRI Committee).

All Tekes funding is competitive. Tekes funds for applied research in universities, research institutes and large companies, provides competitive grants and loans for development and innovation in SME’s, grants and loans for YIC’s (Young Innovative Companies). Tekes also funds start-ups, and through Tekes Venture Capital Ltd, a fund of funds, contributes to seed phase VC-investments. A special target of Tekes funding is to build incentives for cooperation and knowledge interaction.

Private non-profit (PNP) funders are mainly private foundations. Most of the funding was (2014) allocated to researchers in HEIs (62%) and in PROs (11%), and to PNP sector (24%).

### 3.3.2 Funding sources and funding flows

Government budget appropriation or outlays for R&D in 2015 are presented in Table 5. In 2015 GBAORD amounted €2,002b; the share of MEC was 54% while that of MEE was 31%. The share of MEC has increased during recent years mainly due to additional funding to the Academy of Finland, and cuts in funding of VTT, other PROs and Tekes (Statistics Finland; R&D funding in state budget 2015)\textsuperscript{18}.

<table>
<thead>
<tr>
<th>Table 4 Government budget appropriation or outlays for R&amp;D in 2015\textsuperscript{19}</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D funding total</td>
</tr>
<tr>
<td>Universities</td>
</tr>
<tr>
<td>Academy of Finland</td>
</tr>
<tr>
<td>Tekes</td>
</tr>
<tr>
<td>Government research institutes</td>
</tr>
<tr>
<td>Other R&amp;D funding</td>
</tr>
<tr>
<td>University hospitals</td>
</tr>
</tbody>
</table>

\textsuperscript{17} http://www.minedu.fi/OPM/Koulutus/ammattikorkeakoulutus/ammattikorkeakoulu_uudistus/index.html?lang=en
According to the Statistics Finland, R&D funding from other public sources than the Government in 2014 was €85m (4.5 % of public funding). This is mainly R&D funded by the local authorities (municipalities).

International funding has grown since 2011 (€1,128m in 2014). Most of it is multinational’s intramural R&D expenditures. EU funding has been growing steadily but slowly during the last years. In 2013 it was €185m but decreased in 2014 to €178m.

Although the private sector participates in the funding of the research carried out by the higher education and public sector, most of their funding naturally goes to private R&D. 97 % of the domestic private went to business sector in 2014. 80 % of R&D funding from abroad was directed to the private sector. Around 13 % of the foreign funding went to universities and 7 % to the public research organisations.

In 2014, most of the university funding came from various public sources (82 %), especially from the MEC but also from the funding agencies, the Academy of Finland and Tekes. The share of private sector (domestic and from abroad) in HEI funding was 5 % (€78m), and from abroad universities collected 10 %. The share of private sector (domestic and from abroad) in PRO funding was 11 % (€69m), and from abroad PROs collected 13 %. The share of EU funding of the international funding was in HEIs 75 % and in PROs 62 %.

International VC investments (institutional, private) indicating R&D related FDI can be estimated from the data of the FVCA (Finnish Venture Capital Association). Foreign VC/PE investments in 2014 were €50m, 0.025% of GDP.

The total EU funding that Finland received in the 6th Framework programme (FP6) was €327m and in the 7th Framework programme (FP7) €883m. The latter is 1.18 times the money Finland paid as the effective membership fee to the FP7 (Tekes 2014, Finland as a net receiver in the EU 7th Framework programme and EC statistics). Finland’s share (% of EU total contribution) was in the FP6 2.1 %, in the FP7 2.2 %, and the share of participations in the ongoing H2020 is 2.2 % (EC data). The EU funding that Finland received in H2020 (until 30.10.2015) was €200m, 1.12 times the money Finland paid as the effective membership fee to the H2020. The major change compared to the FP7 was a clear growth of SME participation. The share of funding collected by SMEs increased from 11% (FP7) to 22% (H2020).

Comparing the FP (Framework Programme) participation in Finland to other member states, the role of the FP programmes internationalising research has been and will be very important. Finland ranks fairly high in the number of programme participations per capita or funding received per capita. However, when measured against to the national R&D effort, Finland ranks low. Indeed, the RIC recommends increasing participation in the FP programmes by 50 %.

The structural funds (SF) programme 2014–2020, allocated under the Regional Competitiveness and Employment objective for Mainland Finland, will distribute a total of €1,299m, of which the share of the European Regional Development Fund (ERDF) will be €733m, while the European Social Fund (ESF) will contribute €536m (MEE; Finland’s FP programme, in Finnish). The share of ERDF allocated under RTDI priorities will be 41 %.

The absorption of the allocated SF funding 2007–2013 (under RTDI priorities) was 75-100% in all regions (IU Progress Report). As the private investments in R&D in Finland have been high, the relative role of the Structural funds has not been very significant for RTDI on the national level. Anyhow, the SFs have boosted regional activities in RTDI. The main challenge in the use of SFs on the previous period (2007–2013) has been the allocation of resources. Resources have been split into too many small projects with a regional or national focus.

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Responding to global challenges, specialisation, strategic choices, and focusing on forerunners have not been as clear as in the case of national funding. Thus the focus has not been very strong on renewing structures and the economy.  

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding

The legal framework for the allocation of R&D project and institutional funds has been stable for many years in Finland. Within the framework, the share of competitive funding increased until 2009 and then decreased until 2013, the decrease in 2009–2013 being 2%. Starting in 2013, changes have been made to the framework itself, including the reform of research institutes and research funding, and new funding models for universities and polytechnics. However, the new government has made major changes in the public R&D funding. In 2015 €50m was taken from the institutional funding of universities to be allocated by the Academy of Finland as competitive project funding. The target is to build incentives for universities’ change in strategic focus. On the other hand the cuts in Tekes funding mandate will decrease the share of project funding.

Looking at the government budget appropriation or outlays for R&D (GBAORD) in 2015 (see Table 5) the share of institutional funding for HEIs is 29% and for PROs 13% of the GBAORD. 45% of GBAORD is allocated through Tekes and the Academy of Finland, which both fully operate within a competitive project funding framework. In 2014, 68% of Tekes funding was allocated to the business sector, 24% to HEIs, and 8% to PROs. The Academy of Finland allocated 82% to HEIs, and 9% to PROs.

The category of other public funding (12% of GBAORD) includes governmental funds allocated by ministries as well funds allocated by ELY-centres and regional councils (most of it structural funds). These are mainly competitive project funds. When estimating the share of institutional and project funding of GBAORD it is assumed that “Other public funding” is mostly project funding (as it probably is). Now, the share of institutional funding is 43% and project funding 57%. The share of project funding of GBAORD has decreased from 56% (2009) to 54% (2014) but increased again in 2015 to 57%. At the same time competitive elements have been increased in institutional funding. The new recommendation by the RIC proposes a €210m increase in GBAORD by 2020, and 65% of this increase would be competitive funding, but the government has decided to cut GBAORD by €153m in 2016 (see Chapter 2.2). On the other hand the planned spearhead projects of the government will change these figures.

3.4.2 Institutional funding

The share of institutional and project funding varies in HEI’s and PRO’s. Based on their budgets and action the share of institutional funding (for research) in HEI’s was 42% and in PRO’s 49% in 2013. According to the new performance and quality based funding model of universities (Ministry of Education and Culture 2014; Universities Core Funding) the government appropriations for universities (90% of HEI institutional funding) will be allocated on the basis of completed qualifications and credits as well as scientific publications and attracted competitive project funding. The funding model for universities will be revised again in 2017. Moreover, institutional funding for universities of applied sciences (10% of HEI institutional funding) (Ministry of Education and Culture: Polytechnic reform 2011–2014) is revised to better support improvement in the quality of teaching and research. The governmental funding for polytechnics will be allocated in the ratio of 70:30 considering the number of degrees awarded and performance indicators. So, institutional funding includes a strong competitive element for universities and a reasonable competitive element for polytechnics.

The funding model for polytechnics will be changed again in 2017.\textsuperscript{25} Institutional funding for PROs is mainly pure block funding.

### 3.4.3 Project funding

The share of funding (for research) from outside sources was 52\% in HEI’s and 48\% in PRO’s in 2014. Almost all of it was project funding, including Tekes and Academy of Finland funding, other governmental sources, international project based funding (especially FP and SF funding), funding from domestic enterprises and from other governmental sources.

#### Table 5 Institutional and project funding (€ million) for HEIs and PROs 2014

(Statistics Finland 2015, Research and development 2014)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total funding</th>
<th>Institutional funding (incl. own capital)</th>
<th>Project funding</th>
<th>Project funding source</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEI</td>
<td>1486</td>
<td>710</td>
<td>776</td>
<td>266 Academy of Finland</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>125 Tekes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>148 From abroad</td>
</tr>
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<td>123 Other public funding</td>
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<td>PRO</td>
<td>563</td>
<td>295</td>
<td>268</td>
<td>53 Tekes</td>
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<td>23 Academy of Finland</td>
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<td>68 Other public/Funds</td>
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As a result of the already briefly discussed reform of research institutes and research funding 19\% of institutional funding for research institutes will be subjected to competition. The objective was to make €70m available for project funding by. The budget will be reallocated from several sources in 2015–2017; including the state research institutes’ institutional funding (€52.5m), the Academy of Finland’s project funding (€7.5m) and Tekes’ project funding (€10m). The Strategic Research Council (SRC), which will manage €55m of these funds, is located at the Academy of Finland, but the funding decision will make the State government. The funding of newly formed council is competitive and funding decisions are based not only on the scientific quality but also on the societal impact. Secondly, the reform creates another new opening: a funding pool for evidence based decision-making. The pool’s funding will be increased to €12.5m, and is under the disposal of the government (led by the Prime Minister’s Office). The pool provides project funding to enhance evidence based decision-making.

In Finland there are two main agencies who allocate most of the project funding for R&D: the Academy of Finland and Tekes. In 2015 the funds of the Academy are €415.6m. This includes funds (an increase of €50m) taken from the institutional funding of universities, targeting at strengthening the strategic focus of the universities. The Academy’s funding is focused on scientific research and the funding decisions are based on international standards for peer review. The experts are mostly international.

\textsuperscript{25} http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2015/liitteet/tr18.pdf?lang=fi
The funding criteria of the Academy of Finland are:

- Scientific quality and innovativeness of the research plan
- Competence of the applicant/research team
- Feasibility of the research plan
- Cooperation contacts for the research
- Significance of the research project for the promotion of professional careers in research and researcher training.

In 2014, the Academy’s funding was allocated to research projects (57 %), including thematic programmes (12 %) and the Centres of Excellence programme (9 %), to researchers (30 %), to research infrastructure (6 %), and international cooperation (7 %).

All of Academy and SRC programmes are thematic. The Academy’s programmes are targeted at HEIs and PROS, and SRC programmes HEIs, PROs and BES. The funding criteria of the SRC include besides scientific quality also expected societal impacts.

The funding for researchers or individuals (€96m, 30 % of the Academy funding) was directed to

- Academy Professors €5.5m
- Academy Research Fellows €26.6m
- Postdoctoral Researchers €26.2m
- Research costs of research posts €28.8m
- FiDiPro €9.0 million

Further, in 2015 €50m more funds were allocated from Universities’ institutional funding to the Academy to be used for boosting universities to focus on strategic choices and to better profile themselves.

All of Tekes funding is competitive based on funding instruments. These instruments are used in different funding concepts. In turns, strategic choices are made by using the concepts. About 60 % of the funding is allocated to the concepts (strategic choices) and 40 % of the funding is reactively based on demand. The major concepts have been Tekes programmes, Tekes campaigns, SHOK (Strategic Centres for Science, Technology and Innovation) programmes and start-up funding. The funding criteria of Tekes varies depending on the nature of the project but in general the criteria includes the scientific or technological excellence, relevance to the economy and society, business and internationalisation targets and opportunities, cooperation, international cooperation, resources, economic status of a company and commitment of private financiers, risks, and business and project plans. Starting 1st January 2016 Tekes renewed some of criteria to better boost the growth of exports. The evaluation is made in-house by Tekes experts who have experience in both research and business. External experts can’t be used because if the best experts on a certain industrial sector are used, they are competitors of the company who is applying for funding – and this causes a conflict of interest. An exception is the start-up funding – external experts from VC funds and business angel communities are used to evaluate pitches of start-up CEOs. Tekes provides funding for applied research in universities, research institutes and large companies, provides competitive grants and loans for development and innovation in SME’s, and grants with a special instrument dedicated for YICs (young innovative companies). Tekes also funds start-ups and through Tekes Venture Capital Ltd, a fund of funds, contributes to seed phase VC-investments. A typical target fund of Tekes Venture Capital Ltd is a Finnish fund organised as a limited partnership company with a

management company. Funding agreements follow the market practices, taking into account the additions described in the state subsidy programme of Tekes Venture Capital Ltd.

These additions are connected with, among other things, restrictions in (or lack thereof) possible asymmetric distribution of profits of target companies, and demands associated with the fund’s investment process and reporting.

Finally, a special target of Tekes funding is to build incentives for cooperation and knowledge interaction. In 2014 Tekes funding (€550m) was directed as follows: grants to HEIs and PROs €178m, grants to enterprises €230m, and loans to enterprises €141m (Tekes statistics, in Finnish)\(^{27}\). Tekes funding decision mandate in 2015 is €594m which includes €44m Structural funds, and a mandate to operate €23m of other ministries funds (State budget 2015, in Finnish)\(^{28}\). Tekes funding mandate for R&D will be cut by 27% in 2016.\(^{29}\)

The main concepts of Tekes for making strategic choices are programmes, changing campaigns and special funding concepts for HEIS and PROs. Tekes programmes are thematic focusing on Tekes strategic focus areas (natural resources and a sustainable economy, intelligent living environment, and vitality of people), and on Shared success factors of all sectors (Business concepts, Services and intangibility as value creators, and Digitalisation). The ongoing and recently completed programmes are listed in the Annex 2.

Tekes’ Changing campaigns are a type of programmes directed especially to small and medium-sized enterprises and they are smaller than actual programmes. They can be targeted to certain sectors or themes that are important and topical from the standpoint of companies. The campaigns differ in their contents. They can offer, for example, calls and events. The ongoing campaigns are listed in the Annex 2.

The government has decided to cancel the special funding for the SHOKS.

Special funding concepts for HEIS and PROs are\(^{30}\):

**Public research network with companies**

Tekes’ most common funding instrument for research projects carried out by universities, polytechnics and research institutes. The funding is targeted to research projects that create new competence and solutions for identified needs of businesses and industries.

**New knowledge and business from research ideas**

In this project type research organisations develop an idea further while preparing for the commercialisation of the idea into new business.

**Strategic research openings**

Strategic research openings create new high-level competences in areas expected to be important for businesses in the future.

**Horizon 2020 funding and funding for Horizon 2020 project preparation**

Tekes encourages PROs and HEIs to focus on topics of the Horizon 2020 programme and also funds preparing of projects and promoting of Finnish companies’ Horizon 2020 participation.

\(^{27}\) [http://www.tekes.fi/tekies/tietopankki/](http://www.tekes.fi/tekies/tietopankki/)


Tekes funding for companies includes (as a part of a programme or campaign or outside them):

- Funding for Planning for global growth
- Funding for Research projects carried out by companies
- Funding for Development and piloting
- Funding for Young innovative companies
- Funding for Workplace innovations

Public programmes offering project-based funding in Finland are thematic, meaning that strategic focus is important. This is considered to be must in a small country. Programmes’ priority-setting responds well to societal challenges because the programmes are planned and prepared in wide cooperation between various stakeholders. According to the evaluations (see 2.2 and Annex 3), impacts of the programmes are mostly well in line with the objectives.

Most of the project funding in Finland is focused on research teams, multidisciplinary research, cooperative research and innovation-targeted research. The rationale for this is to enhance trust as the way reach better societal impacts. This has always been the rationale of the Tekes funding but today also the Academy funding is expected to reach and to be able to measure societal impacts.

### 3.4.4 Other allocation mechanisms

Ministries’ and Tekes’ activities include minor amount of contract research. These mechanisms include non-allocated research funding of the ministries, in particular the cross-ministerial funding for policy-relevant research by Prime Minister’s office (TEAS), €11m for 2016 (budget proposal), and government appropriations to research at university hospitals, €15m in 2016 (budget proposal).

### 3.5 Public funding for private R&I

#### 3.5.1 Direct funding for private R&I

In 2011 BERD financed by direct and tax funding (% of total BERD) was 2.85 % in Finland\(^\text{31}\).

The public innovation ecosystem, i.e. the funding streams to cover the entire R&D&I process from fundamental research to market innovation are in Finland organised as cooperative services of funding organisations and as public private partnerships. The concepts are based on the experience that the innovation process is not a linear chain from basic research to commercialisation but an interactive process where activities are concurrent and parallel. Tekes resources are targeted to innovation. Public-private-partnerships are typical in cases when Tekes is funding universities, research institutes or large companies. Indeed, the partnerships are prerequisites for funding. Tekes programmes and SHOK programmes include projects, which are led by, and involve, public and private sector participants, and there is also cooperation between the projects. Tekes programmes are always thematic and by nature Innovation programmes. In later phases of the innovation process there are many cooperative funding and service concepts like Vigo and Team Finland (see chapter 2.2).

Tekes funding for universities and research institutes includes concepts like Public research networked with companies and New knowledge and business from research ideas where companies are involved in research projects. About half of the cooperation between universities, research institutes and companies in Finland is partly funded by

Tekes. The major types of innovation funding and funding streams improving access to finance for innovative companies are described below.

The total funding of Tekes is channelled through different concepts, which are:
- around 40% for customer initiatives based on demand;
- around 20% for research programmes of the Strategic Centres for Science, Technology and Innovation (SHOK);
- around 25% to focus areas through Tekes programmes;
- around 15% to other strategic choices.

Termination of the special funding for SHOK programmes, termination of INKA programme, and cuts in Tekes funding will change the above mentioned shares, starting in 2016.

Public project funding for business R&D in 2014, according to Statistics Finland\textsuperscript{32}, was €223m. Most of the funding came from Tekes, and almost half of it were loans. The share of loans was 2.3 % and the share of grants 2.8 % of the R&D expenditures of the enterprises. 76 % of the Tekes funding was directed to SMEs and 24 % to big companies co-operative research.

The cuts in Tekes funding in 2016 will change the above mentioned shares starting in 2016. It's obvious that the share of SMEs will grow, and co-operation between companies and HEIs and PROS will decrease. There are no tax incentives for business R&D in Finland. Thus the incentives for business R&D are very low in Finland compared to other OECD countries\textsuperscript{33}.

In particular, Tekes programmes and the programmes of the Strategic Centres for Science, Technology and Innovation (SHOK) have integrated public and private resources. The SHOKs are private companies including public-private networks that engage in intensive and long-term work to achieve shared goals. The introduction of the SHOK concept has created important structural changes in Tekes funding to selected strategic areas but this will change due to the decisions by the government.

Tekes has been the main funder of SHOK programmes. In addition, the Academy of Finland has allocated a small amount of funding using a special application process on the fields of SHOK research but the grantees are HEIs and PROs. The new funding pillar (SRC) located at the Academy of Finland is mandated to fund cooperative research, also private companies (see Chapter 3.4.3).

Additionally Finnvera, TESI and ELY-Centres all have instruments related to innovation. Most of these instruments are related to general funding or financing for businesses but in many cases these also target development and (innovative) start-ups (see Chapter 1.2.2). Finnvera’s role is crucial in the commercialisation phase of innovation processes, although it is not focused on innovations. Even though the share of Tekes customers among Finnvera customers is only 10 %, the share of Finnvera customers among Tekes customers is 60 % in a longer time span. Finnvera is a specialised financing company owned by the State. Finnvera provides financing for the start, growth and internationalisation of enterprises and guarantees against risks arising from exports (see Chapter 1.2.2). Finnvera strengthens the operating potential and competitiveness of Finnish enterprises by offering loans, domestic guarantees, venture capital investments, export credit guarantees and other services associated with the financing of exports. The risks included in financing are shared between Finnvera and other providers of financing. Finnvera’s SME financing issued in 2014 was €1b and Export credit guarantees and

\textsuperscript{32}http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true
\textsuperscript{33}http://ifuturo.org/documentacion/Science%20Technology%20and%20Industry%20Outlook%202014.pdf
special guarantees €5b. Finnvera’s mandate and risk taking were enlarged in 2015 (Finnvera News 01.2015)\textsuperscript{34}.

Start-ups and young innovative companies (YIC) need a different kind of financial ecosystem. The funding for start-ups and YICs is a good example of concurrent initiatives (private and public, top down and bottom up) in Finland (see Chapter 5.2). Early stage VC funding seems to be developing (see Chapter 5.4), and Finnvera’s enlarged mandate offers better opportunities for financing commercialisation, growth and internationalisation of R&D results. Public-private partnerships are enhanced especially by Tekes funding concepts. However, the incentives for private sector R&D investments are weakening. Challenges still remain related to producing new good business ideas and collecting private equity for later stage growth.

Services for internationalisation were integrated to operate as the Team Finland concept\textsuperscript{35} (see Chapter 2.2).

The priority setting of the programmes aimed at funding private sector, too, (Tekes programmes) is a combination of top-down and bottom-up processes. Societal challenges and global megatrends defined in cooperative foresight processes define the general theme of the programmes. Preparation of individual programmes involves participants from all sectors: BES, HEI and PRO. The decision to start a programme depends on the commitment of enterprises to funding and to performing their own projects. Funding criteria are very clear to all participants because they are the same for all programmes and tailored for different customers. Peer reviews are not used due to the confidential information of company plans. However, all programmes, as well as, funding schemes (instruments) are regularly evaluated. International benchmarks are done occasionally – they could be more regularly used. The impacts of the programmes depend on the nature of the programme (see Annex 2) but all the programmes intensify business–academia cooperation. Finland was ranked #1 in university-industry collaboration in R&D by the WEF Global Competitiveness Report 2015–2016\textsuperscript{36} and the Global Innovation Index 2015.\textsuperscript{37}

3.5.2 Public Procurement of Innovative solutions

The total value of public procurement in Finland was €33.09b Euro in 2012, equal to approx. 17.20% of GDP.\textsuperscript{38} The public sector has a significant role in the development and renewal of markets (e.g. health, social services, environment, construction, and transport) and municipalities represent 2/3 of procurement volume.

PCP/PPI landscape


\textsuperscript{34} https://www.finnvera.fi/eng/Finnvera/News/(newsid)/3641
\textsuperscript{35} http://www.tem.fi/en/enterprises/promoting_internationalisation_of_enterprises/team_finland
\textsuperscript{36} http://reports.weforum.org/global-competitiveness-report-2015-2016/
\textsuperscript{39} See: http://www.finlex.fi/en/
Finland intends to implement the remaining optional features of the mentioned Directives, i.e. dynamic purchasing systems and electronic auctions, at a later date. The government proposal is still being finalised, with a Parliamentary reading possibly starting in March 2016. New Acts include a section on innovation partnership and a definition of innovation.

Prior to 2009 the role of innovation oriented public procurement was modest in Finland but the development of public procurement in research and innovation policies is underway and high on the political agenda. For instance the Research and Innovation Policy Guidelines for 2011–2015\(^{40}\) (2010) placed emphasis on public procurement by referring to it as one of the key tools of demand driven innovation policy. The development of public procurement is also one of the key themes in the Action plan (Ministry of Employment & Economy, MEE) and Policy framework for demand and user-driven innovation\(^{41}\). Finland’s national innovation strategy defines public procurement as a demand driven innovation policy tool. The intention is to develop public procurement practices, in order to create opportunities for and encourage innovative procurements. The action plan also refers to the reform of the Act on Public Procurement. The reform is based on the revision of the public procurement Directives announced in 2013. The main barriers in implementing demand-side policies in Finland are the small domestic markets and to some extent the dispersed local government sector. As a result active participation of Finnish organisations to the EU Lead Market is seen as a very important approach in the action plan by the MEE. On the other hand the small markets can possibly work as an efficient pilot market for global innovations.

**PCP/PPI initiatives**

Tekes had a programme for piloting public procurement of innovation – 70 projects were funded 2008-2013 with the main focus areas of construction and real estate, social and health care, energy and environment, and water supply. It provides a financial incentive for public procurers in Finland to undertake more "innovative" procurements. TEKES funds the planning of public contracts aiming at renewal of services and activities. This funding is targeted at all Contracting Authorities, and it typically covers 50% (depending on type of cost, funding can vary between 25% and 75%) of total project costs. The procurement must be extensive enough to have an impact on the development of the sector, at least regionally. The planning and preparation of an innovative procurement should encourage active dialogue with potential tenderers and end-users. Additionally, strategic commitment to an innovative procurement is expected from the Contracting Authority. Budget for and number of PPI projects have risen constantly, starting with 1 in 2008, 5 in 2009 and reaching 25 in 2012 and a funding available of €2.5m.

The aim of the new Smart Procurement programme (2013 - 2016)\(^{42}\) is to create smart demand, which will provide the prerequisites for new market creation and growth. The main focus areas for the programme are those areas in which the public (or private) procurement has a major impact on the market: energy and environment, ICT, health care, built environment, security and safety and private strategic procurement. Furthermore, smart procurement is integrated as a theme in some other programmes, too. The programme budget is about €60m of which TEKES covers half.

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Moreover, the INKA programme (recently ended) included objectives related to innovative and precompetitive public procurement, and the Growth agreement between the state and the 12 largest cities include commitments of these cities to implementing innovative and precompetitive procurement.

Procu-Inno (2011-2013) – a research and development project (funded by TEKES) focused on public procurement of innovation in Finland. The project was coordinated by VTT and the City of Helsinki, City of Pori and the Finnish Transport Agency. Procu-Inno analysed a selection of Finnish procurement projects, prepared case studies, elaborated a framework for managing the innovation procurement in Finland and furthermore set up a collaboration platform for practitioners. Procu-Inno also promoted PCP: it created a Finnish research network on this topic and supported pre-commercial public procurement approaches and applications in Finland. It is thematically open and has no specific mobility focus.

Since 2012 TEKES began initiatives to promote PCP, allocating a budget of €6m to co-finance 4-5 PCP projects.43 A pilot project, funded by FP7 emerged in 2012 – called Silver – Forum Virium Helsinki is one of its partners44.

Under the R&I action plan 2012 – Cleantech – a Finnish national project related to the environment was a first strategic target area for the public procurement of innovations. The aim was to set a target percentage to enhance the adoption of sustainable solutions in the field of Cleantech that promote innovation activities. An objective was set to direct 1% of public procurement towards the purchasing of new solutions in the Cleantech field (Proposed measure 18: Ministry of Employment and the Economy, Ministry of the Environment). The generation and diffusion of innovations is promoted by setting a target percentage (such as 2 or 3%) for public procurement that enhances research, development and innovation activities. Expertise in procurement is enhanced by strengthening and developing comprehensive support and advisory services in matters of public procurement related to innovation. Financial and other incentives for procurement related to innovation were developed as part of the Effectiveness and Productivity Programme of central government and the productivity programme of municipalities (Proposed measure 19: Ministry of Employment and the Economy, Ministry of Finance).

**Smart Kalasatama**

Aims to experiment intelligent city planning – development projects, up-to-date public transport information, ride-sharing for goods and the digitalised monitoring of the condition of the buildings. It includes 5 agile piloting projects.

**DreamBroker**

A learning and communication solutions initiative, in which public procurements had a crucial impact on development. It was listed as Finland’s fastest growing technology company in 2012.

**RAKLI - Innovation procurement clinics**

The Procurement Clinics scheme run by RAKLI (the Finnish Association of Building Owners and Construction Clients) is designed to facilitate dialogue between public sector clients and potential service providers. Workshops involving clients, suppliers and other relevant actors analyse a specific procurement problem indicated by a client, and publicly present identified solutions.

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43 Experience from development of policy instruments for PPI in Finland: http://www.vtt.fi/files/sites/procuinno/procuinno1602_lundstrom.pdf  
44 http://www.silverpcp.eu/
UDI (User-Driven Innovation)

The purpose of the website is to describe some of the benefits of user-driven innovation for society and businesses. The cases describe a few Finnish examples of how closer cooperation with users has resulted in more pleasant and higher-value products and services.

3.5.3 Indirect financial support for private R&I

In Finland governmental support to research and innovation has mainly been channelled through direct funding and this seems to continue. Indirect funding measures have been used three decades ago and again in 2013–2014. The government budget for 2013 included two tax incentives aimed at growth seeking businesses. The Tax Incentive for Private Investors targets business angels investing equity in SMEs. The incentive provides a possibility to postpone paying capital gains taxes as long as those gains are re-invested in qualifying businesses. The R&D Tax Incentive was a deduction from corporate income taxes tied to the wage costs of R&D personnel in Finland. The total sum of deduction in costs was €65m in 2013 causing €15m loss in tax revenues. In 2014, the government decided to terminate it due to the lowering of corporate tax (State budget 2014), and because the R&D tax incentive presumably doesn’t have any impact on adding R&D investments of enterprises when direct funding has been measured to have an additionality of 2 (Ali-Yrkkö J. 2008 and Einiö E. 2009). This will be re-evaluated in the evaluation of the tax incentive scheme. Starting 2015 the only special tax incentive for R&I is targeted to Business Angels. The new government Programme includes a proposal that donations (€850 - €0.5m) to HEIs made by individuals will be deductible in taxation, as well as a decision to continue tax relief for foreign key employees.

3.6 Business R&D

3.6.1 The development in business R&D intensity

Figure 7 shows the GDP share of BERD decrease since 2010 to below 2005 levels. The decline is more evident after 2011 and is related to the severe drop in R&D expenditure in manufacturing in the period 2011-2012. A small part of these overall decline in BERD were compensated for by an increase of R&D expenditure in services, notably in both ICT and professional activities sectors. Equally, the share of services is very high (up to 50% in many manufacturers) among manufacturing companies at present, and therefore a much greater share of BERD is focused on services than the statistics indicate. Manufacture and Services account for more than 97% of the BERD expenditure in the period under study but the relative shares have changed and the gap between the two has reduced. In fact, BERD in manufacture went from 2.07% of GDP in 2010 to 1.62% in 2013 whereas BERD in the service sector increased from 0.46% to 0.59% of GDP during the same period.

45 http://udi.fi/en
Figure 6 BERD intensity broken down by most important macro sectors (C= manufacture, G_N=services).

The private sector (curves C and G-N describe BERD intensity of domestic companies, not of private (C and G-N) sector altogether) is the main funder of the Finnish BERD. However, from 2012 its contribution is reduced and at the same time R&D funds from abroad become more important due to major enterprises’ changed ownership arrangements.\footnote{http://www.stat.fi/tl/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html} As a result, the gap between the business contribution and the total BERD widens in 2012-2014.

Figure 7 BERD by source of funds

3.6.2 The development in business R&D intensity by sector

Manufacture of computer, electronic and optical products is the leading sector in terms of R&D expenditure in Finland. Figure 9 (Business is Domestic business and Abroad includes foreign business funds) shows a mild negative trend in the R&D expenditures in this sector from 2008 to 2011 followed by a sharp decline in 2012. The following year R&D expenditure dropped further. According to Statistics Finland, in the electronics industry, R&D expenditure went down by EUR 14 million in 2014 compared to the previous year. As a dominant player in this sector, Nokia’s R&D intensity saw a negative growth over a 3 year period of -11.2%.
Smaller companies in the field such as Tieto (still a fairly large company) and Vaisala also saw similar decreases (-3.3% and -2.0%). The other two leading sectors, i.e. manufacture of electrical equipment and manufacture of machinery and equipment have not experienced similar drops. On the contrary they both show increasing trends but the amounts involved are not of the same scale.

![Figure 8](image)

**Figure 8** top sectors in manufacturing (C26=manufacture of computer, electronic and optical products; C27= manufacture of electrical equipment; C28=manufacture of machinery and equipment n.e.c).

As far as services are concerned, there is a significant increase of the R&D expenditure in the information and communication services after 2009, particularly in 2013. R&D expenditure in IT services increases whereas at the same time it decreases in the manufacture of computer, electronic and optical products. In other words regarding the IT sector we observe a shift of the R&D activities from manufacture to services. Professional, scientific and technical activities comprise the second most important in terms of R&D expenditures type of services. The negative trend between 2008 and 2010 was followed by a sharp increase in 2011 which continued in 2012 and stagnated in 2013. Finally, R&D expenditures in wholesales are stable and considerably lower than the previous two sectors, with only one peak in 2012.

![Figure 9](image)

**Figure 9** top service sectors:
J=information and communication, M=professional, scientific and technical activities, G=wholesale and retail trade; repair of motor vehicles and motorcycles

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3.6.3 The development in business R&D intensity and value added

Manufacturing is, by a clear margin, the biggest contributor to Gross Value Added (GVA) in Finland accounting for 15.4% in 2012, which is very close to the EU average. However, its share significantly decreased in recent years from 23.3% in 2007 to 15.4% in 2012. Part of this decline is due to the contraction of the manufacture of computer, electronic and optical products sector (C26) whose value-added declined from over 8 billion in 2007 to less than 800 million in 2012.

Real estate activities and human health and social work activities show an increasing share in the total GVA throughout the period 2007-2012, whereas the contribution from wholesale and retail trade fluctuates slightly over the years.

Within manufacturing, the biggest sector in terms of GVA is manufacturing of machinery and equipment n.e.c., which is also one of the leading sectors in terms of BERD, followed by manufacturing of paper and paper products and manufacturing of food products; beverages and tobacco products, both of low technological intensity (See Figure 11). Manufacturing of chemicals and chemical products should also be noted: its production in 2014 was €25b; its share of manufacturing has increased from 16% (2010) to 20% (2014) by production, and from 13% (2010) to 15% (2014) by added value. Employment of the Chemical industry has been quite stable when other sectors have been struggling.

Figure 10 economic sectors as percentage of the total GVA.
Top 6 sectors in decreasing order: 1) manufacture, 2) Real estate activities, 3) wholesale and retail trade (repair of vehicles and motorcycles), 4) Human health and social work activities; 5) Construction; 6) Public administration and defence; compulsory social security.
Figure 11 GVA in manufacturing. Top 6 manufacturing sectors:
1) Manufacture of machinery and equipment n.e.c.; 2) Manufacture of paper and paper products; 3) Manufacture of food products; beverages and tobacco products; 4) Manufacture of fabricated metal products, except machinery and equipment; 5) Manufacture of chemicals and chemical products; 6) Manufacture of electrical equipment

Figure 12 Value added for the leading sectors

It is clear from figure 13 that the largest R&D performer in Finland - computer manufacturing, electronic and optical products - not only dramatically decreased in R&D intensity but also lost 90% of its Added Value in the period 2007-2012. The increasing share in the export-market of competing products in this sector (e.g. smart phones) from emerging players, along with the weakening cost competitiveness, e.g. high cost of labour in Finland helps explain the trends during this period. Employment in this sector follows a similar trend with losses of about 35% between 2008 and 2013.

Finland’s high-growth enterprises increased in 2012-2013 as did their overall share of the firm-landscape, especially in the manufacture of machinery and equipment in all BERD intensive sectors under study apart from computer manufacturing (C26). Employment trends in Finland are mixed – some sectors saw decreases in overall employment (manufacture of electronics, electrical products and ICT), and increases for retail and professional, scientific & technical activities. The numbers of highly skilled employees increased in all four sectors 2008-2014, indicating the importance of highly skilled workers in the knowledge economy.

48 See Country Report 2015
3.7 Assessment

The role of private sector in the Finnish R&I system is strong. The share of GERD performed by the BES (Business Enterprise Sector) 68 %, and 66 % was funded by the BES in Finland in 2014. The relatively high share of private funding is positive and a clear target. Segmenting private R&D expenditures based on the company size, 77 % of the R&D was executed by large companies, 4 % by micro companies and 19% by other SMEs in 2014 Thus, Finland’s R&D is dominated by large companies. The moderate role of the SMEs is a challenge for Finland. Foreign affiliates’ share has increased in 2015 but is still quite low, 20 % of the Business sector R&D expenditures, indicating modest internationalising of the economy. Public funding of private sector's expenses on R&D is very low, about 3%. These incentives are mainly focused on SMEs and start-ups, and their impacts have been proved to increase private investments in R&D but stronger incentives for the whole business sector would be needed for leveraging business expenditures in R&I as well as for increasing the relevance of public research for businesses. The government has shifted the focus from direct grants to refundable forms of funding which will lower risk taking and change the focus on near to market interests instead of building knowledge capacity for innovation.

Public research organisations perform about 10 % and the higher education institutions around 22 % of all R&D activities in the country. The share of public research funding (0.96 % of GDP) is quite high. Still the quality and output are in need to be strengthened. Project funding (57 %) is dominating over institutional funding (43 %), and institutional funding especially for universities include competitive elements, too. Competition is targeted to increase the quality but a low rate of internationalising and a dispersed HEI and PRO system are challenging the targets. That’s why the government is reforming the system. The trend seems to be to incentivise universities performance to increase outputs.

International funding has been growing since 2011 (17 % of GERD in 2014). Most of it is multinational’s intramural R&D expenditures. EU funding has been growing steadily but slowly during the last years. In 2014 it was 2.7 % of GERD, mostly FP funding. The role structural in R&D funding is minimal. Internationalisation is a clear challenge for Finland.

Private R&D intensity in Finland saw a general decrease since 2005 although it is still at a high level in comparison to other leading EU countries. Manufacturing R&D decreased, in particular in the computer, electronic and optical products sector, an important part of the Finnish economy, while services saw a gradual increase since 2011, though it doesn't offset the overall losses. There are also signs that high-growth enterprises are successfully increasing in many sectors and increasing their share of the overall firm base, except for the sector manufacture of computer, electronic and optical products. Employment is mixed across sectors, although a general trend since 2008 is an increase in highly skilled workers across all sectors. Finland recently reported on a decline in the business sector's share of R&D expenditure from 74% to 68% per cent in 2008 to 2014. In 2015, R&D expenditure is estimated to fall by EUR 45 million, putting its GDP share at no more than 3.1%.49
