“Comparison of selected countries business innovation and R+D profiles using Eurostat and CSO data”

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Context “Impact 2030: Ireland’s Research and Innovation Strategy”

While Ireland's overall investment in R&I has increased in the past decade, our current position as a Strong Innovator on the European Innovation Scoreboard is at risk of being overtaken by other EU Member States, as they improve and invest in their R&I systems. Ireland is no longer one of the ten most innovative Member States, having slipped from sixth place in 2016 to eleventh place in 2021. Likewise, a similar performance can be observed in the Global Innovation Index where Ireland's position has fallen from seventh place in 2016 to nineteenth out of 132 countries in 2021.

Ireland performs well in a number of areas in both scoreboards, ranking first for sales impacts and employment impacts of innovation in the European Innovation Scoreboard and first for knowledge diffusion, fifth for knowledge absorption and tenth for knowledge impact in the Global Innovation Index in 2021. Additionally, Ireland performs well in a number of international disciplinary rankings, displaying the excellence of Irish science (as published in the SFI Annual Report 2020, based on InCites Essential Science Indicators from Clarivate Analytics):

QUESTIONS

- 1) HOW AND WHY HAS ROI PERFORMED RELATIVE TO EU AND GLOBAL INNOVATION RANKINGS AND TO DENMARK AND FINLAND AS LEAD INNOVATORS?
- 2) WHAT IS THE NATURE OF IRELANDS R+D AND INNOVATION PERFORMANCE, BOTH RELATIVE TO INTERNATIONAL INNOVATION LEADERS AND WITHIN ENTERPRISES BY SIZE AND ORIGINS
- 3) WHAT THE FACTORS HAMPERING INNOVATION IN IRELAND BOTH RELATIVE TO OTHER COUNTRIES AND WITHIN ENTERPRISE SIZE AND ORIGIN?
- 4) ARE THERE ANY USEFUL IMPLICATIONS FOR POLICY BOTH NOW AND FUTURE?

Sources

- DFHERIS **“Impact 2030:** Ireland’s Research and Innovation Strategy” https://www.gov.ie/en/publication/27c78-impact-2030-irelands-new-research-and-innovation-strategy/
- European Commission, Directorate-General for Research and Innovation, Hollanders, H., ***European Innovation Scoreboard 2023***, Publications Office of the European Union, 2023, **https://data.europa.eu/doi/10.2777/119961**
- **Global Innovation Index** https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023-en-main-report-global-innovation-index-2023-16th-edition.pdf
- OECD “**Main Science and Technology Indicators,** Volume 2022 Issue 2” (2022) https://www.oecd-ilibrary.org/science-and-technology/main-science-and-technology-indicators/volume-2022/issue-2_1cdcb031-en
- Eurofound/Cedefop (2019) European Company Survey 2019
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  - Research and Development
  - Community Innovation Survey
- Central Statistics Office (ROI)
  - **Business Expenditure on Research and Development** https://www.cso.ie/en/releasesandpublications/ep/p-berd/businessexpenditureonresearchanddevelopment2021-2022/data/
  - **Innovation in Irish Enterprises** https://www.cso.ie/en/releasesandpublications/ep/p-iie/innovationinirishenterprises2020/

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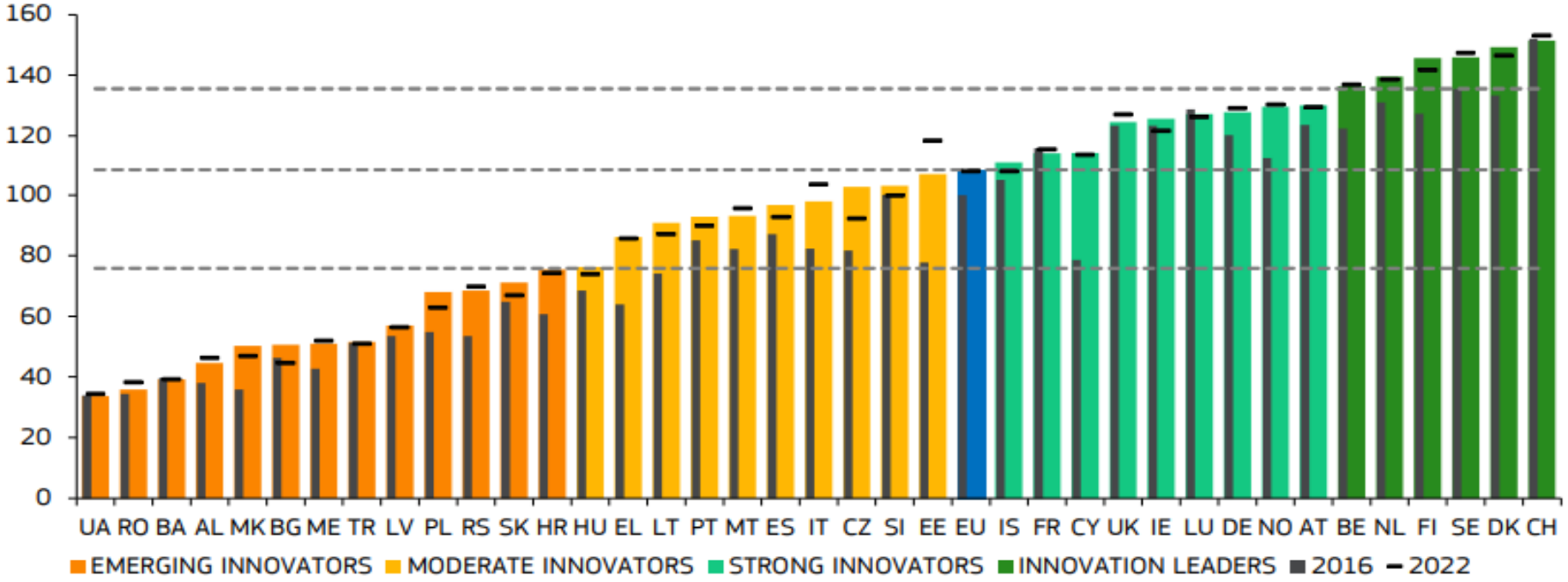
European Innovation Scoreboard

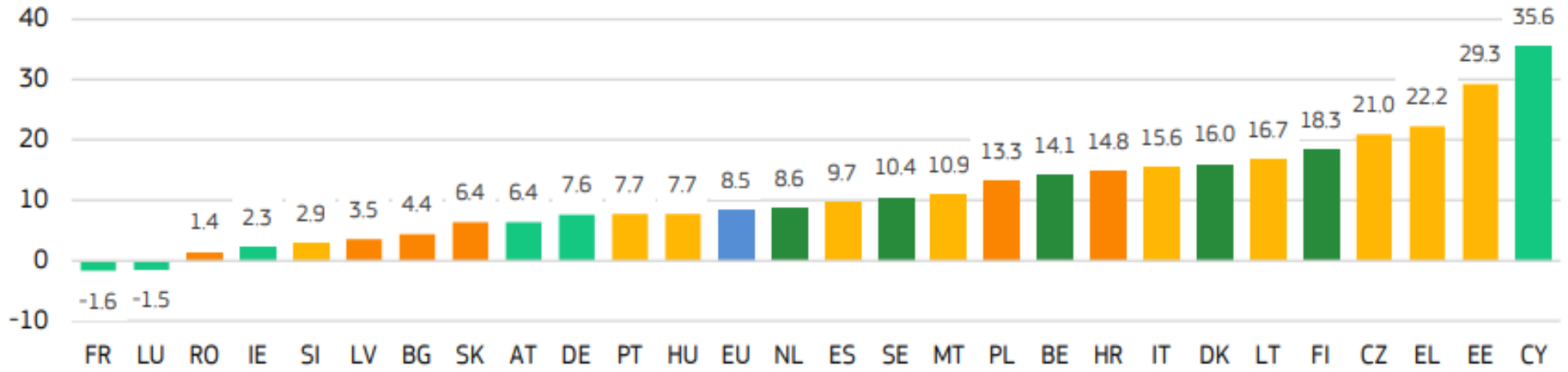
Figure 16: Performance groups: innovation performance per dimension



All performance scores are relative to that of the EU in 2016. Coloured columns show countries' performance in 2023, using the most recent data for 32 indicators. The horizontal hyphens show performance in 2022, using the next most recent data. Grey columns show countries' performance in 2016. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125%, when using the latest 2023 data, have been adjusted upward by multiplying with 1.085 to reflect the performance increase of the EU between 2016 and 2023 as the graph shows performance scores relative to the EU in 2016.

European Innovation Scoreboard

Figure 8: Performance change between 2016 and 2023



Performance change is measured as the difference between the 2023 and 2016 scores relative to that of the EU in 2016.

EUROPEAN INNOVATION SCOREBOARD

DIMENSION	ROI		DK		FIN		EU
	2016	2023	2016	2023	2016	2023	2016 (28) 2023 (27)
HUMAN RESOURCES	142%	156%	122%	177%	136%	157%	100%
RESEARCH SYSTEMS	125%	159%	164%	190%	134%	157%	100%
DIGITALISATION		122%		147%		158%	
FINANCE + SUPPORT	74%	65%	133%	112%	156%	104%	100%
FIRM INVESTMENTS	70%	76%	108%	114%	117%	109%	100%
INFORMATION TECHNOLOGIES		129%		150%		191%	
LINKAGES + ENTERPRENEURSHIP	125%	181%	162%	216%	143%	219%	100%
INTELLECTUAL ASSETS	77%	57%	142%	137%	129%	125%	100%
INNOVATORS	147%	116%	119%	117%	113%	148%	100%
ECONOMIC EFFECTS (EMPLOYMENT AND SALES IMPACTS)	136%	152/139%	124%	108/108%	98%	138/116%	100% (100%/100%)
ENVIRONMENTAL SUSTAINABILITY		109%		129%		78%	100%

How has ROI performed relative to EU and Denmark, Finland?

- ***ROI ahead of EU average***
  - 2016 (5/8) human resources, research systems, linkages, innovators and economic effects
  - 2023 (7/11) human resources, research systems, digitalisation, information technologies, linkages, innovators and economic effects
  - 2016/23 – ROI
    - improvement (5/8) human resources, research systems, firm investments, linkages, economic effects
    - disimprovement (3/8) finance and support, intellectual assets, **innovators**
  - Overall, ROI ranking is driven
    - up by human resources, research system, digitalisation/information technologies and linkages/innovators, and
    - down by finance/support, firm investments, and intellectual assets
- ***ROI relative to Denmark and Finland***
  - 2016 Ahead of Dk human resources, innovators and economic effects
  - 2016 Ahead of Fin human resources, innovators and economic effects
  - 2023 Ahead of Dk economic effects
  - 2023 Ahead of Fin research systems (just), economic effects, environmental sustainability

Global Innovation Index (2023)

Factor	Ireland (Score 2023 (2016))	Ireland (Ranking 2023 (2016))	Denmark (Ranking 2023 (2016))	Finland (Ranking 2023 (2016))	United Kingdom (Ranking 2023 (2016))
Overall Ranking 2023 (2016)		22 (7)	9 (8)	6 (5)	4 (3)
1 Institutions	77.4 (88.1)	15 (12)	5 (7)	3 (2)	24 (13)
2 Human Capital and Research	45.2 (54.0)	28 (20)	9 (4)	5 (1)	8 (7)
3 Infrastructure	59.2 (59.4)	18 (19)	3 (21)	1 (17)	6 (4)
4 Market Sophistication	37.9 (56.9)	51 (19)	21 (6)	12 (12)	3 (4)
5 Business Sophistication	57.0 (53.8)	14 (8)	12 (17)	4 (4)	13 (14)
6 Knowledge and Technology Outputs	46.8 (57.9)	14 (3)	12 (14)	4 (7)	7 (9)
6.3 Knowledge Diffusion	65.3 (86.8)	3 (1)	22 (21)	1 (10)	9 (34)
6.3.4 ICT exports % trade	35.2 (23.1)	1 (1)	34 (51)	1 (8)	20 (39)
8 Creative Outputs	44.1 (53.4)	26 (10)	10 (11)	16 (14)	2 (3)

- **Overall Ireland's GII Ranking fell from 7nd in 2016 to 22nd in 2023**.
- Ranking decreases were in six of the eight Factors and also Score reductions in six of the eight Factors
- **Major Score reductions were in Institutions, Human Capital and Research, Market Sophistication, Knowledge and Technology Outputs and Creative Outputs.**

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Enterprises and Expenditure … on Innovation Activities by area of expenditure 2020

(Eurostat Community Innovation Survey) (inn_cis12_exp$defaultview and related)

Country	Total	10-49	50-249	250+
Ireland Expenditure on …				
… R+D Activities	92.5 (93.2)	93.5	83.5	95.2
… R+D performed inhouse	81.1(82.8)	65.6	57.0	89.8
… R+D contracted out	11.4 (29.8)	27.9	26.5	5.3
… on Innovation (excld R+D)	7.5 (29.3)	6.5	16.5	4.8

Enterprises and Expenditure … on Innovation Activities by area of expenditure 2020 (Eurostat Community Innovation Survey) (inn_cis12_exp$defaultview and related)

Country	Total	10-49	50-249	250+
Denmark Expenditure on …				
… R+D Activities	67.5 (58.1)	62.5	70.3	67.9
… R+D performed inhouse	67.4 (56.2)	61.9	70.0	67.8
… R+D contracted out	0.1 (6.5)	0.6	0.2	0.0
… on Innovation (excld R+D)	32.5 (77.2)	37.5	29.7	32.1

Enterprises and Expenditure … on Innovation Activities by area of expenditure 2020 (Eurostat Community Innovation Survey) (inn_cis12_exp$defaultview and related)

Country	Total	10-49	50-249	250+
Finland Expenditure on …				
… R+D Activities	81.6 (87.6)	81.3	82.8	81.3
… R+D performed inhouse	70.2 (83.1)	66.6	72.8	70.3
… R+D contracted out	11.5 (51.0)	14.7	10.0	11.0
… on Innovation (excld R+D)	18.4 (55.2)	18.7	17.2	18.7

Innovation Expenditure (£m) CSO

	Irish ownership		Non Irish ownership		Total	Total
	2008	2020	2008	2020	2008	2020
All expenditure on Innovation	1692	2009	3588	5426	5280	7435
In-house R+D	340	1246	1269	4835	1609	6081
Purchase of external R+D	58	386	435	425	493	811
Acquisition of machinery, equipment and software	1143	223	1721	113	2844	336
Acquisition of other external knowledge	152	14	163	17	315	31
All other innovation activities	n/a	140	n/a	35	n/a	175

- Innovation spending overall was £7,435m in 2020, up 41% on 2008, of which In-house R+D was 82%
- **Non-Irish owned enterprises spending was 73% of total in 2020, up 51% on 2008, of which inhouse R+D was 89%**
- Irish-owned enterprise spending was 27% in 2020, up 19% on 2008, of which inhouse R+D was 62%

Enterprises engaged in R+D Activities by Ownership Type 2007 and 2021
(CSO Business R+D Expenditure BSA 01)

	Irish Ownership					Non-Irish Ownership					All Nationalities Ownership				
	2007		2021			2007		2021			2007		2021		
Spending Levels £	No	%	No	%	+ % Nos	No	%	No	%	+ % Nos	No	%	No	%	+ % Nos
Any Spending	817	100	1345	100	65%	389	100	585	100	50%	1206	100	1939	100	61%
0-99k	328	40.1	541	40.2	65%	91	23.4	99	16.9	9%	419	33.1	640	33.1	53%
100k-499k	293	35.9	531	39.5	81%	105	27.0	137	23.3	30%	398	34.6	668	34.6	68%
500k-1999k	147	18.0	208	15.5	41%	79	20.3	162	27.7	105%	226	19.2	370	19.2	64%
2000k-4999k	37	4.5	39	2.9	05%	54	13.9	88	15.1	63%	90	6.6	127	6.6	41%
5000k+	12	1.5	26	2.0	117%	61	15.7	100	17.0	64%	73	6.5	126	6.5	73%

- A total of 1939 enterprises were considered be R+D active in 2021, up 61% on 1206 in 2007
- 32% of all R+D active enterprises in 2021 did £ 500K or more spending
- 69% of all R+D active enterprises in 2021 are Irish-Owned, whereas 56% of r+d active enterprises with £500k spending were non-Irish owned.

Business Expenditure on Research and Development (CSO) "Size of Enterprise and Type of Research 2007, 2021" (BSA06)

	Small 2021	Medium 2021	Large 2021	All Enterprises 2007	2021
All types of research and development	100	100	100	100	100
Basic research	9.5	9.2	19.5	10.1	15.7
Applied research	33.9	23.4	19	33.2	22.4
Experimental development	56.7	67.3	61.5	56.7	61.9

- **Nearly two-thirds of all ROI 2021 expenditure on R+D is experimental development (62%),** with applied research (22%) and basic research (16%) (which was an increase on 2007(10%)).
- Basic research, whilst lowest in share of R+D spend overall (16%), large enterprises had over double the share (20%) compared to small and medium enterprises (9.5% and 9.2% respectively).
- While "D" spending was the majority in all enterprise size categories, as % of all R+D spend, Small enterprises had the lowest share (Small 57% v Medium 67% and Large 62%).

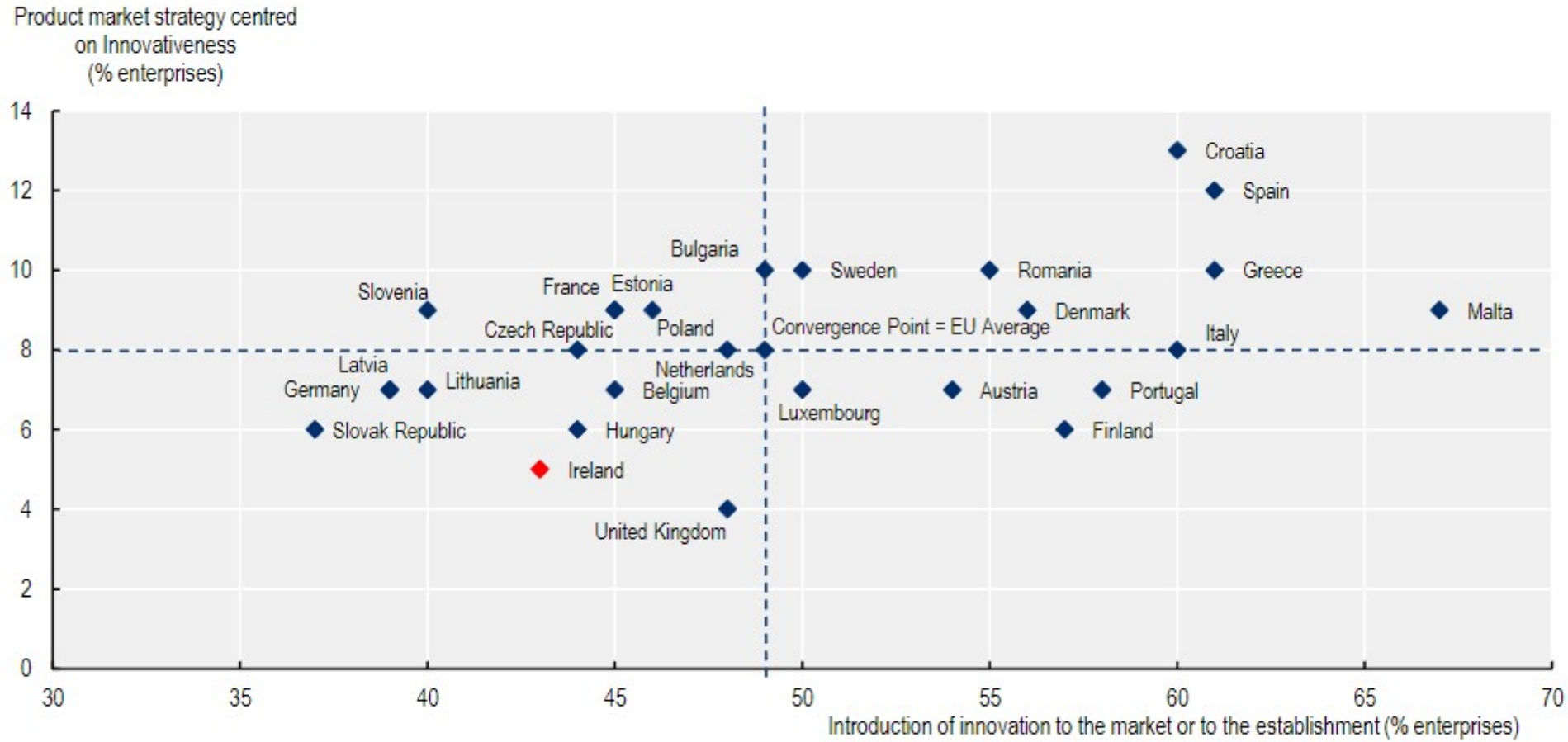
Innovation in Irish Enterprises (CSO) "Detailed Technology Activity Rates 2010-2020"(CIS 34)

Categories of Innovation *	Irish ownership		Non Irish ownership	
	2010	2020	2010	2020
Product Innovation	25.2	27.7	37.9	47.3
Process Innovation	30.7	42.3	40.5	58.0
Product and Process Innovation Combined	16.3	21.8	25.3	38.5
Any Innovation	43.9	53.4	57.3	73.3

(Not included are Ongoing Innovation, Abandoned Innovation and Abandoned and Ongoing Innovation)*

- Three-quarters (73%) of non-Irish –owned enterprises carried out any type of innovation (up 16% points on 2010).
- 47% did product innovation (up 9% points), 58% did process innovation (up 18% points) and 39% did product and process combined (up 13% points).
- Half (53%) of Irish-owned enterprises carried out any type of innovation in 2020, (up 9% points on 2010).
- 28% did product innovation (up 3% points), 42% did process innovation (up 11% points) and 22% did product and process combined (up 6% points).
- **Overall, process innovation was the most engaged in type of innovation for both sources of enterprise; and the gap between % of enterprises doing process and those doing product innovations widened 2010-20 (for Irish-owned, from 6% to 14% points, and for non-Irish owned, from 3% to 11% points)**
- Ratio of % of non-Irish owned enterprises relative to Irish-owned enterprises in 2020 (2010) for any innovation was 1.37(1.31), for product innovation was 1.71(1.50), for process innovation was 1.37 (1.32) , and for product and process combined was 1.77 (1.55).

Figure 4.2. Innovation within enterprises in Ireland, 2019



Source: Eurofound/Cedefop (2019[14]), *European Company Survey 2019*, www.eurofound.europa.eu/surveys/2019/european-company-survey-2019.

R+D Staff by enterprise size 2015 and 2021 (CS0 BSA 12)

	PhD+ researchers			Other researchers			Technicians			Support staff			Total R+D Staff		
	2015	2021	15/21	2015	2021	15/21	2015	2021	15/21	2015	2021	15/21	2015	2021	15/21
Small (10-49)	799	1096	+ 297	3328	3653	+ 325	2078	2644	+ 566	1573	1946	+ 373	7778	9,338	+ 1560
Medium (50-249)	523	489	- 34	3380	3468	+ 88	2484	3078	+ 594	1166	1624	+ 458	7553	8,659	+ 1106
Large (250+)	840	907	+ 67	5303	7127	+ 1824	2380	2968	+ 588	2482	3962	+ 1480	11005	14,964	+ 3959
Total	2162	2491	+ 329	12011	14248	+ 2237	6942	8690	+ 1748	5221	7532	+ 2311	26336	32,961	+ 6,625

- **In 2021, Large enterprises had 45%, Medium 27% and Small 28%, of all R+D Staff.**
- PhD researchers comprise 8% of all R+D Staff, other researchers 43%, technicians 26% and support staff 23%.
- There were higher intensities of PhD researchers in Small Enterprises (12%), Other researchers in Large enterprises (48%), Technicians in medium enterprises (35%) and Support staff in large enterprises (26%).
- Overall, R+D Staff increased by 6,625 over 2015/21, of which PhD researchers were 5%, Other Researchers 34%, Technicians 26% and Support staff were 35% (hence its share increased from 20% to 23% over 2015/21)
- Large enterprises added + 3,959 (60%), mostly other researchers and support staff
- Medium enterprises added + 1106 (17%), mostly technicians and support staff
- **Small enterprises added + 1560 (23%) , spread broadly equally across the four categories, and had 90% of net increase in PhD researchers and about a third of the Technicians increase**

Headcount of research personnel (CSO BSA 13)

	PhD+ researchers		Other researchers		Technicians		Support staff		Total R+D Staff	
	2007	2021	2007	2021	2007	2021	2007	2021	2007	2021
Irish Ownership	459	1290	2681	4700	1373	3978	1510	2473	6022	12441
Non Irish Ownership	720	1201	4382	9547	1575	4712	1250	5059	7928	20519
All Nationalities	1179	2491	7063	14248	2949	8690	2760	7532	13950	32961

"Impact 2030" – "Growing number of researchers from 10 now to 15 per 1000 employed" 2019/30 (11y)

OECD "Total Researchers in full-time equivalent per thousand total employment"

Country	2005	2014	2018	2019	Ratio 2005/18 (13y)	Ratio 2014/18(4y)
Belgium	7.8	11.1	12.0	12.8	1.54	1.08
Czech Republic	4.9	7.1	7.6	7.8	1.55	1.07
Denmark	10.1	14.8	15.7	14.1	1.55	1.06
Estonia	5.4	7.1	7.6	7.7	1.41	1.07
Finland	16.4	15.2	14.4	15.0	0.88	0.95
France	7.7	9.1	10.9	11.0	1.42	1.20
Germany	6.9	8.2	9.7	9.9	1.41	1.18
Ireland	5.9	12.6	11.6	11.6	1.97	0.92
EU27	5.9	7.7	8.7	8.9	1.47	1.04
UK	8.6	9.0	9.4	9.7	1.09	1.09
USA	7.7	9.0	9.8	n/a	1.27	1.09
OECD	7.0	8.2	8.9	n/a	1.27	1.20
China	1.5	2.0	2.4	n/a	1.60	1.13

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Hampering Factor for Innovation Activities (High Importance) Total Enterprises 2020 (Source: Community Innovation Survey)

Hampering Factor for Innovation Activities (High Importance)	DK	EST	ROI	FRANCE	AVERAGE 4 ECONOMIES	RANKING
Lack of internal finance	3	4	3	3	3	2
Lack of external finance	6	6	8	7	7	6
High costs	2	2	4	2	3	2
Lack of qualified employees	4	1	2	4	3	2
Lack of collaboration partners	10	8	10	9	9	7
Difficulties in accessing public grants/subsidies	8	5	5	5	6	4
Uncertain market demand	7	7	6	6	7	5
High competition	5	3	7	8	5	3
Lack of access to external knowledge	9	9	9	10	9	8
Different priorities within the organisation !!	1	n/a	1	1	1	1

- The top factor hampering innovation is “different priorities within the organisation”, in all three countries that surveyed it as a factor, and in all size categories within each of the three countries!
- The factors ranked as second are lack of internal finance, high costs and lack of qualified employees
- There is not great variation in rankings between the four countries, with some exceptions
- The exceptions (in red) include lack of qualified employees (Ireland and Estonia rank it higher), High competition (Denmark and Estonia rank it higher) and Accessing Public subsidies (Denmark ranks it lower)

Factor hampering Innovation Activities Ireland
CSO Ireland (http//data cso.ie /table/CIS81)

	Ranking 2014/16		Ranking 2018/20	
	Industry	Selected Services	Industry	Selected Services
Lack of internal finance	1	1	4(3)	3(2)
Lack of external finance	7	5	8 (7)	8 (7)
High costs	2	2	3 (2)	4 (3)
Lack of qualified employees	4	4	2 (1)	2 (1)
Lack of collaboration partners	8	8	10 (8)	10 (8)
Difficulties in accessing public grants/subsidies	5	6	6 (5)	5 (4)
Uncertain market demand	6	7	5 (4)	6 (5)
High competition	3	3	7 (6)	7 (6)
Lack of access to external knowledge			9	9
Different priorities within the organisation			1	1

Factors Hampering Innovation 2018 and 2020cso

	Irish Ownership		Non Irish ownership	
	2018	2020	2018	2020
Lack of internal finance	14.5	13.9	8.9	5.4
Lack of external finance	8.0	7.0	3.0	1.2
High costs	13.8	13.4	7.7	4.9
Lack of qualified employees	12.4	15.1	7.9	8.1
Lack of collaboration partners	4.6	3.2	2.0	1.8
Difficulties in accessing public grants/subsidies	10.7	10.8	3.2	1.2
Uncertain market demand	8.3	8.8	6.0	3.8
High competition	9.1	7.4	3.7	2.9
Lack of access to external knowledge	4.9	3.9	1.3	1.8
Different priorities within the organisation	17.1	19.4	16.2	17.1

Summary Results/Insights 1

Innovation Rankings

- Ireland – a strong innovator within European Innovation Scoreboard – has strengths in key areas well above the EU average
- The country has fallen in ranking over 2016/22 and is falling further behind Innovation Leaders such as Denmark and Finland
- Ireland has below average/falling scoring in enterprise RDI performance (investments, intellectual assets, innovators)
- Ireland has also significantly fallen behind 2007/2023 in Global Innovation Index, again driven by enterprise related factors, both relatively (rankings) and absolutely (scores).
- Ireland made good progress on Researchers per 1000 employees 2005/14, but has stalled 2014/19 – Denmark and Finland still much higher than all other countries

Summary Results/Insights 2

Type of RDI Performance

- While Irish-owned companies are 70% of R+D Active firms, they are 30% of R+D spending, whereas Non-Irish owned firms represent over half of the firms spending 500k pa on R+D.
- While non-Irish owned firms employ about two thirds of R+D Personnel in 2021, for both Ph Researchers and for Technicians, the share for Irish-owned and Non-Irish owned enterprises is broadly half, whereas for Other Researchers and Support Staff the share is two-thirds for Non-Irish owned.
- Small enterprises added + 1560 (23%) , spread broadly equally across the four categories, and had 90% of net increase in PhD researchers and about a third of the Technicians increase
- Experimental development represents nearly two-thirds of Ireland's R+D spending overall and the majority of such spending for all types of origin sizes
- Process innovation is the biggest type of innovation again across all types
- Compared to Denmark and Finland, Ireland has much less % spend on nonR+D Innovation

Summary Results/Insights 3

Factors hampering innovation

- The top factor hampering innovation is “different priorities within the organisation”, in all three countries that surveyed it as a factor, and in all size categories within each of the three countries!
- The factors ranked as second are lack of internal finance, high costs and lack of qualified employee (The latter is higher ranked in Ireland and has grown in impact over 2018/20)
- Factors inhibiting innovation are ranked similarly for Irish-owned as for Non-Irish owned
- ***The levels for Irish-owned enterprises are generally reported as higher often at more than double that for non-Irish ownership***
- For Irish-owned Enterprises, increasing obstacles are “Lack of Qualified Employees” and “Different Priorities ...” and decreasing “Lack of External Finance” , “Lack of Collaboration Partners”, “High Competition” and “Lack of access to external knowledge”
- Accessing public grants …” fell from reported as obstacle for 3.2% to 1.2% for non-Irish owned enterprises , with a gap of X3.3 growing to X9.0 for Irish-owned compared to non-Irish owned enterprises

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Policy now - "Impact 2030"

PILLARS	FLAGSHIP INITIATIVES
Pillar One Maximising the impact of research and innovation on the economy, society and the environment	New national agency Grand challenges programme New science advice structures "Creating our future" campaign Pillar
Pillar Two Impact of research and innovation structures on excellence and outcomes	Policy advisory forum on R and I, cross-Departmental Steering Group, departmental and agency Implementation Forum Expand Technological University research capabilities New Infrastructure investment framework Comprehensive review of R&I impacts in Ireland
Pillar Three Innovation driving success	Enterprise innovation capability will be broadened and deepened (2022-24 EI "additional 300 indigenous RD&I investment projects 100k+"; IDA ""additional 170 RD&I investment projects") Increase breath and depth of enterprise collaboration with the public research system Simplifying the routes for enterprise to engage with the public research system **Growing number of researchers from 10 now to 15 per 1000 employed and fully embracing lifelong learning** Digital adoption and transformation … will be driven …Digital Transition Fund … Levels of innovation performance in enterprise will be increased across our regions and opportunities for innovation diffusion will be maximised through Smart Specialisation
Pillar Four Talent at the heart of the research and innovation system	Connectivity between Irish R+I capability and the wider skills development agenda, including lifelong learning …. OECD … Irelands Skills Strategy Researchers … skills and career supports, equality, diversity and inclusion, career pathways into wider sectors (OECD Review of Contracts)
Pillar Five All-island, EU and global connectivity	Develop sustainable all-island R&I collaborations, building on the North-South Research Programme Maximise engagement in European Research Area and … other global connections Participate fully in Horizon Europe …drawdown target of £1.5b New international, education, research and innovation strategy

Policy Future? – *More Questions! What is Ireland's Problem?*

- **Nature of our RDI?**
  - *IMBALANCE BETWEEN R+D AND (NON R+D) INNOVATION (V EG DENMARK)?*
  - *ENOUGH FOCUS ON TECHNOLOGY DIFFUSION AND ADOPTION?*
  - IMPORTANCE OF GOING FROM 10 TO 15 RESEARCHERS PER 1000, BUT WHATS PATHWAY (NB 2014-18 NO CHANGE)?
- **Impacts of different enterprise structures?**
  - *ROOTED IN NEEDS AND PRIORITIES OF ENTERPRISES ("DIFFERENT PRIORITIES … (OTHER THAN RDI)")*
  - *ENTERPRISES OF ALL SIZES AND ORIGINS HAVE POTENTIAL* https://niopa.qub.ac.uk/bitstream/NIOPA/13392/1/interrelationship-rd-innovation-productivity-micro-enterprises.pdf
  - *UNDERSTANDING AND ADDRESSING HIGHER % OF REPORTED OBSTACLES FOR IRISH-OWNED ENTERPRISES*
- **Roles of ecosystem?**
  - "NOT ENOUGH QUALIFIED EMPLOYEES" – NEED FOR ENTERPRISES AND HEI/FET GREATER SHARED FOCUS ON NEW ENTRANTS AND LIFELONG LEARNING?

CONCLUSION AND DISCUSSSION

- QUESTIONS AND ANSWERS
- QUESTIN AN ANSWER
- CEIST IS FREAGRA