TR@NSENER PROJECT

THE INNOVATION SYSTEM IN SPAIN: STRENGTHS, WEAKNESSES AND PROPOSALS

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1. What is innovation? R&D and innovation. Importance of innovation
2. Symptoms: state of the Spanish Innovation System
3. Diagnosis: problems of the Spanish Innovation System
4. Therapy: some proposals
5. Key takeaways

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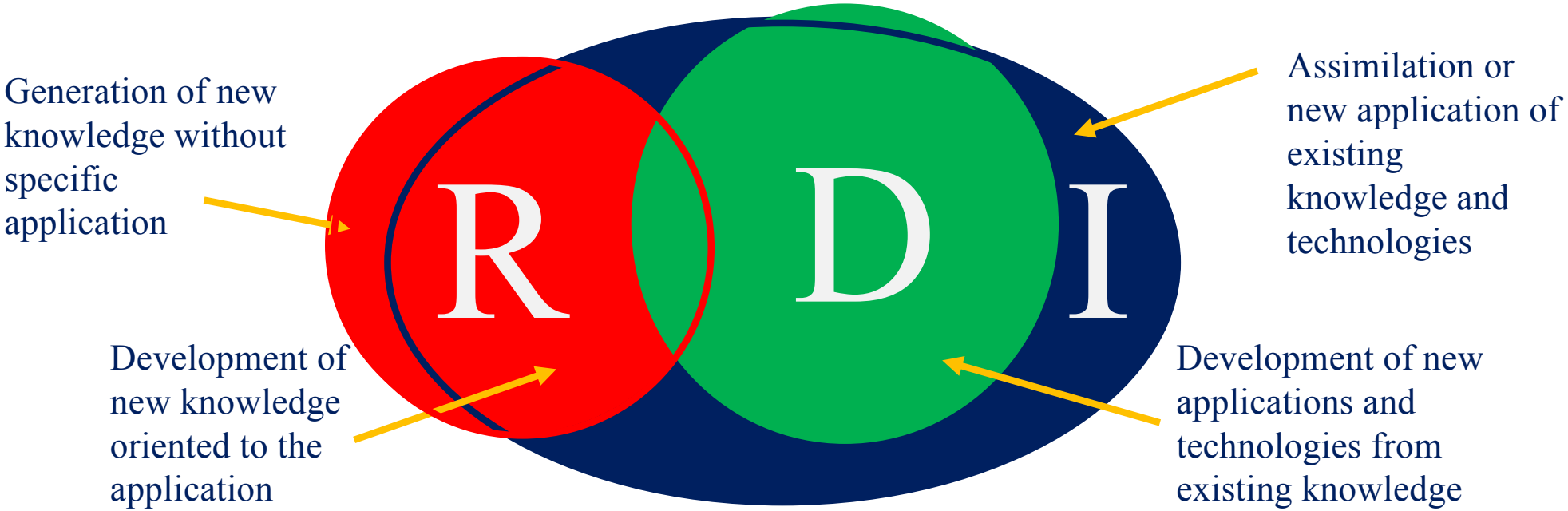
Research, Development and Innovation

Research transforms resources into knowledge through scientific talent, whereas **Innovation** turns knowledge (scientific, organizational) into wealth and social value, generating resources from organizational and individual talent.



Categories of innovation

Innovations are divided into three broad categories:

- **Revolutionary, disruptive or discontinuous** that lead to a completely new technology or process that changes one or several markets, industrial sectors and/or social activities
- **Incremental or evolutionary** that progressively lead to small improvements in existing technologies in a continuous optimization process
- **Translational innovations** that appear when an existing technology is transferred to a new application or industrial sector

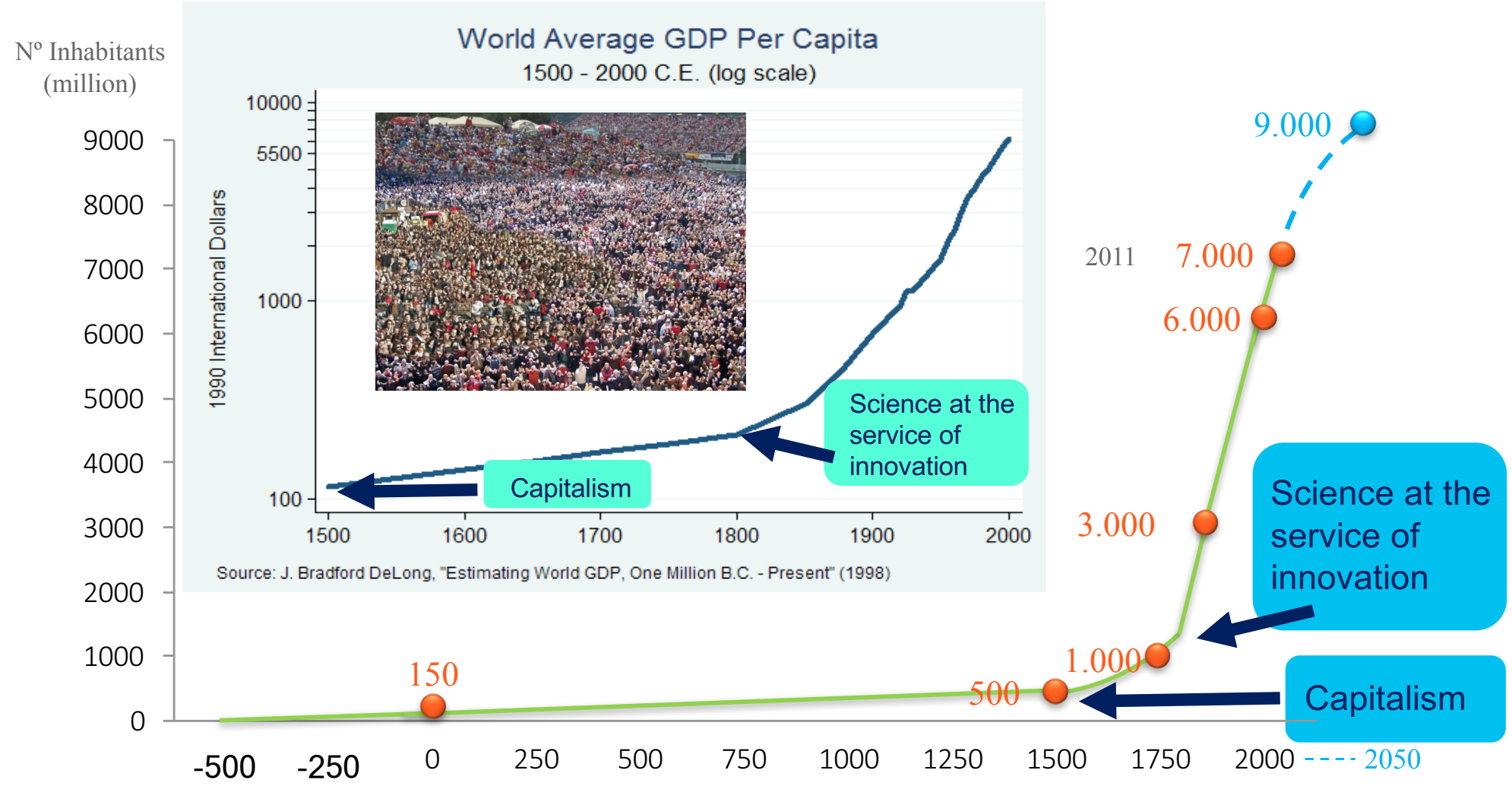
¿Cómo han conseguido sus trabajadores que Audi ahorre 108 millones?

El programa de ideas de la marca batió todos sus récords en 2017, con unas 15.000 propuestas.

Innovation is often divided into five types: **product, process, marketing, organizational and business model**

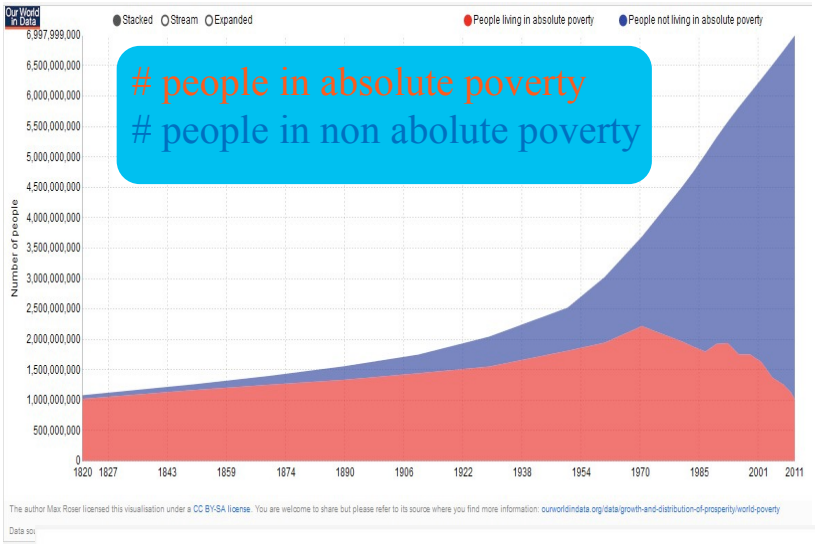
Every action directly or indirectly controlled by humans is susceptible of improvement by innovation

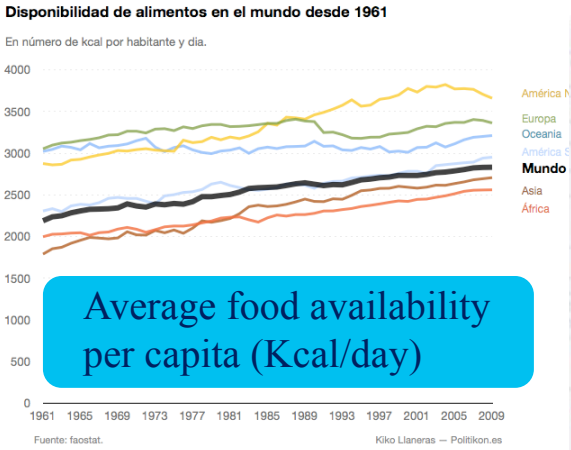
Innovation, driven by capital risk and Science, has been the main driver of modern human growth …

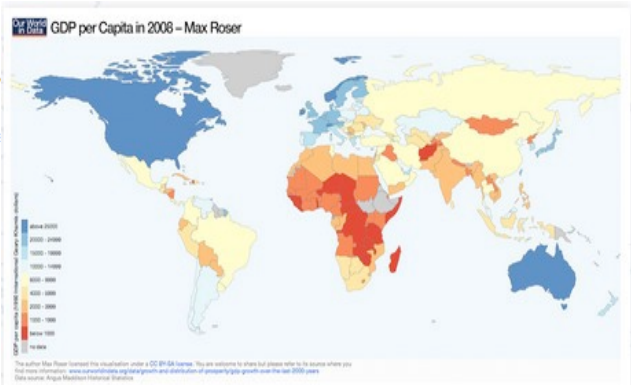


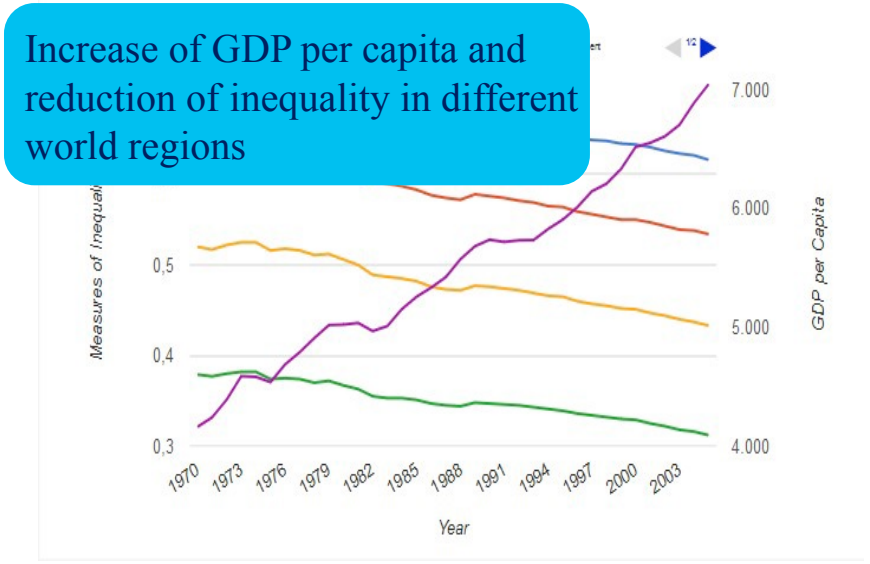
Source: National Institute for Demographic Studies (ined).

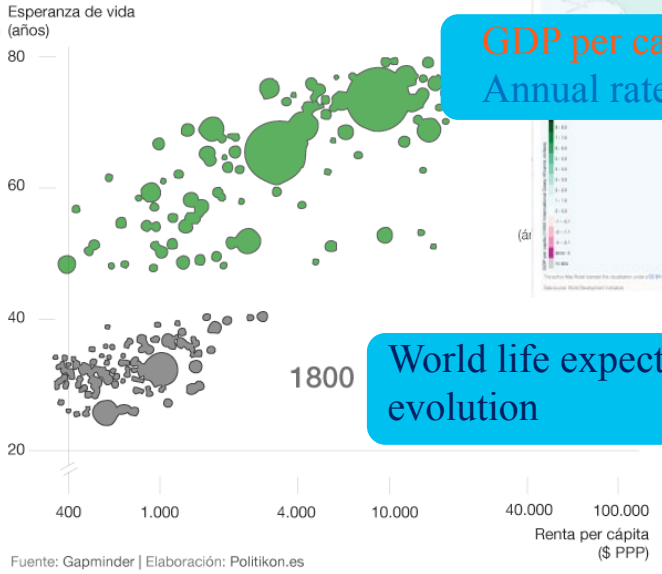
… positively affecting every indicator of global progress and gradually affecting everybody.











Rate annual growth of GDP per capita

Innovation is also a must for companies growth and leadership .

Exhibit B: **The Top 20 R&D Spenders**

The two biggest spenders from 2013, Volkswagen and Samsung, held their positions. Althou dominate this list, the software and Internet sector increased its presence in the top 20 this

Companies that have been among the Top 20 R&D Spenders every year since 2005

Rank 2014	Rank 2013	Company	R&D Spending 2014 US$ Billions	Change from 2013	As a % of Sales
1	1	Volkswagen	$13.5	18.9%	5.2%
2	2	Samsung	$13.4	28.0%	6.4%
3	4	Intel	$10.6	4.6%	20.1%
4	5	Microsoft	$10.4	6.1%	13.4%
5	3	Roche	$10.0	-1.8%	19.8%
6	7	Novartis	$9.9	5.6%	17.0%
7	6	Toyota	$9.1	-7.0%	3.5%
8	10	Johnson & Johnson	$8.2	6.8%	11.5%
9	12	Google	$8.0	17.1%	13.3%
10	8	Merck & Co.	$7.5	-8.1%	17.0%
11	11	General Motors	$7.2	-2.3%	4.6%
12	14	Daimler	$7.0	4.8%	4.4%
13	9	Pfizer	$6.7	-15.1%	12.9%
14	30	Amazon	$6.6	43.8%	8.8%
15	23	Ford	$6.4	16.4%	4.4%
16	15	Sanofi	$6.3	0.1%	14.5%
17	13	Honda	$6.3	-6.6%	5.4%
18	16	IBM	$6.2	-1.2%	6.2%
19	17	GlaxoSmithKline	$6.1	-2.4%	14.8%

"..if we want to succeed as a company, we must drive innovation into everything we do: into technology, into safety, into design and into real-world solutions for environmental issues, like the impact of energy usage on our world."

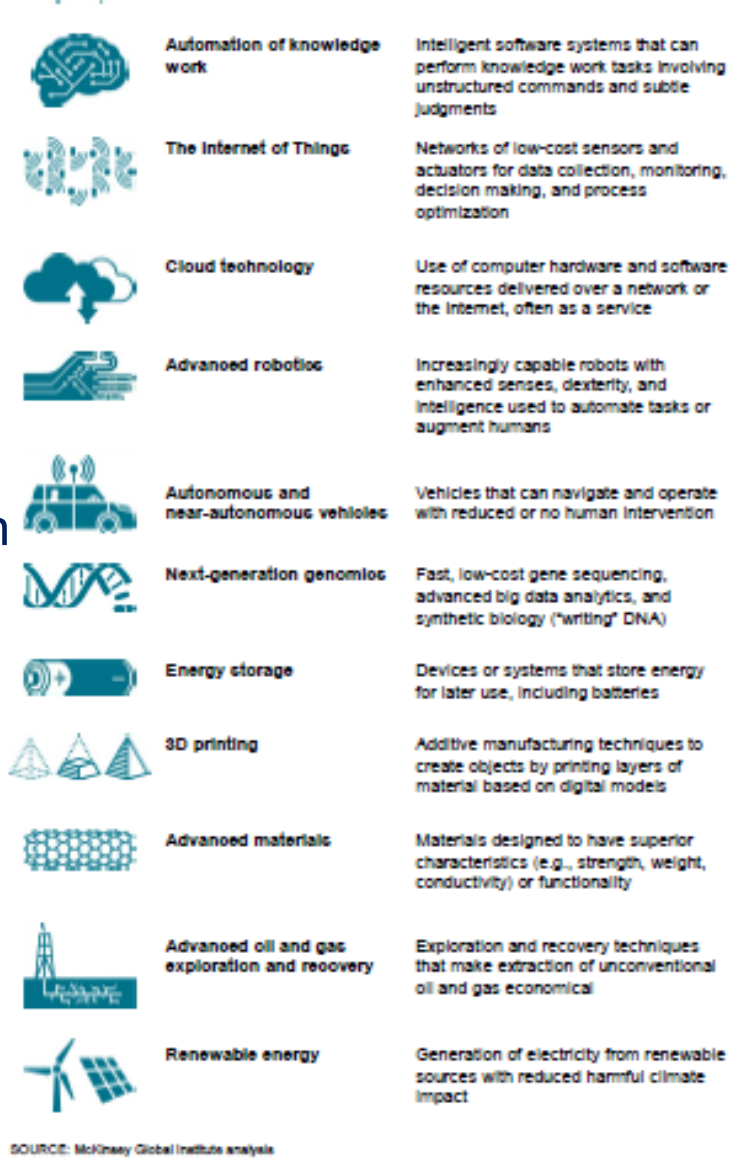
Chairman Bill Ford's speech, 2005

Appearance and global dissemination of new technologies is today the fastest in history and accelerating …

Technology is changing our fundamental way of living (the way we work, we make business, we eat, we move, we keep healthy, we learn and teach, we communicate and interact, ..)

In the near future this may change the fundamental roots of our species (more and more machine dependence, human-machine interaction, immersive VR, prosumers, reproduction and aging, collaborative economy, work scarcity,..)

"Previous technological innovation has always delivered more long-run employment, not less. But things can change"
(The economist, 2014. The future of jobs. The onrushing wave)



… keeping the trend of global inequality reduction, but, at the same time, putting our planet in danger.

A new paradigm of growth is required to simultaneously reduce pollution, waste and the pressure on natural resources.

THIS CAN ONLY BE ACHIEVED AGAIN BY THE CONCURRENCY OF RESEARCH, INNOVATION AND SOCIAL AND POLITICAL COMMITMENT

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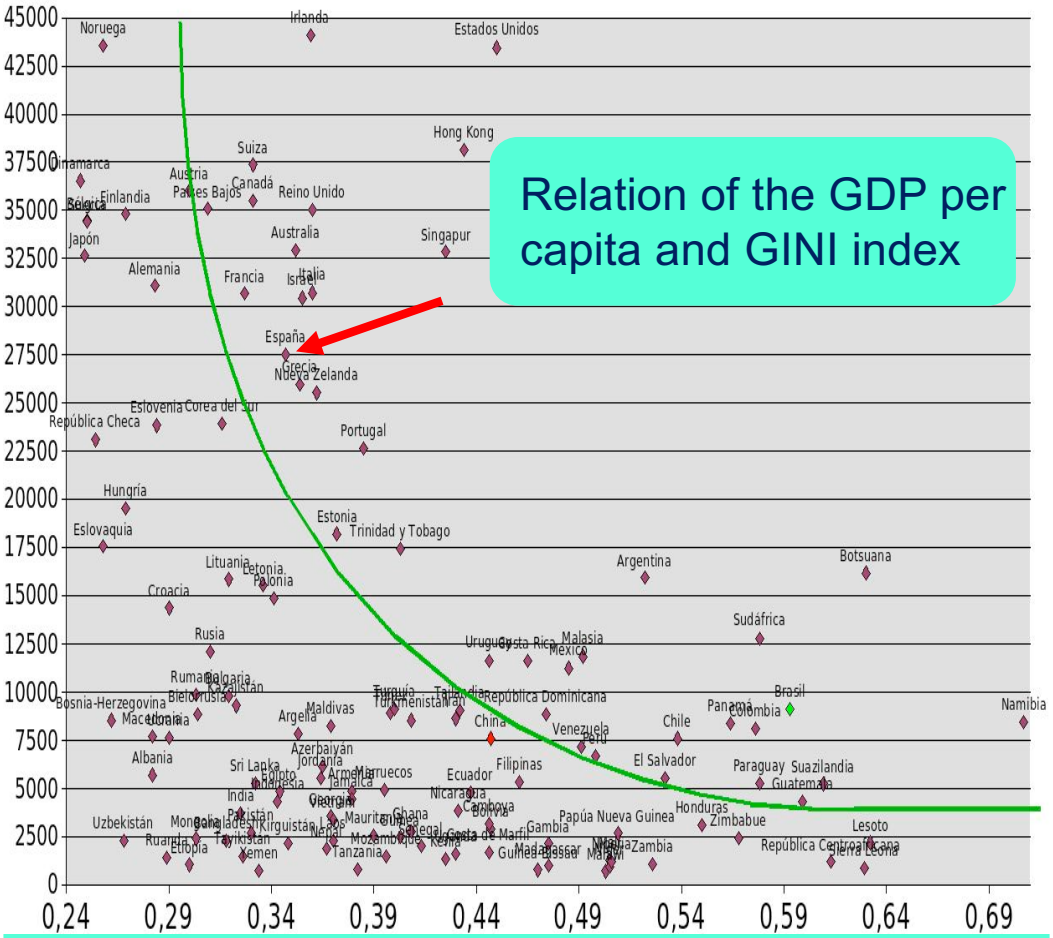
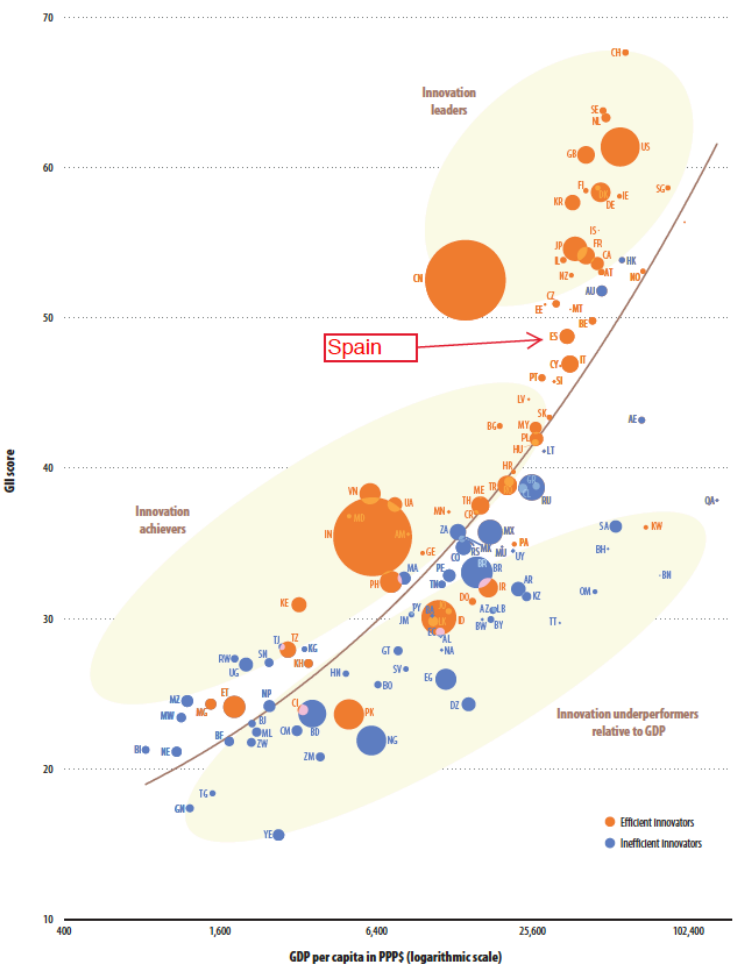
5 Key takeaways

Innovation has also demonstrated to be the most relevant driver for countries growth and competitiveness



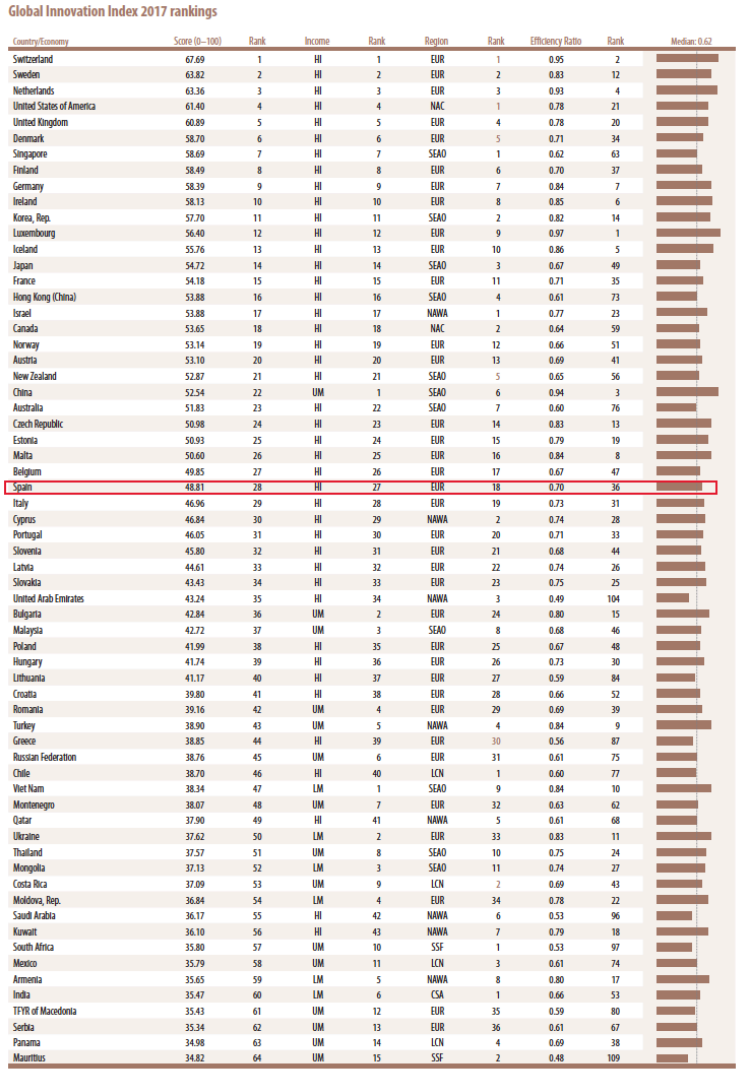
Relation between GDP per capita at purchasing-power parity and GII of the different countries

Figure 4: GII scores and GDP per capita in PPP$ (bubbles sized by population)



Note: 'Efficient innovators' are countries/economies with Innovation Efficiency ratios ≥ 0.62; 'Inefficient innovators' have ratios < 0.62; the trend line is a polynomial of degree three with intercept (R^2 = 0.6431).

How does Spain perform in GII?



Global Innovation Index 2017 rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank
Switzerland	67.69	1	HI	1	EUR	1	0.95	2
Sweden	63.82	2	HI	2	EUR	2	0.83	12
Netherlands	63.36	3	HI	3	EUR	3	0.93	4
United States of America	61.40	4	HI	4	NAC	1	0.78	21
United Kingdom	60.89	5	HI	5	EUR	4	0.78	20
Denmark	58.70	6	HI	6	EUR	5	0.71	34
Singapore	58.69	7	HI	7	SEAO	1	0.62	63
Finland	58.49	8	HI	8	EUR	6	0.70	37
Germany	58.39	9	HI	9	EUR	7	0.84	7
Ireland	58.13	10	HI	10	EUR	8	0.85	6
Korea, Rep.	57.70	11	HI	11	SEAO	2	0.82	14
Luxembourg	56.40	12	HI	12	EUR	9	0.97	1
Iceland	55.76	13	HI	13	EUR	10	0.86	5
Japan	54.72	14	HI	14	SEAO	3	0.67	49
France	54.18	15	HI	15	EUR	11	0.71	35
Hong Kong (China)	53.88	16	HI	16	SEAO	4	0.61	73
Israel	53.88	17	HI	17	NAWA	1	0.77	23
Canada	53.65	18	HI	18	NAC	2	0.64	59
Norway	53.14	19	HI	19	EUR	12	0.66	51
Austria	53.10	20	HI	20	EUR	13	0.69	41
New Zealand	52.87	21	HI	21	SEAO	5	0.65	56
China	52.54	22	UM	1	SEAO	6	0.94	3
Australia	51.83	23	HI	22	SEAO	7	0.60	76
Czech Republic	50.98	24	HI	23	EUR	14	0.83	13
Estonia	50.93	25	HI	24	EUR	15	0.79	19
Malta	50.60	26	HI	25	EUR	16	0.84	8
Belgium	49.85	27	HI	26	EUR	17	0.67	47
Spain	48.81	28	HI	27	EUR	18	0.70	36
Italy	46.96	29	HI	28	EUR	19	0.73	31
Cyprus	46.84	30	HI	29	NAWA	2	0.74	28
Portugal	46.05	31	HI	30	EUR	20	0.71	33
Slovenia	45.80	32	HI	31	EUR	21	0.68	44
Latvia	44.61	33	HI	32	EUR	22	0.74	26
Slovakia	43.43	34	HI	33	EUR	23	0.75	25
United Arab Emirates	43.24	35	HI	34	NAWA	3	0.49	104
Bulgaria	42.84	36	UM	2	EUR	24	0.80	15
Malaysia	42.72	37	UM	3	SEAO	8	0.68	46
Poland	41.99	38	HI	35	EUR	25	0.67	48
Hungary	41.74	39	HI	36	EUR	26	0.73	30
Lithuania	41.17	40	HI	37	EUR	27	0.59	84
Croatia	39.80	41	HI	38	EUR	28	0.66	52
Romania	39.16	42	UM	4	EUR	29	0.69	39
Turkey	38.90	43	UM	5	NAWA	4	0.84	9
Greece	38.85	44	HI	39	EUR	30	0.56	87
Russian Federation	38.76	45	UM	6	EUR	31	0.61	75
Chile	38.70	46	HI	40	LCN	1	0.60	77
Viet Nam	38.34	47	LM	1	SEAO	9	0.84	10
Montenegro	38.07	48	UM	7	EUR	32	0.63	62
Qatar	37.90	49	HI	41	NAWA	5	0.61	68
Ukraine	37.62	50	LM	2	EUR	33	0.83	11
Thailand	37.57	51	UM	8	SEAO	10	0.75	24
Mongolia	37.13	52	LM	3	SEAO	11	0.74	27
Costa Rica	37.09	53	UM	9	LCN	2	0.69	43
Moldova, Rep.	36.84	54	LM	4	EUR	34	0.78	22
Saudi Arabia	36.17	55	HI	42	NAWA	6	0.53	96
Kuwait	36.10	56	HI	43	NAWA	7	0.79	18
South Africa	35.80	57	UM	10	SSF	1	0.53	97
Mexico	35.79	58	UM	11	LCN	3	0.61	74
Armenia	35.65	59	LM	5	NAWA	8	0.80	17
India	35.47	60	LM	6	CSA	1	0.66	53
TFYR of Macedonia	35.43	61	UM	12	EUR	35	0.59	80
Serbia	35.34	62	UM	13	EUR	36	0.61	67
Panama	34.98	63	UM	14	LCN	4	0.69	38
Mauritius	34.82	64	UM	15	SSF	2	0.48	109

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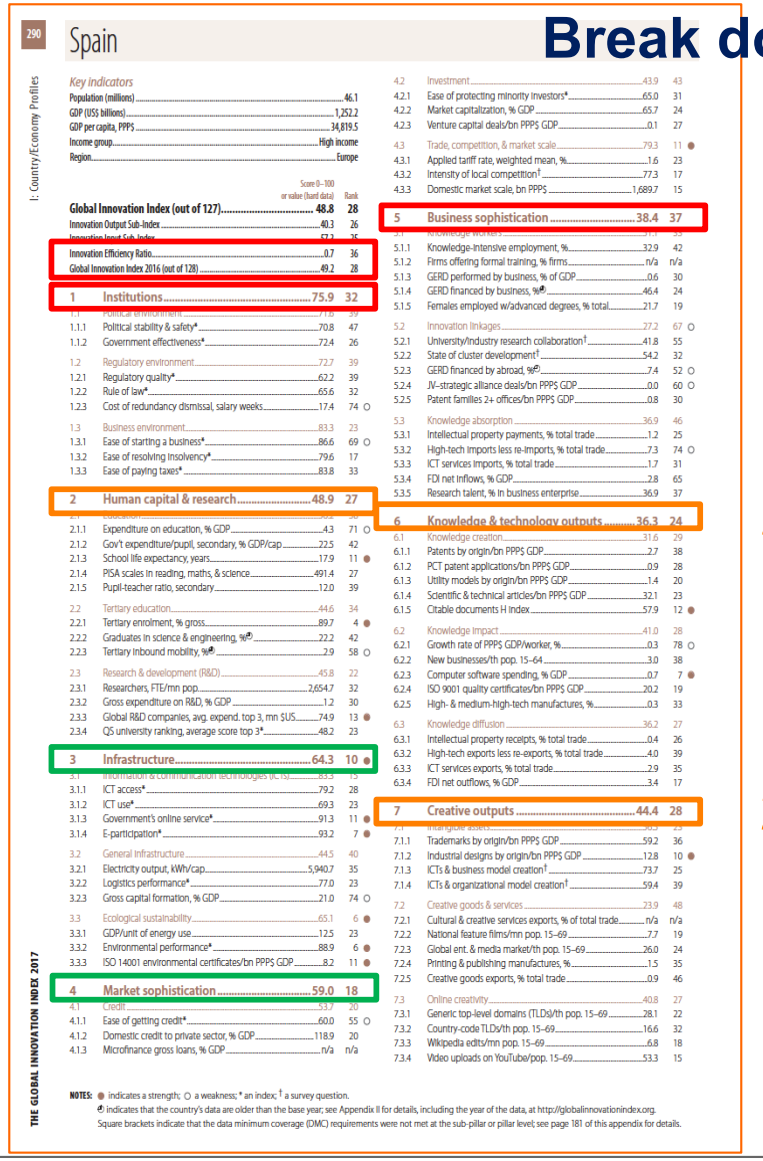
14th Global GDP, 32nd GDP per capita

Break down



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Spain

I: Country/Economy Profiles

Key indicators

Population (millions) 46.1
GDP (US$ billions) 1,252.2
GDP per capita, PPP$ 34,819.5
Income group ..... High income
Region ..... Europe

	Score (0–100 or value (hard data))	Rank
Global Innovation Index (out of 127)	**48.8**	**28**
Innovation Output Sub-Index	40.3	26
Innovation Input Sub-Index	57.2	35
Innovation Efficiency Ratio	0.7	36
Global Innovation Index 2016 (out of 128)	49.2	28
1 Institutions	**75.9**	**32**
1.1 Political environment	71.8	39
1.1.1 Political stability & safety*	70.8	47
1.1.2 Government effectiveness*	72.4	26
1.2 Regulatory environment	72.7	39
1.2.1 Regulatory quality*	62.2	39
1.2.2 Rule of law*	65.6	32
1.2.3 Cost of redundancy dismissal, salary weeks	17.4	74 ○
1.3 Business environment	83.3	23
1.3.1 Ease of starting a business*	86.6	69 ○
1.3.2 Ease of resolving insolvency*	79.6	17
1.3.3 Ease of paying taxes*	83.8	33
2 Human capital & research	**48.9**	**27**
2.1 Education	39.2	36
2.1.1 Expenditure on education, % GDP	4.3	71 ○
2.1.2 Gov't expenditure/pupil, secondary, % GDP/cap	22.5	42
2.1.3 School life expectancy, years	17.9	11 ●
2.1.4 PISA scales in reading, maths, & science	491.4	27
2.1.5 Pupil-teacher ratio, secondary	12.0	39
2.2 Tertiary education	44.6	34
2.2.1 Tertiary enrolment, % gross	89.7	4 ●
2.2.2 Graduates in science & engineering, %[Ⓓ]	22.2	42
2.2.3 Tertiary inbound mobility, %[Ⓓ]	2.9	58 ○
2.3 Research & development (R&D)	45.8	22
2.3.1 Researchers, FTE/mn pop.	2,654.7	32
2.3.2 Gross expenditure on R&D, % GDP	1.2	30
2.3.3 Global R&D companies, avg. expend. top 3, mn $US	74.9	13 ●
2.3.4 QS university ranking, average score top 3*	48.2	23
3 Infrastructure	**64.3**	**10** ●
3.1 Information & communication technologies (ICTs)	83.3	15
3.1.1 ICT access*	79.2	28
3.1.2 ICT use*	69.3	23
3.1.3 Government's online service*	91.3	11 ●
3.1.4 E-participation*	93.2	7 ●
3.2 General infrastructure	44.5	40
3.2.1 Electricity output, kWh/cap	5,940.7	35
3.2.2 Logistics performance*	77.0	23
3.2.3 Gross capital formation, % GDP	21.0	74 ○
3.3 Ecological sustainability	65.1	6 ●
3.3.1 GDP/unit of energy use	12.5	23
3.3.2 Environmental performance*	88.9	6 ●
3.3.3 ISO 14001 environmental certificates/bn PPP$ GDP	8.2	11 ●
4 Market sophistication	**59.0**	**18**
4.1 Credit	53.7	20
4.1.1 Ease of getting credit*	60.0	55 ○
4.1.2 Domestic credit to private sector, % GDP	118.9	20
4.1.3 Microfinance gross loans, % GDP	n/a	n/a
4.2 Investment	43.9	43
4.2.1 Ease of protecting minority investors*	65.0	31
4.2.2 Market capitalization, % GDP	65.7	24
4.2.3 Venture capital deals/bn PPP$ GDP	0.1	27
4.3 Trade, competition, & market scale	79.3	11 ●
4.3.1 Applied tariff rate, weighted mean, %	1.6	23
4.3.2 Intensity of local competition†	77.3	17
4.3.3 Domestic market scale, bn PPP$	1,689.7	15
5 Business sophistication	**38.4**	**37**
5.1 Knowledge workers	31.1	33
5.1.1 Knowledge-intensive employment, %	32.9	42
5.1.2 Firms offering formal training, % firms	n/a	n/a
5.1.3 GERD performed by business, % of GDP	0.6	30
5.1.4 GERD financed by business, %[Ⓓ]	46.4	24
5.1.5 Females employed w/advanced degrees, % total	21.7	19
5.2 Innovation linkages	27.2	67 ○
5.2.1 University/industry research collaboration†	41.8	55
5.2.2 State of cluster development†	54.2	32
5.2.3 GERD financed by abroad, %[Ⓓ]	7.4	52 ○
5.2.4 JV–strategic alliance deals/bn PPP$ GDP	0.0	60 ○
5.2.5 Patent families 2+ offices/bn PPP$ GDP	0.8	30
5.3 Knowledge absorption	36.9	46
5.3.1 Intellectual property payments, % total trade	1.2	25
5.3.2 High-tech imports less re-imports, % total trade	7.3	74 ○
5.3.3 ICT services imports, % total trade	1.7	31
5.3.4 FDI net inflows, % GDP	2.8	65
5.3.5 Research talent, % in business enterprise	36.9	37
6 Knowledge & technology outputs	**36.3**	**24**
6.1 Knowledge creation	31.6	29
6.1.1 Patents by origin/bn PPP$ GDP	2.7	38
6.1.2 PCT patent applications/bn PPP$ GDP	0.9	28
6.1.3 Utility models by origin/bn PPP$ GDP	1.4	20
6.1.4 Scientific & technical articles/bn PPP$ GDP	32.1	23
6.1.5 Citable documents H index	57.9	12 ●
6.2 Knowledge impact	41.0	28
6.2.1 Growth rate of PPP$ GDP/worker, %	0.3	78 ○
6.2.2 New businesses/th pop. 15–64	3.0	38
6.2.3 Computer software spending, % GDP	0.7	7 ●
6.2.4 ISO 9001 quality certificates/bn PPP$ GDP	20.2	19
6.2.5 High- & medium-high-tech manufactures, %	0.3	33
6.3 Knowledge diffusion	36.2	27
6.3.1 Intellectual property receipts, % total trade	0.4	26
6.3.2 High-tech exports less re-exports, % total trade	4.0	39
6.3.3 ICT services exports, % total trade	2.9	35
6.3.4 FDI net outflows, % GDP	3.4	17
7 Creative outputs	**44.4**	**28**
7.1 Intangible assets	30.2	31
7.1.1 Trademarks by origin/bn PPP$ GDP	59.2	36
7.1.2 Industrial designs by origin/bn PPP$ GDP	12.8	10 ●
7.1.3 ICTs & business model creation†	73.7	25
7.1.4 ICTs & organizational model creation†	59.4	39
7.2 Creative goods & services	23.9	48
7.2.1 Cultural & creative services exports, % of total trade	n/a	n/a
7.2.2 National feature films/mn pop. 15–69	7.7	19
7.2.3 Global ent. & media market/th pop. 15–69	26.0	24
7.2.4 Printing & publishing manufactures, %	1.5	35
7.2.5 Creative goods exports, % total trade	0.9	46
7.3 Online creativity	40.8	27
7.3.1 Generic top-level domains (TLDs)/th pop. 15–69	28.1	22
7.3.2 Country-code TLDs/th pop. 15–69	16.6	32
7.3.3 Wikipedia edits/mn pop. 15–69	6.8	18
7.3.4 Video uploads on YouTube/pop. 15–69	53.3	15

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
Ⓓ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data, at http://globalinnovationindex.org.
Square brackets indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level; see page 181 of this appendix for details.

THE GLOBAL INNOVATION INDEX 2017

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10

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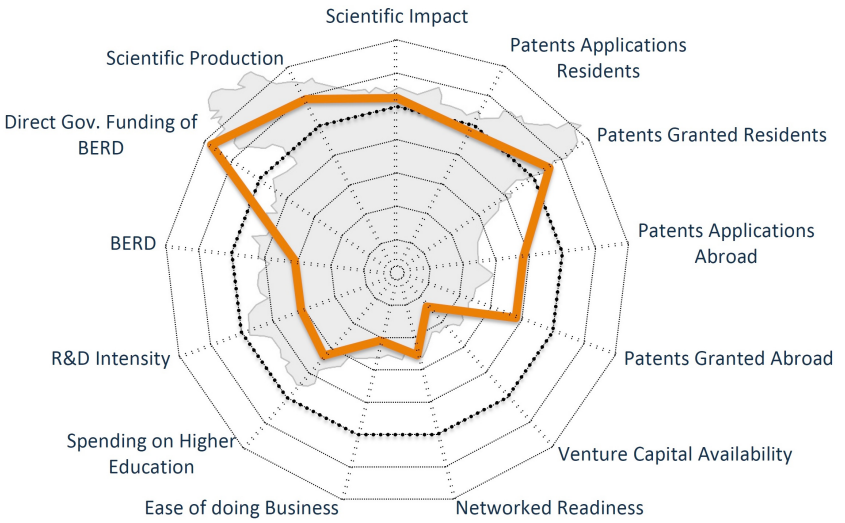
Some strengths of the Spanish Innovation System

Strengths:

- **RDI capacities** available in Universities, PROs, and R&D centers
- **Number of researchers and RDI personnel** with critical mass of scientists and technicians in some areas
- **Quality** and international **impact of the scientific production**, especially in certain areas
- Advanced **scientific** and technological **Infrastructures**
- Increasing **social appreciation of science** and researchers
- Scientific, technological and business **leadership in strategic areas** (biotechnology, energy, ICT, etc.)
- **Advanced communications infrastructures**
- **High percentage of population with tertiary education**
- High percentage of **BERD funded by government** (this indicator should be taken with care if we consider the actual budget executed)
- **Intensive use of ICT** in government and population, although not as much in companies
- **Good environmental indicators**

Innovation in Spain – Relative Competitive Position



● FIGURA 1.33

Primeros 20 países en producción, productividad y calidad.
De entre los 30 primeros en producción.

Fuente: Elaboración propia, Scimago (marzo 2017) e INE-ONU población mundial.

Producción.
Nº de documentos (2014).

POS.	DIF. 2004	PAÍS
1º		Estados Unidos
2º		China
3º		Reino Unido
4º		Alemania
5º		Japón
6º	+5	India
7º	-1	Francia
8º		Italia
9º	-2	Canadá
10º		Australia
11º	-2	**España**
12º	+1	Corea del Sur
13º	+2	Brasil
14º		Holanda
15º	-3	Rusia
16º	+18	Irán
17º	-1	Suiza
18º	-1	Taiwán
19º	+1	Turquía
20º	-1	Polonia

Productividad.
Documentos por mil hab. (2014).

POS.	DIF. 2004	PAÍS
1º		Suiza
2º	+1	Dinamarca
3º	-1	Suecia
4º		Noruega
5º	+1	Australia
6º	-1	Países Bajos
7º		Reino Unido
8º	+1	Bélgica
9º	-1	Canadá
10º		Austria
11º	+8	Portugal
12º	+5	Chequia
13º	-1	Alemania
14º	-2	Estados Unidos
15º		**España**
16º	-3	Francia
17º	-3	Taiwán
18º	-2	Italia
19º	+1	Corea del Sur
20º	+1	Polonia

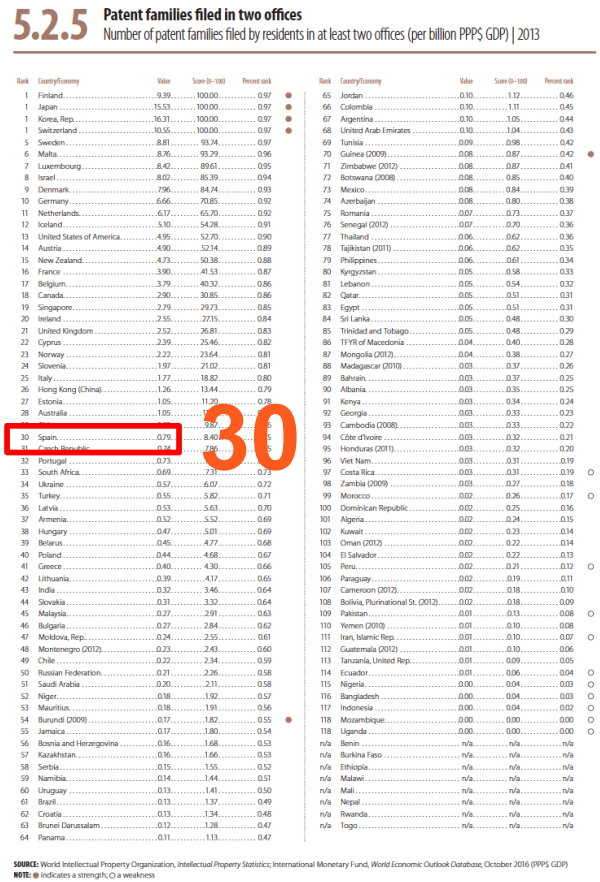
Calidad.
Nº de citas por documento (2013).

POS.	DIF. 2004	PAÍS
1º		Suiza
2º	+1	Países Bajos
3º	-1	Dinamarca
4º	+3	Bélgica
5º	-1	Suecia
6º	-1	Reino Unido
7º	+5	Austria
8º		Noruega
9º	+2	Australia
10º	-5	Estados Unidos
11º	-3	Canadá
12º	+3	Alemania
13º	+1	Italia
14º	+2	Francia
15º	+4	**España**
16º	+5	Portugal
17º	+9	Corea del Sur
18º	+13	Chequia
19º	+5	Japón
20º	+7	Taiwán

However, Spain is not a world champion in innovation. **Symptoms** of this disease

Symptoms:

- Low productivity
- Low salaries
- High unemployment
- Low level of education demonstrated by most indicators
- Poor performance of Spanish universities in international rankings



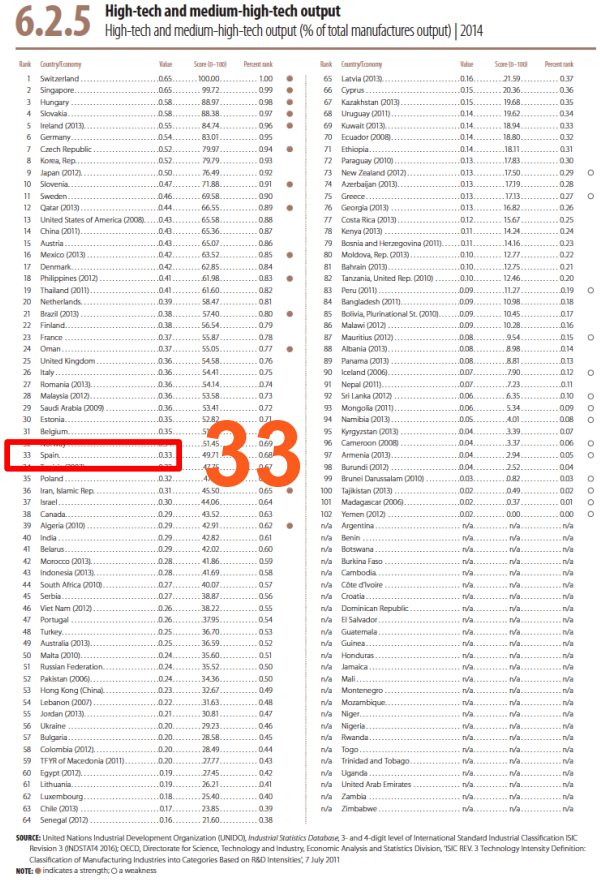
5.2.5 Patent families filed in two offices

Number of patent families filed by residents in at least two offices (per billion PPP$ GDP) | 2013

30

SOURCE: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2016 (PPP$ GDP)

NOTE: ● indicates a strength; ○ a weakness



6.2.5 High-tech and medium-high-tech output

High-tech and medium-high-tech output (% of total manufactures output) | 2014

33

SOURCE: United Nations Industrial Development Organization (UNIDO), *Industrial Statistics Database*, 3- and 4-digit level of International Standard Industrial Classification ISIC Revision 3 (INDSTAT4 2016); OECD, Directorate for Science, Technology and Industry, Economic Analysis and Statistics Division, 'ISIC REV. 3 Technology Intensity Definition: Classification of Manufacturing Industries into Categories Based on R&D Intensities,' 7 July 2011

NOTE: ● indicates a strength; ○ a weakness

- Poor performance in technological output (patents, high-tech goods and exports, ICT services export, …)

1 What is innovation? R&D and innovation. Importance of innovation

2 Symptoms: state of the Spanish Innovation System

3 Diagnosis: problems of the Spanish Innovation System

4 Therapy: some proposals

5 Key takeaways

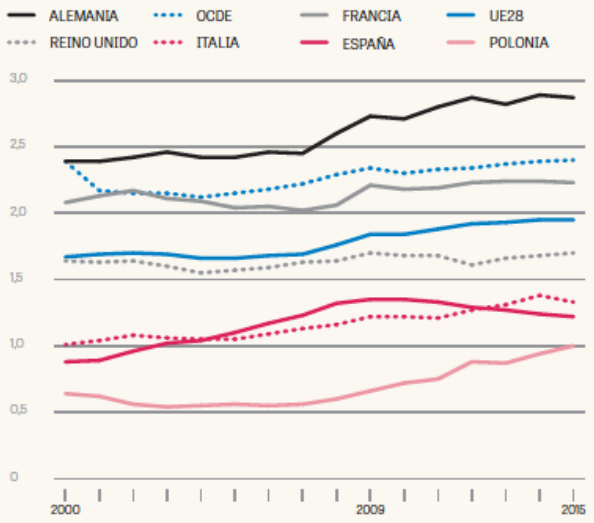
Diagnosis. Main weaknesses of the **governance and socio-economic environment**

- Poor education at all levels and without match with companies' needs
- Low social recognition of research, despite the good opinion on Science and scientists
- Absence of a long-term RDI strategy and low priority of the RDI policy in the administration

FIGURA 1.9 A

Esfuerzo total en I+D en España y países seleccionados, y diferencia con promedio UE28 y OCDE, 2000 - 2015. Como porcentaje del PIB.

Fuente: "Main Science and Technology Indicators, Vol.2016/2" (OCDE 2017) y elaboración propia.



2.3.2 Gross expenditure on R&D (GERD)

GERD: Gross expenditure on R&D (% of GDP) | 2

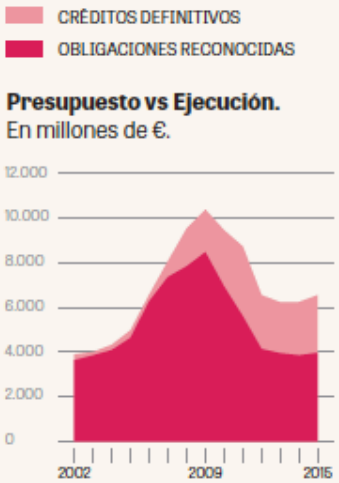
Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Israel	4.30	100.00	1.00	●
2	Korea, Rep.	4.23	98.40	0.99	●
3	Japan	3.49	81.17	0.98	●
4	Sweden	3.28	76.24	0.97	●
5	Austria	3.10	71.91	0.96	●
6	Denmark	3.02	70.12	0.95	
7	Switzerland (2012)	2.97	68.87	0.94	
8	Finland	2.93	68.01	0.94	
9	Germany	2.88	66.89	0.93	
10	United States of America	2.80	65.04	0.92	
11	Belgium	2.46	57.06	0.91	●
12	France	2.23	51.63	0.90	
13	Iceland	2.22	51.34	0.89	
14	Slovenia	2.21	51.30	0.88	
15	Singapore (2014)	2.20	50.91	0.87	
16	Australia (2013)	2.20	50.89	0.86	
17	China	2.09	48.51	0.85	
18	Netherlands	2.01	46.52	0.84	
19	Czech Republic	1.98	45.91	0.83	
20	Norway	1.93	44.59	0.83	
21	United Kingdom	1.71	39.50	0.82	
22	Canada (2014)	1.61	37.29	0.81	
23	Ireland (2014)	1.55	35.71	0.80	
24	Estonia	1.48	34.18	0.79	
25	Hungary	1.39	32.07	0.78	
26	Italy	1.34	30.87	0.77	
27	Luxembourg	1.29	29.70	0.76	
28	Portugal	1.28	29.43	0.75	
29	Malaysia (2014)	1.26	29.11	0.74	
30	Spain	1.22	28.08	0.73	
31	Slovakia	1.19	27.36	0.72	
32	Brazil (2014)	1.17	26.91	0.72	●
33	New Zealand (2013)	1.15	26.59	0.71	
34	Russian Federation	1.13	26.06	0.70	
35	Lithuania	1.04	23.93	0.69	
36	Poland	1.01	23.20	0.68	
37	Turkey (2014)	1.01	23.14	0.67	
38	Bulgaria	0.98	22.54	0.66	
39	Greece	0.96	21.97	0.65	
40	Serbia	0.88	20.20	0.64	
41	United Arab Emirates	0.87	19.85	0.63	
42	Croatia	0.85	19.57	0.62	
43	India (2011)	0.83	19.05	0.61	
44	Saudi Arabia (2013)	0.82	18.73	0.61	
45	Kenya (2010)	0.79	17.99	0.60	
46	Malta (2014)	0.76	17.44	0.59	
47	Hong Kong (China) (2014)	0.74	16.93	0.58	
48	South Africa (2013)	0.73	16.59	0.57	
49	Egypt	0.72	16.51	0.56	
50	Morocco (2010)	0.71	16.32	0.55	
51	Tunisia (2014)	0.65	14.92	0.54	
52	Thailand	0.63	14.24	0.53	
53	Latvia	0.62	14.23	0.52	
54	Ukraine	0.62	14.06	0.51	
55	Argentina (2014)	0.61	13.95	0.50	
56	Ethiopia (2013)	0.60	13.76	0.50	
57	Costa Rica (2014)	0.58	13.28	0.49	
58	Mali (2010)	0.58	13.27	0.48	
59	Mexico	0.55	12.51	0.47	
60	Botswana (2013)	0.54	12.27	0.46	
61	Senegal (2010)	0.54	12.27	0.45	
62	Tanzania, United Rep. (2013)	0.53	12.00	0.44	
63	Belarus	0.52	11.71	0.43	
64	Romania	0.49	11.03	0.42	

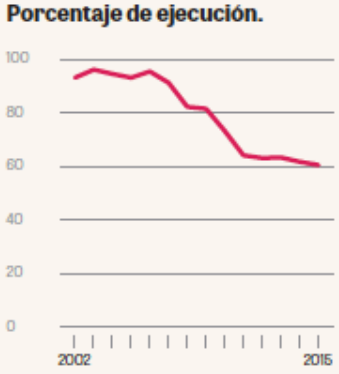
SOURCE: UNESCO Institute for Statistics, *UIS online database*
NOTE: ● indicates a strength; ○ a weakness

FIGURA 2.4

Política 46 (Investigación, Desarrollo e Innovación). 2002–2015.

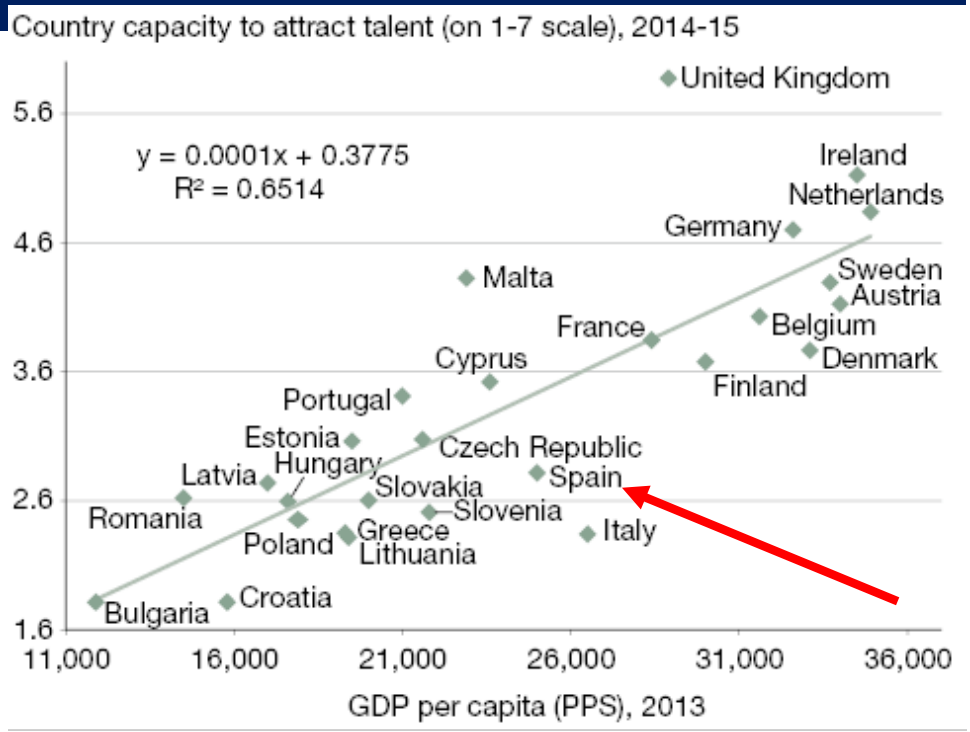
Fuente: Elaboración propia a partir de los Informes de Liquidación de los Presupuestos de 2002 a 2014 de la Intervención General de la Administración del Estado (IGAE). La IGAE ha facilitado a Cotec los datos correspondientes a 2015, a pesar de no haberse publicado todavía el Informe de Liquidación de ese año.





Diagnosis. Main weaknesses of the **governance and socio-economic environment**

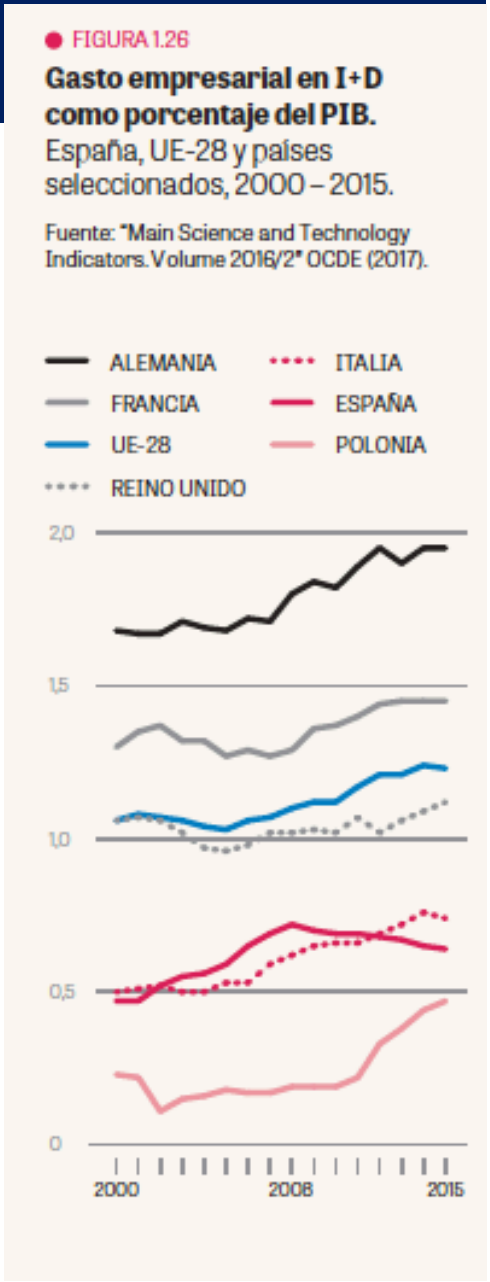
- Bad coordination with Europe and between autonomous regions (repetitions, poor complementarity, no differentiation policies and significant regional disparities, …)
- Very rigid management (e.g. justification not based on results but on fulfilment of the initial budget, difficulties in changing objectives and budget application, contracts, purchase, ..)



- Difficulties for creating new companies (burocracy, financing, tax policy,…)
- Difficulties in the promotion of emergent technologies (regulation, tax policy, public spending not used as attractor of innovation, …) (e.g. new ways of energy production, microfluidics, …)
- Poor policy for talent attraction and retention (recognition, incentives, continuity, …)

Diagnosis. Main weaknesses of Spanish **companies** regarding Innovation

- R&D is not considered an essential component of innovation by most Spanish companies. As consequence the BERD and R&D employment are much lower than the European average.
- Absence or poor innovation and IP protection strategies
- Poor management of R&D projects (organization, professionals)
- Few sufficiently flexible finance instruments for technology-based companies despite the many funding players (SME-instruments, NEOTEC)

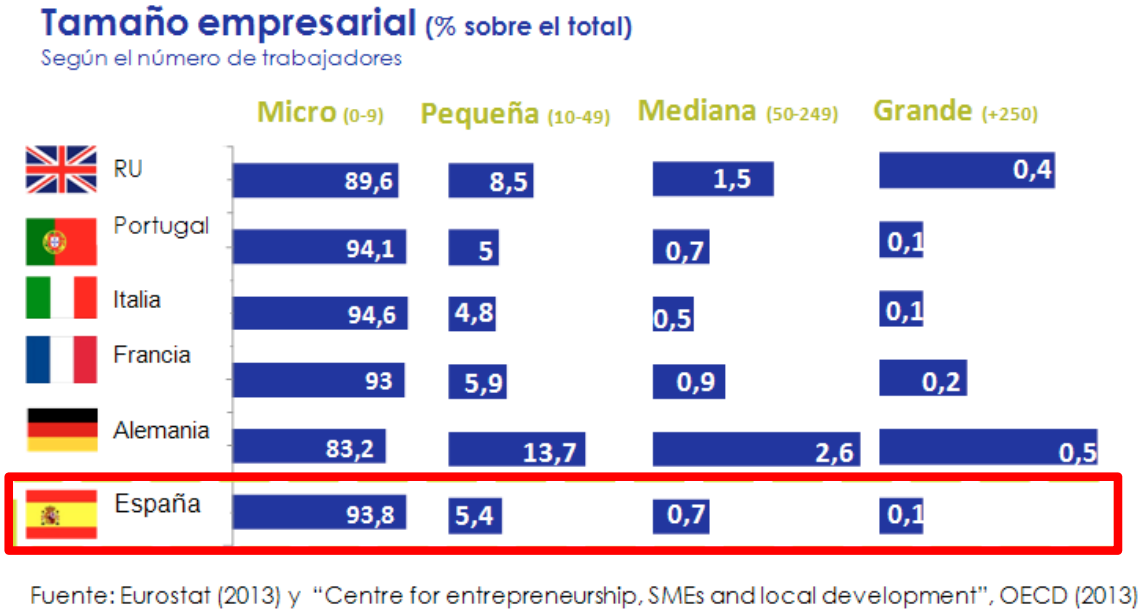


Fondos de la Unión Europea

CDTI

Diagnosis. Main weaknesses of Spanish **companies** regarding Innovation

- Small average size
- Low number of businesses involved in RDI systematically.
- Low level of companies digitalization (Ind4.0) and of internationalization, particularly SMEs.
- Low workers profile (#researchers, #graduates in SEM, #workers in knowledge intensive services, ..)
- Inefficient knowledge management and low technology-absorption capacity of SMEs



Fuente: Eurostat (2013) y "Centre for entrepreneurship, SMEs and local development", OECD (2013)

The level of effort in R&D of Spanish companies is half of the European average. In 2015, Spanish companies executed 52.5% of total R&D expenditure, one of the lowest percentages in Europe (63.3%average in 2015)

Diagnosis. Main weaknesses of Spanish **universities**

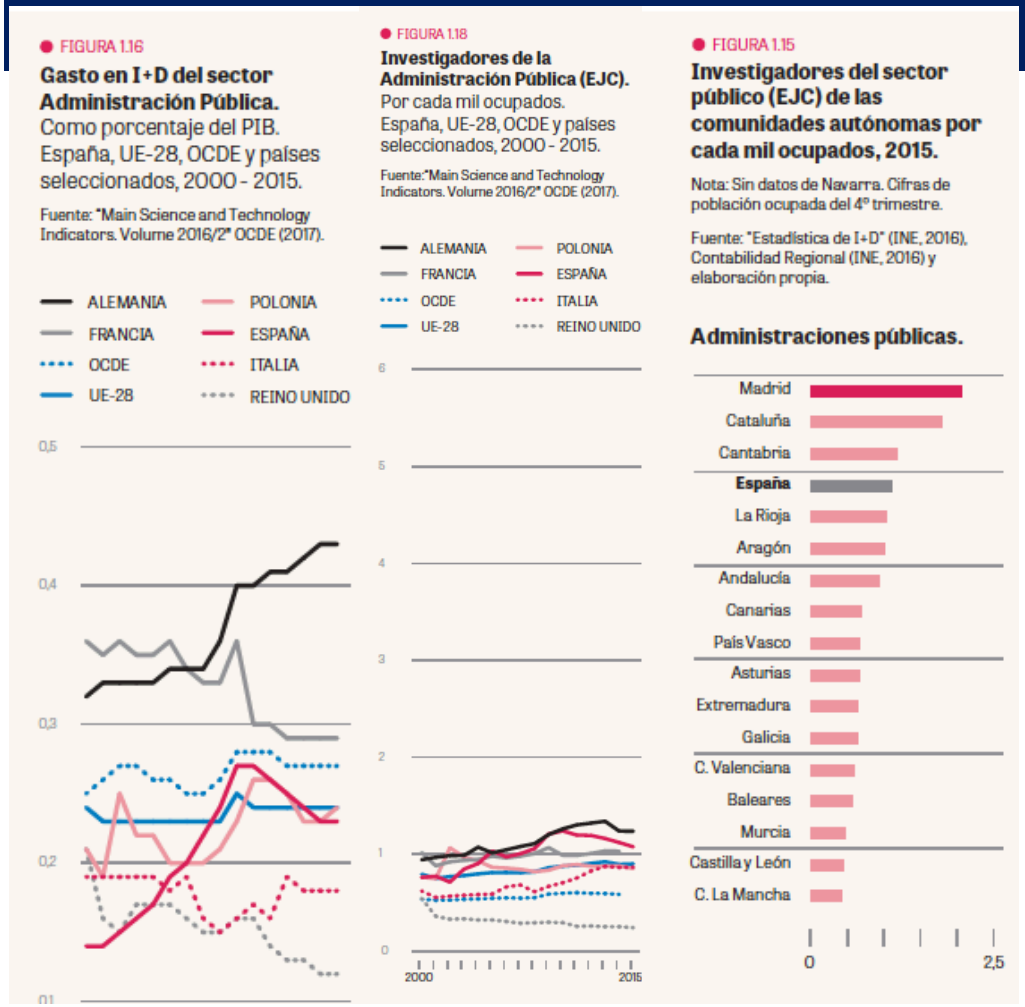


FIGURA 1.16

Gasto en I+D del sector Administración Pública.
Como porcentaje del PIB.
España, UE-28, OCDE y países seleccionados, 2000 - 2015.

Fuente: "Main Science and Technology Indicators. Volume 2016/2" OCDE (2017).

ALEMANIA
FRANCIA
OCDE
UE-28
POLONIA
ESPAÑA
ITALIA
REINO UNIDO

0,5
0,4
0,3
0,2
0,1

FIGURA 1.18

Investigadores de la Administración Pública (EJC).
Por cada mil ocupados.
España, UE-28, OCDE y países seleccionados, 2000 - 2015.

Fuente: "Main Science and Technology Indicators. Volume 2016/2" OCDE (2017).

ALEMANIA
FRANCIA
OCDE
UE-28
POLONIA
ESPAÑA
ITALIA
REINO UNIDO

6
5
4
3
2
1
0
2000
2015

FIGURA 1.15

Investigadores del sector público (EJC) de las comunidades autónomas por cada mil ocupados, 2015.

Nota: Sin datos de Navarra. Cifras de población ocupada del 4º trimestre.

Fuente: "Estadística de I+D" (INE, 2016), Contabilidad Regional (INE, 2016) y elaboración propia.

Administraciones públicas.

Madrid
Cataluña
Cantabria
España
La Rioja
Aragón
Andalucía
Canarias
País Vasco
Asturias
Extremadura
Galicia
C. Valenciana
Baleares
Murcia
Castilla y León
C. La Mancha
0
2,5

- Low level of investment in public R&D
- Rigidity of the models of governance
- Structures and policies mainly oriented to research output and not to technology production and transfer
- Inappropriate policy of recognition and incentives for TT
- No internal innovation strategy
- No differentiation or specialization strategy
- Absence or inappropriate policy of talent attraction and retention, both for students and staff

EXCELENCIA SEVERO OCHOA

AGENCIA ESTATAL DE INVESTIGACIÓN

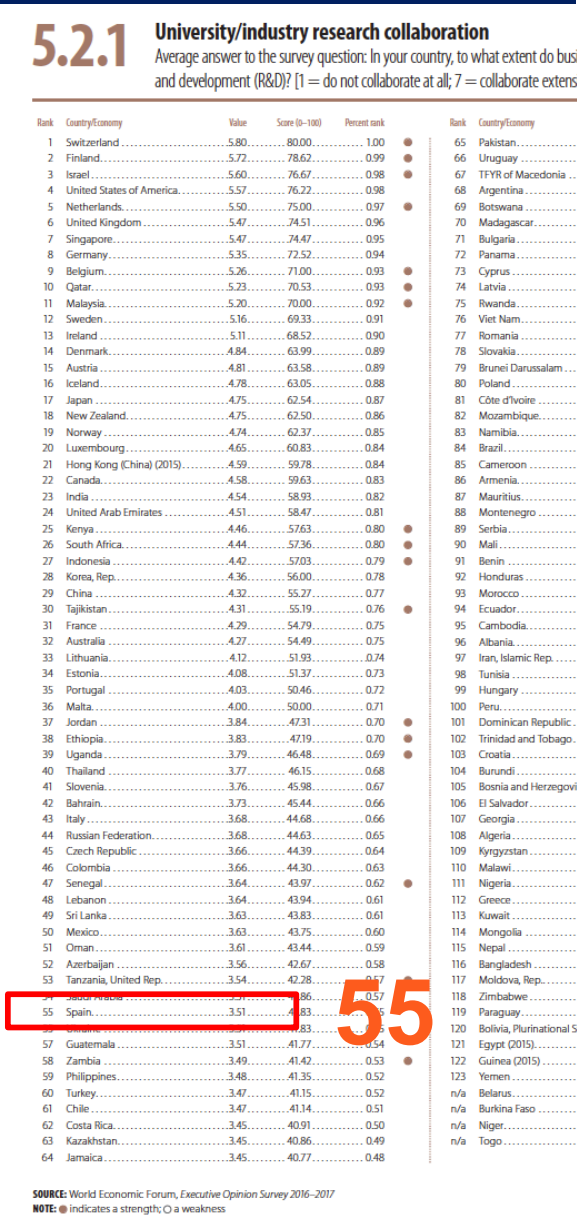
ESHORIZONTE2020
Portal español del Programa Marco de Investigación e Innovación de la Unión Europea

Plan Estatal de Investigación Científica y Técnica y de Innovación 2017-2020

ESTRATEGIA ESPAÑOLA DE CIENCIA Y TECNOLOGÍA Y DE INNOVACIÓN 2013-2020

Diagnosis. Main weaknesses of the Spanish **TT system**

- Absence or inappropriate policy for IP protection, spin-off creation and services and know-how commercialization
- Weak strategy of TT in most universities with very low involvement of companies
- Few people really involved in TT (IP, commercialization, search of opportunities, …)
- Based on short term projects and consulting and not in strategic collaborations and/or long-term big projects (new models of knowledge generation – M2 models)
- Absence of co-investment policies with higher risk but with much higher and recurrent pay-back
- Very few real ecosystems with companies, universities technological centers and other institutions
- Barriers to mobility of RDI personnel between public and business sectors



5.2.1 University/industry research collaboration

Average answer to the survey question: In your country, to what extent do busi and development (R&D)? [1 = do not collaborate at all; 7 = collaborate extens

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy
1	Switzerland	5.80	80.00	1.00	●	65	Pakistan
2	Finland	5.72	78.62	0.99	●	66	Uruguay
3	Israel	5.60	76.67	0.98	●	67	TFYR of Macedonia
4	United States of America	5.57	76.22	0.98		68	Argentina
5	Netherlands	5.50	75.00	0.97	●	69	Botswana
6	United Kingdom	5.47	74.51	0.96		70	Madagascar
7	Singapore	5.47	74.47	0.95		71	Bulgaria
8	Germany	5.35	72.52	0.94		72	Panama
9	Belgium	5.26	71.00	0.93	●	73	Cyprus
10	Qatar	5.23	70.53	0.93	●	74	Latvia
11	Malaysia	5.20	70.00	0.92	●	75	Rwanda
12	Sweden	5.16	69.33	0.91		76	Viet Nam
13	Ireland	5.11	68.52	0.90		77	Romania
14	Denmark	4.84	63.99	0.89		78	Slovakia
15	Austria	4.81	63.58	0.89		79	Brunei Darussalam
16	Iceland	4.78	63.05	0.88		80	Poland
17	Japan	4.75	62.54	0.87		81	Côte d'Ivoire
18	New Zealand	4.75	62.50	0.86		82	Mozambique
19	Norway	4.74	62.37	0.85		83	Namibia
20	Luxembourg	4.65	60.83	0.84		84	Brazil
21	Hong Kong (China) (2015)	4.59	59.78	0.84		85	Cameroon
22	Canada	4.58	59.63	0.83		86	Armenia
23	India	4.54	58.93	0.82		87	Mauritius
24	United Arab Emirates	4.51	58.47	0.81		88	Montenegro
25	Kenya	4.46	57.63	0.80	●	89	Serbia
26	South Africa	4.44	57.36	0.80	●	90	Mali
27	Indonesia	4.42	57.03	0.79	●	91	Benin
28	Korea, Rep.	4.36	56.00	0.78		92	Honduras
29	China	4.32	55.27	0.77		93	Morocco
30	Tajikistan	4.31	55.19	0.76	●	94	Ecuador
31	France	4.29	54.79	0.75		95	Cambodia
32	Australia	4.27	54.49	0.75		96	Albania
33	Lithuania	4.12	51.93	0.74		97	Iran, Islamic Rep.
34	Estonia	4.08	51.37	0.73		98	Tunisia
35	Portugal	4.03	50.46	0.72		99	Hungary
36	Malta	4.00	50.00	0.71		100	Peru
37	Jordan	3.84	47.31	0.70	●	101	Dominican Republic
38	Ethiopia	3.83	47.19	0.70	●	102	Trinidad and Tobago
39	Uganda	3.79	46.48	0.69	●	103	Croatia
40	Thailand	3.77	46.15	0.68		104	Burundi
41	Slovenia	3.76	45.98	0.67		105	Bosnia and Herzegovi
42	Bahrain	3.73	45.44	0.66		106	El Salvador
43	Italy	3.68	44.68	0.66		107	Georgia
44	Russian Federation	3.68	44.63	0.65		108	Algeria
45	Czech Republic	3.66	44.39	0.64		109	Kyrgyzstan
46	Colombia	3.66	44.30	0.63		110	Malawi
47	Senegal	3.64	43.97	0.62	●	111	Nigeria
48	Lebanon	3.64	43.94	0.61		112	Greece
49	Sri Lanka	3.63	43.83	0.61		113	Kuwait
50	Mexico	3.63	43.75	0.60		114	Mongolia
51	Oman	3.61	43.44	0.59		115	Nepal
52	Azerbaijan	3.56	42.67	0.58		116	Bangladesh
53	Tanzania, United Rep.	3.54	42.28	0.57		117	Moldova, Rep.
54	Saudi Arabia	3.51	42.86	0.57		118	Zimbabwe
55	Spain	3.51	42.83	0.56		119	Paraguay
56	Jamaica	3.51	42.83	0.55		120	Bolivia, Plurinational S
57	Guatemala	3.51	41.77	0.54		121	Egypt (2015)
58	Zambia	3.49	41.42	0.53	●	122	Guinea (2015)
59	Philippines	3.48	41.35	0.52		123	Yemen
60	Turkey	3.47	41.15	0.52		n/a	Belarus
61	Chile	3.47	41.14	0.51		n/a	Burkina Faso
62	Costa Rica	3.45	40.91	0.50		n/a	Niger
63	Kazakhstan	3.45	40.86	0.49		n/a	Togo
64	Jamaica	3.45	40.77	0.48			

55

SOURCE: World Economic Forum, *Executive Opinion Survey 2016–2017*
NOTE: ● indicates a strength; ○ a weakness

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A paramount change is needed in the SIS to accomplish the challenges of this new world

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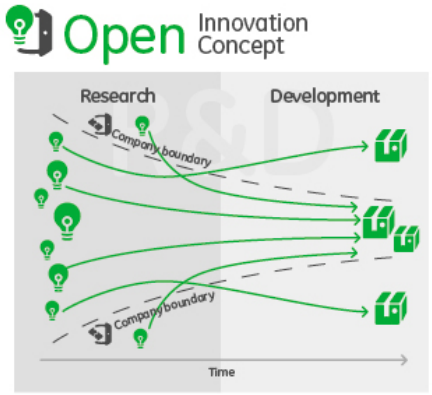
- A pedagogical effort is essential to gain social recognition of the value of education, R&D, innovation and risk
- This should be translated in an intense and stable policy of investment and incentives at all levels, prioritizing technology creation, transfer and assimilation.
  Budget fluctuation is worse than scarcity
- Major changes in education are required at all levels, including bigger resources, more innovative methods and mobility promotion
- Talent creation, attraction and retention at all levels of education should be a state priority
- Flexibility is also key, changing the paradigm of burocratic fulfilment by exigency on results
- Coordination and specialization of countries, regions, universities and companies is essential in this incredibly competitive world with such huge actors
- Administration should promote and not stop emergent technologies and start-ups (e.g. regulations, tax policy, venture capital, grants with shared risk, ..)

A paramount change is needed in the SIS to accomplish the challenges of this new world



- Size matters in companies (incentives for moving from SE to ME)
- Size matters in R&D agents (strategic networks and consortia including universities, centers of excellence, TT centers and companies is the appropriate ecosystem for innovation)

- An adequate innovation strategy is a must for any company independently of its size and possibilities. It is a more a question of culture than money. If you cannot make research or innovation directly, do it openly or wikily and, if possible, in a strategic manner within a consortium or cluster
- Use the talent in your organization for rapidly assimilate and integrate new technologies and innovations

Your company is worth the value of your list of clients and of your know-how, so protect them and take care of both

A paramount change is needed in the SIS to accomplish the challenges of this new world

- Talent attraction both for students and researchers from everywhere should be the main goal of any University
- An adequate innovation strategy for the institution itself is required
- Universities must promote permanent and strategic collaborations within bigger consortia in big long-term projects

- Professional structures are essential for a proper TT strategy (commercialize R&D results, define a well designed IP protection policy and a proper strategy for spin-off creation favoring long-term payback)
- Long-term investment, sharing risks along the aims of a well defined strategic plan is key in the new economy
- Continuous evaluation of the performance of the institution and its employees as well as their alignment with the global strategy is the only way to advance. Money only buys time if the objectives are clear and assumed by all stakeholders

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Key take-aways

The exponential growth of knowledge, technology, information and communication is changing our way of living such that we can foresee a disruption in our civilization

Permanent scientific and technological improvements and the resulting innovation seem unstoppable, being the only way for reducing inequalities worldwide while keeping human progress

As a counterpart, technology is both partly responsible and the only solution for the challenges that we and our planet face today that seem to worsen in the near future

This landscape demands to people, companies, institutions and countries permanent adaptation and new capacities for new demands. Only those with the determination to maintain the effort in R&D, innovation and adaptation will keep the track

Key take-aways

Rank	Country	Type	Final Score	Contributions Score	Detractions Score
1	Finland	Schumpeterian	15.6	14.1	13.9
2	Sweden	Schumpeterian	14.2	13.9	11.1
3	United Kingdom	Schumpeterian	13.7	13.7	10.4
4	Singapore	Advanced Asian Tiger	12.3	15.0	5.9
5	Netherlands	Schumpeterian	12.1	9.6	12.4
6	Denmark	Schumpeterian	11.6	13.5	6.2
7	Belgium	EU Continentalist	11.4	9.4	11.3
8	Ireland	EU Continentalist	10.9	8.7	11.2
9	Austria	EU Continentalist	10.5	9.2	9.7
10	United States	Adam Smithian	10.5	8.5	10.4
11	France	EU Continentalist	10.2	10.2	7.8
12	Germany	EU Continentalist	9.4	7.0	10.3
13	Norway	EU Continentalist	9.4	7.8	9.2
14	Japan	Advanced Asian Tiger	9.2	11.3	4.3
15	Taiwan	Advanced Asian Tiger	9.2	12.3	3.1
16	Slovenia	EU Up and Comer	9.0	9.2	6.5
17	Portugal	EU Continentalist	8.8	7.5	8.4
18	Estonia	EU Up and Comer	7.3	4.3	9.5
19	Iceland	EU Continentalist	7.1	9.0	3.0
20	Switzerland	EU Continentalist	6.8	8.8	2.5

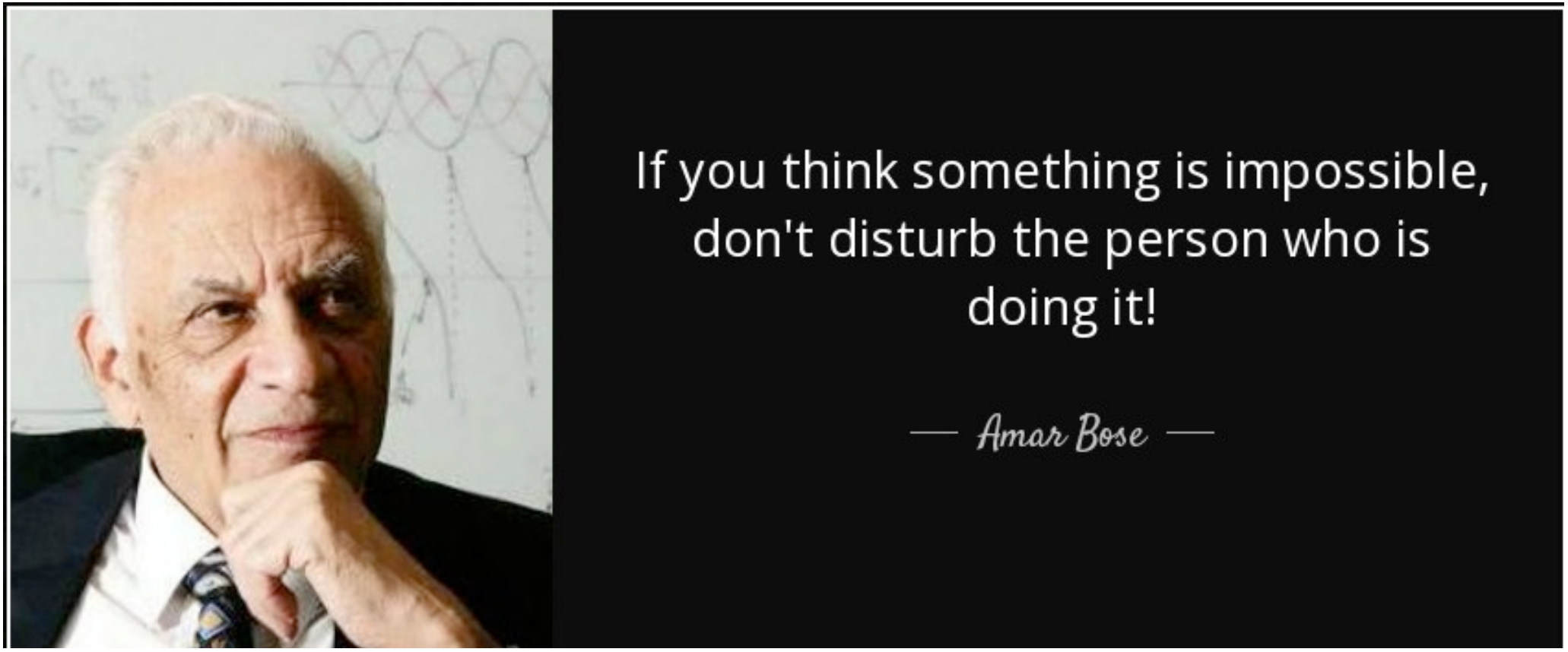
In average, Spain and all its agents (administration, universities and companies) perform poorly in innovation

A jump in education (scientific, cultural and civic) is the necessary (but not sufficient) condition for the changes required

People talent and commitment as well as efficient organizational structures and rules are the essential ingredients to face world competitiveness

Only a global agreement to change the model of education, talent and effort recognition as well as in the socio-economic priorities would allow our country to reduce the inequality and improve the quality of life in the long term

Finally, let´s be positive



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Thank you very much for your attention!!

May, 2018