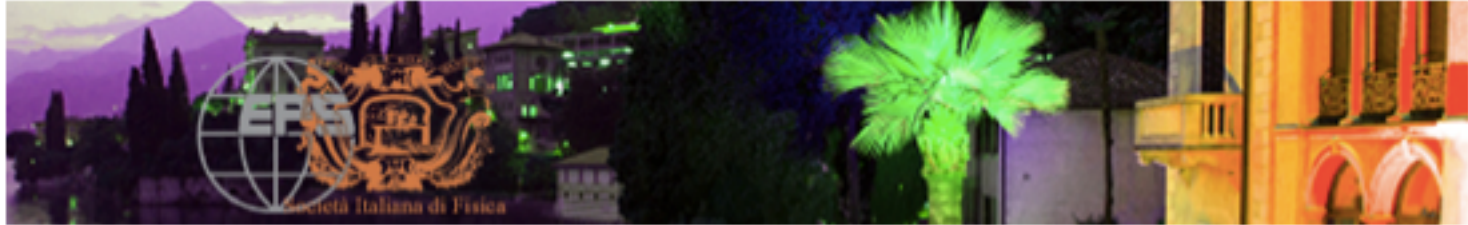


Joint EPS-SIF International School on Energy 2014



Course II - **Energy: basic concepts and forefront ideas**

17 - 23 July 2014 - VILLA MONASTERO - VARENNA, LAKE COMO

The importance
of physics to the
economies of
Europe

Varenna, 17 July 2014

LUISA CIFARELLI
University & INFN, Bologna
CERN, Geneva
Centro Fermi, Rome



- The European Physical Society encompasses:
 - **42 MEMBER SOCIETIES** (*DPG, IOP ... Cyprus*)
 - **40 ASSOCIATE MEMBER INSTITUTIONS** (*CERN, DESY, ESRF, JINR, GSI, ESA... CEA, MPI, FOM, INFN... IHA, IIT, IPTI... CAEN, EDISON*)
 - **MORE THAN 3500 INDIVIDUAL MEMBERS**
- The EPS represents as a whole a community of **OVER 10⁵ PHYSICISTS** (mostly from DPG & IOP)
- The EPS has bilateral agreements with:
 - **22 COLLABORATING SOCIETIES** (*APS, APPS ... EuCheMS*)
- The EPS provides an **INTERNATIONAL FORUM** for physicists and acts as a **FEDERATION** of physical societies
- The EPS works to **PROMOTE** the interests of **PHYSICISTS & PHYSICS** in Europe and the world over
- The EPS headquarters are in Mulhouse, F → further secretariat in Brussels, B



Statements & Studies

EPS regularly issues **STUDIES/SURVEYS** and relative **POSITION STATEMENTS/PAPERS** concerning not only the physicists' community but also the **whole society**, on topics such as:

EDUCATION — ENERGY — CLIMATE

ENVIRONMENT — GENDER — CAREERS

COMMUNICATION — TECHNOLOGY TRANSFER

RESEARCH — ECONOMY — ASSESSMENT ...

Statements & Studies

(inspired by IOP)

- Report commissioned by EPS in **2012** to an **independent** business & economics corporation (Cebr) on the importance of physics in the economies of **EU27 countries (plus Norway and Switzerland, non-EU EFTA)** over **2007-2010**
FOR THE FIRST TIME !
- Completed in December **2012** and printed beginning of **2013**
- Plan settled for its **timely distribution & presentation** in various relevant European councils and meetings:
 - **EPS Council, Strasbourg, France, 5 April 2013**
 - **CERN Council, Geneva, Switzerland, 21 June 2013**
 - **JINR Scientific Council, Dubna, Russia, 19 September 2013**
 - **SIF Round Table on Technology Transfer, Trieste, Italy, 24 September 2013**
 - **OECD Global Science Forum on Knowledge Economy, Istanbul, Turkey, 21 October 2013**
 - etc.



The importance of physics to the economies of Europe

TARGET AUDIENCE

- ✓ EU policy makers
- ✓ European Parliament
- ✓ European Institutions (EC, ERA ...)
- ✓ National/global policy makers
- ✓ EPS Member Societies → trigger studies at national level
- ✓ EPS Associate Members (scientific/academic institutions, but also enterprises, corporations & industries)

Full Report →

Executive
Summary ↓

The importance of physics
to the economies of Europe

Report by Cebr
Centre for Economics and Business Research
for the European Physical Society



Purpose of the Report

- Explain to policy makers that:
 - **physics** makes an important contribution to the economy and is not simply limited to academic research
 - **funding scientific research and education** is an investment for the future, not only for the **economy** but for many diverse areas of **technological development** (health , energy, communication and so on)
 - **steady progress and long lasting welfare**
- Provide to the physics community a **powerful tool** to show that **physics counts ...**

Physics evaluation procedure

- Perform a **quantitative** and as much as possible **objective & unbiased** statistical analysis of the contribution of physics to the business economy
- Use an **independent** consultancy firm, specialised in the treatment of business data (**Cebr** — Centre for Economics & Business Research, London, UK)
- Use **public domain data**
- Make an appropriate **definition of the contour** of the study taking into account **all physics sectors** (not only particle physics!)

Data sources

- Use **EU Eurostat's Structural Business Statistics (SBS)** based on data (supply-and-use & input-output tables) provided by **enterprises** and categorized under NACE classification
- Use, in particular, **Human Resources in Science and Technology (HRST)** employment statistics of Eurostat
- Use the **NACE classification scheme** (*Nomenclature Générale des Activités Economiques dans les Communautés Européennes*), the EU framework to classify the different economic activities
- Use **NACE Rev. 2** with 65 broad industry categories in the 'whole economy', out of which 49 are covered by the SBS database in the 'business economy'
- Use also other information from bodies such as World Trade Organisation, United Nations, US Census Bureau, Japan Customs ...






Physics-based industries & activities

- Physics-based industries are defined as industries where the **use of physics** – in terms of **technologies, expertise and innovation** – is **critical to their existence**
- The physics-based activities considered in this Report include to varying degrees the sectors of:
 - Electrical, civil, & mechanical engineering
 - Energy
 - Information technology & communications
 - Design & manufacturing
 - Transportation
 - Medicine & related life-science fields
 - Technologies used in space

NACE Rev. 2

Definition of physics-based activities

Subset of 77 codes out of a total of over 700

Code	Description	Code	Description
6.1	Extraction of crude petroleum	27.51	Manufacture of electric domestic appliances
6.2	Extraction of natural gas	27.9	Manufacture of other electrical equipment
9.1	Support activities for petroleum and natural gas extraction 	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
20.13	Manufacture of other inorganic basic chemicals	28.21	Manufacture of ovens, furnaces and furnace burners
21.2	Manufacture of pharmaceutical preparations	28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)
23.44	Manufacture of other technical ceramic products	28.25	Manufacture of non-domestic cooling and ventilation equipment
24.46	Processing of nuclear fuel 	28.29	Manufacture of other general-purpose machinery n.e.c.
25.21	Manufacture of central heating radiators and boilers	28.49	Manufacture of other machine tools
25.3	Manufacture of steam generators, except central heating hot water boilers	28.92	Manufacture of machinery for mining, quarrying and construction
25.4	Manufacture of weapons and ammunition	28.99	Manufacture of other special-purpose machinery n.e.c.
25.99	Manufacture of other fabricated metal products n.e.c.	29.1	Manufacture of motor vehicles 
26.11	Manufacture of electronic components 	29.31	Manufacture of electrical and electronic equipment for motor vehicles
26.12	Manufacture of loaded electronic boards	30.11	Building of ships and floating structures 






NACE Rev. 2

Definition of physics-based activities (cont.)

26.2	Manufacture of computers and peripheral equipment	30.2	Manufacture of railway locomotives and rolling stock
26.3	Manufacture of communication equipment	30.3	Manufacture of air and spacecraft and related machinery
26.4	Manufacture of consumer electronics ←	30.4	Manufacture of military fighting vehicles
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	30.91	Manufacture of motorcycles
26.6	Manufacture of irradiation, electromedical and electrotherapeutic equipment	32.5	Manufacture of medical and dental instruments and supplies ←
26.7	Manufacture of optical instruments and photographic equipment	32.99	Other manufacturing n.e.c.
26.8	Manufacture of magnetic and optical media	33.11	Repair of fabricated metal products
27.11	Manufacture of electric motors, generators and transformers	33.12	Repair of machinery
27.12	Manufacture of electricity distribution and control apparatus	33.13	Repair of electronic and optical equipment
27.2	Manufacture of batteries and accumulators	33.14	Repair of electrical equipment
27.31	Manufacture of fibre optic cables ←	33.15	Repair and maintenance of ships and boats
27.32	Manufacture of other electronic and electric wires and cables	33.16	Repair and maintenance of aircraft and spacecraft
27.33	Manufacture of wiring devices	33.17	Repair and maintenance of other transport equipment
27.4	Manufacture of electric lighting equipment ←	33.2	Installation of industrial machinery and equipment ←

NACE Rev. 2

Definition of physics-based activities (cont.)

35.11	Production of electricity	61.9	Other telecommunications activities
38.12	Collection of hazardous waste	62.09	Other information technology and computer service activities
38.22	Treatment and disposal of hazardous waste	71.11	Architectural activities
51.22	Space transport 	71.12	Engineering activities and related technical consultancy
52.21	Service activities incidental to land transportation	71.2	Technical testing and analysis 
52.22	Service activities incidental to water transportation	72.11	Research and experimental development on biotechnology 
52.23	Service activities incidental to air transportation	72.19	Other research and experimental development on natural sciences and engineering
60.1	Radio broadcasting	72.2	Research and experimental development on social sciences and humanities
60.2	Television programming and broadcasting activities	74.2	Photographic activities
61.1	Wired telecommunications activities	74.9	Other professional, scientific and technical activities n.e.c.
61.2	Wireless telecommunications activities 	95.12	Repair of communication equipment
61.3	Satellite telecommunications activities 		

Physics-based industries & activities

- Depending on the particular datasets analysed in different parts of this Report, the size and importance of physics-based industries to the wider European economy were estimated using **different comparators**:

‘business economy’ & ‘whole economy’

- ‘Whole economy’ represents a **larger** comparator than the ‘business economy’ which does **not include**, for example, agriculture, financial, public administration and other non-market services
- Physics-based activities which are **not included** within the NACE codes are largely non-market services & activities
 - For example education and health, sports and entertainment are omitted, as well as national and European/international physics research facilities, including **CERN**

Cebr Full Report



Making Business Sense



The importance of physics to the economies of Europe

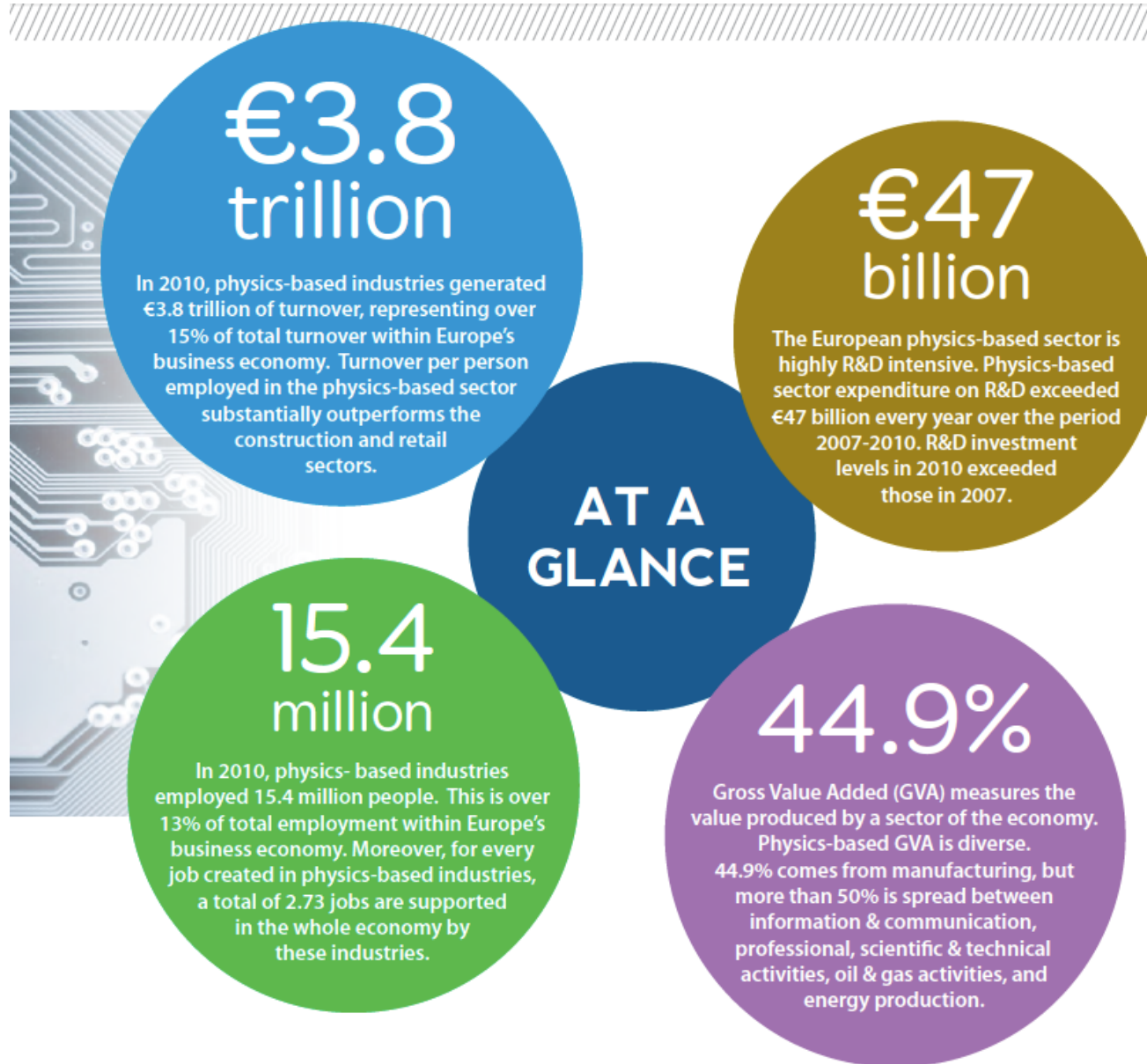
A study to determine the importance of physics to the EU27 and constituent national economies through the analysis of the economic impact and structure of physics-based industry and output

http://www.eps.org/?page=policy_economy
(59 pages)

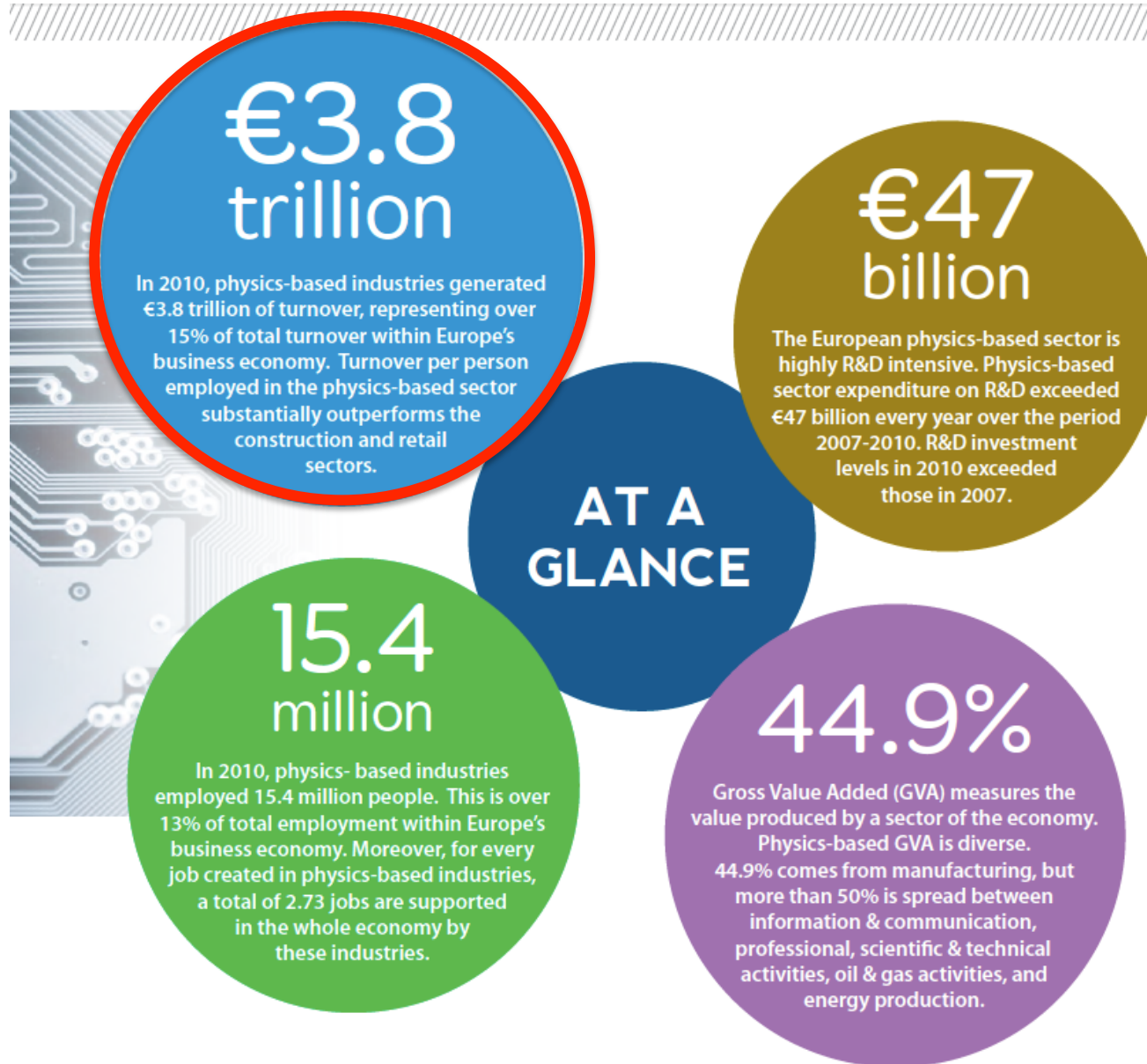
Report for the European Physical Society

December 2012 – Revised January 2013

Results in brief



Results in brief

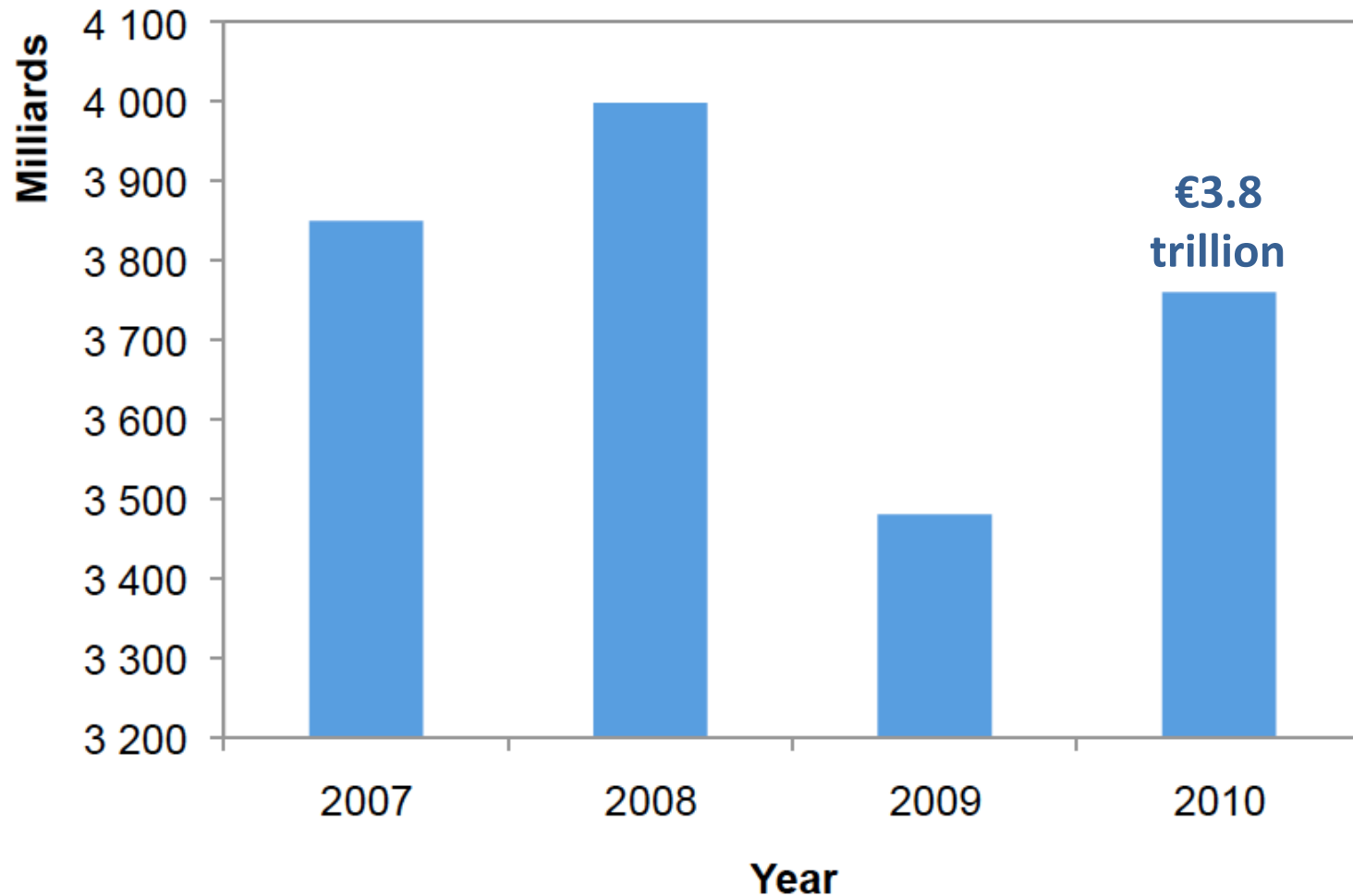


€3.8 trillion

In 2010, physics-based industries generated **€3.8 trillion of turnover (*i.e.* revenue)**, representing over **15%** of total turnover within Europe's business economy

Turnover per person employed in the physics-based sector substantially **outperforms** the construction and retail sectors

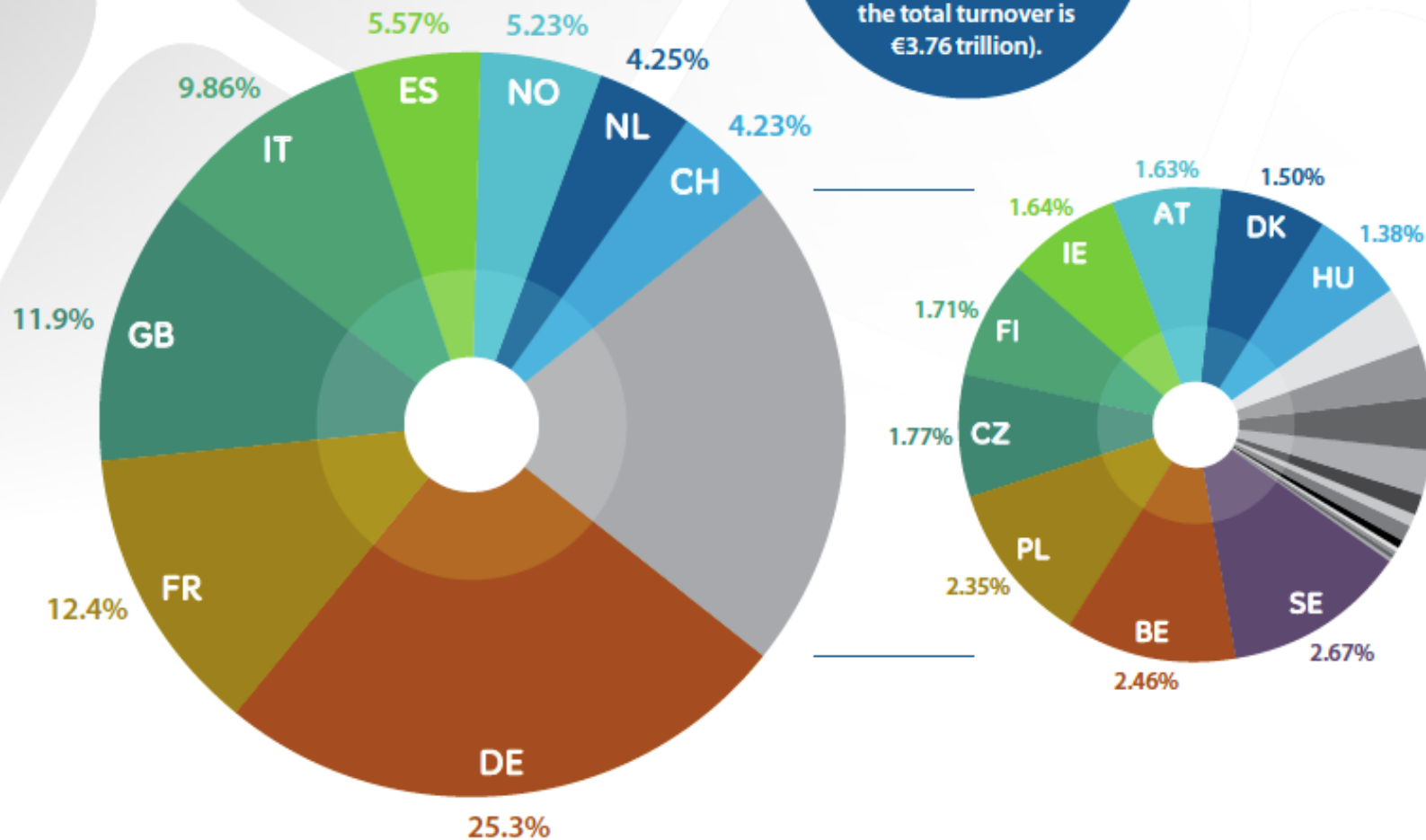
Turnover in physics-based industries (€ current prices)



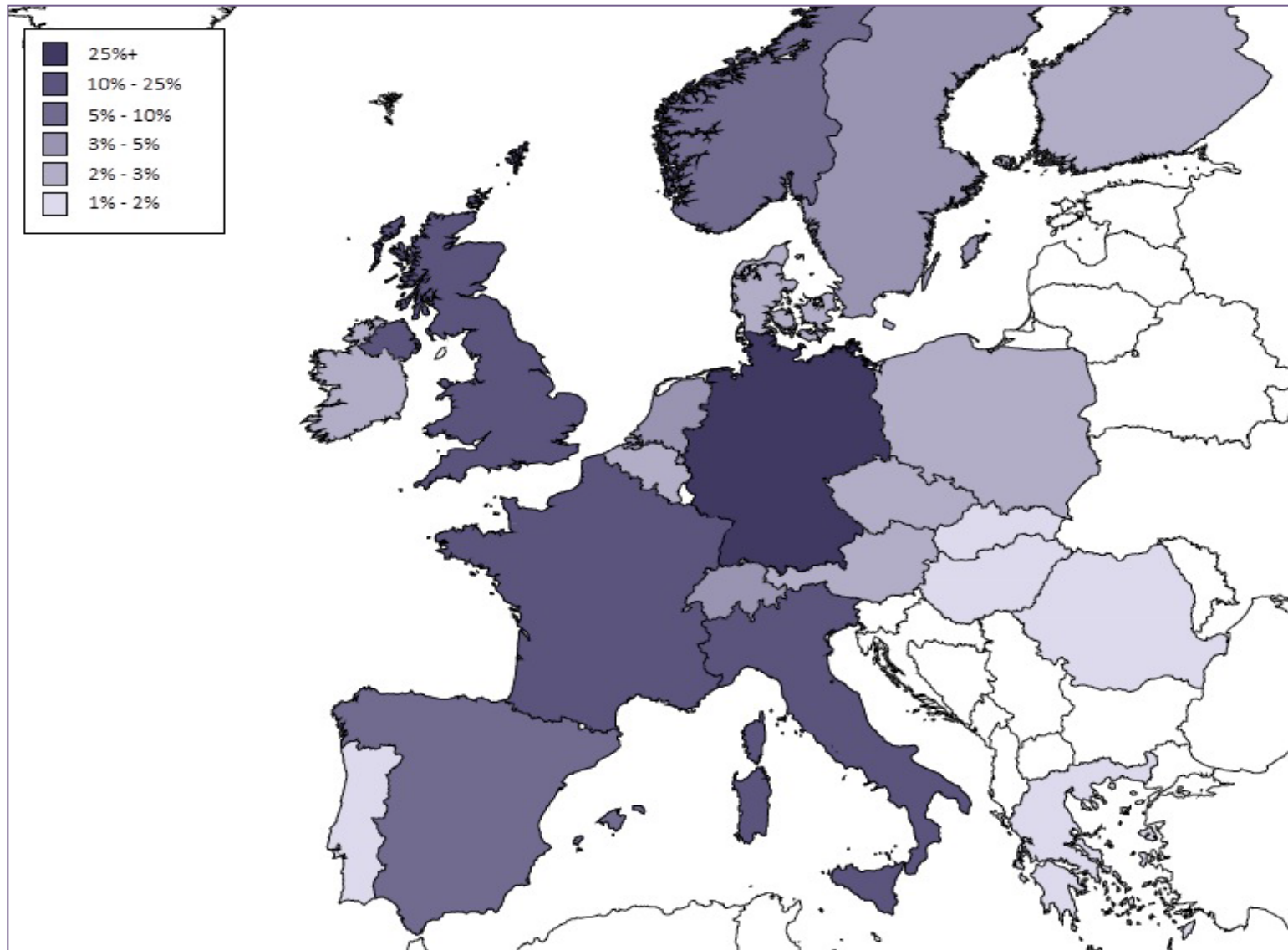
Contribution to total EU turnover

FIGURE 1

Contribution of the different countries in Europe to turnover from physics-based industries (using 2010 data where the total turnover is €3.76 trillion).



Country share of total physics-based turnover in the EU27, Norway & Switzerland (average 2007-2010)



	GVA in Physics-Based Industry, millions of euro, current prices			
	2007	2008	2009	2010
Austria	22,680	24,574	22,279	23,419
Belgium	27,305	27,092	26,858	30,562
Bulgaria	2,855	3,172	3,120	3,294
Cyprus	964	1,006	997	1,149
Czech Republic	17,715	19,038	15,775	16,739
Denmark	23,381	27,025	22,936	24,961
Estonia	1,154	1,188	1,114	1,165
Finland	20,659	20,192	14,943	15,892
France	145,843	142,879	133,994	141,380
Germany	294,398	291,348	263,129	301,062
Greece	10,835	11,683	10,719	12,429
Hungary	11,386	12,301	10,926	12,225
Ireland	20,273	23,382	20,888	21,735
Italy	115,593	116,576	105,289	119,840
Latvia	1,194	1,281	971	977
Lithuania	1,487	1,442	1,093	1,127
Luxembourg	2,316	2,336	1,979	1,991
Malta	503	509	471	524
Netherlands	46,877	49,749	50,385	52,569
Norway	82,975	101,931	74,218	81,782
Poland	25,659	30,847	25,716	28,705
Portugal	12,704	10,677	10,519	11,041
Romania	9,384	10,908	9,251	9,751
Slovakia	5,445	5,512	5,301	6,332
Slovenia	3,821	3,856	3,259	3,693
Spain	74,279	77,252	70,094	67,928
Sweden	36,395	33,745	29,050	37,163
Switzerland	59,884	60,024	53,536	58,849
United Kingdom	228,317	218,129	170,746	187,844
Total	1,306,284	1,329,655	1,159,556	1,276,125

Contribution to
total EU GVA
(Gross Value Added,
analogous of GDP
at global level)

GVA

GVA (Gross Value Added) is a measure of the value from production in the national accounts and can be thought of as:

(value of industrial output, i.e. turnover – intermediate consumption)

i.e.

(value of what is produced – value of intermediate goods and services used as inputs to produce it)

GVA is also commonly known as **income from production** and is distributed in three directions: i) to employees, ii) to investors and iii) to government

GVA is linked as a measurement to **GDP** – both being a measure of economic output:

(GVA + taxes on products – subsidies on products = GDP)



available at industrial level



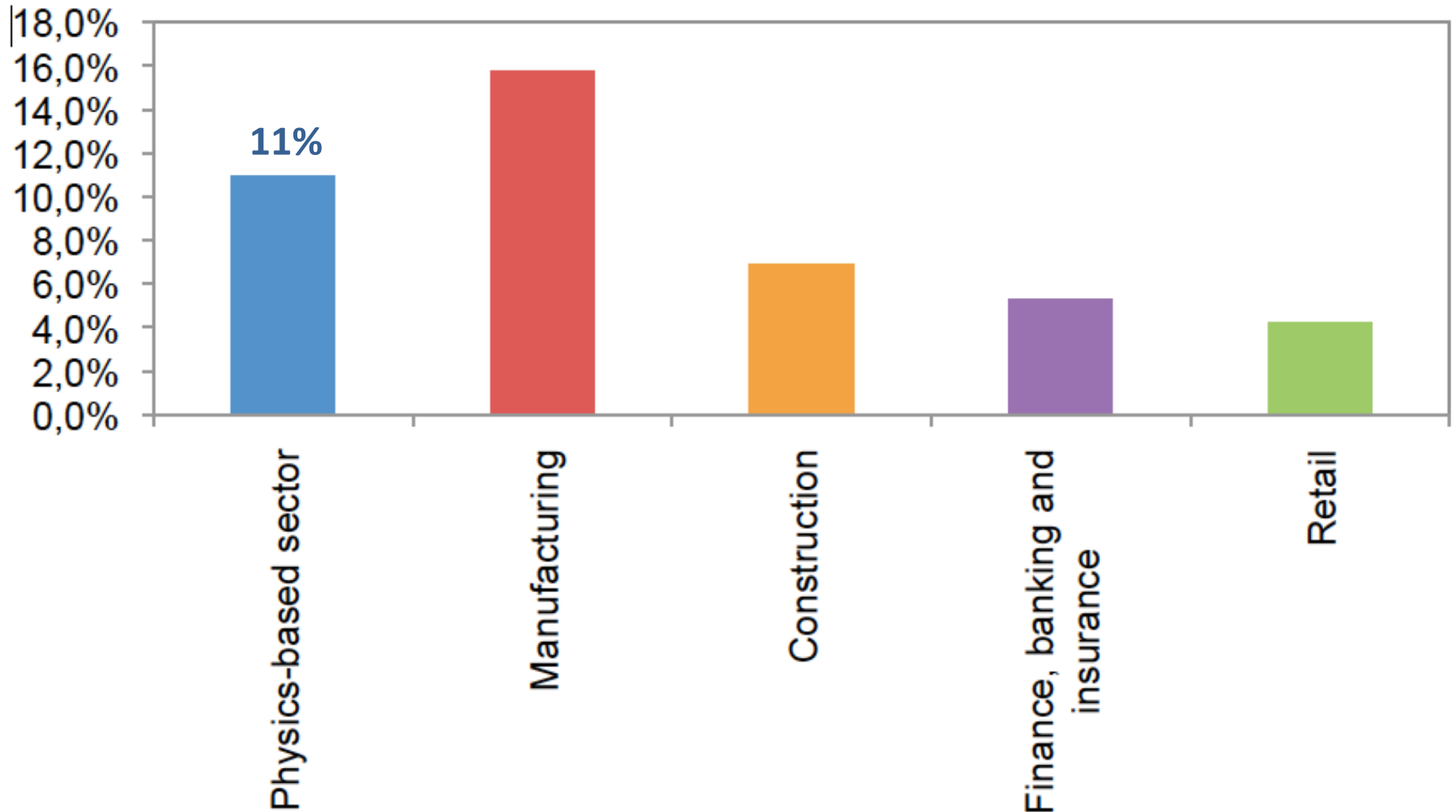
available at whole economy level

	GVA in Physics-Based Industry, millions of euro, current prices			
	2007	2008	2009	2010
Austria	22,680	24,574	22,279	23,419
Belgium	27,305	27,092	26,858	30,562
Bulgaria	2,855	3,172	3,120	3,294
Cyprus	964	1,006	997	1,149
Czech Republic	17,715	19,038	15,775	16,739
Denmark	23,381	27,025	22,936	24,961
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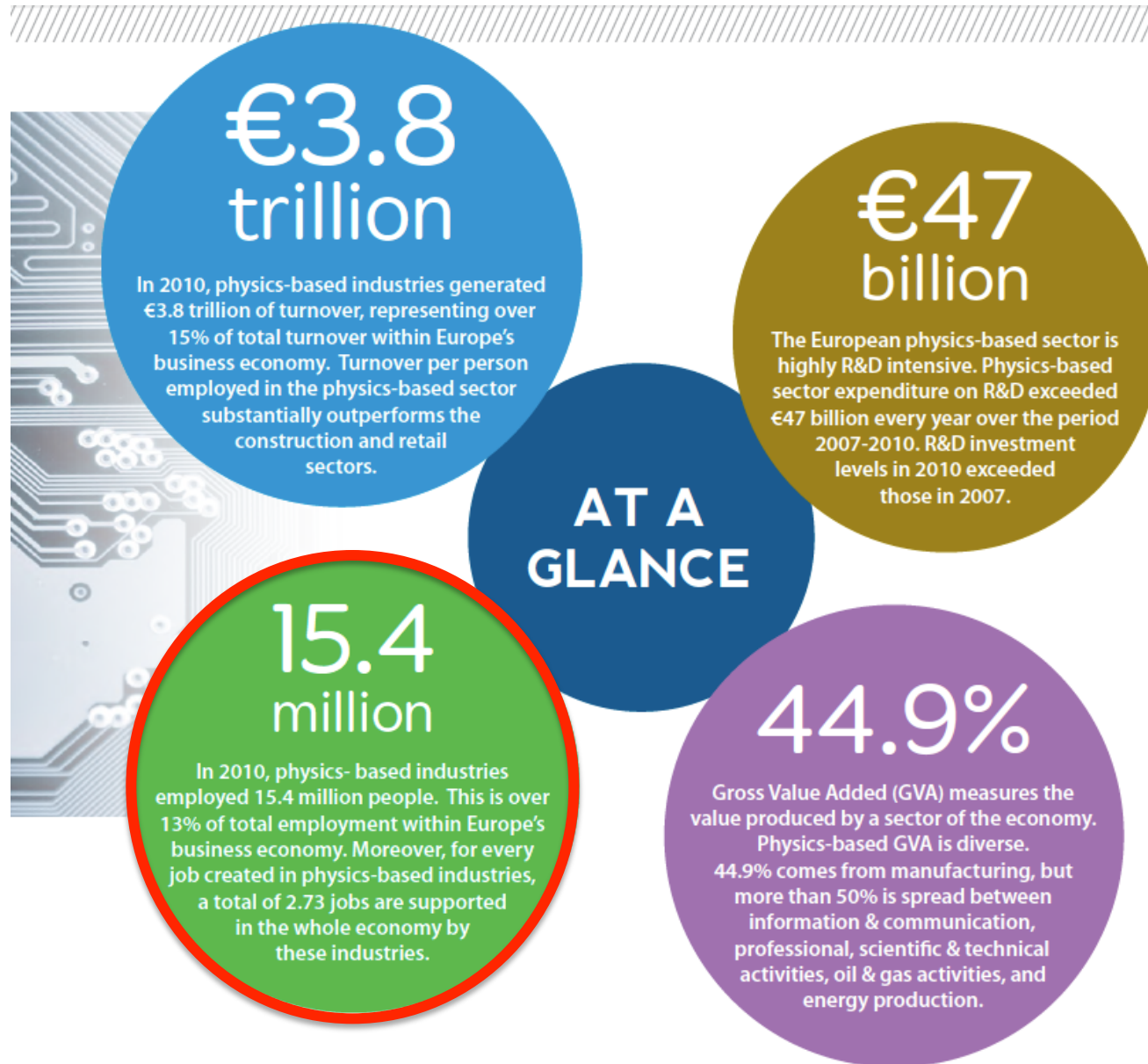
Contribution to
total EU GVA
(Gross Value Added,
analogous of GDP
at global level)

~ €1.3 trillion/yr

Selected sectors' shares of EU27-wide GVA at basic prices (€11.2 trillion in 2008)



Results in brief



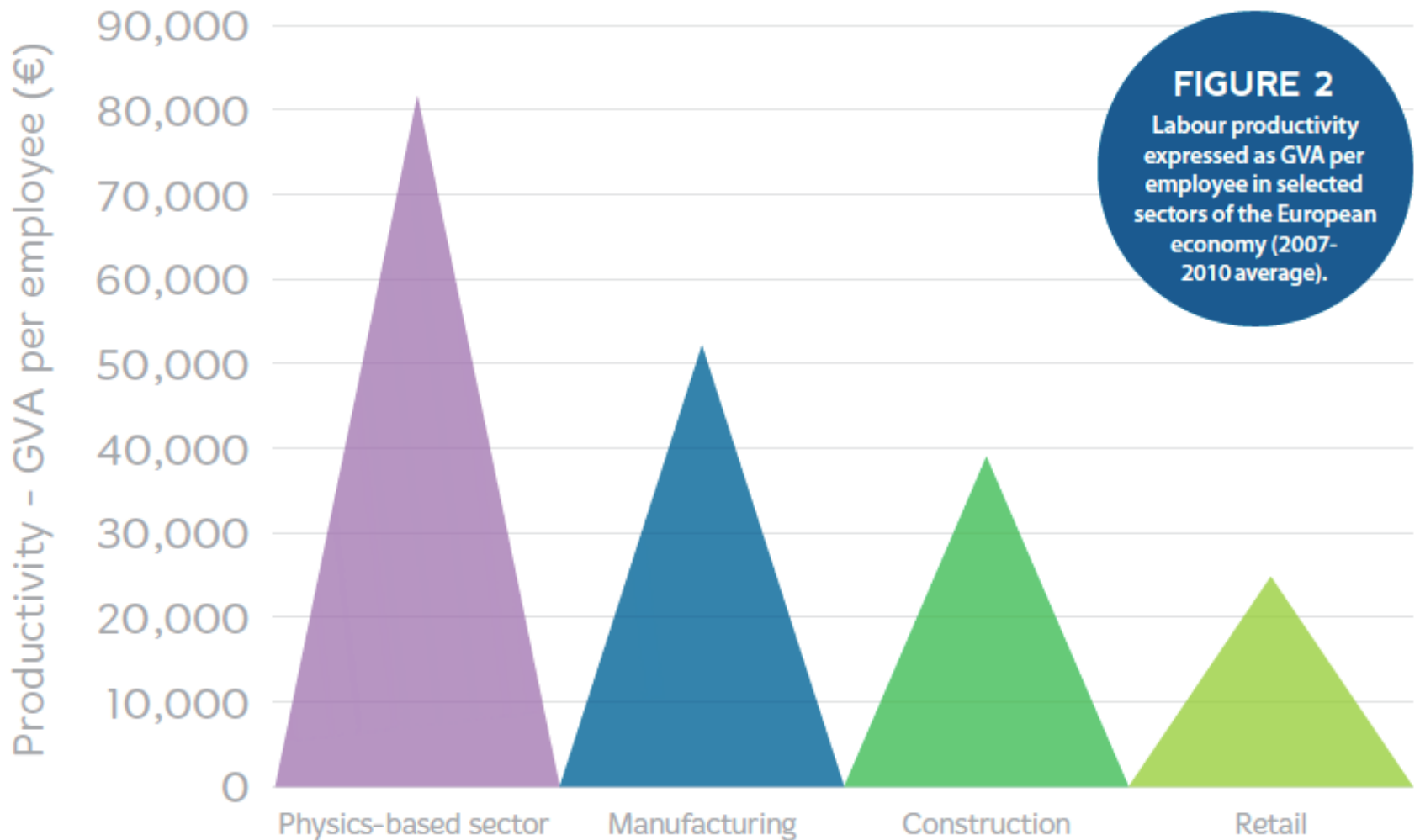
15.4 million

In 2010, physics-based industries employed
15.4 million people

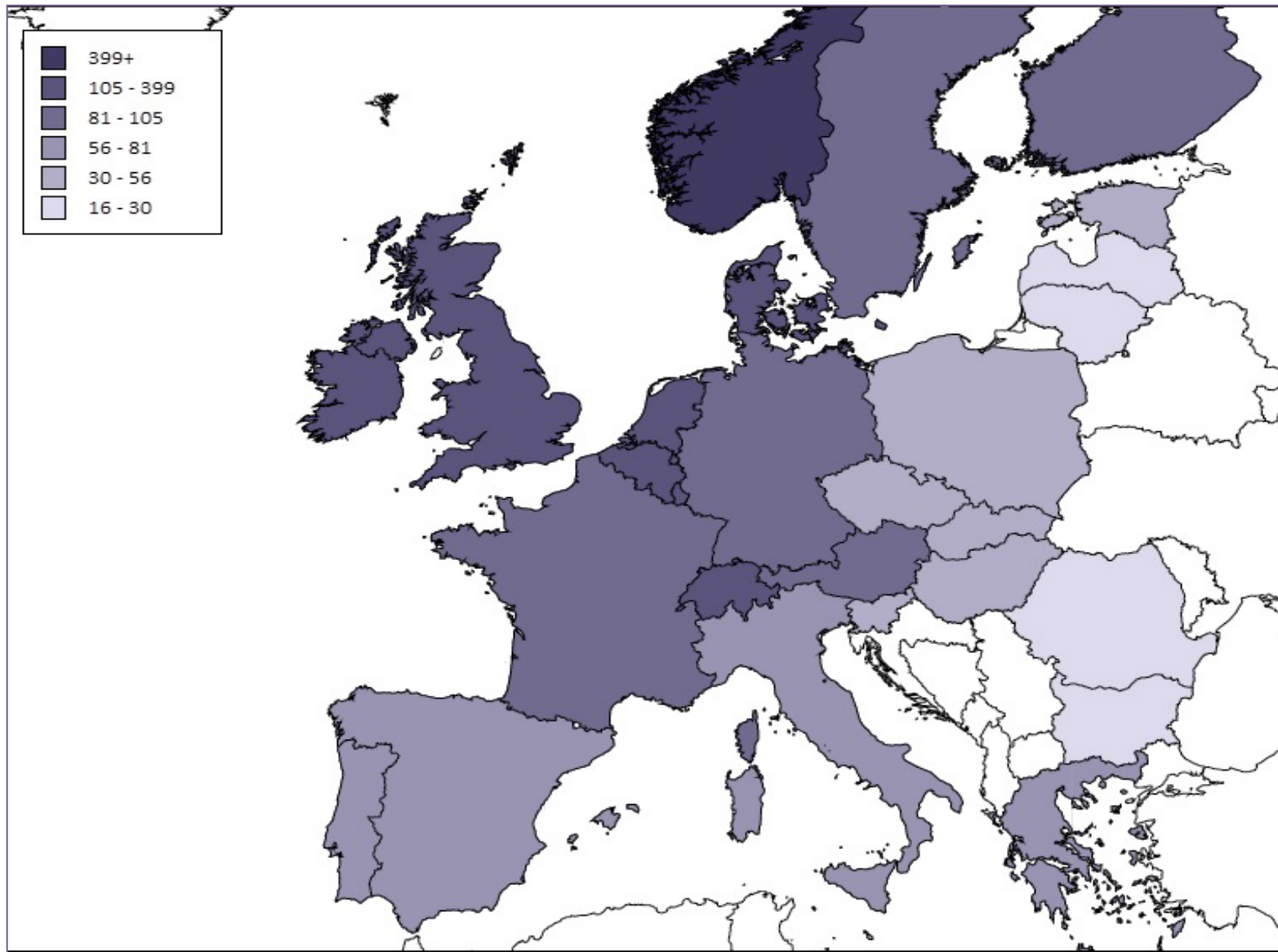
This is over **13%** of total employment within
Europe's business economy

Moreover, for every job created in physics-
based industries, a total of **2.73** jobs are
supported in the whole economy by these
industries

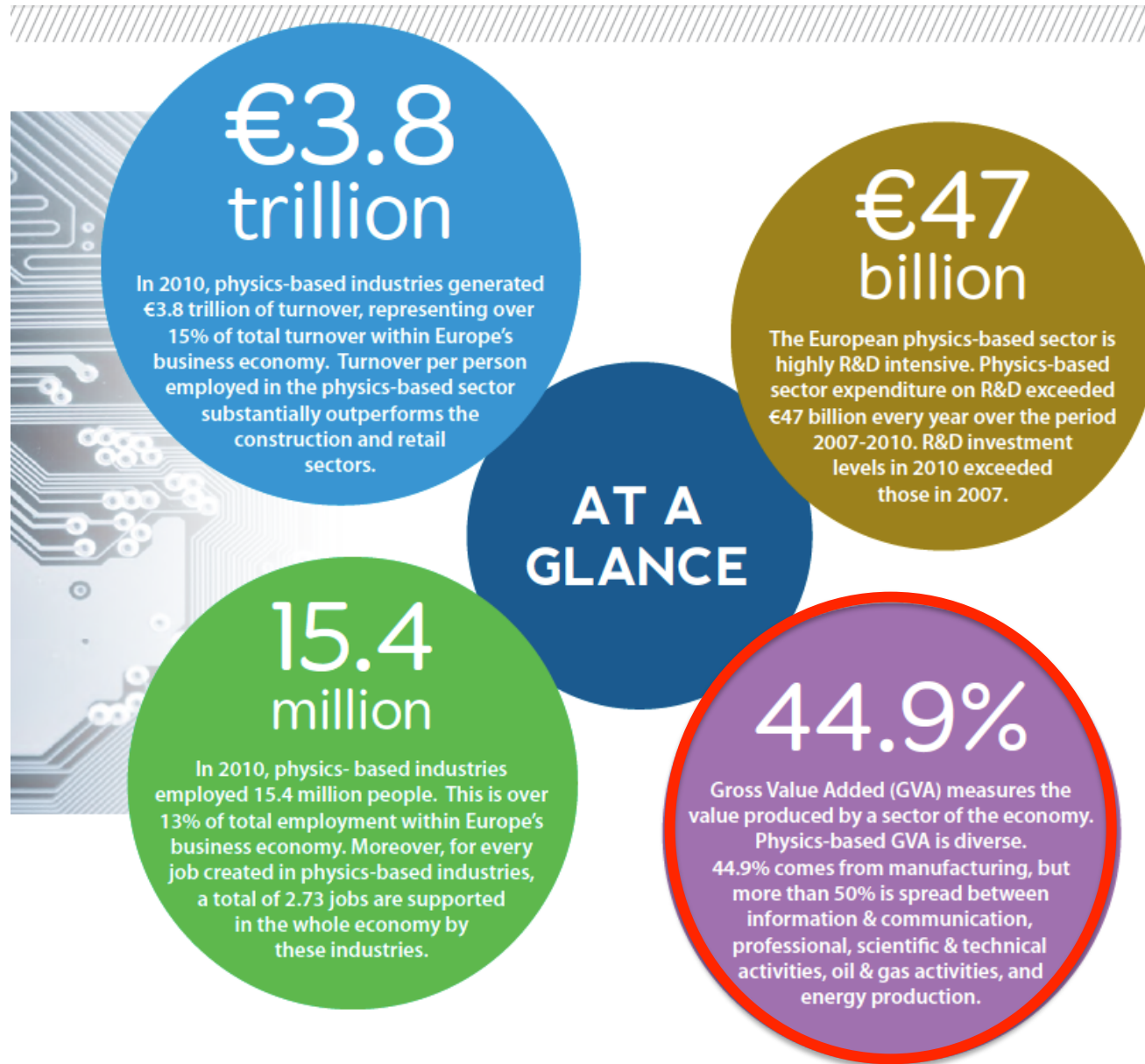
Labour productivity – GVA/employee (average 2007-2010)



Physics-based productivity (GVA/employee) in the EU27, Norway & Switzerland (€ thousand, average 2007-2010)



Results in brief

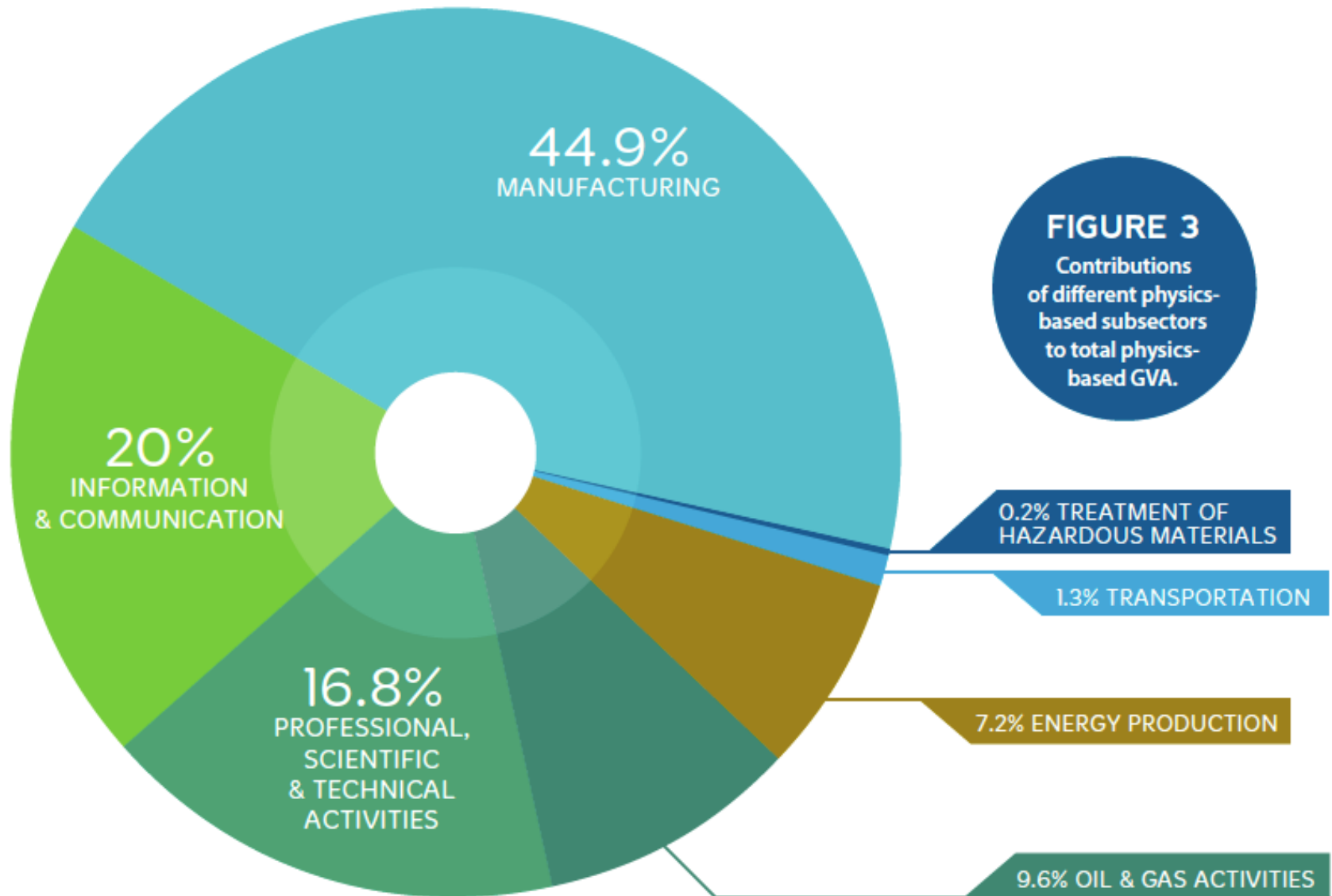


44.9%

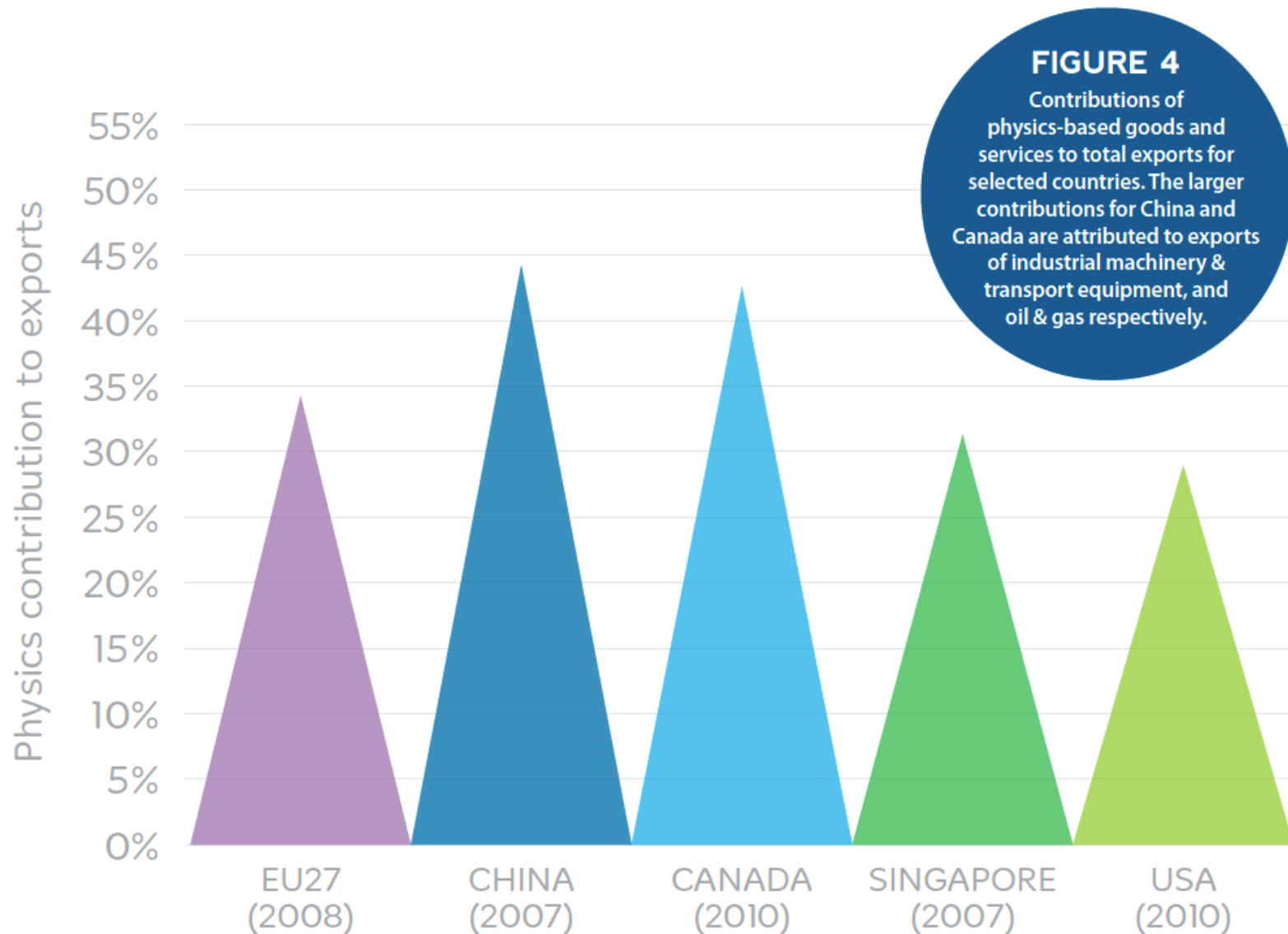
Gross Value Added (GVA) measures the value produced by a sector of the economy: physics-based GVA is **diverse**

44.9% comes from **manufacturing**, but more than 50% is spread between information & communication, professional, scientific & technical activities, oil & gas activities, and energy production

Contribution of physics-based subsectors to total physics-based GVA



Physics-based goods & services contributions to exports



Message



- ✓ Europe has a long lasting tradition in physics, science and technology (**CERN is an outstanding example – of course not only CERN!**)
- ✓ The Cebr Report commissioned by the EPS **clearly** highlights the importance of physics to the European economy
- ✓ Our hope is that the message conveyed by the EPS through this Report will be **inspiring for the future**, both at the European and national levels, and make a convincing case for the **support of physics in all of its facets:**

— from education to research, to business and industry —

The Impacts of Large Research Infrastructures
on Economic Innovation and on Society

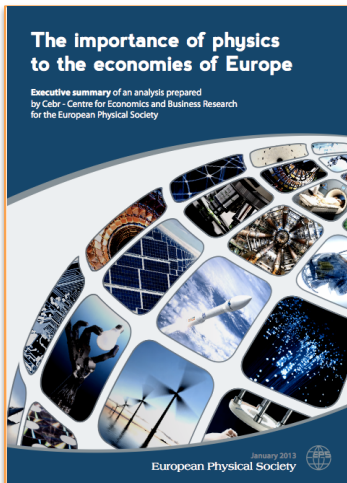
CASE STUDIES AT CERN



Report commissioned by CERN
to OECD Global Science Forum
in 2012

Approved by
OECD Committee for
Scientific & Technological Policy
in June 2014

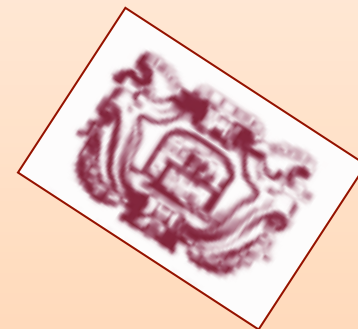
<http://www.oecd.org/sti/sci-tech/CERN-case-studies.pdf>
(79 pages)



→ Study for Italy

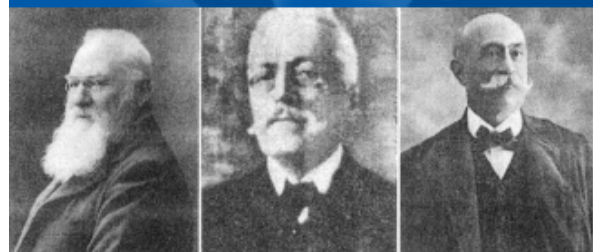
FOR THE FIRST TIME !

- Working Group coordinated by SIF, with the participation of:
 - **INFN**
 - **INAF**
 - **CNR**
 - **INRIM**
 - **Centro Fermi**
- Deloitte
- Istat & Eurostat data
- Period 2008-2011
- Completed by the end of 2013 – Revised in January 2014





ITALIAN PHYSICAL SOCIETY
SOCIETÀ ITALIANA DI FISICA



La Società Italiana di Fisica (SIF), fondata nel 1897, è un'associazione non-profit che ha lo scopo di **promuovere, favorire e tutelare lo studio e il progresso della Fisica** in Italia e all'estero.



La SIF rappresenta la **comunità scientifica italiana**, dal mondo della ricerca e dell'insegnamento a quello professionale, in **tutti campi della Fisica** e in tutti i settori applicativi: **Medicina, Biologia, Informatica, Economia e Finanza, Meteorologia e Climatologia, Ambiente, Archeometria, Beni Culturali.**





ITALIAN PHYSICAL SOCIETY
SOCIETÀ ITALIANA DI FISICA

La SIF conta più di **3000 Soci**, promuove e organizza sui
temi più sentiti dalla comunità dei fisici
Ricerca, Professione, Legislazione, Didattica, Università
varie attività:

- * **Scuola Internazionale E. Fermi**
 - * **Editoria**
 - * **Energia**
 - * **Fisica ed Economia**
 - * **Professione Fisico**
- * **Piano Lauree Scientifiche**
 - * **Gender**
- * **Commissione Didattica Permanente**

Full Report →

Executive
Summary ↓



http://www.sif.it/attivita/physics_economy
(36 pages)

NACE Rev. 2

Definition of physics-based sector (PBS) activities

Subset of 78 codes out of a total of over 700

DIRECT PHYSICS-BASED EMPLOYMENT BY NACE 4-DIGIT INDUSTRY, ITALY, 2011 (% Attributable refers to proportion of all sector activity counted as physics-based)

NACE Code	% Attributable	Direct Physics-based Employment	NACE Code	% Attributable	Direct Physics-based Employment
0910 : Support activities for petroleum and natural gas extraction	100%	8,100	2841 : Manufacture of metal forming machinery	100%	17,200
2011 : Manufacture of industrial gases	2%	100	2849 : Manufacture of other machine tools	100%	21,500
2013 : Manufacture of other inorganic basic chemicals	100%	6,000	2892 : Manufacture of machinery for mining, quarrying and construction	100%	21,700
2059 : Manufacture of other chemical products n.e.c.	2%	300	2899 : Manufacture of other special-purpose machinery n.e.c.	100%	21,700
2110 : Manufacture of basic pharmaceutical products	1%	100	2910 : Manufacture of motor vehicles	47%	30,000
2120 : Manufacture of pharmaceutical preparations	100%	51,000	2931 : Manufacture of electrical and electronic equipment for motor vehicles	100%	11,200
2229 : Manufacture of other plastic products	2%	1,800	3011 : Building of ships and floating structures	100%	16,200
2319 : Manufacture and processing of other glass, including technical glassware	2%	200	3020 : Manufacture of railway locomotives and rolling stock	100%	10,400
2344 : Manufacture of other technical ceramic products	100%	500	3030 : Manufacture of air and spacecraft and related machinery	100%	31,900
2452 : Casting of steel	8%	200	3040 : Manufacture of military fighting vehicles	100%	1,300
2521 : Manufacture of central heating radiators and boilers	100%	4,200	3250 : Manufacture of medical and dental instruments and supplies	100%	61,800
2530 : Manufacture of steam generators, except central heating hot water boilers	100%	2,700	3299 : Other manufacturing n.e.c.	25%	4,500
2540 : Manufacture of weapons and ammunition	100%	7,000	3320 : Installation of industrial machinery and equipment	100%	52,700
2561 : Treatment and coating of metals	2%	700	3511 : Production of electricity	100%	25,200
2593 : Manufacture of wire products, chain and springs	2%	200	3512 : Transmission of electricity	100%	3,500
2599 : Manufacture of other fabricated metal products n.e.c.	100%	79,300	3513 : Distribution of electricity	100%	23,600
2611 : Manufacture of electronic components	100%	29,200	3514 : Trade of electricity	10%	700
2612 : Manufacture of loaded electronic boards	100%	9,000	3812 : Collection of hazardous waste	100%	2,600
2620 : Manufacture of computers and peripheral equipment	100%	6,800	3822 : Treatment and disposal of hazardous waste	100%	3,000
2630 : Manufacture of communication equipment	100%	26,800	4222 : Construction of utility projects for electricity and telecommunications	1%	200
2640 : Manufacture of consumer electronics	100%	2,500	4321 : Electrical installation	23%	54,800
2651 : Manufacture of instruments and appliances for measuring, testing and navigation	100%	22,400	4322 : Plumbing, heat and air-conditioning installation	19%	37,200
2660 : Manufacture of irradiation, electromedical and electrotherapeutic equipment	100%	12,700	5221 : Service activities incidental to land transportation	11%	8,800
2670 : Manufacture of optical instruments and photographic equipment	100%	2,100	5222 : Service activities incidental to water transportation	100%	12,200
2680 : Manufacture of magnetic and optical media	100%	100	5223 : Service activities incidental to air transportation	100%	26,900
2711 : Manufacture of electric motors, generators and transformers	100%	29,700	6110 : Wired telecommunications activities	100%	60,000
2712 : Manufacture of electricity distribution and control apparatus	100%	23,900	6120 : Wireless telecommunications activities	100%	22,100
2720 : Manufacture of batteries and accumulators	100%	2,900	6130 : Satellite telecommunications activities	10%	-
2731 : Manufacture of fibre optic cables	100%	1,300	6190 : Other telecommunications activities	2%	300
2732 : Manufacture of other electronic and electric wires and cables	100%	11,000	6209 : Other information technology and computer service activities	2%	500
2733 : Manufacture of wiring devices	100%	6,600	7022 : Business and other management consultancy activities	10%	9,600
2740 : Manufacture of electric lighting equipment	100%	17,100	7111 : Architectural activities	6%	4,500
2751 : Manufacture of electric domestic appliances	100%	38,400	7112 : Engineering activities and related technical consultancy	42%	81,900
2790 : Manufacture of other electrical equipment	100%	34,600	7120 : Technical testing and analysis	32%	10,400
2811 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	100%	17,300	7211 : Research and experimental development on biotechnology	100%	3,100
2821 : Manufacture of ovens, furnaces and furnace burners	100%	12,000	7219 : Other research and experimental development on natural sciences and engineering	100%	17,000
2823 : Manufacture of office machinery and equipment (except computers and peripheral equipment)	100%	2,100	7420 : Photographic activities	10%	1,900
2825 : Manufacture of non-domestic cooling and ventilation equipment	100%	31,300	7490 : Other professional, scientific and technical activities n.e.c.	100%	112,900
2829 : Manufacture of other general-purpose machinery n.e.c.	100%	72,400	8422 : Defence activities	33%	106,400

Note: Figures round to nearest 100 for disclosure purposes. May not sum to estimates presented in the remainder of the document due to rounding.

Source: Deloitte

THE QUANTIFIABLE IMPACTS OF PHYSICS-BASED SECTORS IN ITALY, 2011: 60-SECOND SUMMARY

The direct physics-based sector is a major contributor to the Italian economy ...

1.51 million
total jobs
in 2011



6.1%
Italian
employment
in 2011

€118 billion
GVA
contribution
in 2011



7.4%
Italian GDP
in 2011

... productivity levels are high ...

€ 78,100 GVA
per worker in
physics-based
sectors in 2011



22% higher than
the all-sector
average in Italy
in 2011

... and have increased since 2008 ...

2.5% real increase in
GVA per worker in
physics-based sectors
from 2008 to 2011



–1.5% the equivalent
contraction in all-sector
GVA per worker in Italy
from 2008 to 2011

... but employment has suffered badly ...

114,000 net jobs
lost in physics-based
sectors
from 2008 to 2011



–7% variation from
2008 to 2011
(all economy –2%
by comparison)



Physics-based direct GVA contribution is spread across a range of Italian industries in 2011 ...



49% in
manufacturing



22% in
transport &
communications



16% in
utilities



8% in
business services
(inc. R&D)

... with extra impacts in many more industries from the physics-based supply chain and consumer spending



1.4 million
jobs in retail,
wholesale,
hotels & catering



340,000
jobs in
other services



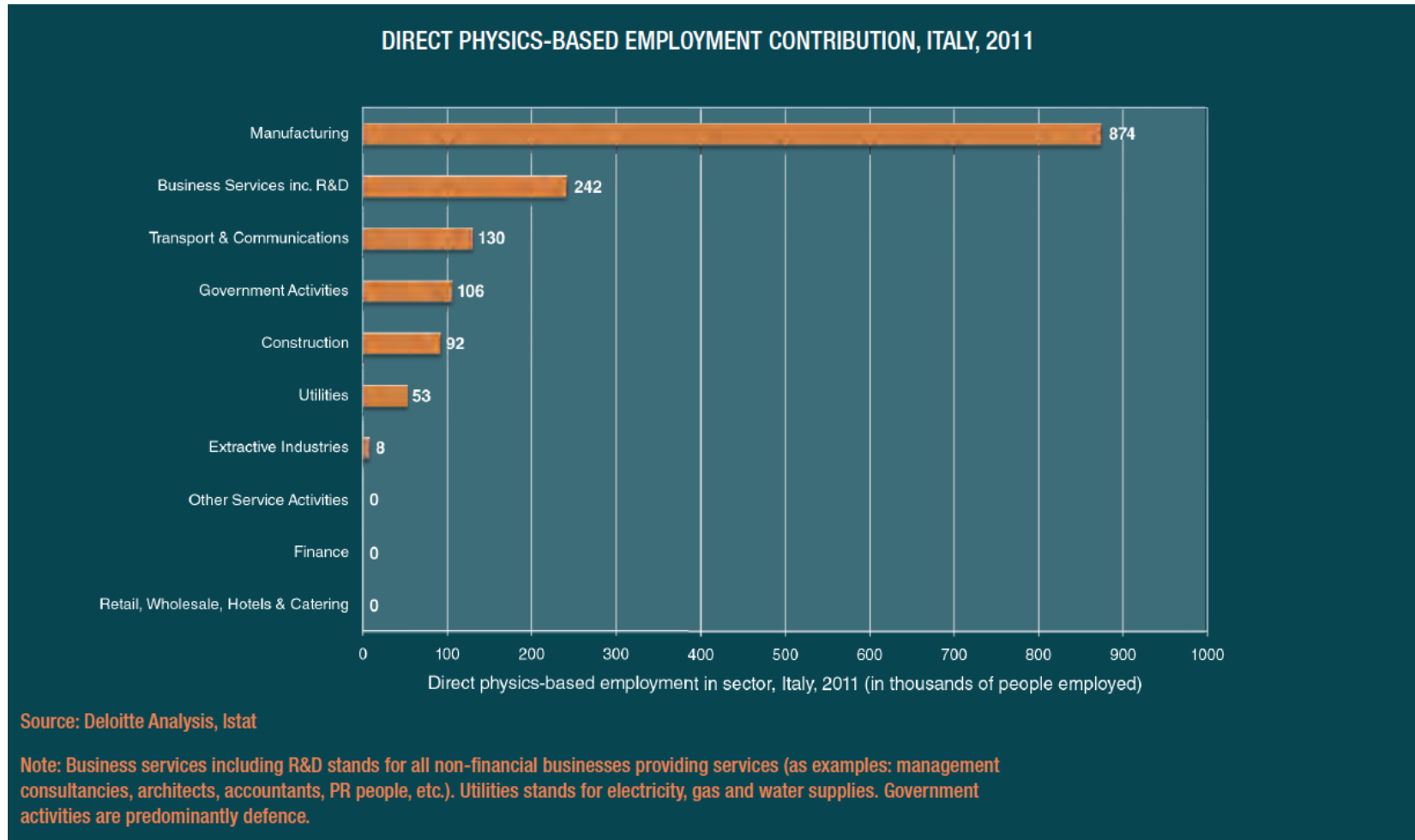
220,000
jobs in
construction



90,000
jobs in
finance

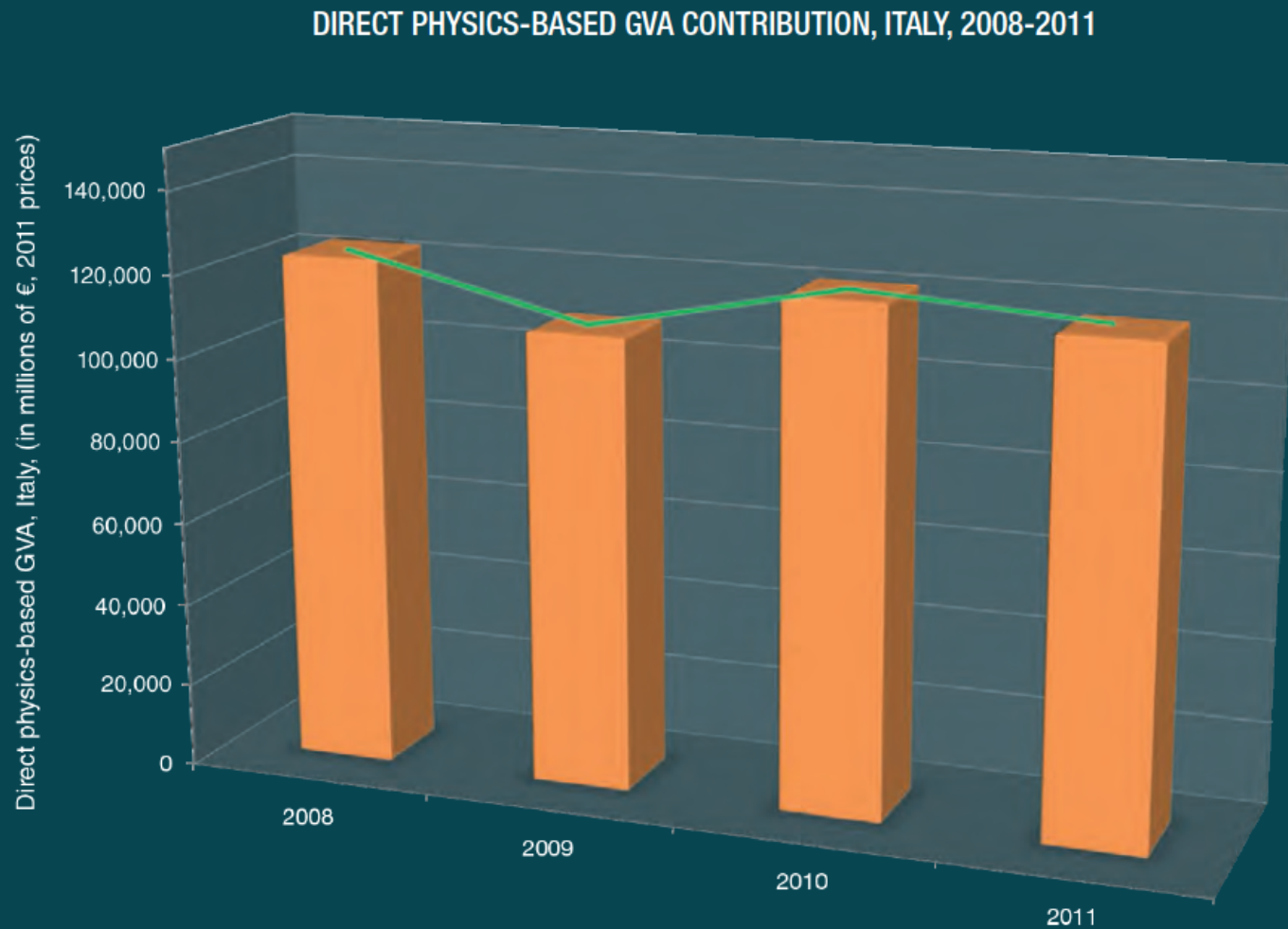
Direct physics-based sector (PBS) employment 1.51 million jobs in 2011 → 6.1% of total in Italy

Manufacturing: 58% of all PBS jobs



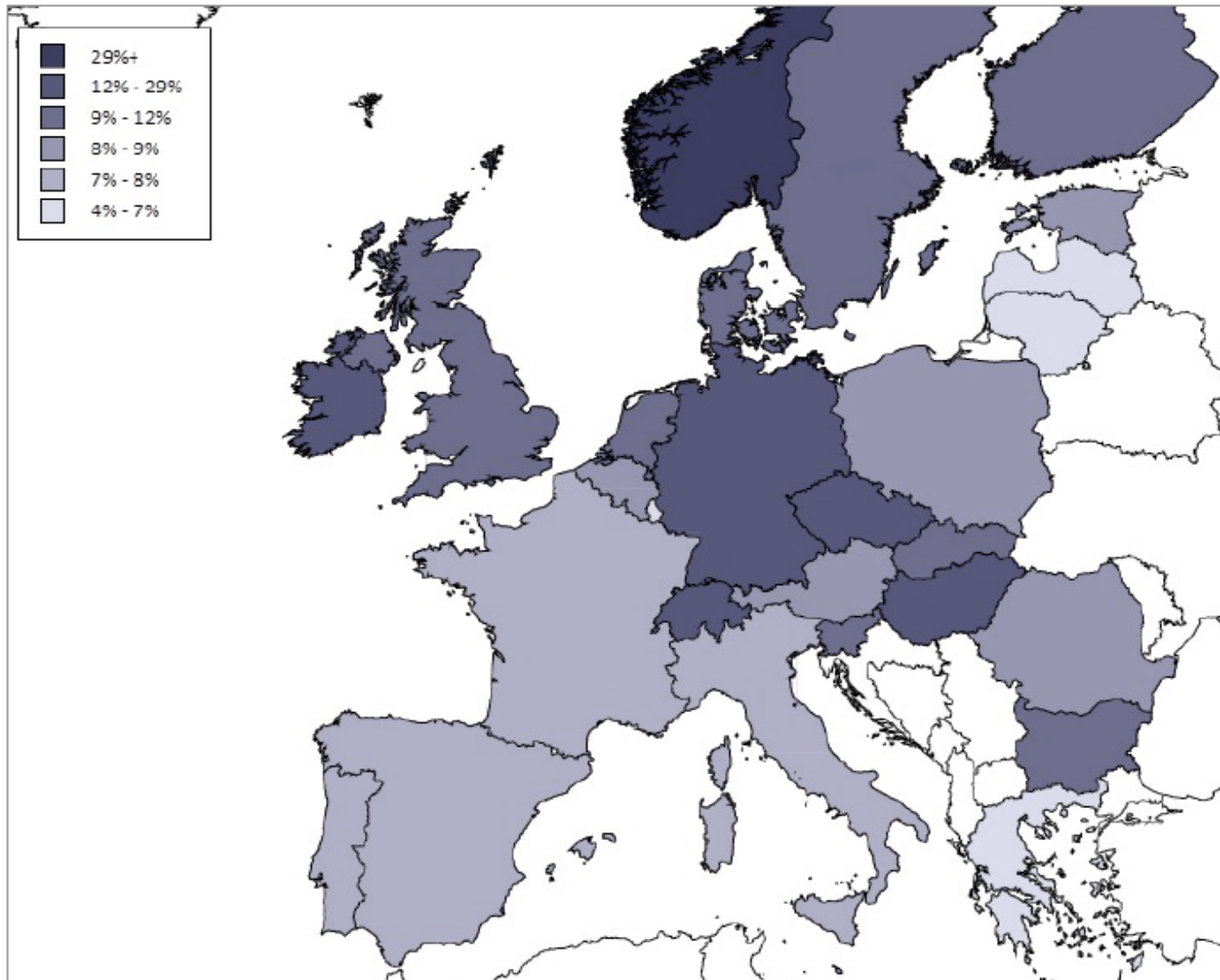
PBS jobs lost from 2008 to 2011 (7%)
mostly in Manufacturing

Direct physics-based sector (PBS) accounted for €118 billion of GVA in 2011 → 7.4% of Italy's GDP



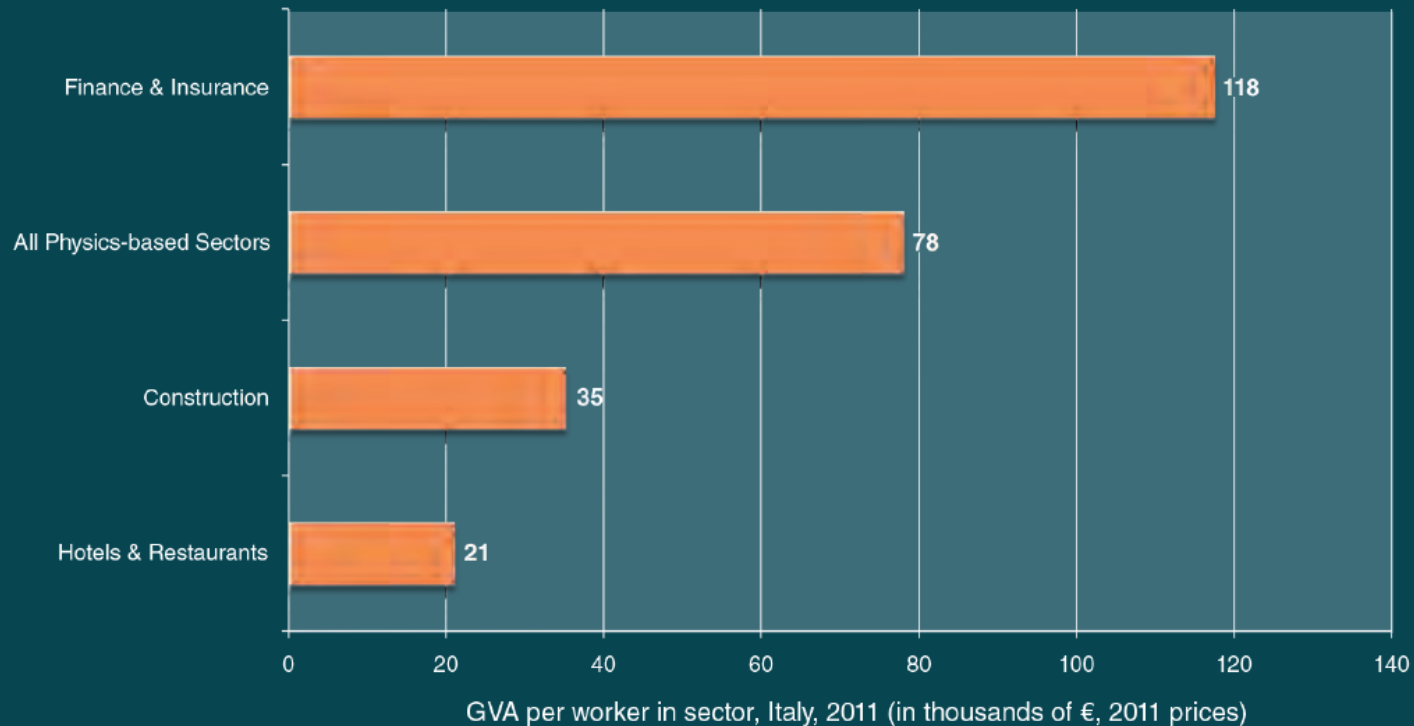
Source: Deloitte, Istat

Physics-based GVA as a proportion of GDP in the EU27, Norway & Switzerland (%, average 2007-2010)

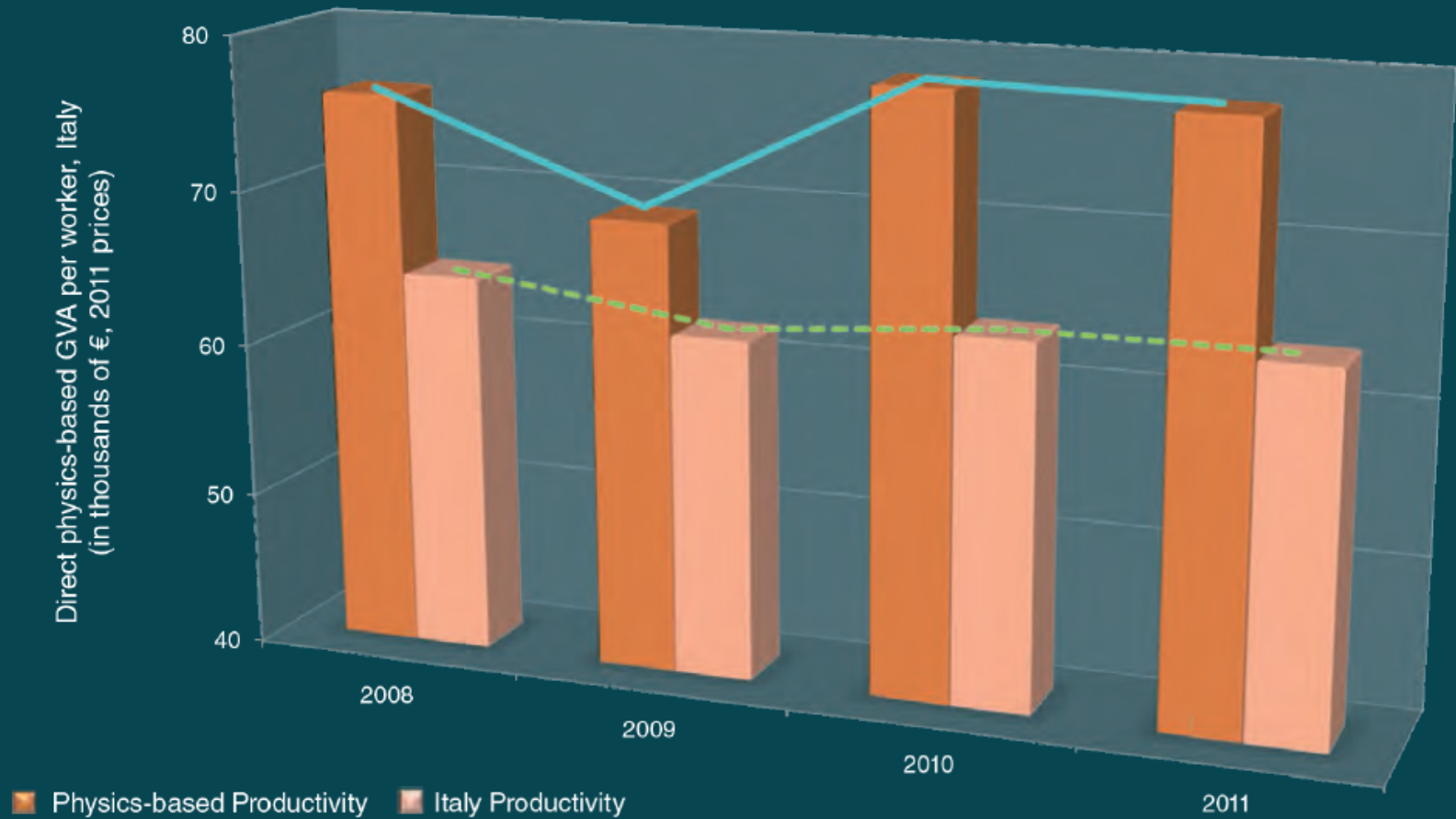


Physics-based sector (PBS) productivity (GVA/worker) €78,100 in 2011 → 22% higher than all-sector productivity in Italy

PHYSICS-BASED PRODUCTIVITY PER WORKER (GVA) VERSUS PRODUCTIVITY IN OTHER SECTORS, ITALY, 2011



DIRECT PHYSICS-BASED PRODUCTIVITY PER WORKER (GVA), ITALY, 2008-2011



Physics-based sector (PBS) activity concentrated in Northern Italy

PHYSICS-BASED SECTORS CONTRIBUTION ACROSS ITALIAN REGIONS, 2011

Region	All Economy		Physics-based Sectors				
	GVA (at production factor cost, in billions of €)	Number of people employed	GVA (at production factor cost, in billions of €)	Number of people employed	Relative productivity	% Regional GVA	% Regional employment
North	457.8	9,513,000	67.5	929,000	96	14.7	9.8
Central	149.4	3,376,000	21.7	261,000	110	14.5	7.7
South	130.1	3,729,000	16.8	216,000	103	12.9	5.8
Italy	737.3	16,618,000	105.9	1,406,000	100	14.4	8.5

Source: Deloitte, Istat

Note: Here the quoted GVA figures are lower than elsewhere in this study because of: a) the use of production factor cost instead of market price; b) missing regional data for both physics-based and non-physics-based sectors (predominantly in defence and finance).

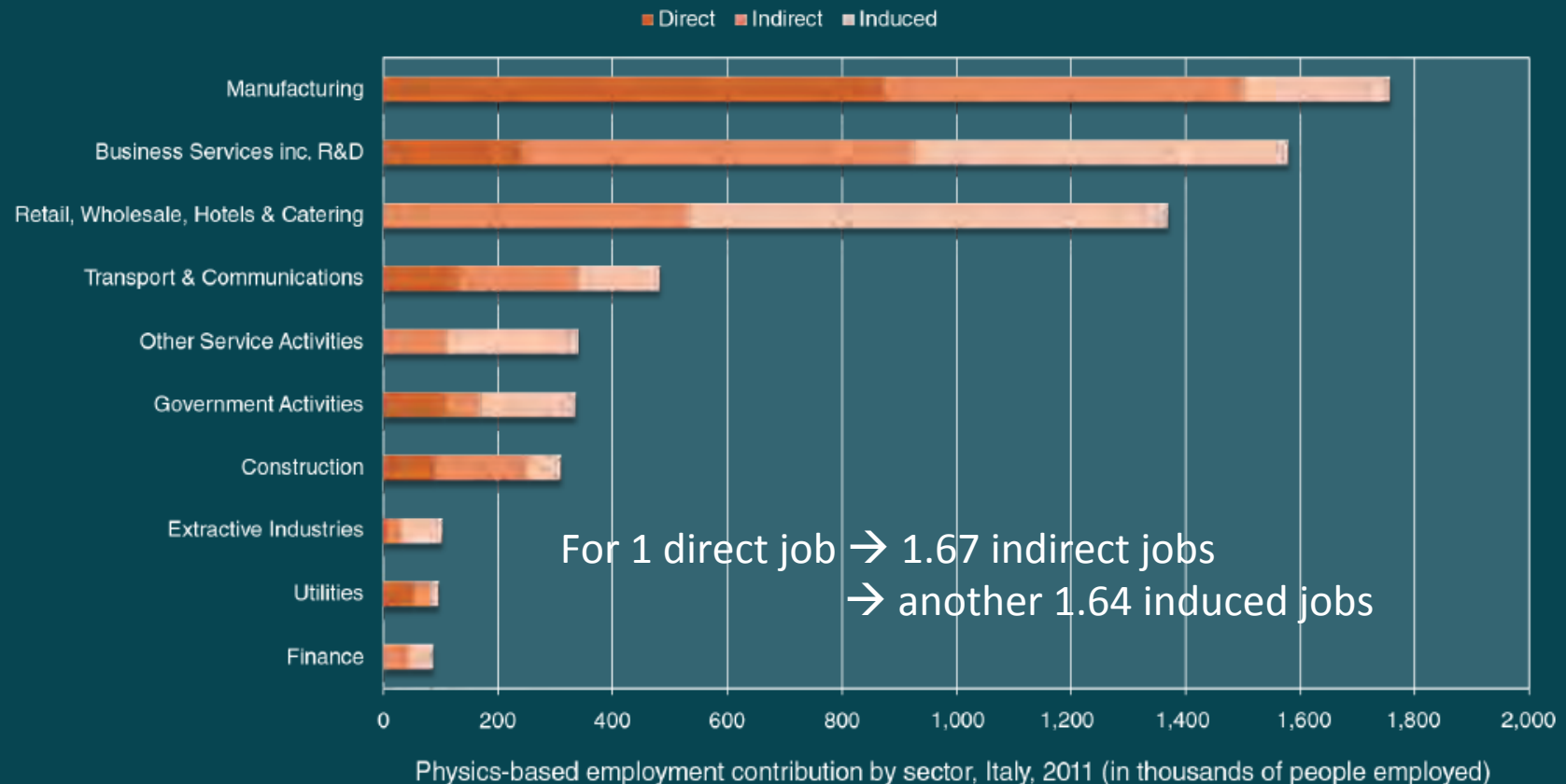
Productivity (GVA/worker) higher in Central & Southern Italy
due to a concentration of capital intensive activities:
extractive industries, utilities (electricity, gas, water supply)
+ manufactures of computer, electronic & optical products

Physics-based sector (PBS) footprint in 2011

6.5 million jobs → 25% of total

Aggregated contribution: direct + indirect (business-to-business supply-chain spending) + induced (consumer spending)

TOTAL PHYSICS-BASED EMPLOYMENT CONTRIBUTION, ITALY, 2011

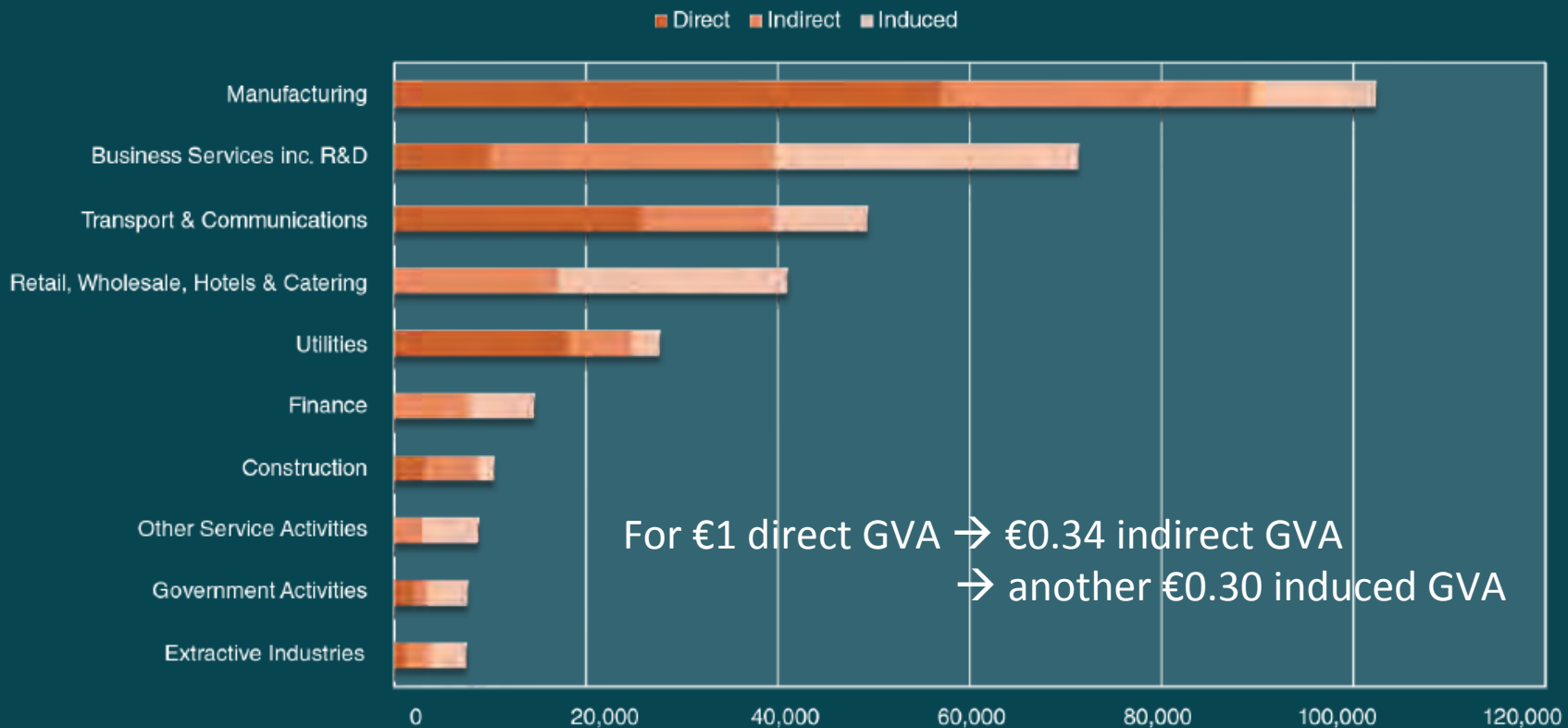


Physics-based sector (PBS) footprint in 2011

€341 billion of GVA → 22% of total GDP

Aggregated contribution: direct + indirect (business-to-business supply-chain spending) + induced (consumer spending)

TOTAL PHYSICS-BASED GVA CONTRIBUTION, ITALY, 2011

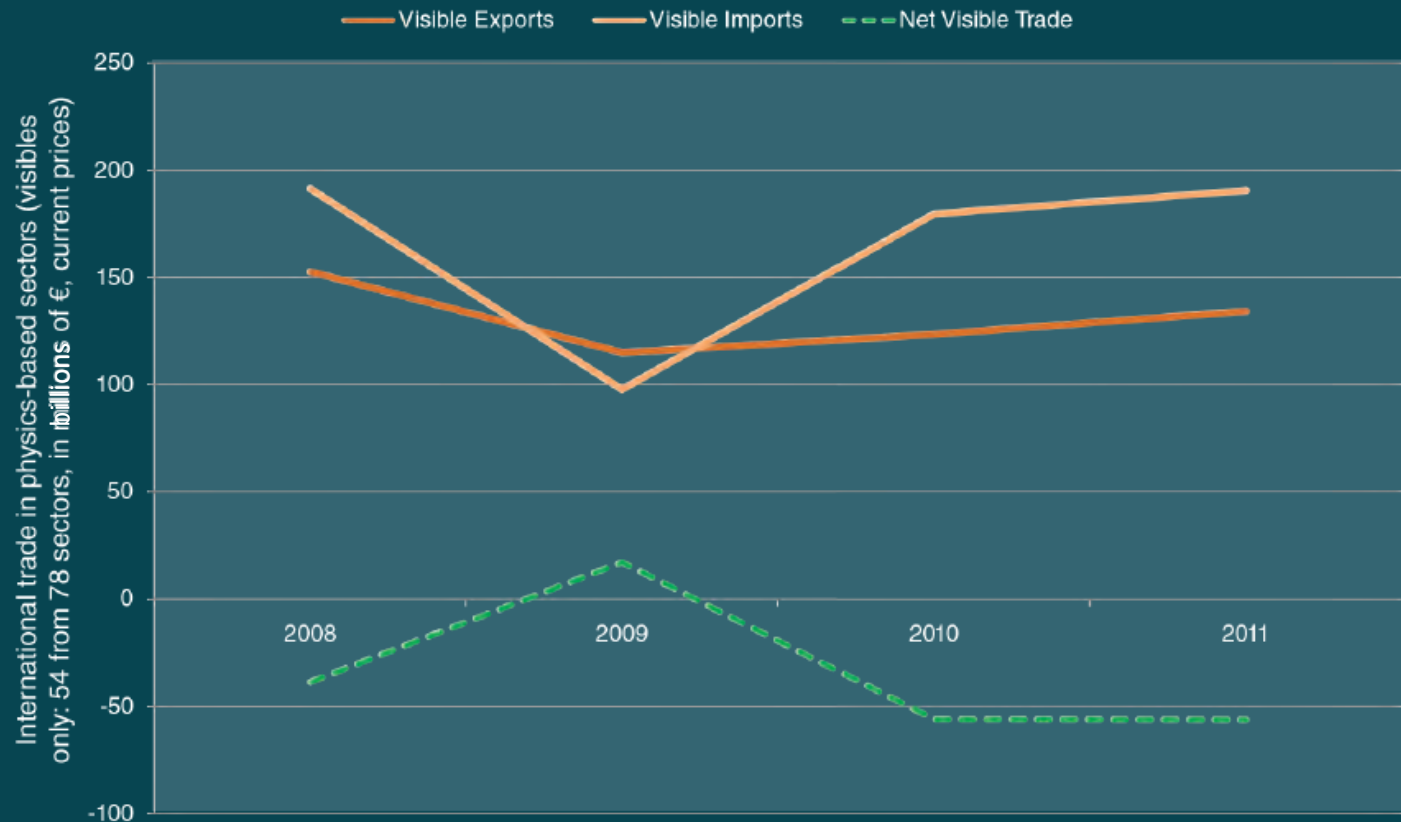


Physics-based GVA contribution by sector, Italy, 2011 (in millions of €, 2011 prices)

Physics-based sector (PBS) exports in 2008-2011

€130 billion → 35% of all Italian physical goods exports

INTERNATIONAL TRADE IN PHYSICS-BASED SECTORS (VISIBLES ONLY) ITALY, 2008-2011, CURRENT PRICES



Source: Deloitte, Istat

Note: Only physics-based sectors where that data exists are included. Current prices (non-inflation adjusted) are considered due to issues with deflating imports and exports at a disaggregate level.

Conclusion



- ✓ The Deloitte Report commissioned by the SIF **clearly** highlights the importance of physics to the Italian economy **especially on metrics such as productivity**
- ✓ Our hope is that the message conveyed by the SIF through this Report will be **inspiring for the future**, both at the European and national levels
- ✓ Investing in physics today in Italy is the right thing to do
 - **through education, research, business and industry** —