The Community Innovation Survey (CIS): 28 Years of Measuring Innovation

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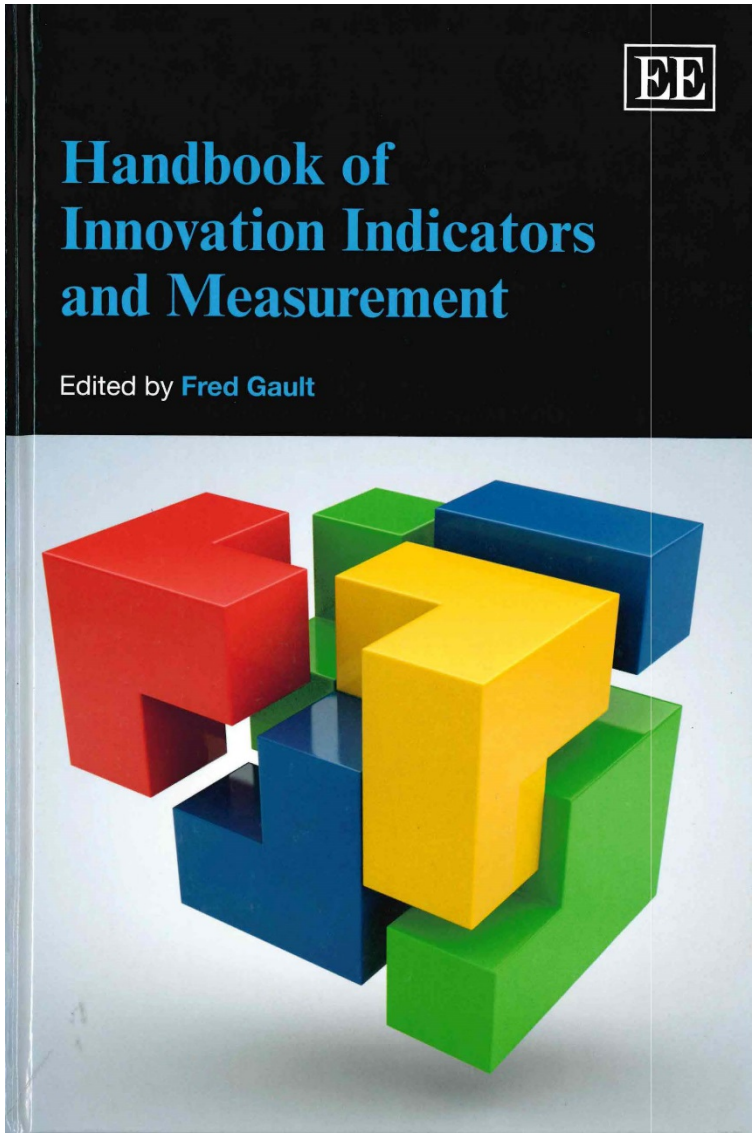
AGENDA

- Brief history of the CIS
- The CIS approach to measuring innovation
- Implementing the Oslo Manual 2018 in the CIS
- Challenges of producing internationally comparable innovation data
- Using the CIS for policy and research
- Outlook

BRIEF HISTORY OF THE CIS

A BRIEF HISTORY OF THE CIS



3 History of the Community Innovation Survey

Anthony Arundel and Keith Smith

1. INTRODUCTION

The Community Innovation Survey (CIS) was first developed in the early 1990s. It arose from a shared view by researchers and policy makers that understanding the extent and distribution of innovation activity required direct and economy-wide indicators of innovation inputs and outputs at the firm level.[1] These included tangible and intangible investments in innovation, outputs in terms of sales of new or changed products, plus data on such topics as collaboration, and knowledge flows.

The first CIS has evolved into the largest innovation survey in the world based on the number of participating countries and the number of responding enterprises. It is conducted in the 27 member states of the European Union (EU) plus Norway and Iceland, and is used in many of the candidate states to the EU, such as Croatia and Turkey. The 2008 CIS, the most recent survey for which data are available, obtained responses from 196 000 enterprises in the EU-27 countries. The CIS has influenced the design of innovation survey questions in other countries, including Australia, Canada, China, Japan, New Zealand, Russia, South Africa, Switzerland and the USA. The frequency of the CIS was increased after 2004 from every four years to every two years. The last completed survey at the time of writing, CIS 2010, was implemented in 2011 and a proposed version of the questionnaire for the next survey, CIS 2012, was produced in July 2012.

The CIS survey produces policy-relevant indicators that are used in Europe's Innovation Union Scoreboard (IUS) and by the OECD. Six out of 25 indicators in the 2011 IUS are obtained from the CIS, including indicators for innovation expenditures as a share of turnover, the percentage of SMEs that develop innovations in house, and the percentage of turnover from new-to-market and new-to-firm innovations. In addition, the survey provides a rich data source for academic research. As shown in Figure 3.1, the number of academic papers, in English, that use CIS data has increased from fewer than ten per year before 2000 to over 50 per year after 2008. Academics also continue to be interested in each version of the

WHY INNOVATION SURVEYS?

- **R&D surveys** provided an incomplete picture of innovation efforts of firms:
  - missing innovation inputs other than R&D („non-technological innovation“)
  - no measures on innovation output, and how inputs are transferred into outputs
- **Innovation surveys** were initially meant to complement R&D data

1992: THE BIRTH OF THE CIS

- Joint effort of **OECD**, **European Commission** and **academics**:
  - Developing a methodology (Oslo Manual)
  - Developing a harmonised questionnaire
  - Implementing a large-scale survey in 14 European countries by academic institutions
- **CIS 1** was largely experimental in nature:
  - divergent survey methodologies and national questionnaires
  - highly valuable source for analysis

TIMELINE OF THE CIS

CIS 1 (1992)	Oslo Manual	Technological innovation, manufacturing only
CIS 2 (1996)	Oslo Manual, 2nd ed., coordinated by Eurostat	Including services (separate questionnaire)
CIS 3 (2000)		Single questionnaire, dropping „technological“ from innovation
CIS 4 (2004)	Oslo Manual, 3rd ed., EC Regulation	Including non-technological innovation (marketing, organisational)
CIS 2006		Frequency increased to 2-years
...		
CIS 2018	Oslo Manual, 4th ed.	Back to 2 types of innovation (product and process), avoiding big „innovation filter“

CIS: CORE INNOVATION INDICATORS

- **Introduction of innovations**
  - Product, process, 2004-2016: marketing, organisational — **C**
  - New-to-market product innovation — **C**
  - Share of turnover from product innovation — **C**
- **Innovation activities**
  - ongoing or abandoned activities — **C**
  - type of activity: R&D, acquisition of machinery/software/ other knowledge, others (training, marketing, design, ...) — **V**
  - expenditure by activity — **C**
- **Funding and cooperation**
  - Public funding by type of funder (regional, national, EU) — **V**
  - Cooperation by type and location of partner — **C**

C compulsory to report to Eurostat
V reported on a voluntary basis

CIS: A BROAD SCOPE OF OTHER TOPICS

CIS	Innovation topics	Special topics (one-off)
1992	Information sources, objectives, obstacles, IPRs, sales share by product life cycle	Technology acquisition/transfer
1996	Information sources, objectives	
2000	Information sources, effects, obstacles, IPRs	Patenting
2004	Information sources, effects, obstacles, IPRs	
2006	Information sources, effects, obstacles, IPRs	
2008	Information sources, objectives	Environmental innovation
2010	Information sources, objectives, obstacles	Creativity and skills
2012	Information sources, IPRs	Firm objectives, strategies, obstacles
2014	Public procurement, obstacles, IPRs	Environmental innovation
2016	Information sources, planned activities, obstacles, legislation, IPRs	Innovation in logistics
2018	Financing, obstacles, legislation, IPRs	Knowledge flows

CIS: INDICATORS BEYOND INNOVATION

- **General firm characteristics**
  - Part of enterprise group, foreign ownership
  - Employees with university degree
- **General events in the firm**
  - Mergers & acquisitions, outsourcing/insourcing of activities
- **Geographical markets**
  - Geographical markets served, export volume
- **Firm strategies**
  - Importance of different strategies
- **Expenditure on tangible and intangible capital**
  - Expenditure on fixed capital, design, IP, software/databases, marketing, training

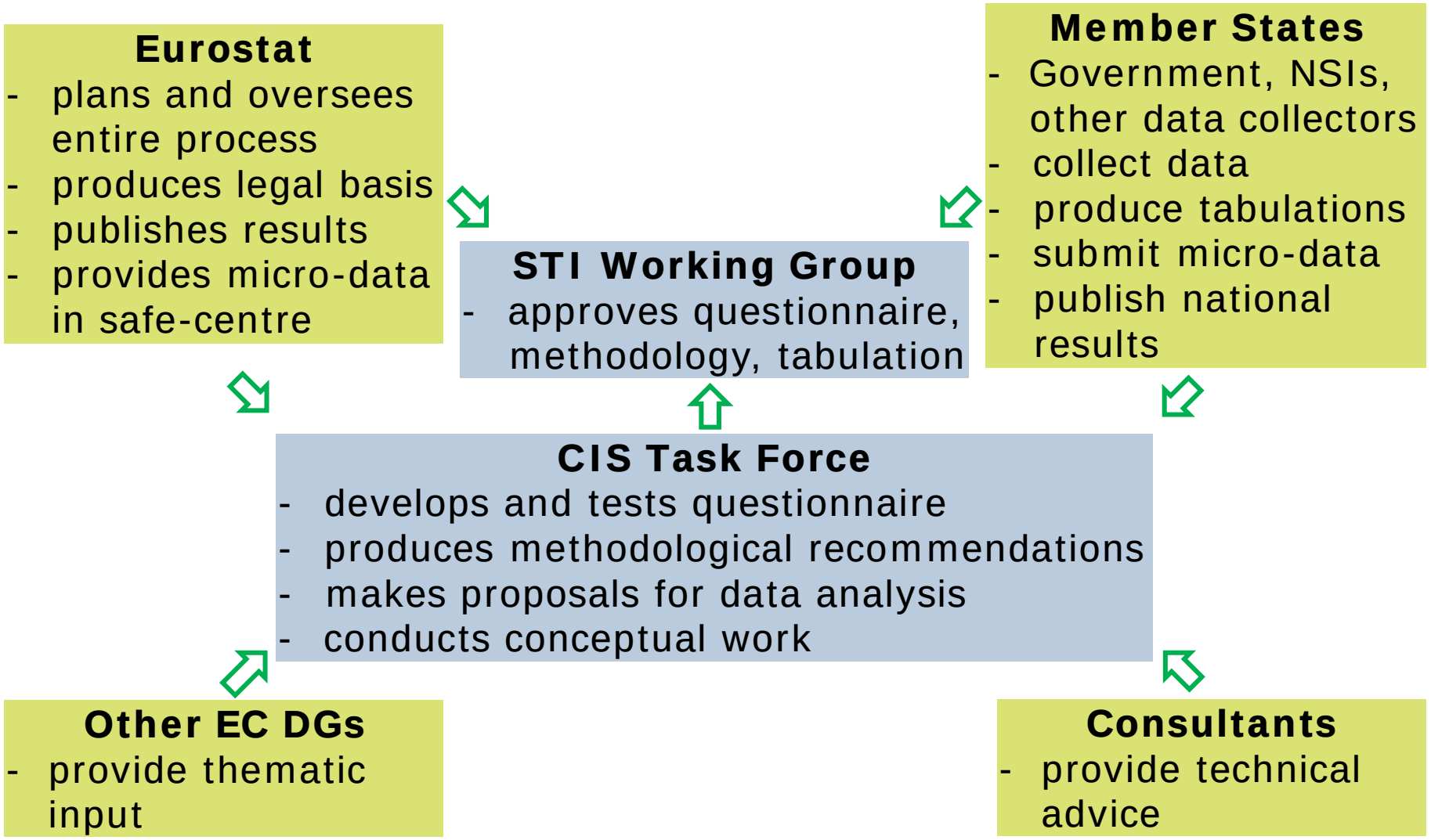
THE CIS APPROACH TO INNOVATION MEASUREMENT

- **Subject-based**:
  - Unit of analysis: the firm (not the innovation)
- **Subjective** definition of innovation (firm perspective):
  - New to the firm (and not new to the world) as benchmark
- Four main **questionnaire blocks**:
  - Introduction of innovations
  - Characteristics of innovation activities
  - Themes related to innovation
  - Characteristics of the firm

CIS METHODOLOGY

- **Target population**
  - Enterprises with 10+ employed persons
  - Industry (B to E) and services (46, H, J, K, 71 to 73)
- **Sampling**
  - Stratified random sample, census for large enterprises
- **Questionnaire**
  - National versions of harmonised questionnaire (paper or on-line)
- **Obligation to give information**
  - Depending on national legislation (compulsory in most countries)
- **Data analysis**
  - Imputation and weighting based on national standards

CIS ORGANISATION



? QUESTIONS ?

- **Do you have any questions at this point?**
  - On the role of innovation statistics in business enterprise statistics and EU policy making?
  - On how survey questions are selected?
  - On how the CIS is organised?
  - …?
- **I do have a few questions to you:**
  - How do you decide on the questions to be included in your national innovation survey?
  - Are researchers or policy makers involved in that process?
  - What is the position of your national innovation survey within business statistics?

IMPLEMENTING THE OM 2018 IN THE CIS

IMPLEMENTING OM 2018 IN THE CIS

- **Main changes owing to OM 2018**
  - Product innovation: including design changes (previously part of marketing innovation)
  - Business process innovation: incl. all organisational innovation and three types of marketing innovation
  - Innovation expenditure: non-R&D expenditure separated by type of expenditure (personnel, material/services, capital)
- **Other changes**
  - Public funding: to all firms + link to R&D/innovation
  - Cooperation: to all firms, separated by R&D, other innovation, other activities

PRODUCT INNOVATION: OM3

2. Product innovation (good or service)

A product innovation is the market introduction of a **new** or **significantly** improved **good or service** with respect to its capabilities, user friendliness, components or sub-systems.

- Product innovations (new or improved) **must be new to your enterprise**, but they **do not need to be new to your market**.
- Product innovations could have been originally developed by your enterprise or by other enterprises or organisations.

A **good** is usually a tangible object such as a smartphone, furniture, or packaged software, but downloadable software, music and film are also goods. A **service** is usually intangible, such as retailing, insurance, educational courses, air travel, consulting, etc.

2.1 During the three years 2014 to 2016, did your enterprise introduce:

	Yes	No
Goods innovations: New or significantly improved goods (*exclude the simple resale of new goods and changes of a solely aesthetic nature*)	☐	☐
Service innovations: New or significantly improved services	☐	☐

PRODUCT INNOVATION: OM4

3 Innovation

A **product innovation** is a new or improved good or service that differs significantly from the firm's previous goods or services and which has been implemented on the market.

Include:

- ✓ significant changes to the design of a good
- ✓ digital goods or services

Exclude: — the simple re-sale of new goods and changes of a solely aesthetic nature

3.1 During the three years 2016 to 2018, did your enterprise introduce any:

	Yes	No
New or improved goods	☐	☐
New or improved services	☐	☐

IMPLEMENTING OM 2018 IN THE CIS

- **Product innovation: choices made**
  - Refrain from adding a third category (in addition to goods and services): “knowledge-capturing products” as respondents may find this concept difficult to understand
  - Refrain from adding a separate item „significant changes to the design of a product“
  - Allowing Member States to add additional items, or to clarify that goods and services can include digital goods/services

See also „**Guidance on CIS 2018 Questions**“ (Eurostat Document G4/STI/CIS/2018/Document_03)

BUSINESS PROCESS INNOVATION: OM3

3. Process innovation

A process innovation is the implementation of a **new** or **significantly** improved production process, distribution method, or supporting activity.

- Process innovations **must be new to your enterprise**, but they **do not need to be new to your market**.
- The innovation could have been originally developed by your enterprise or by other enterprises or organisations.
- Exclude purely organisational innovations – these are covered in section 8.

3.1 During the three years 2014 to 2016, did your enterprise introduce:

	Yes	No
New or significantly improved methods of manufacturing for producing goods or services	☐	☐
New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services	☐	☐
New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing	☐	☐

BUSINESS PROCESS INNOVATION: OM3

9. Marketing innovation

A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from your enterprise's existing marketing methods and which has not been used before.

- It requires significant changes in product design or packaging, product placement, product promotion or pricing.
- Exclude seasonal, regular and other routine changes in marketing methods.

9.1 During the three years 2014 to 2016, did your enterprise introduce:

	Yes	No
Significant changes to the aesthetic **design** or **packaging** of a good or service (*exclude changes that alter the product's functional or user characteristics – these are product innovations*)	☐	☐
New media or techniques for **product promotion** *(i.e. first time use of a new advertising media, a new brand image, introduction of loyalty cards, etc*)	☐	☐
New methods for **product placement** or sales channels *(i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc)*	☐	☐
New methods of **pricing** goods or services *(i.e. first time use of variable pricing by demand, discount systems, etc)*	☐	☐

BUSINESS PROCESS INNOVATION: OM3

8. Organisational innovation

An organisational innovation is a new organisational method in your enterprise's business practices (including knowledge management), workplace organisation or external relations that has not been previously used by your enterprise.

- It must be the result of strategic decisions taken by management.
- Exclude mergers or acquisitions, even if for the first time.

8.1 During the three years 2014 to 2016, did your enterprise introduce:

	Yes	No
New **business practices** for organising procedures (i.e. first time use of supply chain management, business re-engineering, knowledge management, lean production, quality management, etc.)	☐	☐
New methods of **organising work responsibilities and decision making** (i.e. first time use of a new system of employee responsibilities, team work, decentralisation, integration or de-integration of departments, education/training systems, etc.)	☐	☐
New methods of **organising external relations** with other enterprises or public organisations (i.e. first time use of alliances, partnerships, outsourcing or sub-contracting, etc.)	☐	☐

BUSINESS PROCESS INNOVATION: OM4

A **business process innovation** is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and which has been implemented within the firm.

3.6 During the three years 2016 to 2018, did your enterprise introduce any of the following types of new or improved processes that differ significantly from your previous processes?

	Yes	No
Methods for producing goods or providing services (including methods for developing goods or services)	☐	☐
Logistics, delivery or distribution methods	☐	☐
Methods for information processing or communication	☐	☐
Methods for accounting or other administrative operations	☐	☐
Business practices for organising procedures or external relations	☐	☐
Methods of organising work responsibility, decision making or human resource management	☐	☐
Marketing methods for promotion, packaging, pricing, product placement or after sales services	☐	☐

IMPLEMENTING OM 2018 IN THE CIS

- **Business process innovation: choices made**
  - Comply with OM 2018 and allow, as far as possible, for comparison with previous definitions of process, organisational and marketing innovation
  - Merge „production methods“ and „methods in product and business process development“ since cognitive testing found that respondents confused the latter item with „any R&D activity“
  - Separate administration and management as this activity comprises quite different organisation methods
  - Add after sales services to marketing methods

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BUSINESS PROCESS INNOVATION: COMPARING OM 2018 AND CIS 2018

OM 2018		CIS 2018
1. Production of goods or services	→	Methods for producing goods or for providing services (incl. development methods)
2. Distribution and logistics	→	Logistics, delivery and distribution methods
3. Marketing and sales	→	Marketing methods for promotion, packaging, pricing, product placement, after sales services
4. Information and communication systems	→	Methods for information processing and communication
5. Administration and management	→	Methods for accounting or other administrative procedures
	↘	Business practices for organising procedures or external relations
6. Product and business process development	↘	Methods for organising work responsibility, decision making, human resource management

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BUSINESS PROCESS INNOVATION: COMPARING CIS 2016 AND CIS 2018

CIS 2016	CIS 2018
- Methods of manufacturing or producing goods or services	- Methods for producing goods or for providing services (incl. *develop. meth.*)
- Logistics, delivery and distribution methods	- Logistics, delivery and distribution methods
- Supporting activities for processes	- Methods for information processing and communication
	- Methods for accounting or other administrative procedures
- Business practices for organizing procedures - Methods of organising external relations - Methods for organising work responsibility and decision making	- Business practices for organising procedures or external relations - Methods for organising work responsibility, decision making, *human resource management*
- *Significant changes to design*, packaging - Media/techniques for product promotion - Methods for product placement - Methods of pricing	- Marketing methods for promotion, packaging, pricing, product placement, *after sales services*

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TRANSITION FROM CIS 2016 TO 2018

Description	Variable	CIS 2016	CIS 2018	Deviation	Approach to minimise deviation
Innovation-active enterprises	INNO	2.1, 3.1, 4.1, 8.1, 9.1	3.9	incl. abandoned or ongoing organisational or marketing innovation activities	none
Product or process innovation active enterprises	INNOACT	2.1, 3.1, 4.1,	3.1, 3.6 a)-d), 3.9 b)+ c)	incl. abandoned or ongoing organisational or marketing innovation activities, potentially excl. abandoned R&D activities aiming at product or process innovation	none
Innovative enterprises	INNOS	2.1, 3.1, 8.1, 9.1	3.1, 3.6	conceptually identical	-
Product innovative enterprises	INPDT	2.1	3.1	almost identical (2018 includes design changes)	none
Process innovative enterprises	INPCS	3.1	3.6 a)-d)	conceptually identical	-
Organisation innovative enterprises	INORG	8.1	3.6 e)+f)	conceptually identical	-
Marketing innovative enterprises	INMKT	9.1	3.6 g)	very close (2018 excludes design changes)	none
Enterprises with abandoned innovation activities	INABA	4.1 a)	3.9 c)	incl. abandoned organisational or marketing innovation activities, excl. abandoned R&D activities	none

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TRANSITION FROM CIS 2016 TO 2018

Description[1)]	Variable	CIS 2016[2)]	CIS 2018[2)]	Deviation	Approach to minimise deviation
Enterprises with ongoing innovation activities	INONG	4.1 b)	3.9 b)	incl. ongoing organisational or marketing innovation activities, excl. ongoing R&D activities	none
R&D performers	RRD	5.1 a)+b)	3.9 d)	conceptually identical	-
Total innovation expenditure	EXPTOT	5.2 f)	3.10 a)+b)+c)	incl. expenditure on organisational or marketing innovation activities	EXPTOT when INPDT or INPCS or INABA or INONG or RRD is "yes"
Share of turnover from new-to-market product innovation	NEWMAR_TURN	2.4	3.3	almost identical (2018 includes design changes)	none
Share of turnover from only new-to-firm product innovation	NEWFRM_TURN	2.4	3.3	almost identical (2018 includes design changes)	none
Enterprises with cooperation on innovation activities	CO_ALL	7.2	3.14 a)+b)	incl. cooperation on organisational or marketing innovation activities	CO_ALL when INPDT or INPCS or INABA or INONG or RRD is "yes"
Enterprises receiving public funding for innovation activities	FUNPUB	6.1	3.13 column B	incl. public funding for organisational or marketing innovation activities	FUNPUB when INPDT or INPCS or INABA or INONG or RRD is "yes"

IMPACT OF CHANGES – RESULTS FROM THE GERMAN CIS 2018

- **Method**
  - Compare responses of firms that participated both in CIS 2016 & CIS 2018
  - Reference point: change in firms that participated both in CIS 2014 & CIS 2016
  - Data: German CIS (which is based on a panel sample)
  - Analysis of sample responses (no weighted data!)

IMPACT OF CHANGES: PRODUCT INNOVATION

(share in all firms, %)	**2016**	**2018**	*2014*	*2016*
Goods	**22**	**24**	*24*	*22*
Services	**14**	**20**	*12*	*13*
Product Innovator	**38**	**37**	*36*	*38*
	n = 3220		n = 3407	

* 2016: including marketing innovation in design

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

IMPACT OF CHANGES: BUSINESS PROCESS INNOVATION

(share in all firms, %)	2016	2018	*2014*	*2016*
Methods for goods/service production	**17**	**21**	*17*	*17*
Logistics, distribution methods	**6**	**10**	*6*	*6*
Methods for information processing	**12**	**28**	*12*	*14*
Methods for administrative operations		**20**		
Practices for business organisation	**29**	**17**	*30*	*28*
Methods for work organisation	**24**	**24**	*24*	*23*
Marketing methods	**28**	**17**	*30*	*26*
Process innovator (OM3a)	**30**	**41**	*26*	*30*
Process innovator (OM3b)		**38**		
Process innovator (OM4)	**55**	**49**	*55*	*54*
	n = 3220		n = 3407	

OM3a: Methods for goods/service production, logistics/distribution methods, methods for information processing, methods for administrative operations

OM3b: Methods for goods/service production, logistics/distribution methods, methods for information processing

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

IMPACT OF CHANGES: TOTAL INNOVATORS

Base: OM3 (share in all firms, %)	**2016**	**2018**	*2014*	*2016*
Product innovation only	**19**	**12**	*18*	*19*
Both product & process innovation	**19**	**25**	*18*	*19*
Process innovation only	**11**	**16**	*9*	*11*
Innovator share	**49**	**53**	*45*	*49*

Base: OM4 (share in all firms, %)	**2016**	**2018**	*2014*	*2016*
Product innovation only	**10**	**8**	*9*	*10*
Both product & process innovation	**33**	**29**	*34*	*33*
Process innovation only	**21**	**20**	*21*	*20*
Innovator share	**64**	**57**	*63*	*64*
	n = 3220		n = 3407	

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

IMPACT OF CHANGES: INNOVATION FILTER

(share in all firms, %)	2016	2018	*2014*	*2016*
ongoing innov. act.	**36**	**35**	*37*	*37*
abandoned innov. act.	**12**	**9**	*14*	*11*
ongoing or abandoned	**38**	**37**	*38*	*38*

(share in all firms, %)	2016	2018	*2014*	*2016*
Innovation filter (OM3)	**55**	**59**	*53*	*54*
Innovation filter (OM4)	**68**	**62**	*68*	*67*
Difference	**13**	**3**	*15*	*13*
	n = 3220		n = 3407	

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

INNOVATION EXPENDITURE: OM3

5.2 **How much did your enterprise spend on each of the following innovation activities in 2016 only?** Innovation activities are defined in question 5.1 above. Include current expenditures (including labour costs, contracted-out activities, and other related costs) as well as capital expenditures on buildings and equipment.[7]

Please fill in '0' if your enterprise had no expenditures for an activity in 2016

Please estimate if you lack precise accounting data

In-house R&D (Include current expenditures including labour costs and capital expenditures on buildings and equipment specifically for R&D)	
External R&D	
Acquisition of machinery, equipment, software & buildings (Exclude expenditures on these items that are for R&D)	
Acquisition of existing knowledge from other enterprises or organisations	
All other innovation activities including design, training, marketing, and other relevant activities	
Total of the above innovation activities	

INNOVATION EXPENDITURE: OM4

3.10 How much did your enterprise spend on innovation and research and development (R&D) in 2018?

- Please note that question 3.10 refers, exceptionally, **only to the year 2018**, not the three year period 2016 to 2018.
- Please **tick 'none' for all categories** if you enterprise **did not have any expenditure on innovation and/or R&D** in 2018.

	Expenditures on innovation and R&D in 2018	
	Please estimate if you lack precise accounting data	*Please tick, if there were no such expenditures in 2018*
R&D performed in-house (Include current expenditures including labour costs and capital expenditures (buildings, machinery, equipment, software etc.) specifically for R&D)	__,___,___,000 €	☐ none
R&D contracted out to others (including enterprises in own enterprise group)	__,___,___,000 €	☐ none
All other innovation expenditures* **(i.e. excluding R&D)**	__,___,___,000 €	☐ none
Of which:		
Own personnel working on innovation	__,___,___,000 €	☐ none
Services, materials, supplies purchased from others for innovation	__,___,___,000 €	☐ none
Capital goods for innovation (acquisition of machinery, equipment, software, IPRs, buildings etc.)	__,___,___,000 €	☐ none

INNOVATION EXPENDITURE: ITEM NON-RESPONSE

(share in all innovation active firms, %)	2016 OM3 filter	2018 OM3 filter	2018 OM4 filter
Missing share: in-house R&D expenditure	**8**	**12**	**11**
Missing share: external R&D expenditure	**12**	**9**	**9**
Missing share: exp. on acqu. machinery etc.	**14**		
Missing share: exp. on other ext. knowledge	**13**		
Missing share: exp. on other activities	**17**		
Missing share: exp. on non-R&D expenditure		**29**	**29**
Missing share: personnel expenditure		**31**	**30**
Missing share: material/service expenditure		**31**	**30**
Missing share: capital expenditure	**14**	**29**	**28**
Missing share: total innovation expenditure	**16**	**30**	**30**
No. of missings (max: 7)	**0.9**	**1.7**	**1.7**
Share of enterprises in filter with all missing	**4**	**2**	**2**
	n = 1758	n = 1886	n = 1988

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

COOPERATION: OM3

7.2 During the three years 2014 to 2016, did your enterprise co-operate on any of your innovation activities with other enterprises or organisations? Innovation co-operation is active participation with other enterprises or organisations on innovation activities. Both partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

No ☐ *(Go to section 8)*
Yes ☐ *(Go to question 7.3)*

7.3 Please indicate the type of innovation co-operation partner by location

(Tick all that apply)

Type of co-operation partner	**[Your country]**	**Other Europe****	**All other countries**
A. Other enterprises within your enterprise group	☐	☐	☐
B. Suppliers of equipment, materials, components, or software	☐	☐	☐
C. Clients or customers from the private sector	☐	☐	☐
D. Clients or customers from the public sector*	☐	☐	☐
E. Competitors or other enterprises in your sector	☐	☐	☐
F. Consultants or commercial labs	☐	☐	☐
G. Universities or other higher education institutes	☐	☐	☐
H. Government or public research institutes	☐	☐	☐
I. Private research institutes	☐	☐	☐

COOPERATION: OM4

3.15 During the three years 2016 to 2018, did your enterprise co-operate* with other enterprises or organisations ?

	Yes	No
a) On R&D	☐	☐
b) On other innovation activities (excluding R&D)	☐	☐
c) On any other business activities	☐	☐

* Co-operation is active participation with other enterprises or organisations. Partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

If 'yes' to either option a) or b), go to question 3.16
Otherwise go to question 3.17

COOPERATION: OM4

3.16 Please indicate the type of innovation co-operation partner by location

Tick all that apply

Type of co-operation partner	[Your country]	Other EU* or EFTA**	All other countries
Private business enterprises outside your enterprise group	☐	☐	☐
Consultants, commercial labs, or private research institutes	☐	☐	☐
Suppliers of equipment, materials, components or software	☐	☐	☐
Enterprises that are your clients or customers	☐	☐	☐
Enterprises that are your competitors	☐	☐	☐
Other enterprises	☐	☐	☐
Enterprises within your enterprise group	☐	☐	☐
Universities or other higher education institutions	☐	☐	☐
Government or public research institutes	☐	☐	☐
Clients or customers from the public sector***	☐	☐	☐
Non-profit organisations	☐	☐	☐

IMPACT OF CHANGES: COOPERATION

(share in all innovation active firms, %)	**2016**	**2018**	*2014*	*2016*
R&D or innovation cooperation	**31**	**30**	*32*	*32*
R&D cooperation		**25**		
Other innovation cooperation		**12**		
Other cooperation		**16**		
Any cooperation		**39**		
	n = 1739		n = 1700	

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

PUBLIC FUNDING: OM3

6.1 During the three years 2014 to 2016, did your enterprise receive any public financial support for innovation activities from the following levels of government? Include financial support via tax credits or deductions, grants, subsidised loans, and loan guarantees. Exclude R&D and other innovation activities conducted entirely for the public sector* under contract.

	Yes	No
Local or regional authorities	☐	☐
Central government (including central government agencies or ministries)	☐	☐
The European Union (EU)	☐	☐
If yes, did your enterprise participate in the EU 7th Framework Programme for Research and Technical Development or in the Horizon 2020 Programme for Research and Innovation?	☐	☐

*The public sector includes government owned organisations such as local, regional and national administrations and agencies, schools, hospitals, and government providers of services such as security, transport, housing, energy, etc.

PUBLIC FUNDING: OM4

3.13 During the three years from 2016 to 2018, did your enterprise receive any public financial support from the following levels of government?

Include financial support via grants, subsidised loans, and loan guarantees. Exclude revenues from public sector* procurement contracts.

			If your enterprise received financial support: was part of this used for R&D or other innovation activities?	
	Yes	No	Yes	No
Local or regional authorities*	☐	☐	☐	☐
National government*	☐	☐	☐	☐
EU Horizon 2020 Programme for Research and Innovation	☐	☐	☐	☐
Other financial support from a European Union institution*	☐	☐	☐	☐

* Include financial support via grants, subsidised loans, and loan guarantees. Exclude financing of activities under contract by the public sector*. The public sector includes government owned organisations such as local, regional and national administrations and agencies, schools, hospitals, and government providers of services such as security, transport, housing, energy, etc.

IMPACT OF CHANGES: PUBLIC FUNDING

(share in all innovation active firms, %)	**2016**	**2018**	*2014*	*2016*
Public Funding for R&D/innovation	**31**	**29**	*30*	*30*
... from local/regional authorities	**8**	**10**	*9*	*9*
... from national authorities	**17**	**13**	*18*	*18*
... from EU framework programmes	**5**	**4**	*6*	*5*
... from other EU sources	**5**	**4**	*3*	*4*
Public Funding for any purpose		**37**		
	n = 1717		n = 1681	

Source: German Innovation Survey (Mannheim Innovation Panel), net sample analysis, no weighting

? QUESTIONS ?

- **Do you have any questions at this point?**
  - On the new concepts of product and business process innovation?
  - On measuring innovation expenditure?
  - …?
- **I do have a few questions to you:**
  - How did you implement OM 2018 in your innovation survey?
  - Did you make any attempts to enable comparison between OM3 and OM 2018 concepts, and if yes: what did you do?
  - Did you make any observations yet on likely changes of key innovation indicators (e.g. share of enterprises with innovations) due to the new OM 2018 concepts?

CHALLENGES OF PRODUCING INTERNATIONALLY COMPARABLE INNOVATION DATA

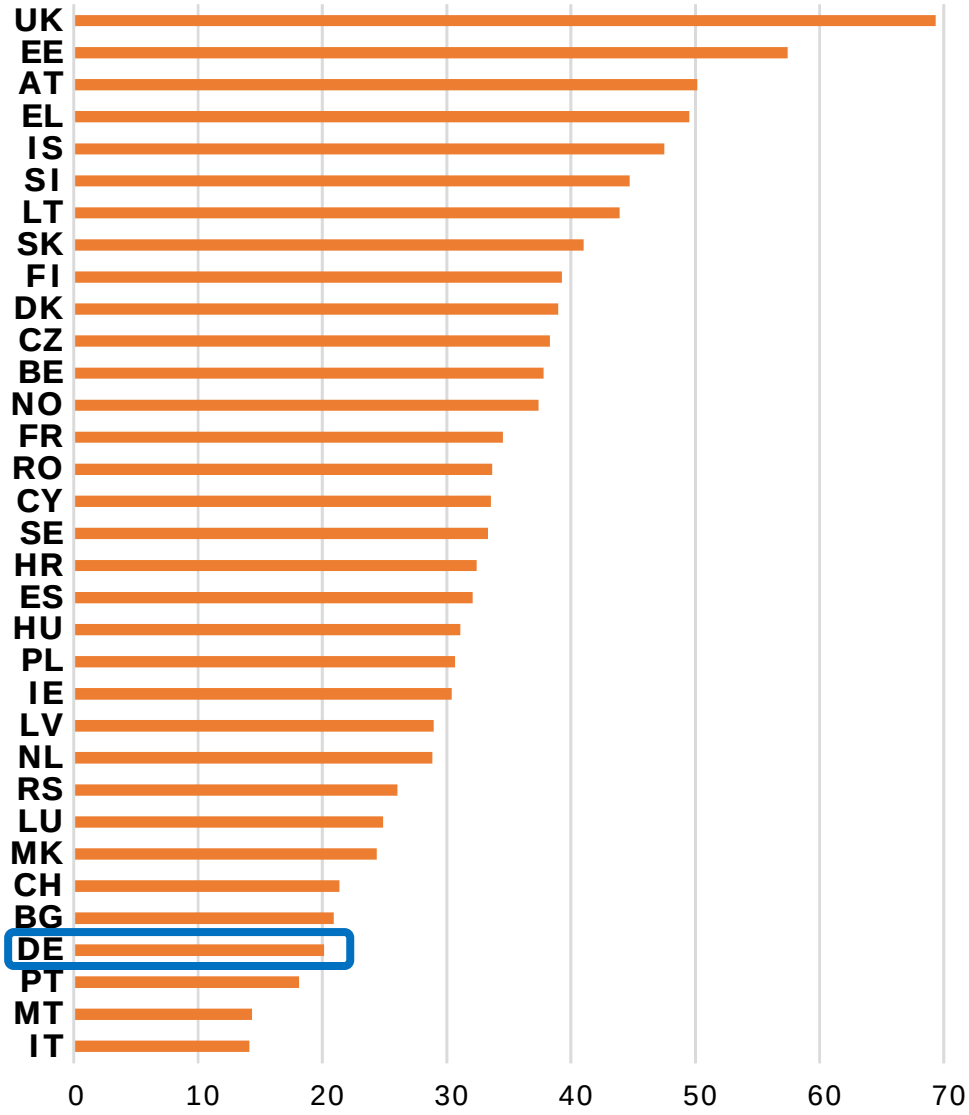
CHALLENGES OF PRODUCING INTERNATIONALLY COMPARABLE INNOVATION DATA

- **Substantial progress made**
  - Comprehensive set of innovation indicators
  - Coverage of 30+ European countries
  - Biennial update
- **Still room for improvement**
  - For some indicators, results do not look completely plausible
  - Harmonisation stops at model questionnaire and methodological guidelines

SOURCES FOR DISHARMONY

- **Questionnaire**
  - Translation into national language
  - Design follows national standards for business surveys
  - Sequence of questions, adding/deleting questions or question items
  - Prefilling of items
- **Survey methodology**
  - Wide variety of survey methods: voluntary/mandatory, paper/online, panel/cross-section sampling, combination with other surveys (e.g. R&D)
  - Choice of respondents in enterprises
- **Data analysis**
  - Differences in item non-response imputation, unit non-response correction
  - Different weighting methods

Share of Innovation Active Firms with Innovation Cooperation



Source: CIS 2016

EXAMPLE 1: TRANSLATION

7.2 During the three years 2014 to 2016, did your enterprise co-operate on any of your innovation activities with other enterprises or organisations? Innovation co-operation is active participation with other enterprises or organisations on innovation activities. Both partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

No	☐ *(Go to section 8)*
Yes	☐ *(Go to question 7.3)*

Translation of „co-operate“

share in all innovation active firms		any cooperation	with universities/ research institutes
a) „kooperieren“	2010	18%	12%
	2016	19%	12%
b) „zusammenarbeiten“ (working together)	2011	38%	30%
	2017	-	26%

ZEW

Share of turnover from product innovation by degree of novelty

Source: CIS 2016

EXAMPLE 2: QUESTION DESIGN

CIS Model Questionnaire

2.3 Were any of your product innovations (goods or services) during the three years 2014 to 2016:

		Yes	No
New to your market?	Your enterprise introduced a new or significantly improved product onto your market before your competitors (it may have already been available in other markets)	☐	☐
Only new to your enterprise?	Your enterprise introduced a new or significantly improved product that was already available from your competitors in your market	☐	☐

2.4 Using the definitions above, please give the percent of your total turnover[5] in 2016 from:

New or significantly improved products introduced during the three years 2014 to 2016 that were **new to your market** ☐☐☐ %

New or significantly improved products introduced during the three years 2014 to 2016 that were **only new to your enterprise** ☐☐☐ %

Products that were **unchanged or only marginally modified** during the three years 2014 to 2016 (include the resale of new products purchased from other enterprises) ☐☐☐ %

Total turnover in 2016 1 0 0 %

German Innovation Survey

2.1 During the years 2014 to 2016, did your enterprise introduce new or significantly improved products / services?

Yes ..... ☐ 1 No ..... ☐ 2 → *Please continue with* ***Section 3.***

2.2 How does your turnover (incl. exports) break down among the following types of products in 2016?

Newly introduced or significantly improved products / services during 2014 to 2016 ..... ca. ☐ %

Unchanged or slightly changed products / services since 2014
(incl. products / services developed and produced entirely by other enterprises) ..... ca. ☐ %

Total turnover in 2016: **1 0 0** %

2.3 Were any of the product innovations introduced during 2014 to 2016 new to the market, i.e. your enterprise was the first one to market these products / services?

Yes ..... ☐ 1 → What was the share in total sales of these market novelties in 2016? ..... ca. ☐ %
No ..... ☐ 2 ↓

Were any of these market novelties ... *(Tick all that apply)*
... new to the local / German market? ..... ☐ 1
... new to the European market? ..... ☐ 1
... new to the world market? ..... ☐ 1 → Share in total sales of these world market novelties in 2016? ca. ☐ %

FIRST CONCLUSIONS

- Innovation Surveys cannot rely on **global standards** for key concepts and variables that would be understood by **all firms** in the **same way**
- **Terminology** and **question design** is critical for reliable and comparable results
- Much **more research** would be required to identify likely impacts of **survey methodology**, e.g.
  - language/terminology
  - question design and sequencing
  - role of respondents (position in firm, experience)
  - survey method

? QUESTIONS ?

- **Do you have any questions at this point?**
  - …?
- **I do have a few questions to you:**
  - Is translation an issue for you when designing your innovation survey?
  - Did you experiment with different designs for the same question, and if yes: what are your findings?
  - Did you come about any other sources of comparability problems?

USING THE CIS FOR POLICY AND RESEARCH

USING THE CIS FOR POLICY

- Monitoring of innovation trends
- Scoreboards and benchmarking of countries
- Sector analysis of innovation performance
- Information on special topics (e.g. eco-innovation, public procurement of innovation, innovation in logistics)
- Analysing barriers to innovation
- Typology of firms by innovation
- Evaluation of innovation policy

EXAMPLE 1: EUROPEAN INNOVATION SCOREBOARD (EIS)

- Evaluating innovation performance of European countries (and non-European comparator countries) based on a multi-indicator approach
- CIS supplies 6 (of 27) indicators
- **Regional Innovation Scoreboard**: CIS supplies 6 of 17 indicators, CIS indicators restricted to SMEs (since CIS does not allow for the regionalisation of innovation activities of large firms with several locations)

EIS INDICATORS

FRAMEWORK CONDITIONS

- Human resources
  - 1.1.1 New doctorate graduates
  - 1.1.2 Population aged 25-34 with tertiary education
  - 1.1.3 Lifelong learning
- Attractive research systems
  - 1.2.1 International scientific co-publications
  - 1.2.2 Top 10% most cited publications
  - 1.2.3 Foreign doctorate students
- Innovation-friendly environment
  - 1.3.1 Broadband penetration
  - 1.3.2 Opportunity-driven entrepreneurship

INVESTMENTS

- Finance and support
  - 2.1.1 R&D expenditure in the public sector
  - 2.1.2 Venture capital expenditures
- Firm investments
  - 2.2.1 R&D expenditure in the business sector
  - 2.2.2 Non-R&D innovation expenditures
  - 2.2.3 Enterprises providing training to develop or upgrade ICT skills of their personnel

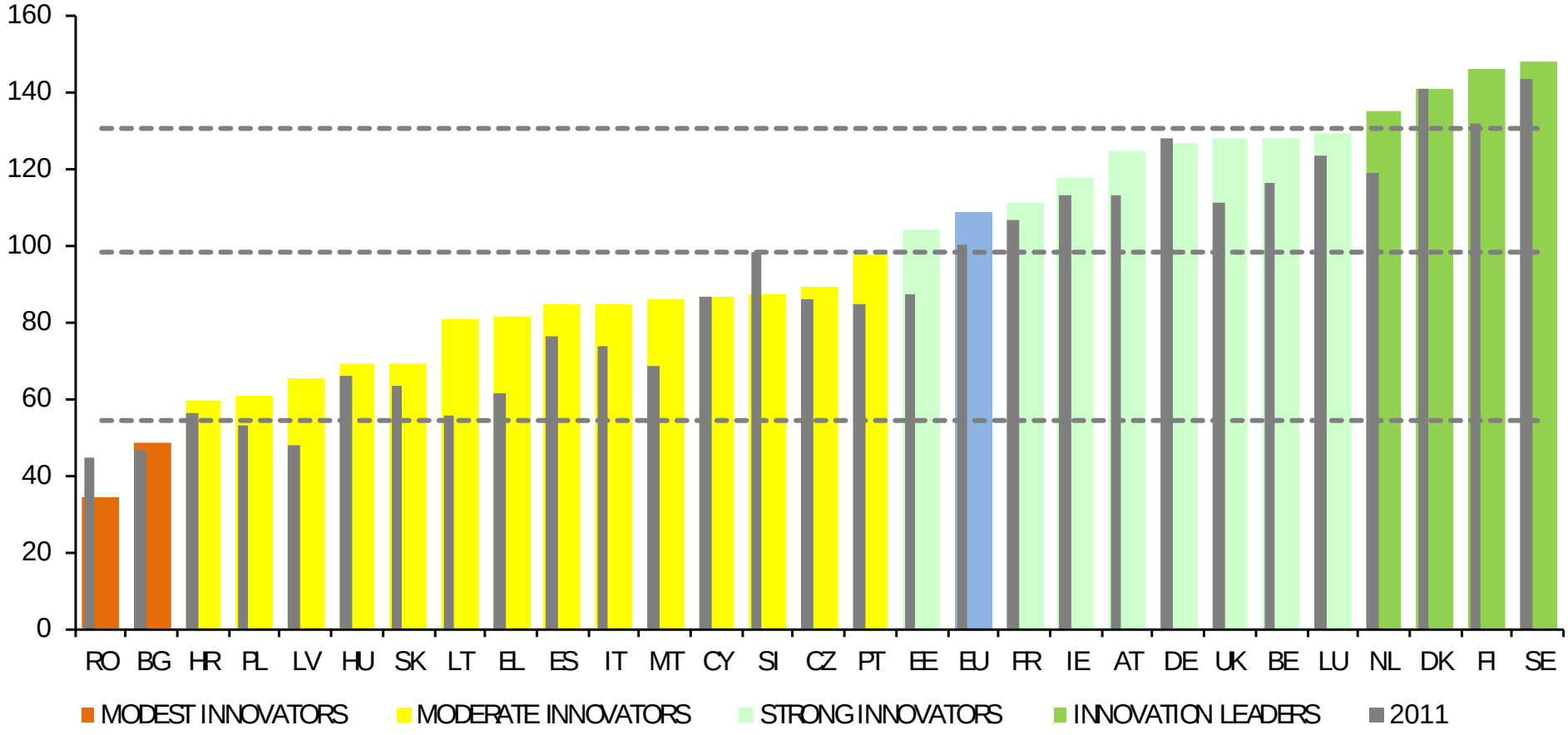
INNOVATION ACTIVITIES

- Innovators
  - 3.1.1 SMEs with product or process innovations
  - 3.1.2 SMEs with marketing or organisational innovations
  - 3.1.3 SMEs innovating in-house
- Linkages
  - 3.2.1 Innovative SMEs collaborating with others
  - 3.2.2 Public-private co-publications
  - 3.2.3 Private co-funding of public R&D expenditures
- Intellectual assets
  - 3.3.1 PCT patent applications
  - 3.3.2 Trademark applications
  - 3.3.3 Design applications

IMPACTS

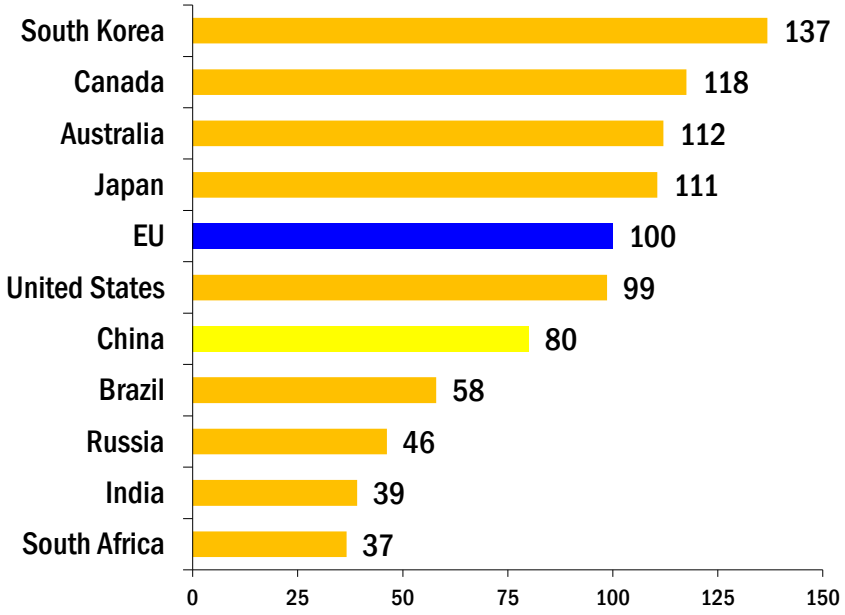
- Employment impacts
  - 4.1.1 Employment in knowledge-intensive activities
  - 4.1.2 Employment fast-growing enterprises of innovative sectors
- Sales impacts
  - 4.2.1 Medium and high-tech product exports
  - 4.2.2 Knowledge-intensive services exports
  - 4.2.3 Sales of new-to-market and new-to-firm product innovations

EIS RESULTS 2019

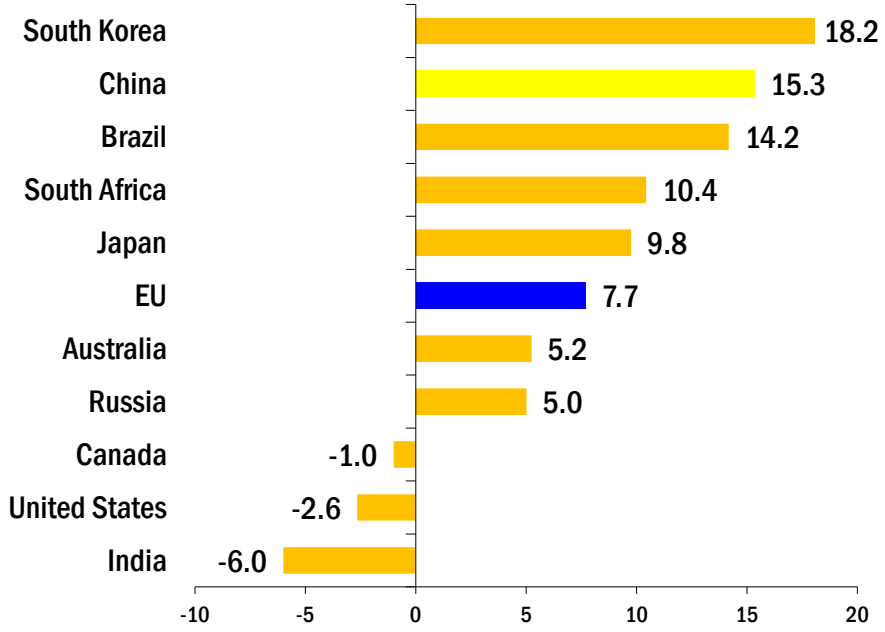


EIS – GLOBAL COMPARISON (no CIS indicators!)

Global innovation performance

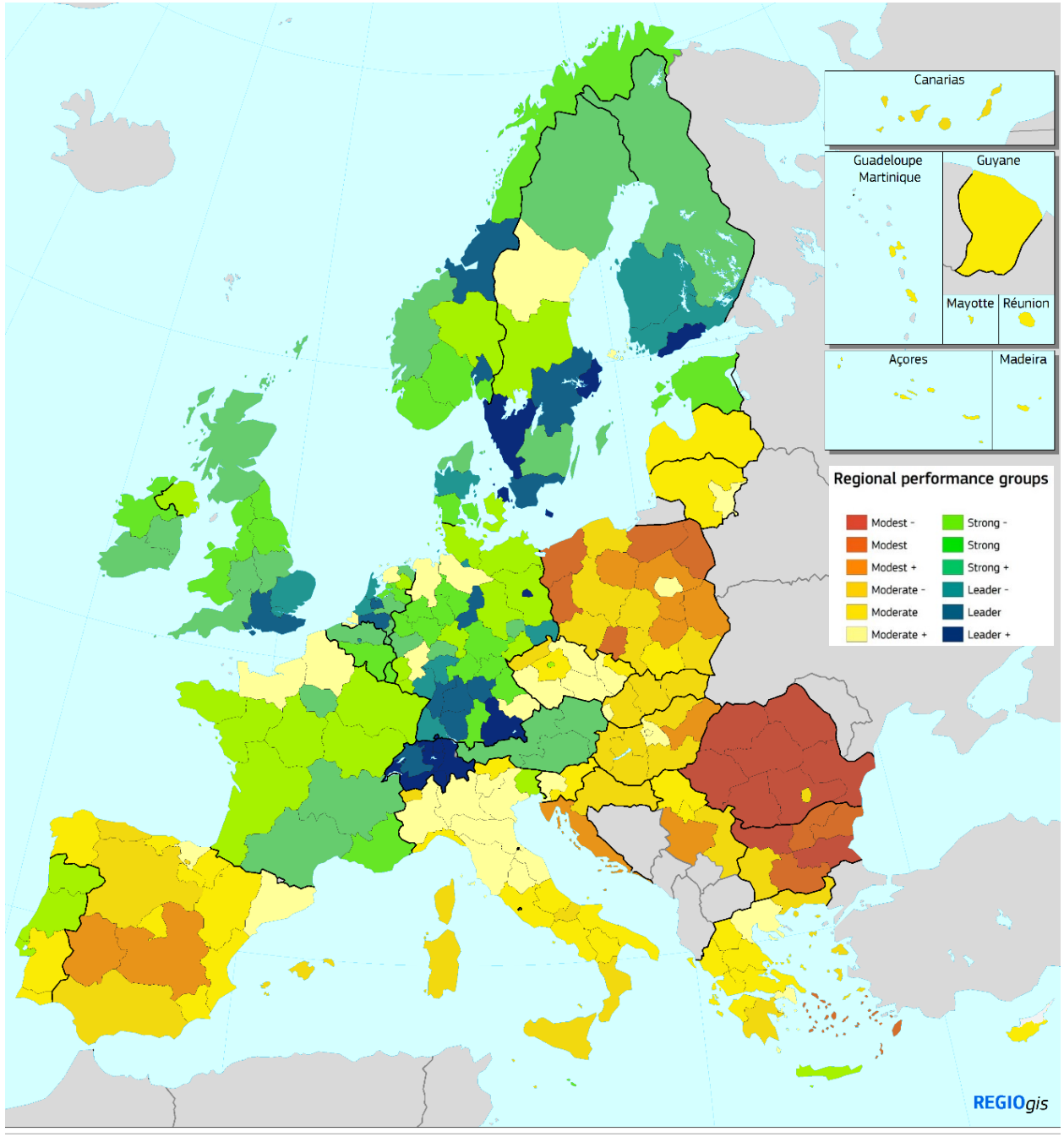


Global innovation growth rates



ZEW

REGIONAL INNOVATION SCOREBOARD



EXAMPLE 2: PROFILING OF FIRMS

- Analysing the innovation capabilities and performance of firms
- Considering that there are different ways to innovation, and firms may follow different paths depending on the market/institutional environment
- Linking different variables from the CIS
  - type of innovation (product/process, new-to-market)
  - source for innovation (in-house development, own R&D)
- Assign each firm to a single profile
  - no overlaps, balanced, descriptive (not normative)

EXAMPLE 2: PROFILING OF FIRMS

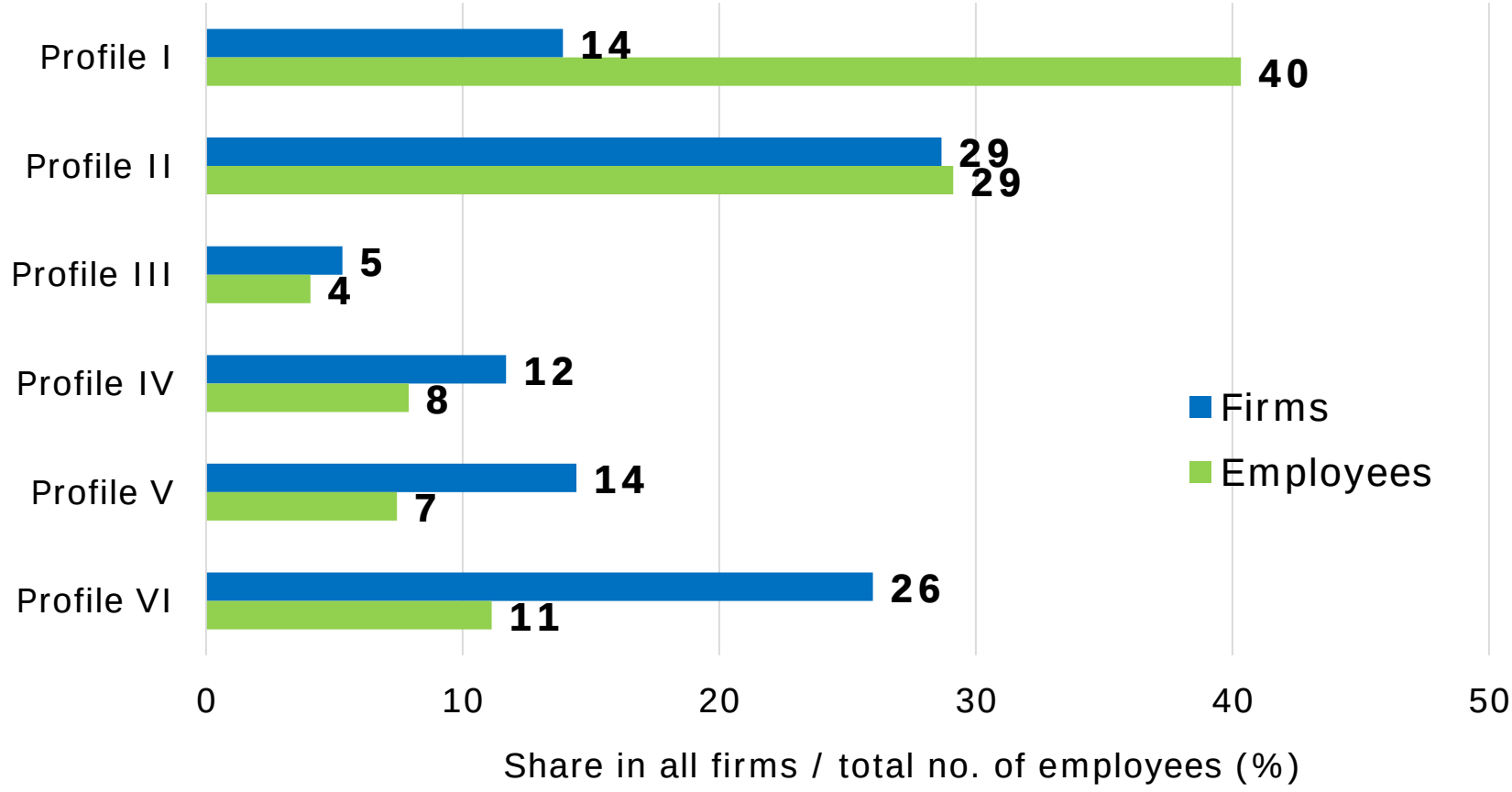
Innovators												Non-innovators				
with substantial own innovation capacities									with little or no own innovation capacities			with own innovation activities and/or potential				No innovation activity, no innovation potential
with new-to-market product innovation			assortment and/or marketing innovations (but no new-to-market product innovation)			only non-marketing business process innovation			Total	with R&D	without R&D	Total	with on-going or abandoned innovation activity		with innovation potential	
Total	with R&D	without R&D	Total	with R&D	without R&D	Total	with R&D	without R&D					with R&D	without R&D		
Profile I	*Profile I.A*	*Profile I.B*	***Profile II***	*Profile II.A*	*Profile II.B*	***Profile III***	*Profile III.A*	*Profile III.B*	***Profile IV***	*Profile IV.A*	*Profile IV.B*	***Profile V***	*Profile V.A*	*Profile V.B*	*Profile V.C*	***Profile VI***

No. of enterprises / No. of employed persons / Turnover

Innovation indicators: innovation expenditure, turnover share from product innovation, public support, hampering factors, etc.

Other indicators: geographical markets, firm strategies, use of IPRs, etc.

EXAMPLE 2: PROFILING OF FIRMS – FIRST, PRELIMINARY RESULTS (selected countries only)



USING THE CIS FOR RESEARCH

- Micro-data made available to researchers
  - Eurostat
  - Member States
- Micro-data allow a multitude of analyses:
  - Determinants of innovation activities and success
  - Effects of innovation on firm performance (Crépon, Duguet, Mairesse 1998) and employment (Harrison, Jaumandreu, Mairesse, Peters 2014)
  - Role of public support (input and output additionality)
  - Information sources and cooperation („open innovation“)
  - Complementarity of in-house and external knowledge
  - Eco-innovation, innovation in services
  - Innovation and exports

CIS SAFE CENTRE DATA

- Most comprehensive firm-level data set in Europe
- Micro data transmitted by Member States to Eurostat
- Access based on application procedure involving all countries whose data are applied for
- Two versions of the data set
  - Scientific use file: anonymised data (anonymisation done by Eurostat), data files are sent to researchers
  - Original data: access at Eurostat‘s Safe Centre only
- Micro-moment dataset: linking four surveys (CIS, ICT, SBS, business register), aggregate by sector, size and age and including information on statistical moments

EXAMPLE: EMPLOYMENT EFFECTS

Contents lists available at ScienceDirect

International Journal of Industrial Organization

journal homepage: www.elsevier.com/locate/ijio

Does innovation stimulate employment? A firm-level analysis using comparable micro-data from four European countries ☆

Rupert Harrison [a,b], Jordi Jaumandreu [c,d,*], Jacques Mairesse [e,f,g], Bettina Peters [h,i]

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Original article

Does innovation stimulate employment? Evidence from China, France, Germany, and The Netherlands

Jun Hou[1], Can Huang[2,*], Georg Licht[3], Jacques Mairesse[4,5,6], Pierre Mohnen[6,7], Benoît Mulkay[8], Bettina Peters[3,9], Yilin Wu[10], Yanyun Zhao[11], and Feng Zhen[12]

EXAMPLE: EMPLOYMENT EFFECTS

Table 6
Impacts of innovation on employment growth[a]: Contributions to average growth
Manufacturing and Services firms, 1998–2000.[b]

		Manufacturing				Services			
		France	Germany	Spain	UK	France	Germany	Spain	UK
Firms' employment growth	l	8.3	5.9	14.2	6.6	15.5	10.2	25.9	16.1
Productivity trend in production of old products	*trend*	−1.9	−7.5	−5.7	−6.8	−2.3	−3.0	1.0	−5.0
Gross effect of process innovation in old products	$\hat{\alpha}_1 w_{PO}$	−0.1	−0.6	0.3	−0.4	−0.1	0.1	−0.0	0.2
Sales growth in old products for *non product innovators*	$w_{NI} g_{NI}$	4.8	6.0	12.2	9.0	9.9	5.4	18.5	15.5
Non innovators		4.1	4.0	9.8	7.1	8.7	4.8	16.3	13.8
Process innovators only		0.7	2.0	2.4	1.8	1.2	0.6	2.2	1.6
Net sales growth of *product innovators* (new prods-subs.)	$w_I g_I$	5.5	8.0	7.4	4.8	8.0	7.6	6.5	5.4
Sales growth due to old products		−2.1	−8.9	−5.6	−5.1	−1.6	−7.4	−3.5	−3.4
Sales growth due to new products		7.7	16.9	13.0	9.9	.5	15.0	9.9	8.8

[a] Based on descriptives of Table 1a and Table 1b and regressions B and D of Table 3.
[b] Rates of growth for the whole period.

Table 6. Employment growth decomposition in manufacturing and services, France, Germany, and The Netherlands, 2002–2004, China, 1990–2006

	Manufacturing				Services		
	FR	NL	DE	CN[a]	FR	NL	DE
Employment growth total	−0.6	−1.8	1.8	1.6	10.7	3.3	5.9
Decomposed into							
Productivity trend in production of old products	−3.9	−7.3	−6.1	−13.0	3.1	−5.3	−1.8
Contribution of process innovations	0.0	−0.1	−0.7	–	0.0	0.0	−0.1
Output growth of old products for non-product innovators	1.2	3.1	3.1	11.6	5.0	6.5	4.4
Thereof for							
Non-innovators	0.7	2.1	1.6	11.6	4.0	5.5	3.9
Process innovators only	0.5	1.0	1.6	–	1.0	0.9	0.4
Net contribution of product innovations	2.2	2.4	5.5	3.0	2.7	2.2	3.4
Thereof							
Output reduction in old products	−8.3	−6.5	−12.3	−3.0	−3.3	−1.8	−7.0
Output increase in new products	10.5	8.9	17.8	6.0	6.0	4.0	10.4

[a]The growth rates over the 8 years between 1999 and 2006 have been converted to 3-year growth rates by multiplying all the figures for China by 3/8 to make them comparable to the European figures (assuming a constant growth rate over the whole period).

? QUESTIONS ?

- **Do you have any questions at this point?**
  - On how we actually provide data to researchers?
  - On how policy is using innovation indicators and data?
  - …?
- **I do have a few questions to you:**
  - Can researchers have access to the micro-data of your innovation survey, and if yes: through what way?
  - Did policy makers ever approach you with a request for adding certain topics to your innovation survey?
  - Do you use your innovation data for policy analysis?

OUTLOOK

NEXT STEPS IN THE CIS

- New **legal framework** from CIS 2022 onwards: full integration in European business statistics
- **Long-term planning** of special themes and new questions, based on a compilation of all innovation surveys & questions (worldwide) used so far
- Strengthening the **analytical use** of CIS data (with profiling of firms as a first step)
- Improving the provision of **regional data**, e.g. by expanding sample size
- Further **harmonisation**, based on analyses of impacts of survey methodologies

Thank you very much for your attention!

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