



The role of the EU in global value chains

Research project "Assessment of EU internal market integration"

Motivation of the project

- *Recent trends: income embodied in intra-EU trade growing less than in extra-EU*
- *Institutional dimension: single market not yet completed*
- *Ongoing debate on risk sharing: less or more symmetric business cycles?*
- *New analytical tools: [WIOD 2016 release](#)*



Key research questions to be answered throughout the project

- *How did the nature of value chains, in which EU members participate, evolve since 2000?*
- *Did specialization patterns changed significantly within the EU, both on a spatial and industrial basis?*
- *What is the impact of existing barriers for further integration, particularly regulation in the service sector?*
- *Did productivity increase through further specialization? In which industries? Which countries benefited more, which less?*

Presentation contents

VALUE ADDED GENERATION THROUGH PRODUCTION CHAINS

Definition, industry coverage, methodology

EMPIRICAL APPLICATIONS

*Reading the declining share of the EU economy
through value chains*

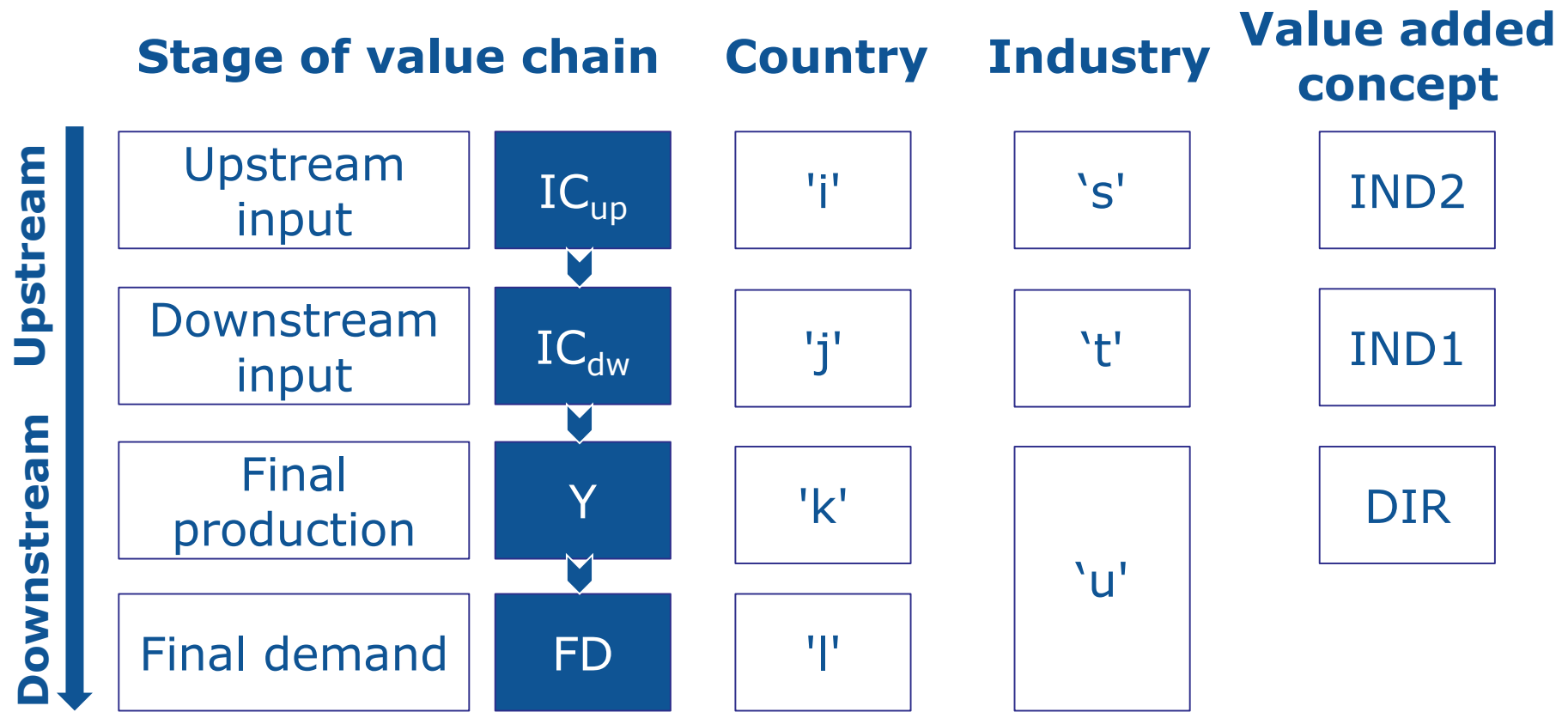
An insight into 'C21 – Pharma' value chain

VALUE ADDED GENERATION THROUGH PRODUCTION CHAINS

DEFINITION

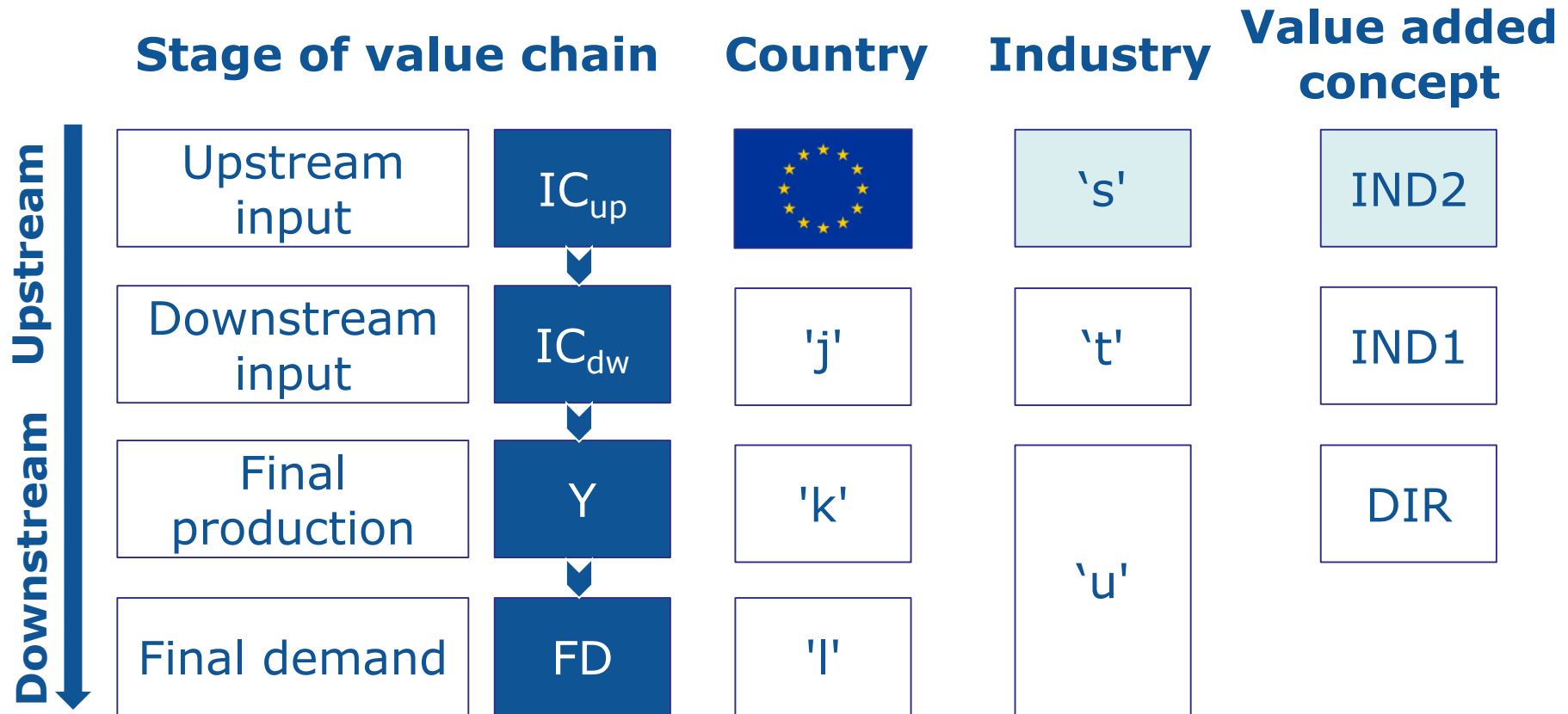


Definition of a value chain



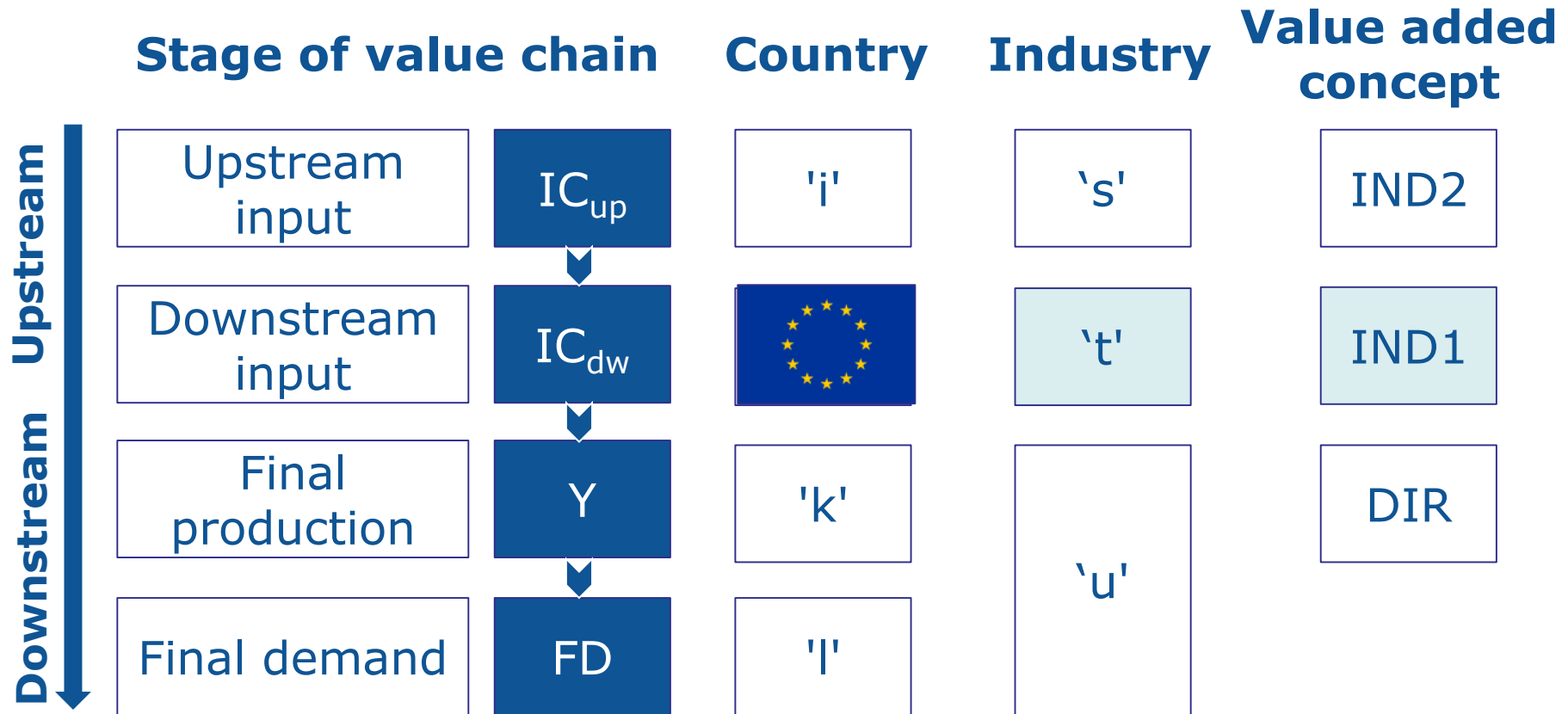


Indirect value added in the EU as upstream input supplier



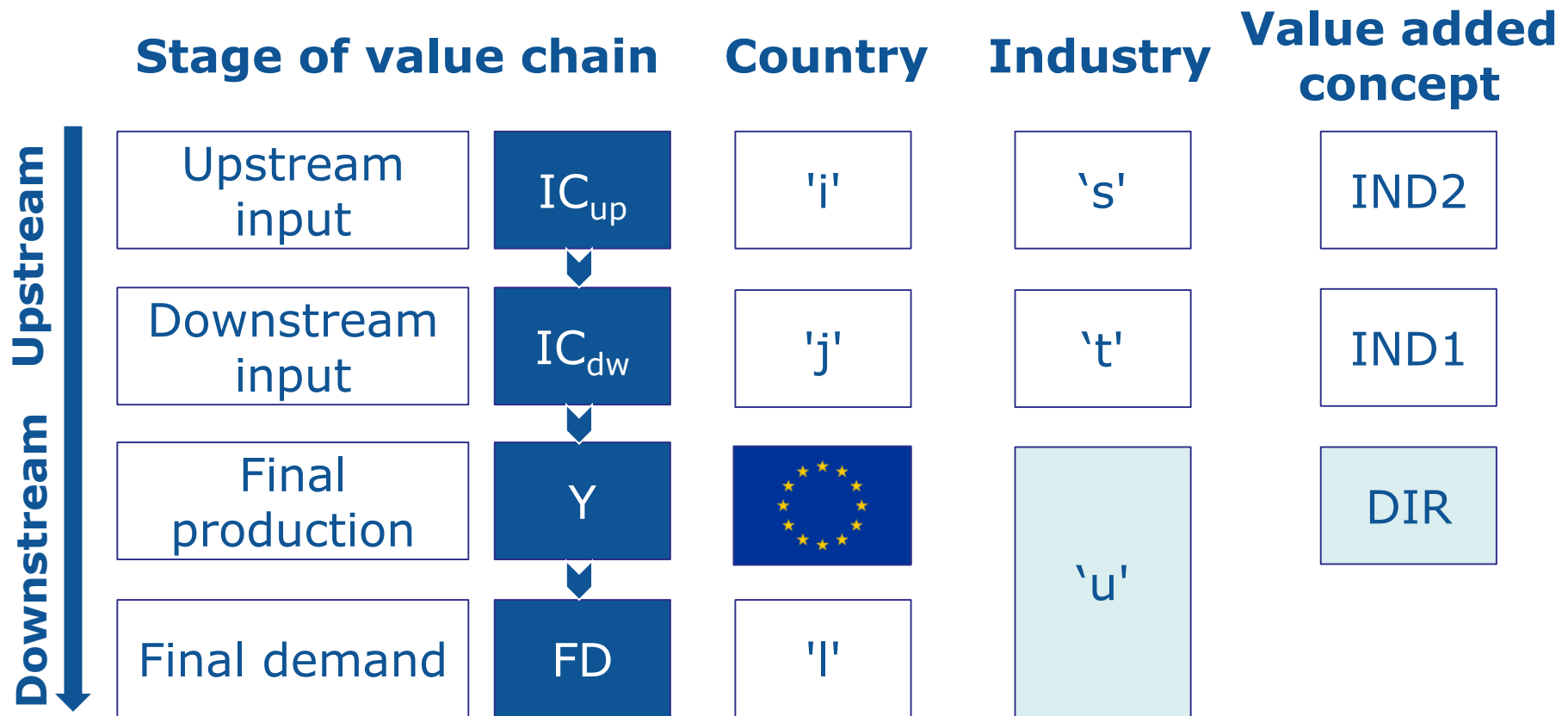


Indirect value added in the EU as downstream input supplier





Direct value added in the EU as final producer



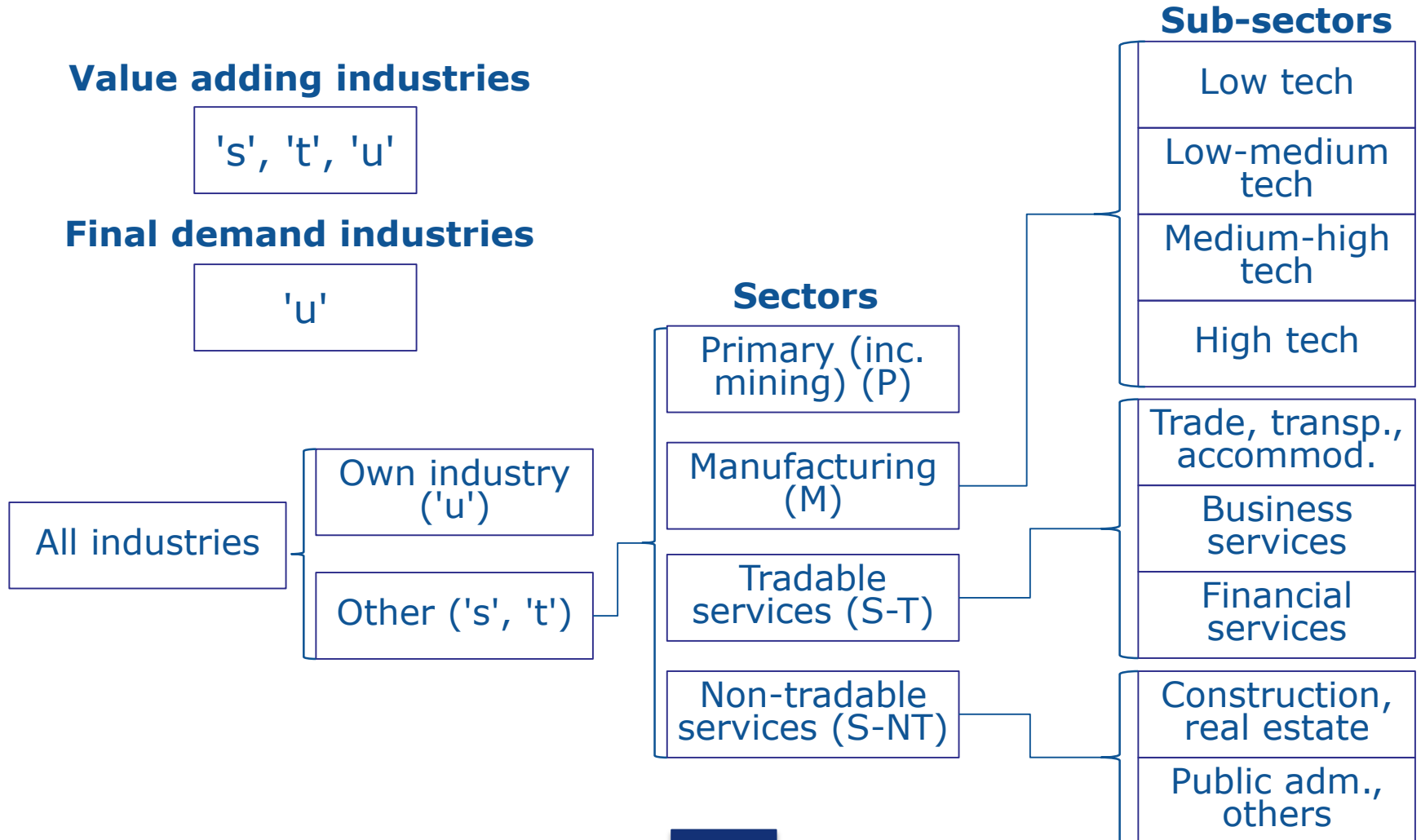


VALUE ADDED GENERATION THROUGH PRODUCTION CHAINS

INDUSTRY COVERAGE



Industry coverage





Industry classification: manufacturing according to technology intensity

Manufacturing (M)

C10-C12 Manufacture of food products, beverages and tobacco products
 C13-C15 Manufacture of textiles, wearing apparel and leather products
 C16 Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
 C17 Manufacture of paper and paper products
 C18 Printing and reproduction of recorded media
 C31_C32 Manufacture of furniture; other manufacturing
 D35 Electricity, gas, steam and air conditioning supply
 E36 Water collection, treatment and supply
 E37-E39 Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services

Low tech (M-L)

Low-medium tech (M-LM)

C19 Manufacture of coke and refined petroleum products
 C22 Manufacture of rubber and plastic products
 C23 Manufacture of other non-metallic mineral products
 C24 Manufacture of basic metals
 C25 Manufacture of fabricated metal products, except machinery and equipment
 C33 Repair and installation of machinery and equipment

Medium-high tech (M-MH)

C20 Manufacture of chemicals and chemical products
 C27 Manufacture of electrical equipment
 C28 Manufacture of machinery and equipment n.e.c.
 C29 Manufacture of motor vehicles, trailers and semi-trailers

High tech (M-H)

C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations
 C26 Manufacture of computer, electronic and optical products
 C30 Manufacture of other transport equipment

Industry classification: services according to their tradability and type of activities (1/2)

Tradable services (S-T)

G45 Wholesale and retail trade and repair of motor vehicles and motorcycles
 G46 Wholesale trade, except of motor vehicles and motorcycles
 G47 Retail trade, except of motor vehicles and motorcycles
 H49 Land transport and transport via pipelines
 H50 Water transport
 H51 Air transport
 H52 Warehousing and support activities for transportation
 H53 Postal and courier activities
 I Accommodation and food service activities

Trade, transp., accomod. (G&H&I)

Business services (J&M&N)

J58 Publishing activities
 J59_J60 Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
 J61 Telecommunications
 J62_J63 Computer programming, consultancy and related activities; information service activities
 M69_M70 Legal and accounting activities; activities of head offices; management consultancy activities
 M71 Architectural and engineering activities; technical testing and analysis
 M72 Scientific research and development
 M73 Advertising and market research
 M74_M75 Other professional, scientific and technical activities; veterinary activities
 N Administrative and support service activities

Financial services (K)

K64 Financial service activities, except insurance and pension funding
 K65 Insurance, reinsurance and pension funding, except compulsory social security
 K66 Activities auxiliary to financial services and insurance activities



Industry classification: services according to their tradability and type of activities (1/2)

Non-tradable services (S-NT)

Construction, real estate (F&L)

F Construction
L68 Real estate activities

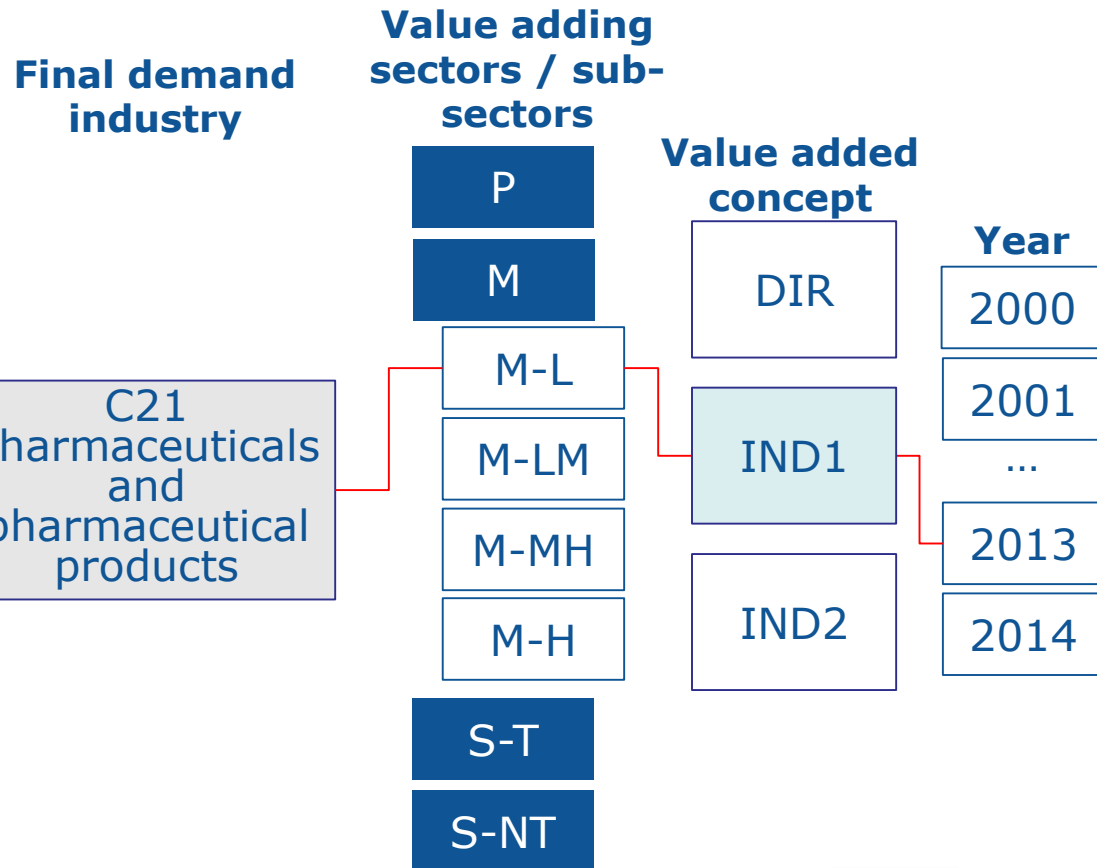
Public adm., others (O_U)

O84 Public administration and defence; compulsory social security
P85 Education
Q Human health and social work activities
R_S Other service activities
T Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U Activities of extraterritorial organizations and bodies



Empirical application: example

Value added throughout the value chain of pharma industry



Value added in low-tech manufactures of country 'j' in 2013 as downstream suppliers of inputs to the production of pharma products in country 'k' for final demand of country 'i', proportional to the participation of country 'i' in upstream stages of the value chain

Countries

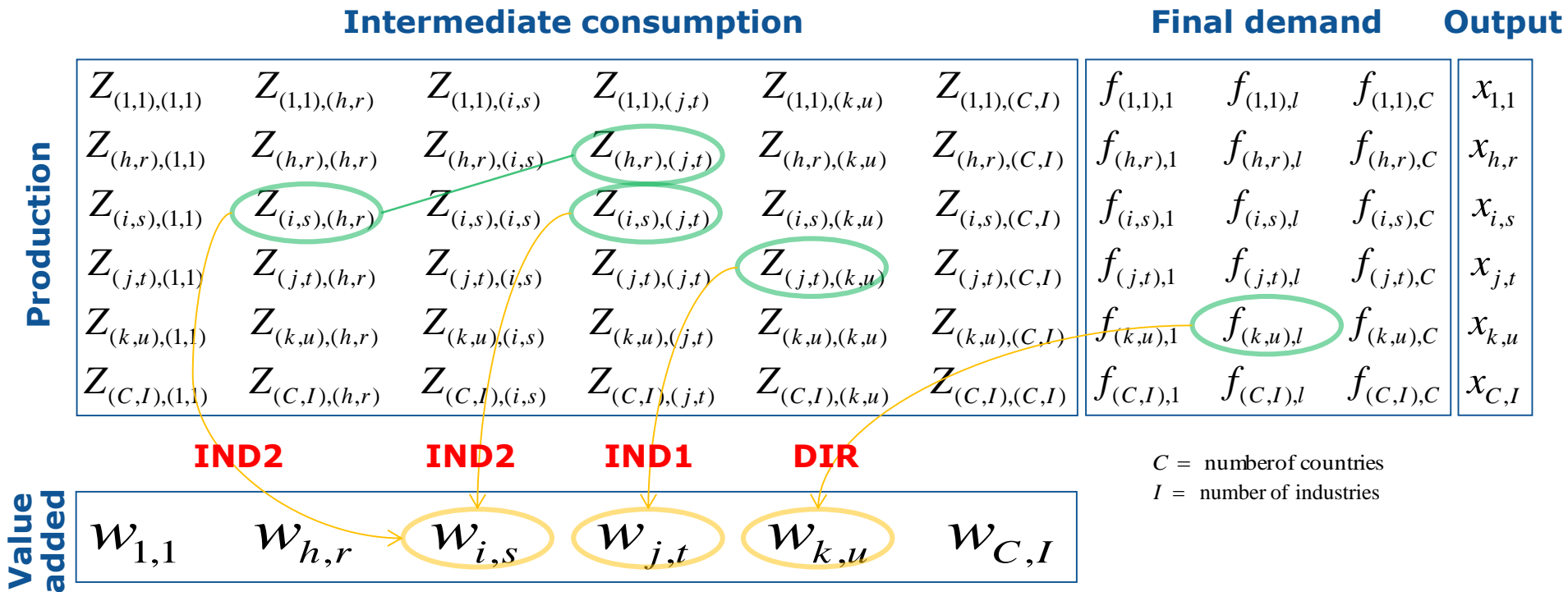
	i	1	2	3	4	5	6
j\k	1	1	1	1	1	1	1
1	1	152447.4	0.040099	0.085108	0.000326	0.037542	0.400107
2	1	0.02107	0.011273	8.73E-05	3.42E-07	7.91E-06	3.44E-05
3	1	0.154898	0.000715	0.044658	1.33E-06	0.000101	0.000293
4	1	0.002516	1.73E-05	5.62E-05	0.000254	1.63E-06	4.49E-06
5	1	0.123589	0.000133	0.000425	2.85E-06	0.030397	0.00046
6	1	0.517003	0.000532	0.000442	5.44E-07	0.000154	0.241105
7	1	0.200609	0.000368	0.0003	3.22E-07	3.22E-05	9.99E-05
8	1	2.78667					0.02346
9	1	0.00325					7E-06
10	1	0.00770					1E-05
11	1	0.41834					0.00724
12	1	0.754265	0.0004	0.000618	1.92E-06	0.000141	0.000424
13	1	0.103659	0.00021	0.000514	1.16E-06	0.000105	0.000148
14	1	0.000588	7.69E-07	9.75E-07	2E-09	1.67E-07	4.61E-07

(44x44)x(44x44) matrix

VALUE ADDED GENERATION THROUGH PRODUCTION CHAINS

METHODOLOGY

Multi-regional input output framework



Technological coefficients

Output

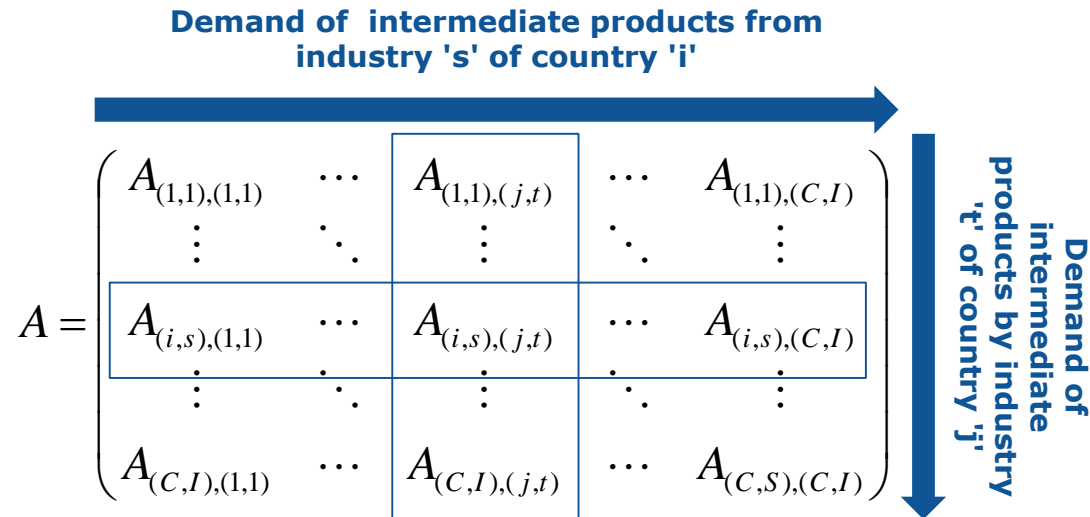
$$x = Z + f$$

Intermediate consumption

$$Z = A \times x$$

$$A_{(i,s),(j,t)} = \frac{Z_{(i,s),(j,t)}}{x_{j,t}}$$

Intermediate products from industry 's' of country 'i' used by industry 't' of country 'j' as a share of total output of industry 't' of country 'j'



Industrial inter-linkages

Production embodied in final demand (*Leontief inverse*)

$$x = A \times x + f \quad \longrightarrow \quad x = (I - A)^{-1} \times f = B \times f$$

Output of industry 's' of country 'i' embodied in one unit of final demand

$b_{(i,s),(l,u)}$

Output of industry 's' of country 'i' embodied in one unit of final demand of products from industry 'u' by country 'l'

$$B = \begin{pmatrix} b_{(1,1),(1,1)} & \cdots & b_{(1,1),(l,u)} & \cdots & b_{(1,1),(C,I)} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ b_{(i,s),(1,1)} & \cdots & b_{(i,s),(l,u)} & \cdots & b_{(i,s),(C,I)} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ b_{(C,I),(1,1)} & \cdots & b_{(C,I),(l,u)} & \cdots & b_{(C,I),(C,I)} \end{pmatrix}$$

Output supported by one unit of final demand of products from industry 'u' by country 'l'

Value added generation

Value added embodied in final demand

$$w = v \times B \times f$$

Ratio of value added over output of industry 's' of country 'i'

$$v_{i,s} = \frac{w_{i,s}}{x_{i,s}}$$

Final demand of products from industry 'u' of country 'k'

$$f_{(k,u)} = \sum_{l=1}^C f_{(k,u),l}$$

$$v = \begin{pmatrix} v_{1,1} & \cdots & 0 & \cdots & 0 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ 0 & \cdots & v_{i,s} & \cdots & 0 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ 0 & \cdots & 0 & \cdots & v_{C,I} \end{pmatrix}$$

$$f = \begin{pmatrix} f_{(1,1)} & \cdots & 0 & \cdots & 0 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ 0 & \cdots & f_{(k,u)} & \cdots & 0 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ 0 & \cdots & 0 & \cdots & f_{(C,I)} \end{pmatrix}$$

Value added decomposition

Indirect 2 (upstream input supply)

$$VAIND2_{i,s}^{(i,s)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)} = \sum_g \sum_q \sum_h \sum_r w_{i,s} \times b_{(i,s),(g,q)} \times A_{(h,r),(j,t)} \times A_{(j,t),(k,u)} \times f_{(k,u),l}$$

Indirect 1 (downstream input supply)

$$VAIND1_{j,t}^{(i,s)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)} = w_{j,t} \times A_{(j,t),(k,u)} \times f_{(k,u),l} \times \frac{VAIND2_{i,s}^{(i,s)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)}}{\sum_h \sum_r VAIND2_{h,r}^{(h,r)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)}}$$

Direct (producer)

$$VADIR_{k,u}^{(i,s)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)} = w_{k,u} \times f_{(k,u),l} \times \frac{VAIND1_{j,t}^{(j,t)\triangleleft(k,u)\triangleleft(l)}}{\sum_h \sum_r VAIND1_{h,r}^{(h,r)\triangleleft(k,u)\triangleleft(l)}} \times \frac{VAIND2_{i,s}^{(i,s)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)}}{\sum_h \sum_r VAIND2_{h,r}^{(h,r)\triangleleft(j,t)\triangleleft(k,u)\triangleleft(l)}}$$

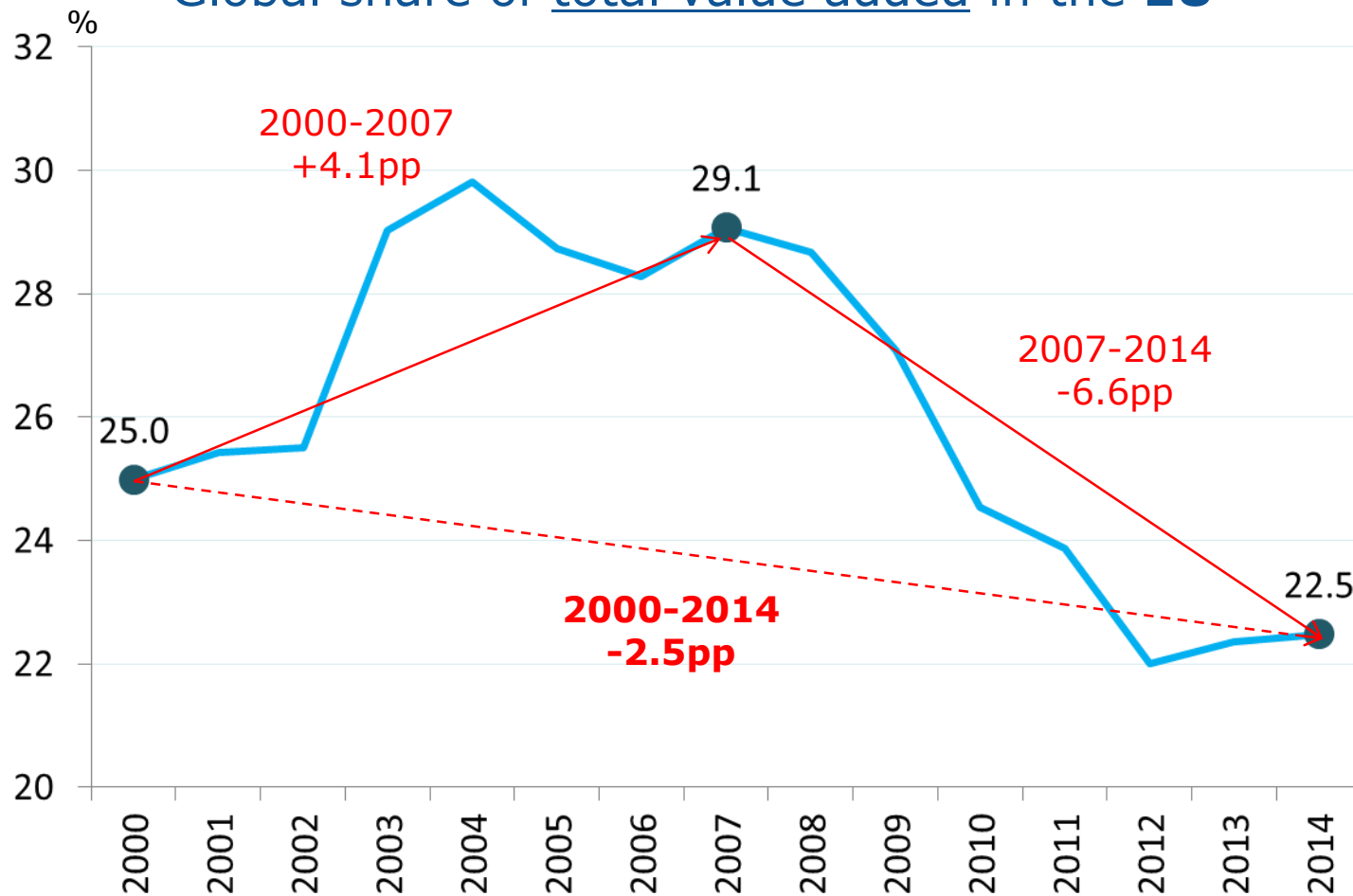
EMPIRICAL APPLICATIONS

*READING THE DECLINING SHARE
OF THE EU ECONOMY THROUGH
VALUE CHAINS*



EU losing share in world's economy

Global share of total value added in the **EU**

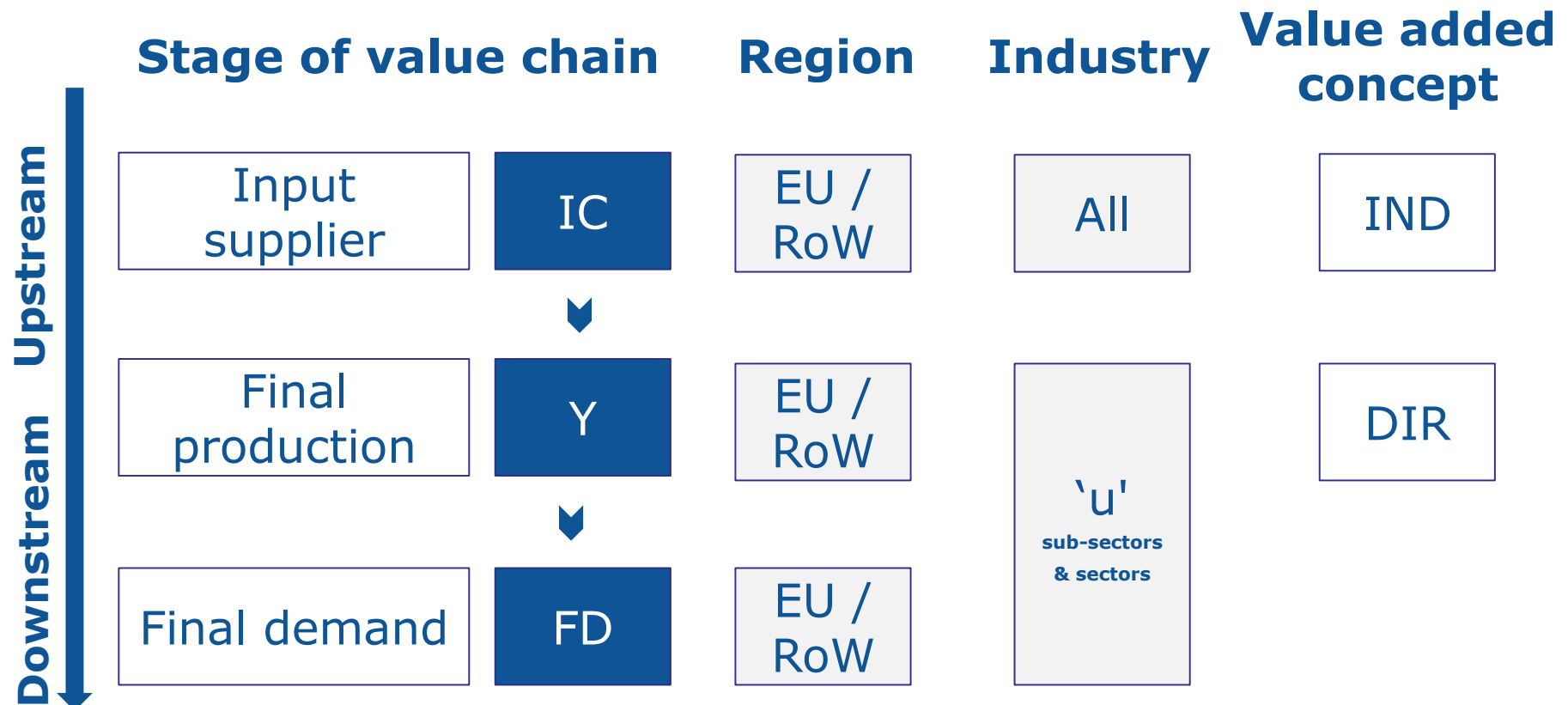


A few research questions (1/2)

- *How did the participation of the EU in value chains evolve during the last 15 years?*
- *Was that an homogenous process across periods and value chains?*
- *How did the composition of EU value added changed accordingly?*

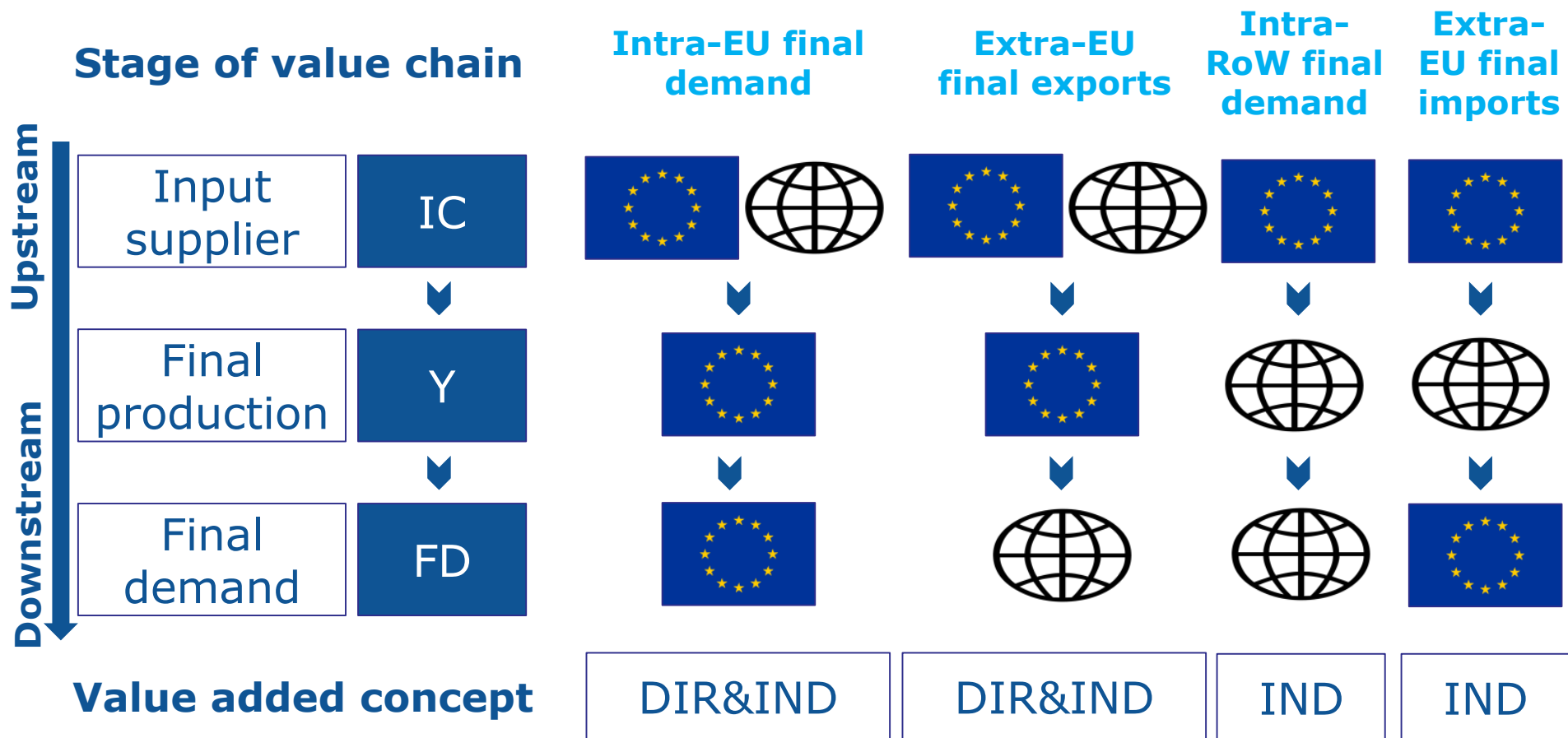


Using broad-defined value chains: definition





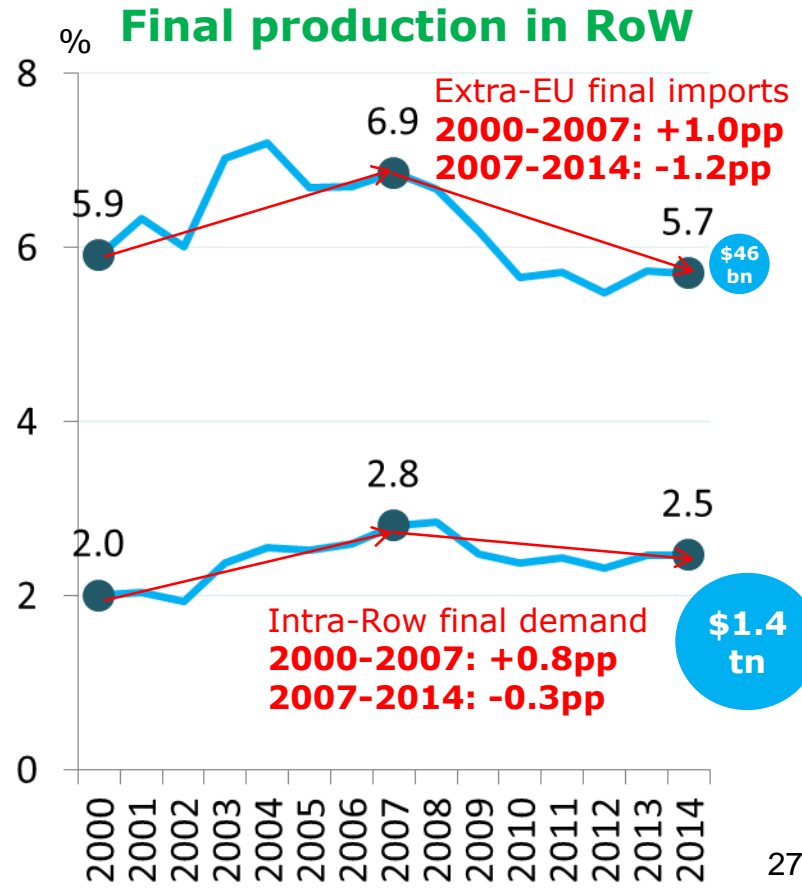
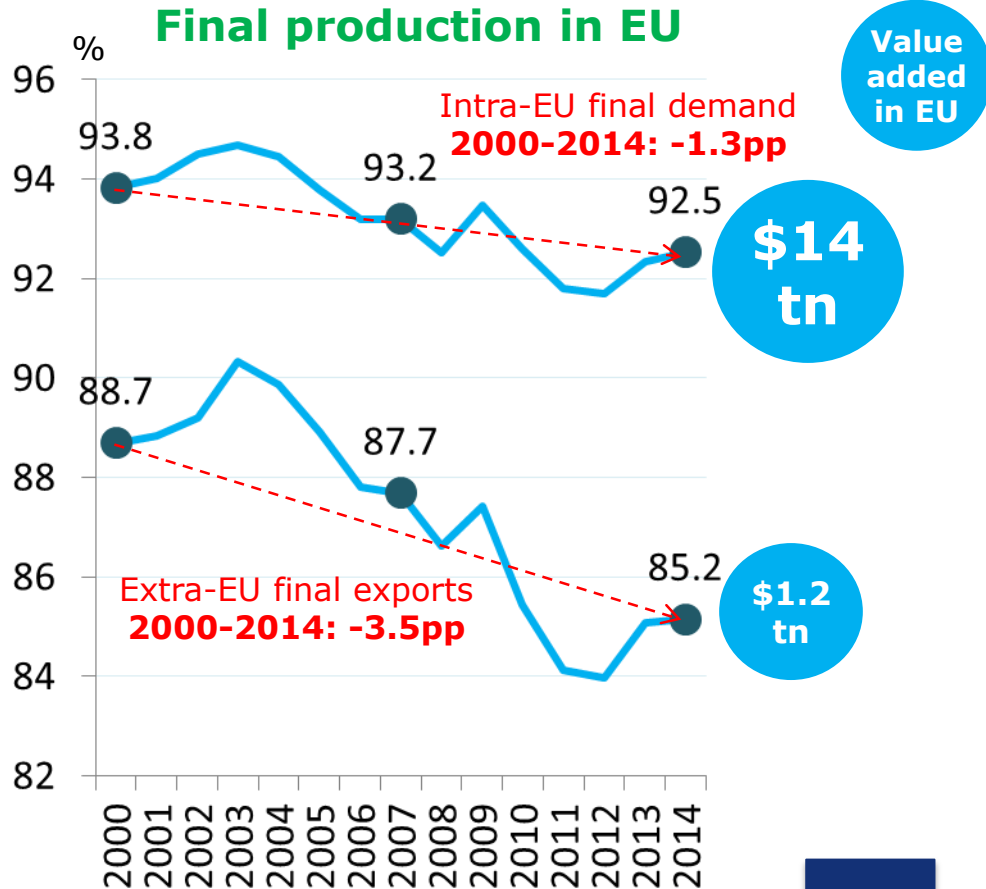
Value added in the EU through value chains





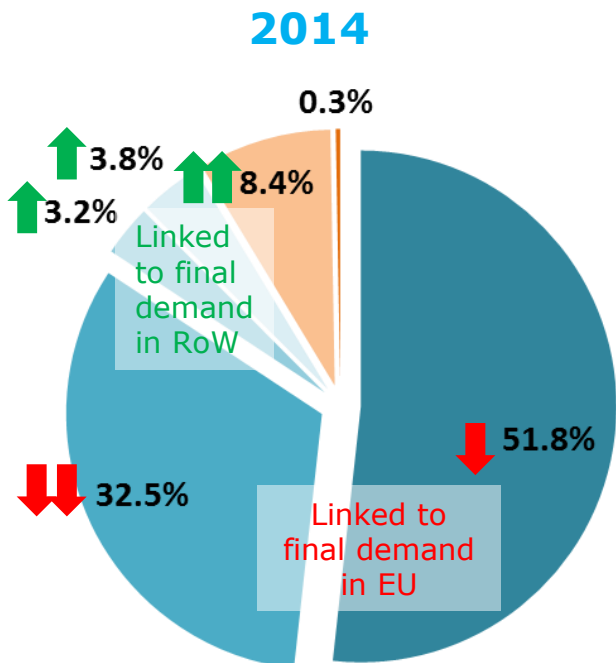
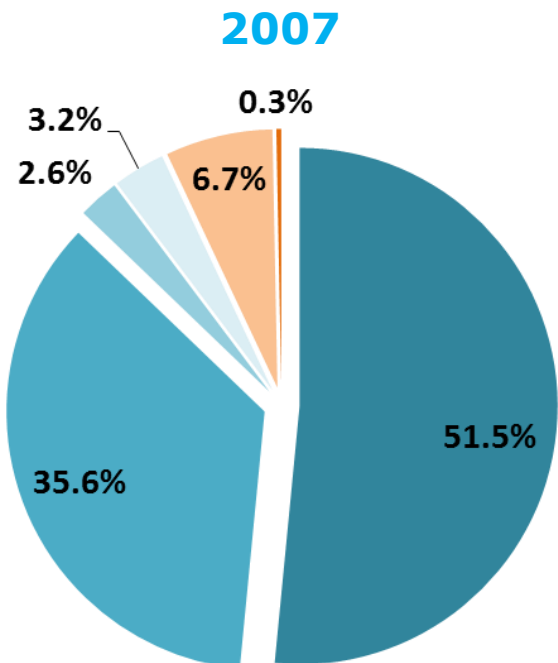
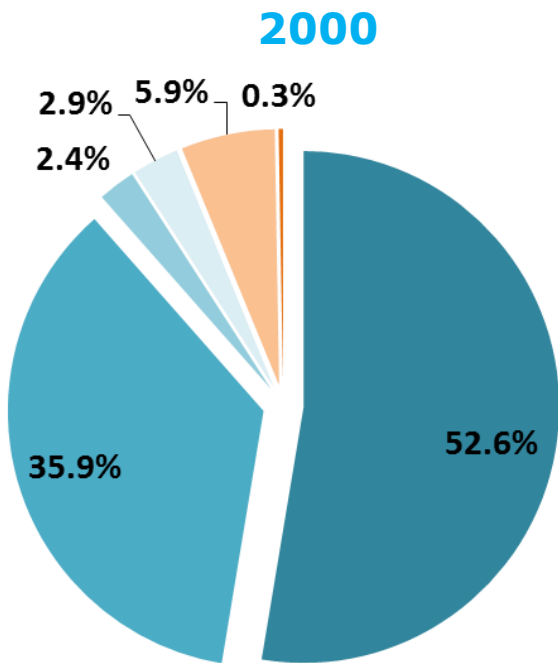
EU losing share in world's economy: particularly when final producer in VCs

Global share of total value added in the **EU**, *by value chain*





Changing composition of EU value added



- Direct: Intra-EU final demand
- Indirect: Intra-EU final demand
- Direct: Extra-EU final exports
- Indirect: Extra-EU final exports
- Indirect: Intra-RoW final demand
- Indirect: Extra-EU final imports

2000-2007

-1.1pp
-0.3pp
+0.2pp
+0.3pp
+0.8pp
=

2007-2014 (2000-2014)

+0.3pp (-0.8pp)
-3.1pp (-3.4pp)
+0.6pp (+0.8pp)
+0.6pp (+0.9pp)
+1.7pp (+2.5pp)
= (=)



A few research questions (2/2)

- *Which are the factors behind the loss of global economic relevance of the EU (demand, market share, fragmentation?)*
- *Which industries are contributing to a larger extent to this phenomenon?*
- *Are factors common across industries?*



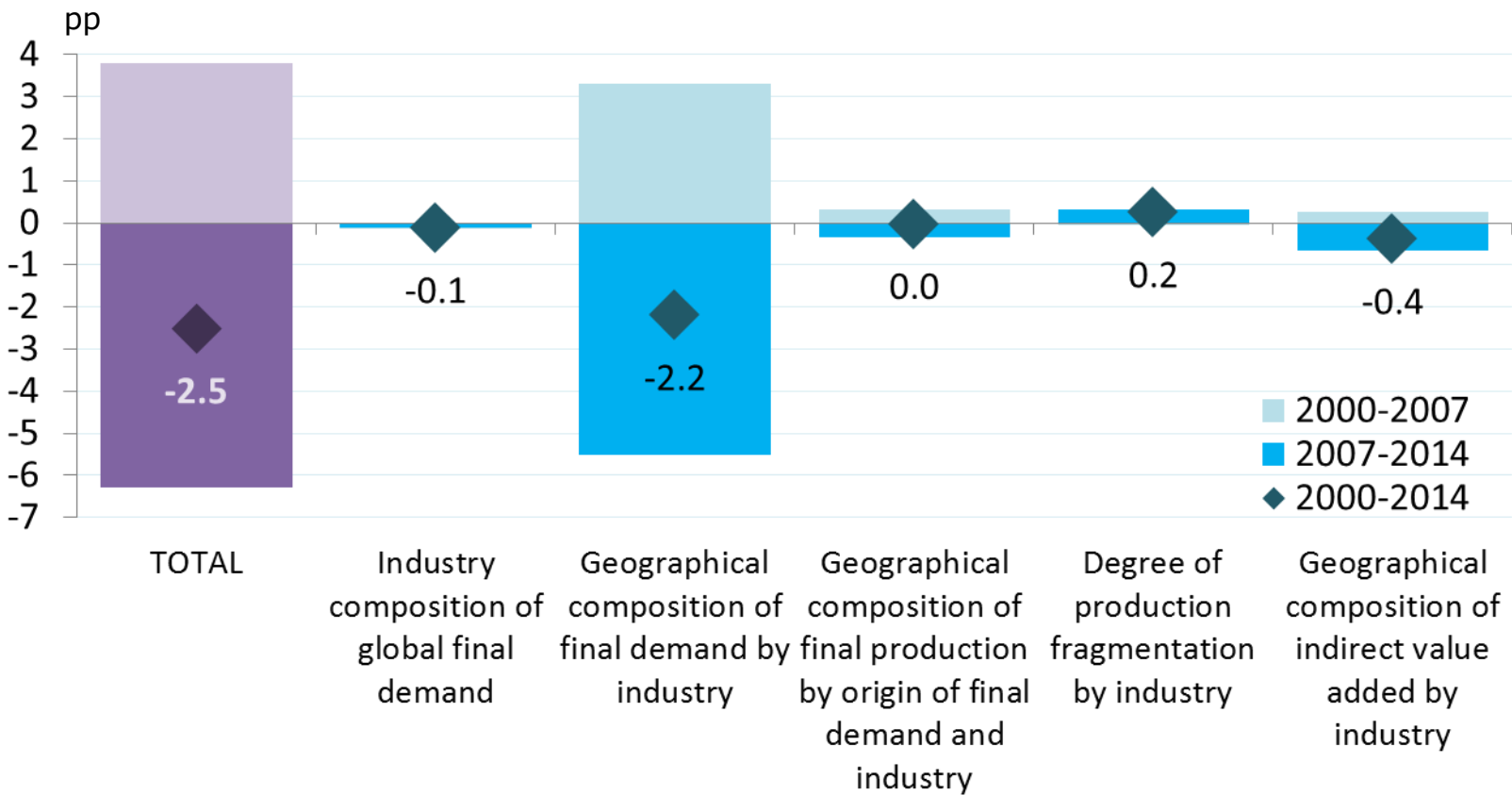
Dimensions of shift-share analysis

<p>Period</p>	<p>2000-2014 and sub-periods (2000-2007 & 2007-2014)</p>
<p>Industry coverage</p>	<p>Industries / sub-sectors and sectors of final demand</p>
<p>Factors</p>	<p>Industry composition of global final demand <i>Construction increased its global share in final demand to 13% in 2014 from 11% in 2000</i></p> <p>Geographical composition of final demand by industry <i>The share of EU in global final demand of motor vehicles decreased to 18% in 2014 from 27% in 2000</i></p> <p>Geographical composition of final production by origin of final demand <i>The share of EU in final supply of air transport services in Rest-of-World decreased from 5.6% in 2000 to 4.1% in 2014</i></p> <p>Degree of production fragmentation by industry <i>Indirect value added embodied in extra-EU final exports of basic metals increased by 7pp between 2000 and 2014 up to 74%</i></p> <p>Geographical composition of indirect value added by industry <i>The participation of the EU in indirect value added embodied in intra-EU final demand of health services declined to 80% in 2014 from 87% in 2000</i></p>

Examples

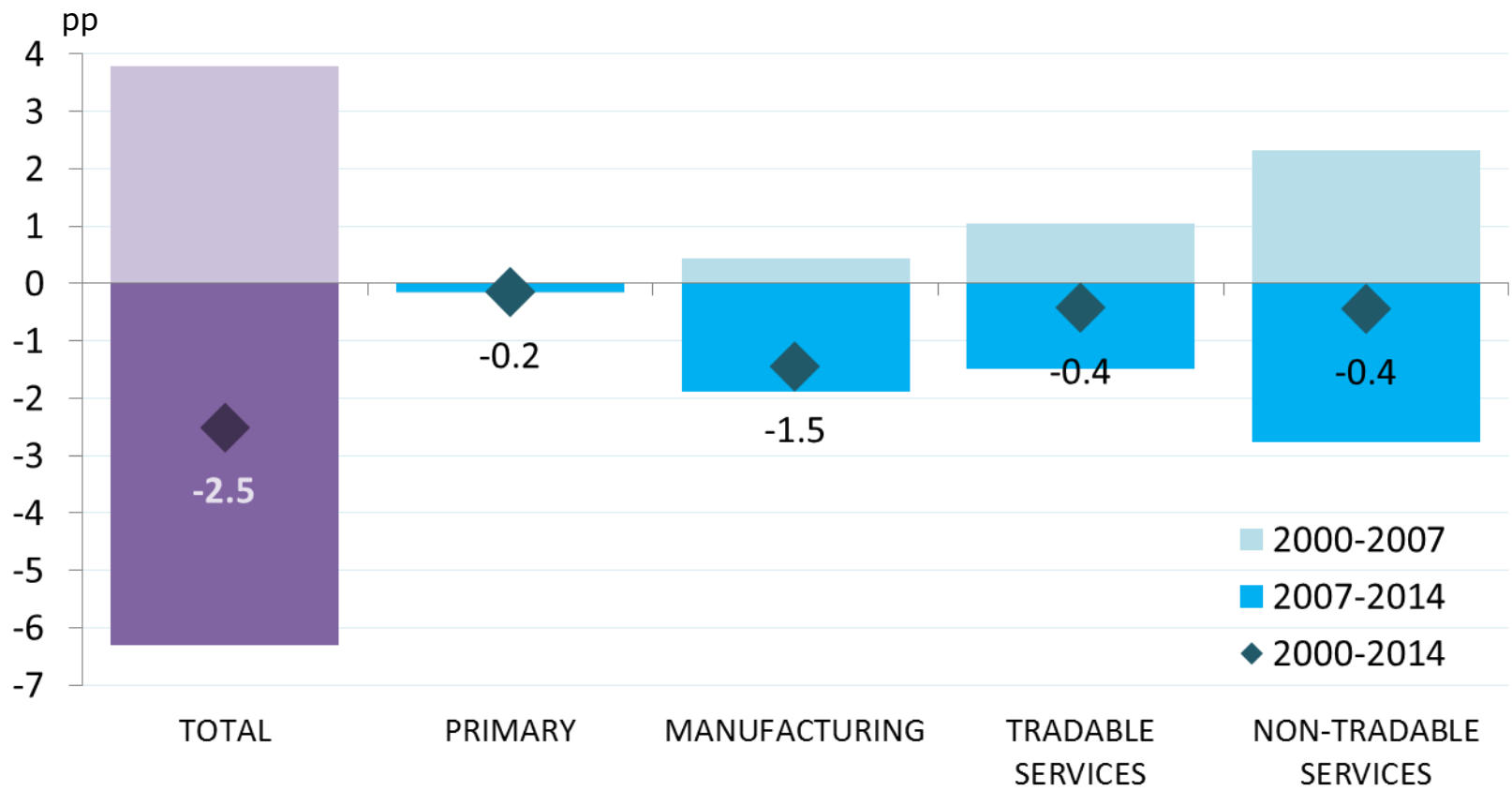


Contribution to change in global share of total value added in the EU (by factor)



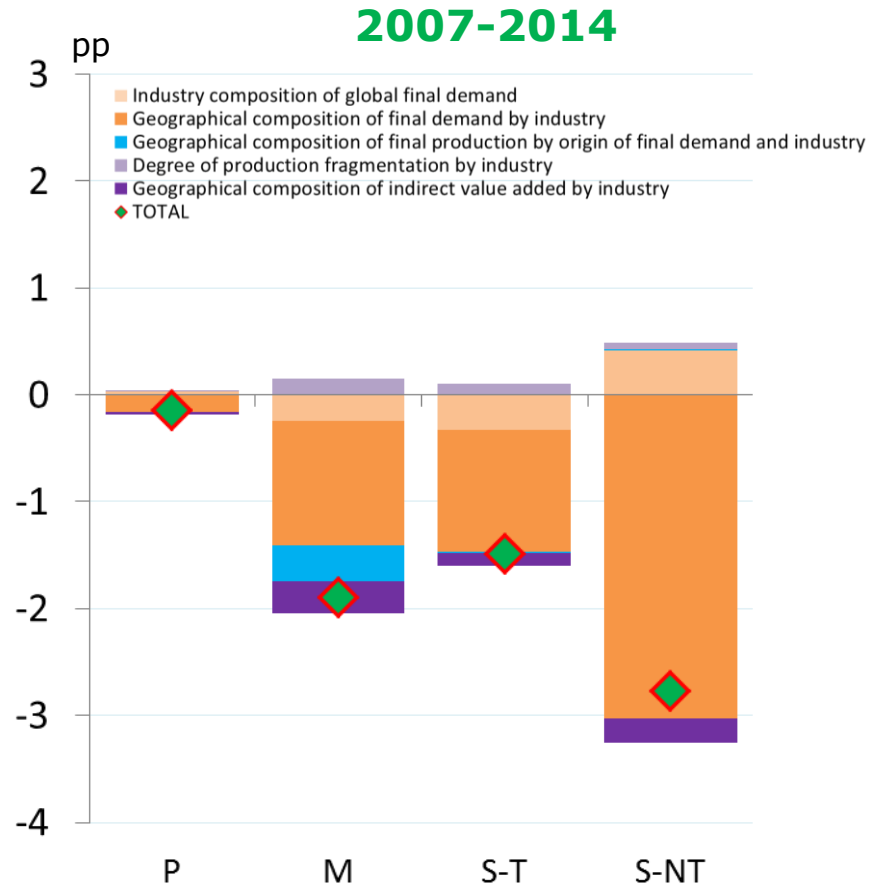
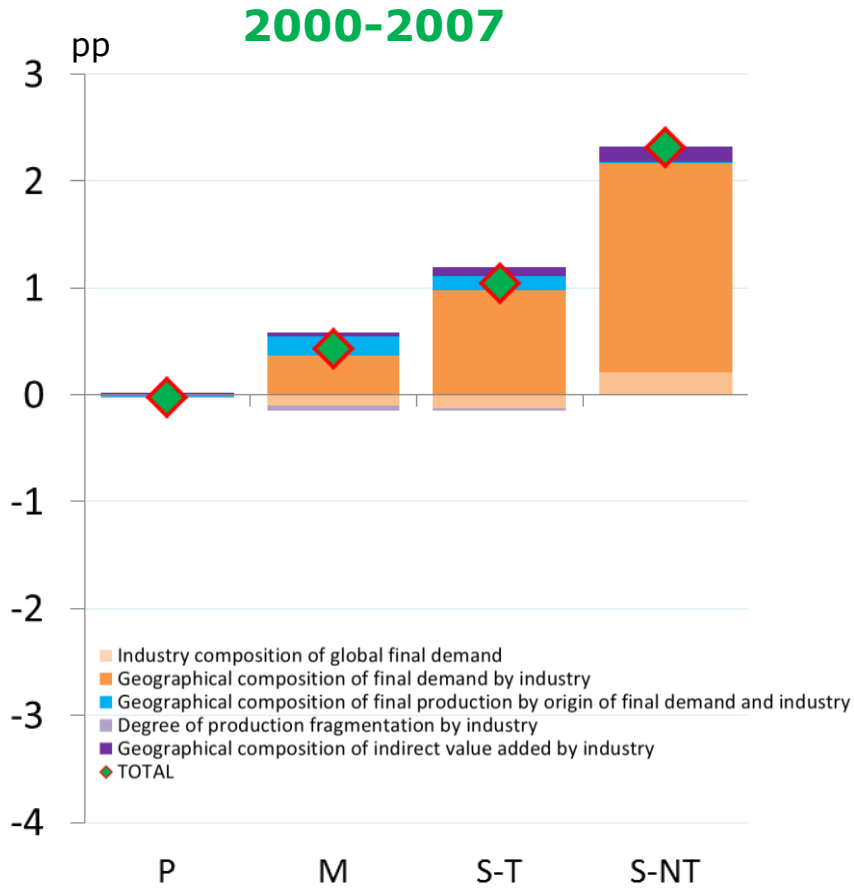


Contribution to change in global share of total value added in the EU (by sector of final demand)



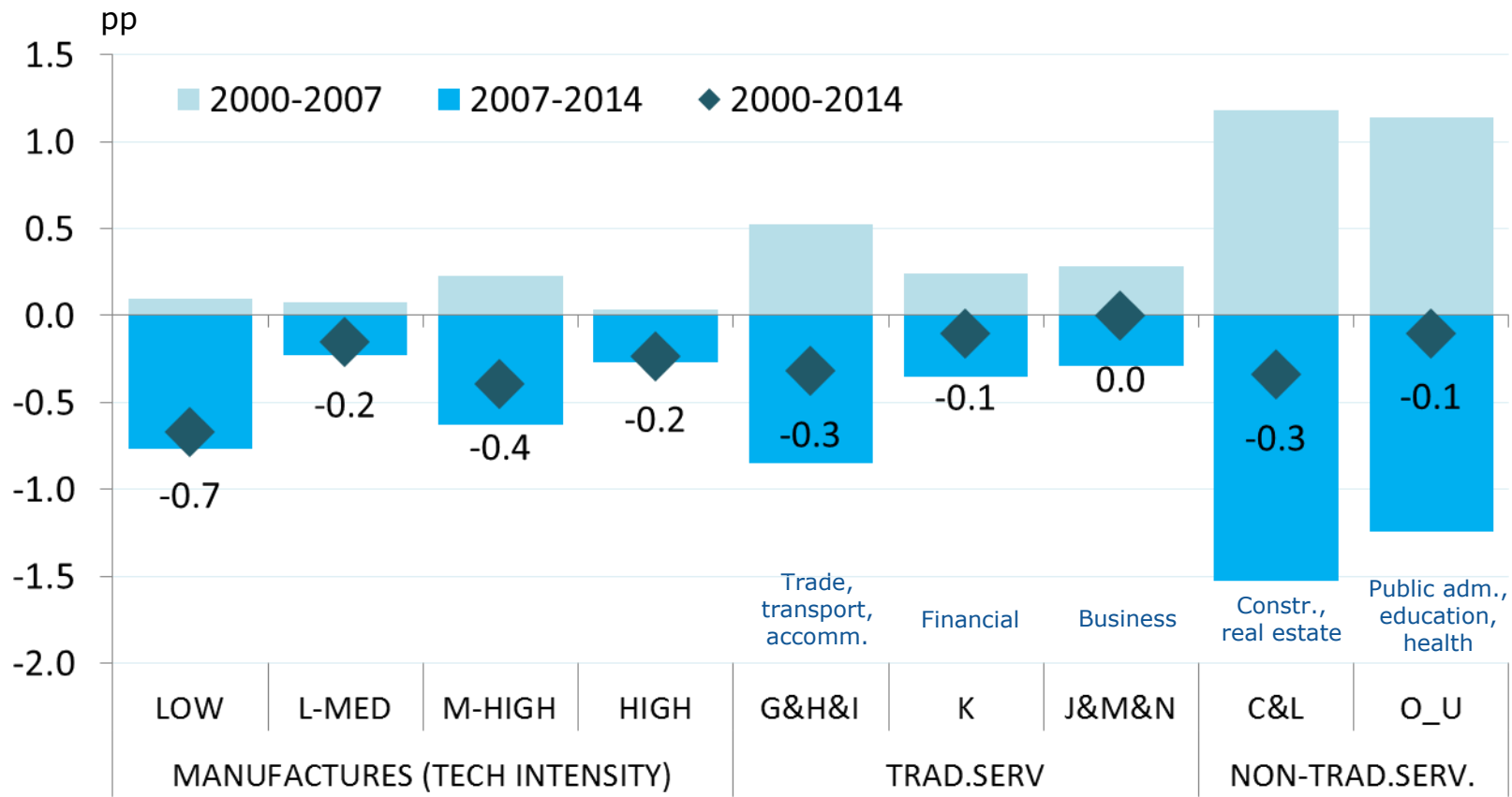


Contribution to change in global share of total value added in the EU (by sector of final demand and factor)



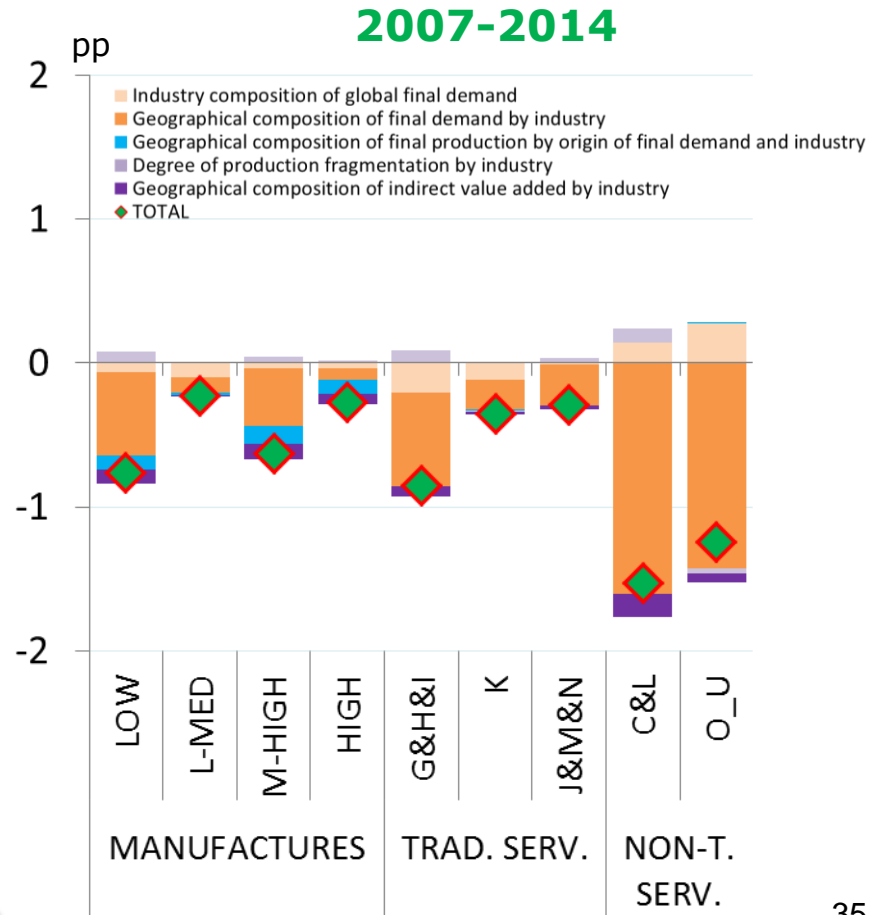
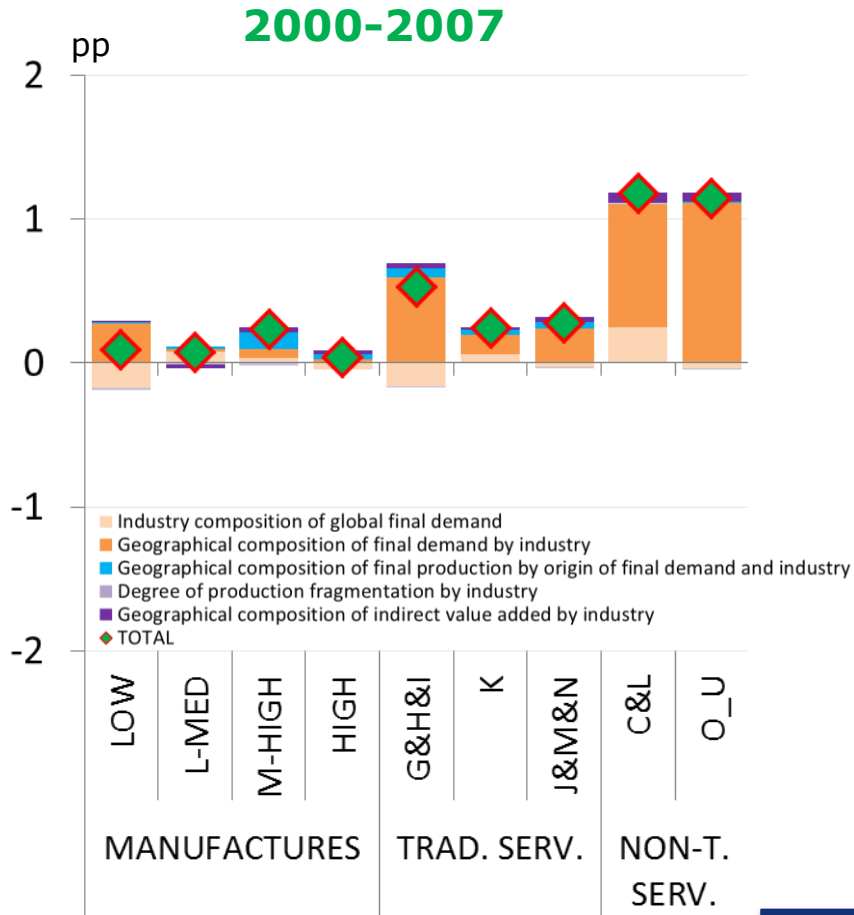


Contribution to change in global share of total value added in the EU (by sub-sector of final demand)



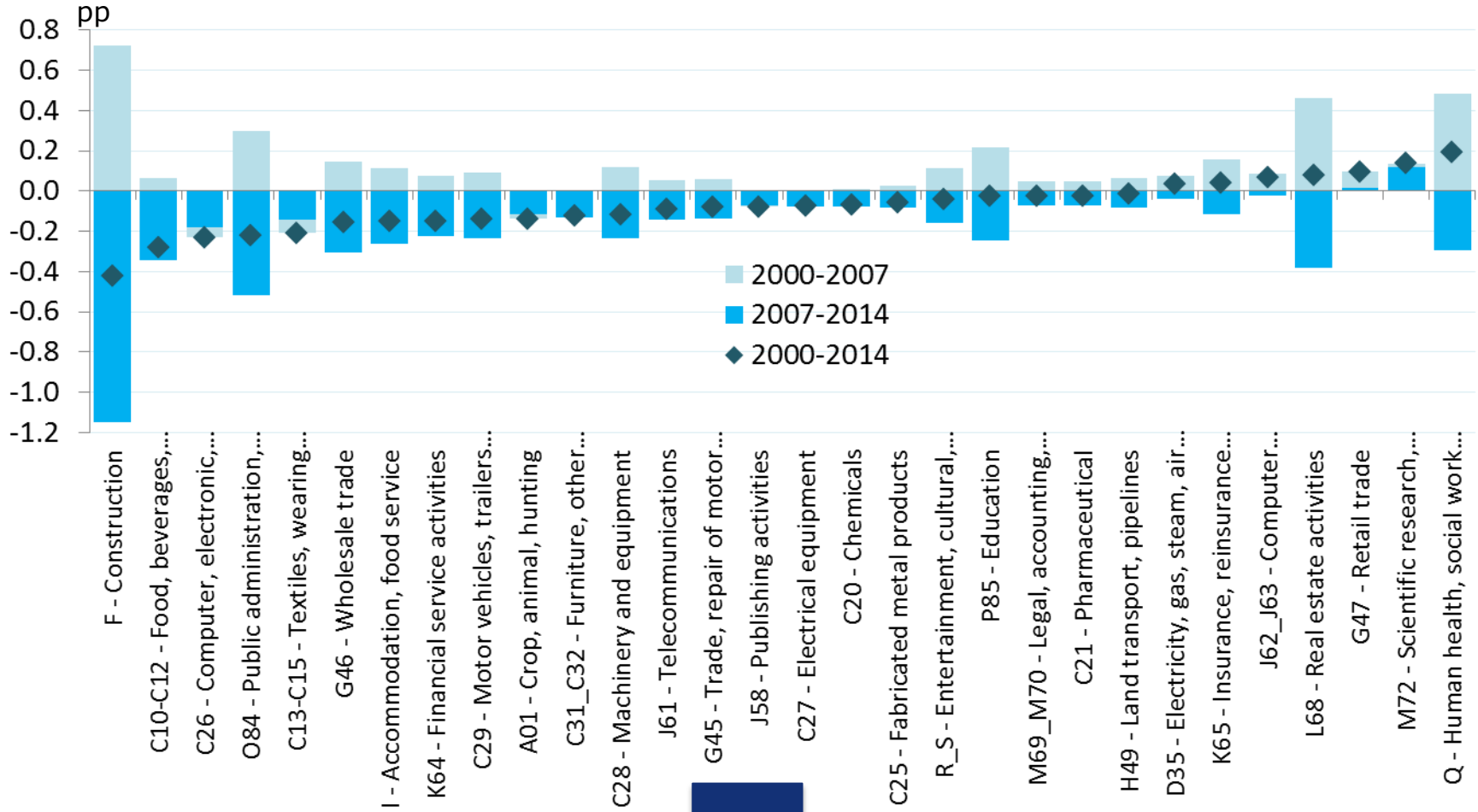


Contribution to change in global share of total value added in the EU (by sub-sector of final demand and factor)

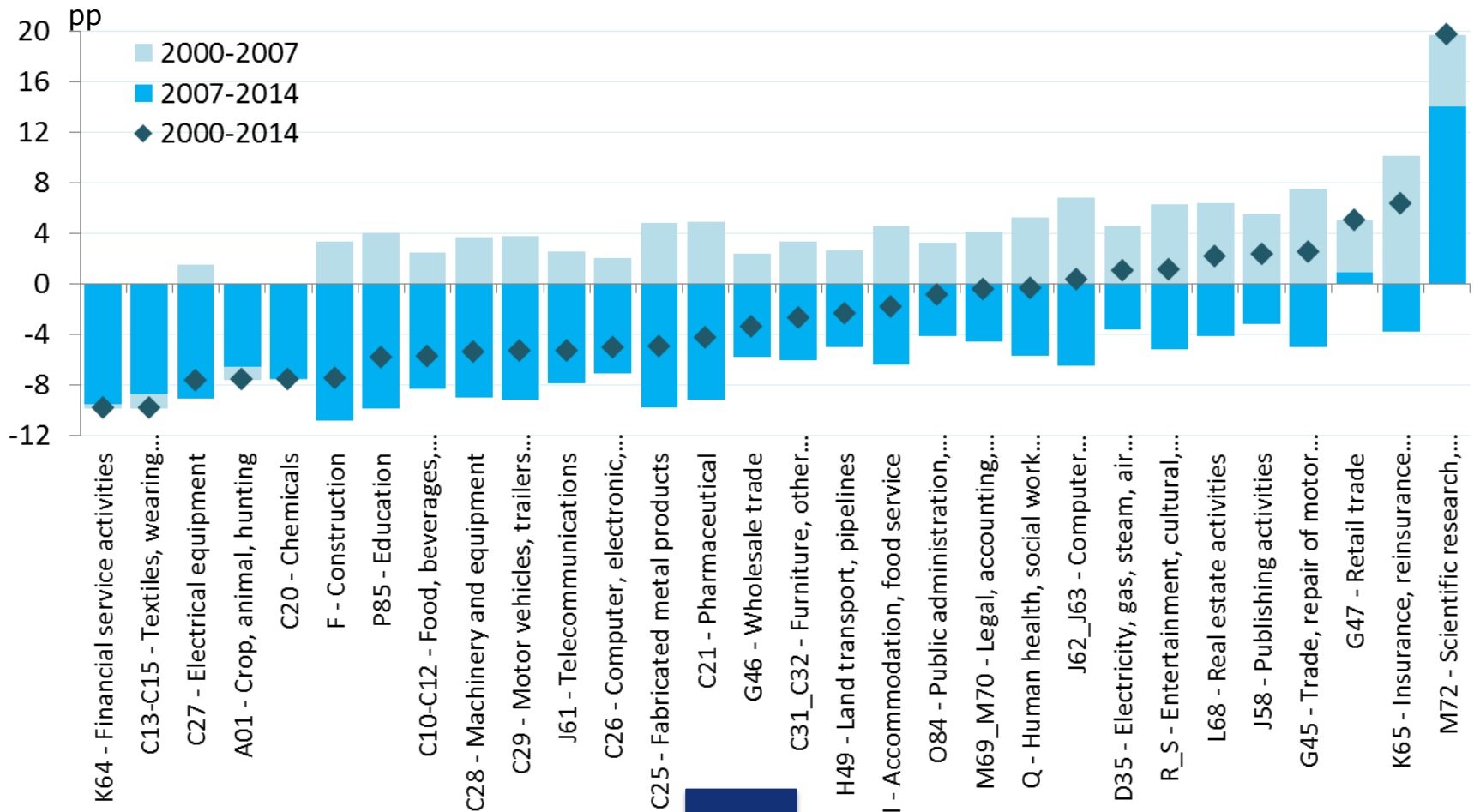




Contribution to change in global share of total value added in the EU (by industry of final demand, selected 30 industries)

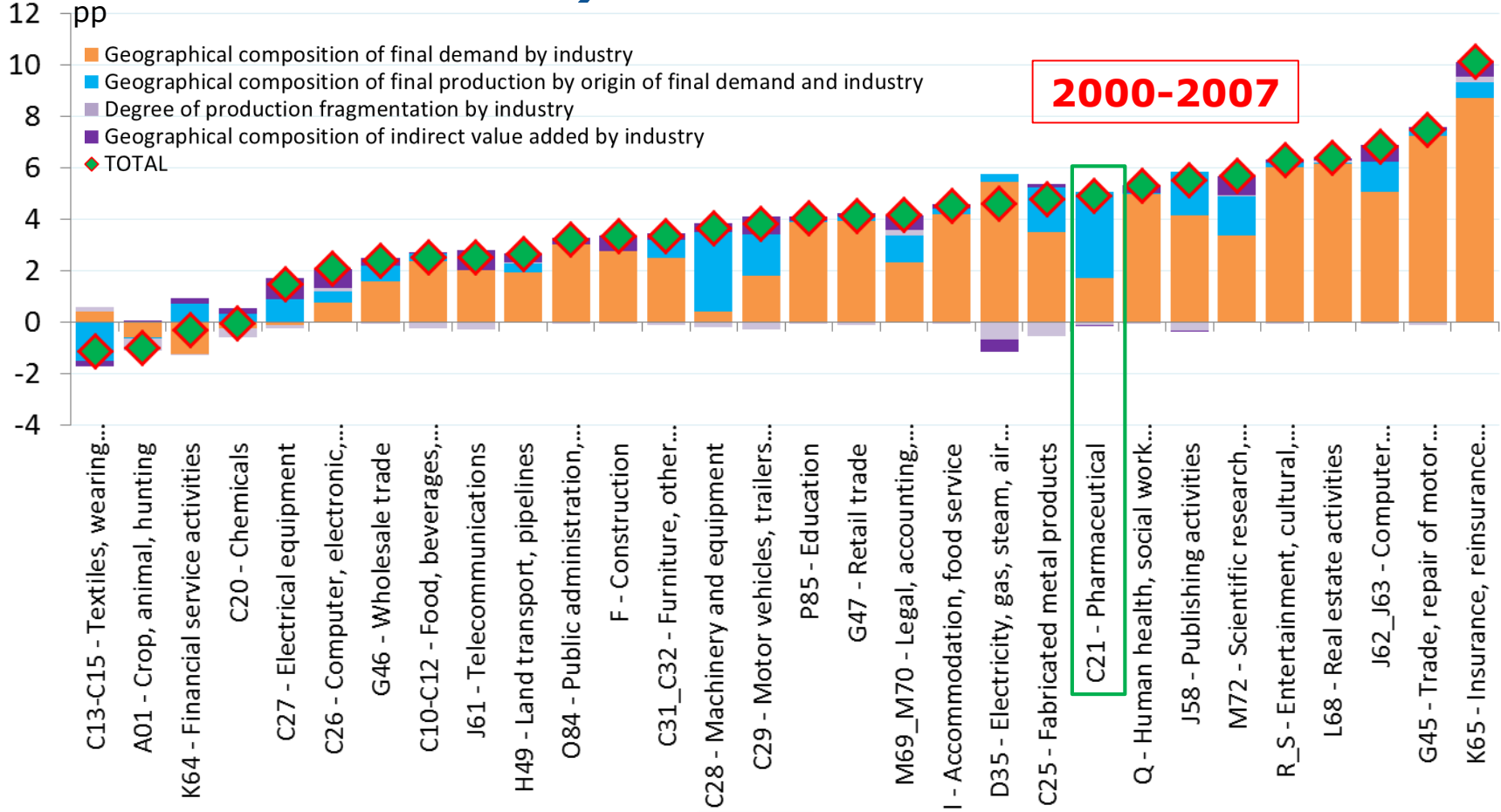


Contribution to change in global share of *industrial* value added in the EU (by industry of final demand, selected 30 industries)



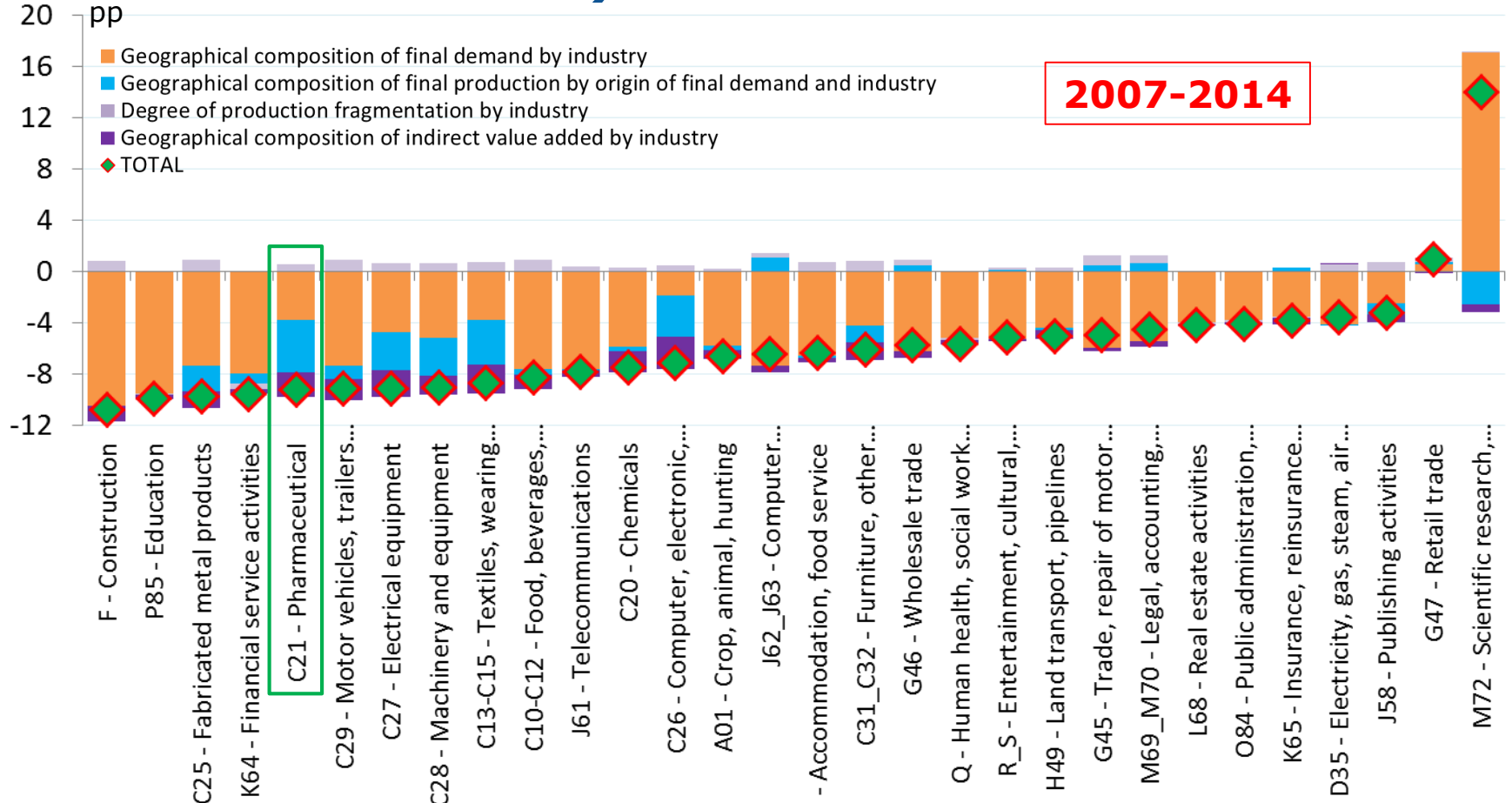


Contribution to change in global share of *industrial* value added in the EU (by industry of final demand, selected 30 industries)





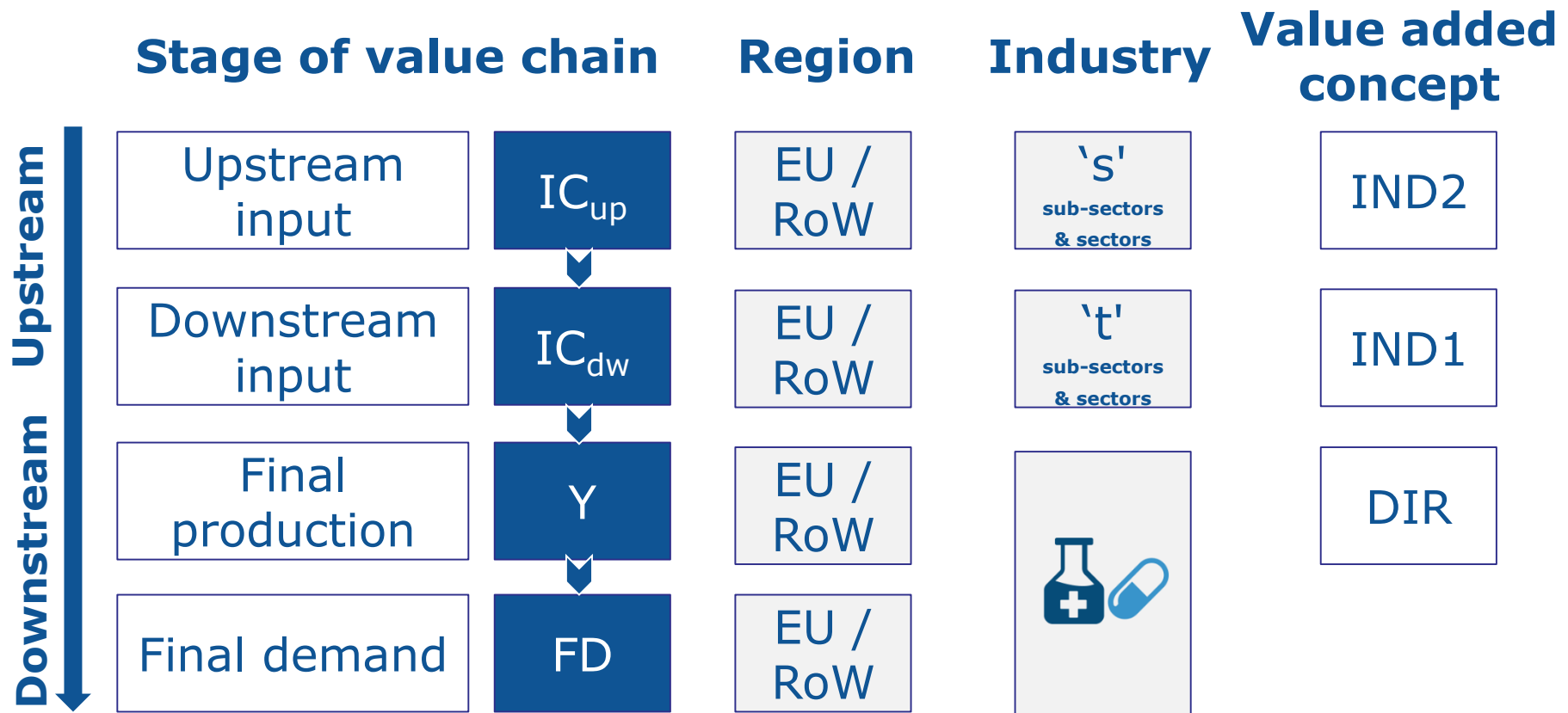
Contribution to change in global share of industrial value added in the EU (by industry of final demand, selected 30 industries)



EMPIRICAL APPLICATIONS

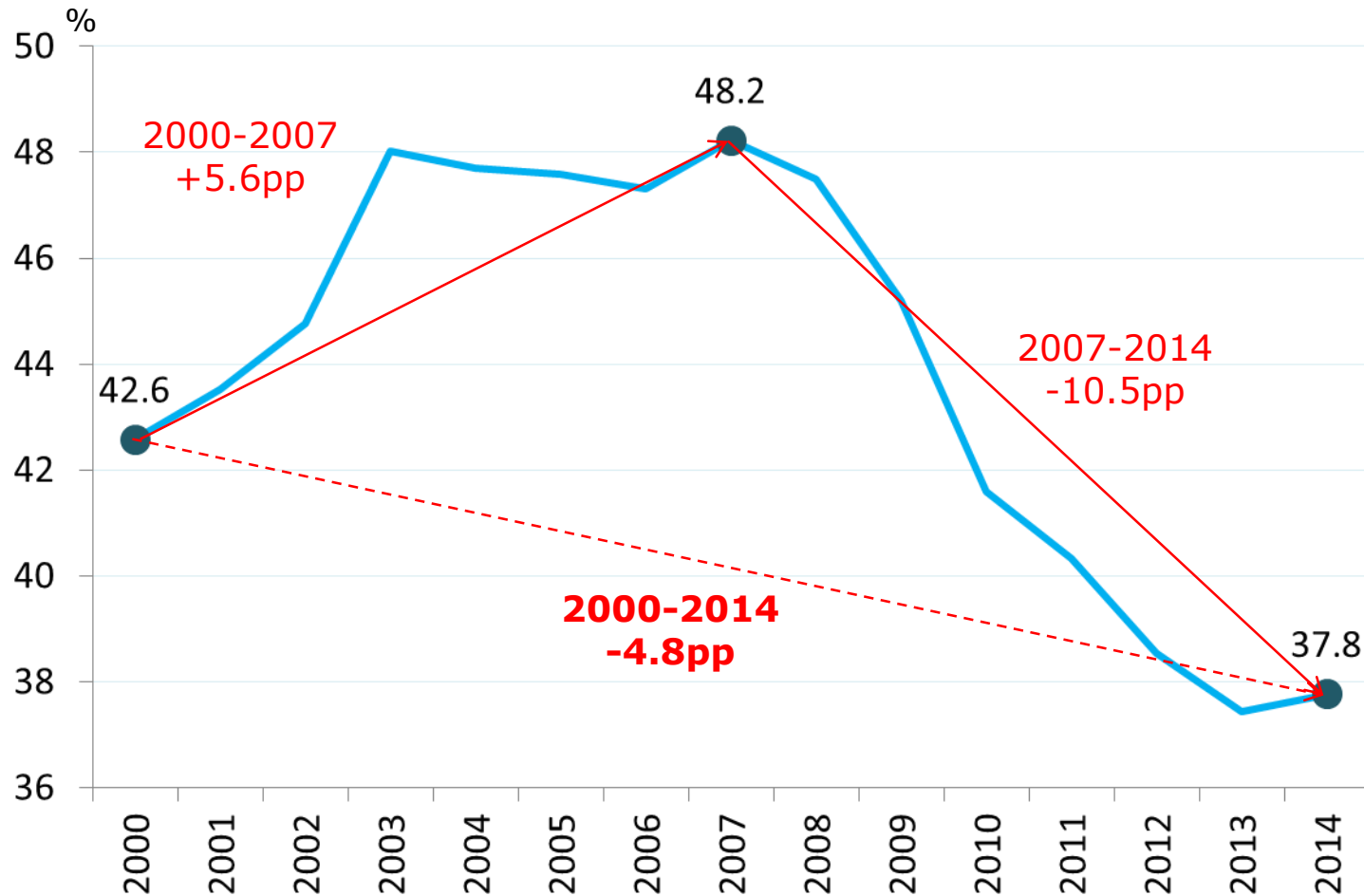
***AN INSIGHT INTO 'C21 – PHARMA'
VALUE CHAIN***

Definition of the C21 value chain





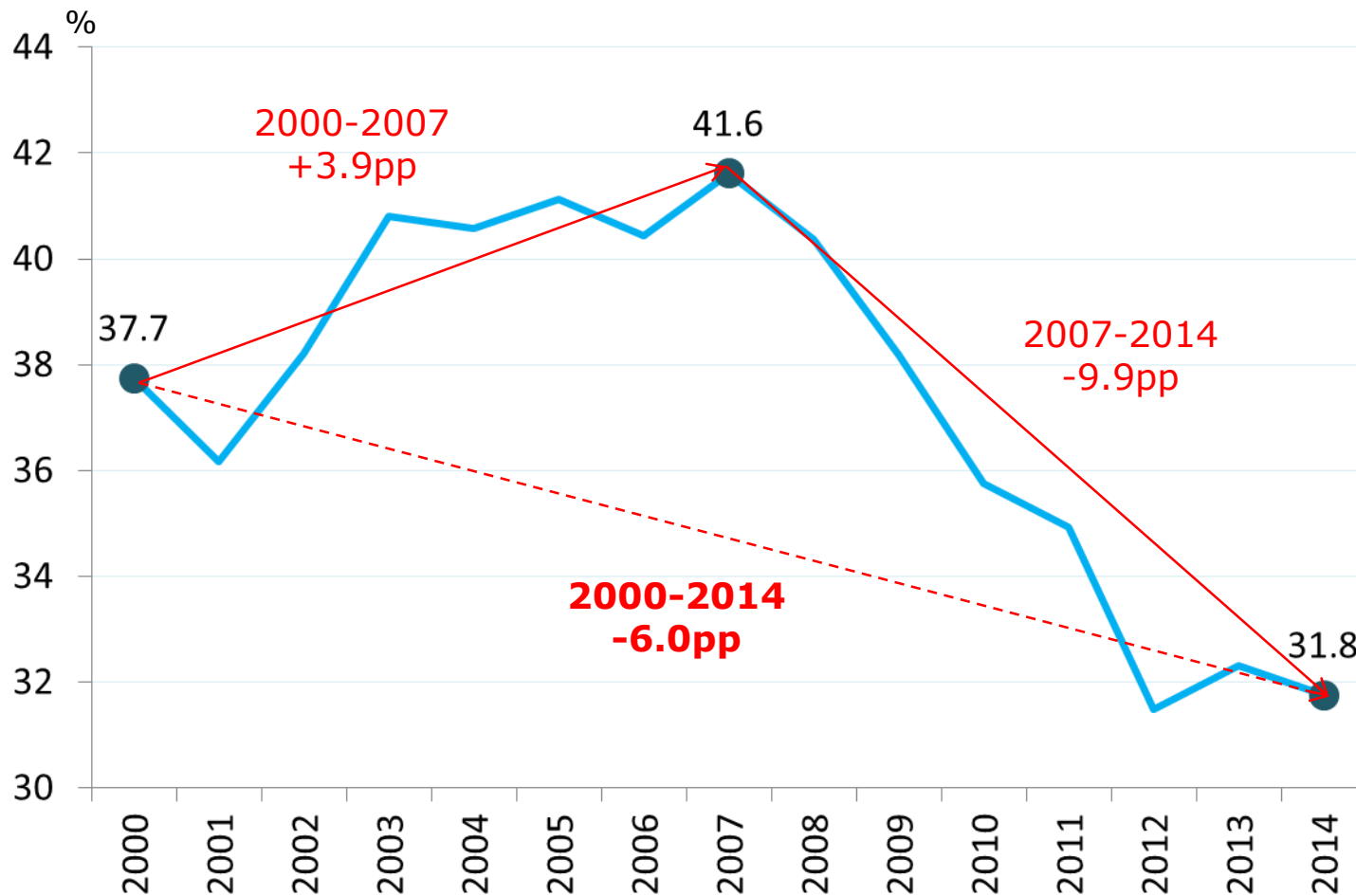
EU losing global share in value added embodied in final demand of C21 products



A few research questions (1/3)

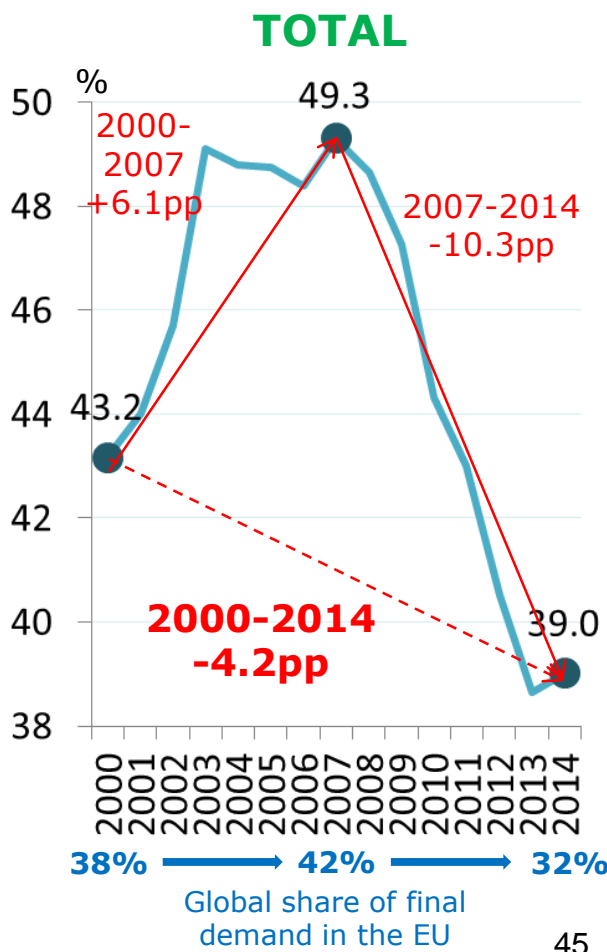
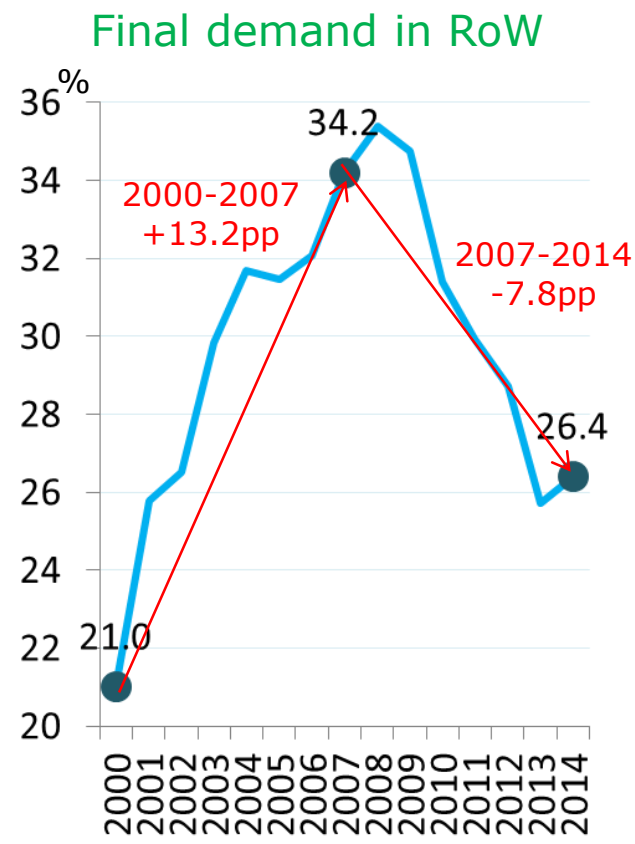
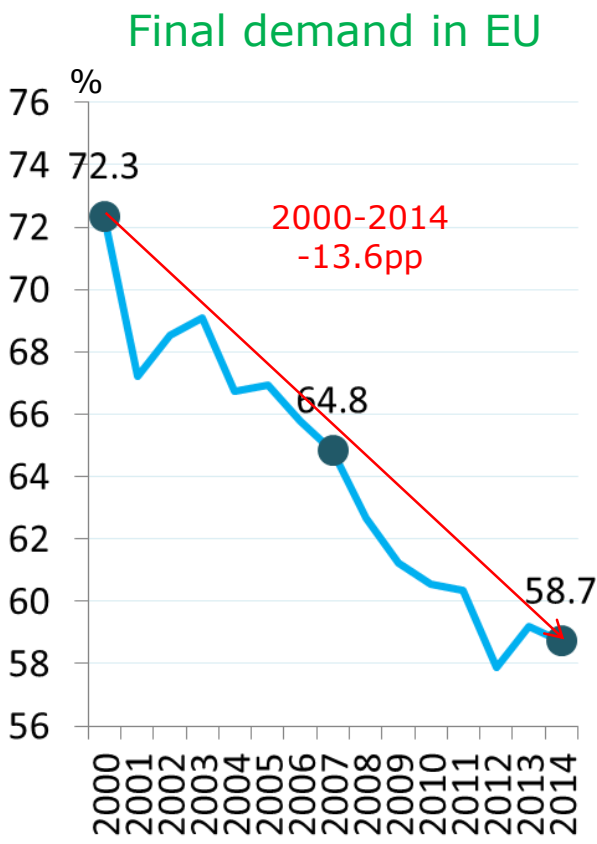
- *How did global final demand of C21 products evolve during the last 15 years?*
- *Did the EU win or lose global market share in C21 production? Was the process homogeneous across value chains?*
- *How did fragmentation of C21 value chain change? Did the EU increase its participation as input supplier?*

Global share of *final demand* in the EU of C21 products



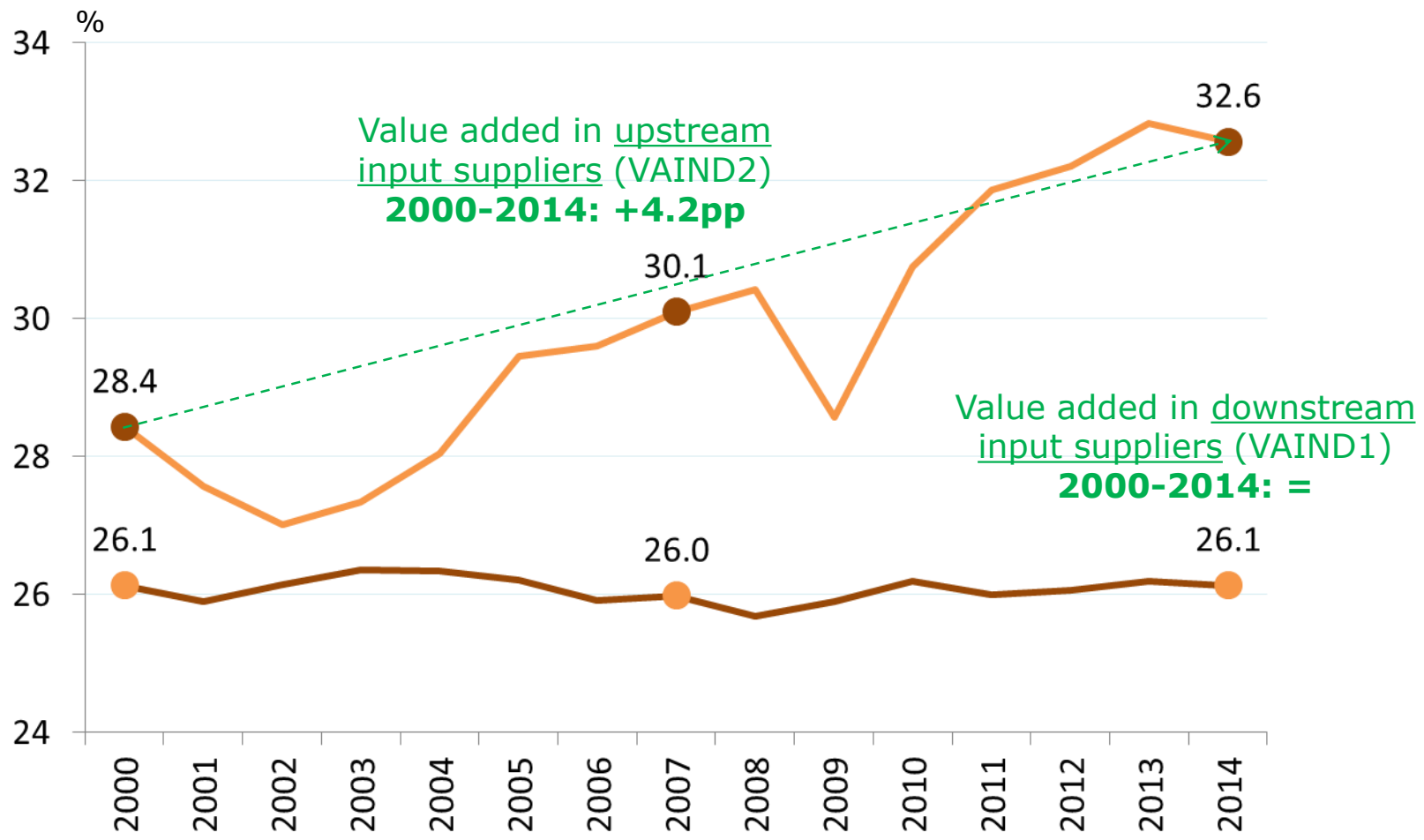


Global share of *final production* in the EU of C21 products (by origin of final demand)





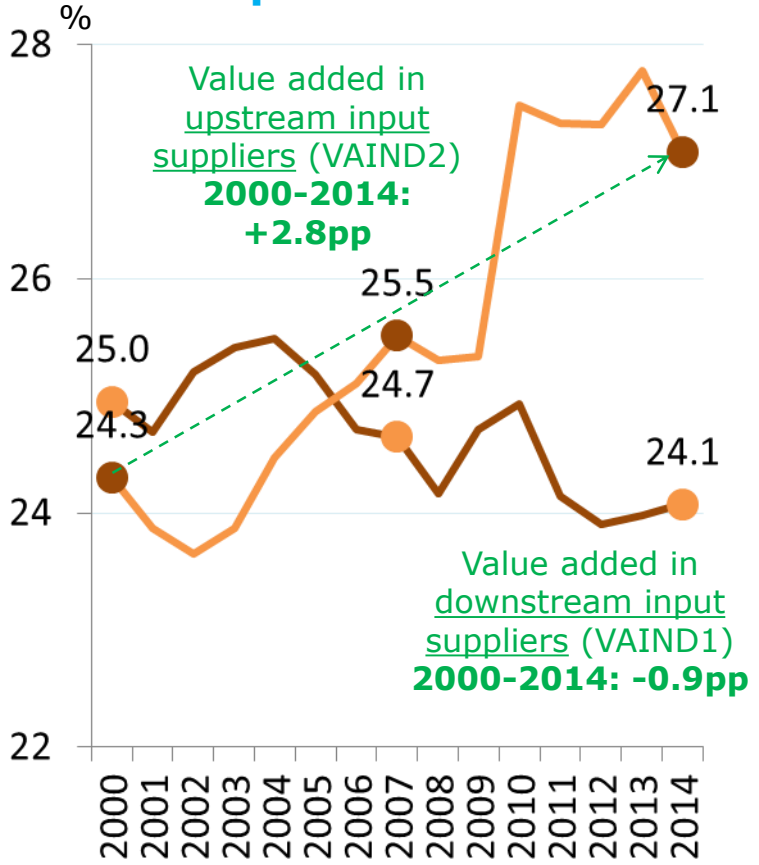
Global share of *indirect value added in the world embodied in final demand of C21 products*



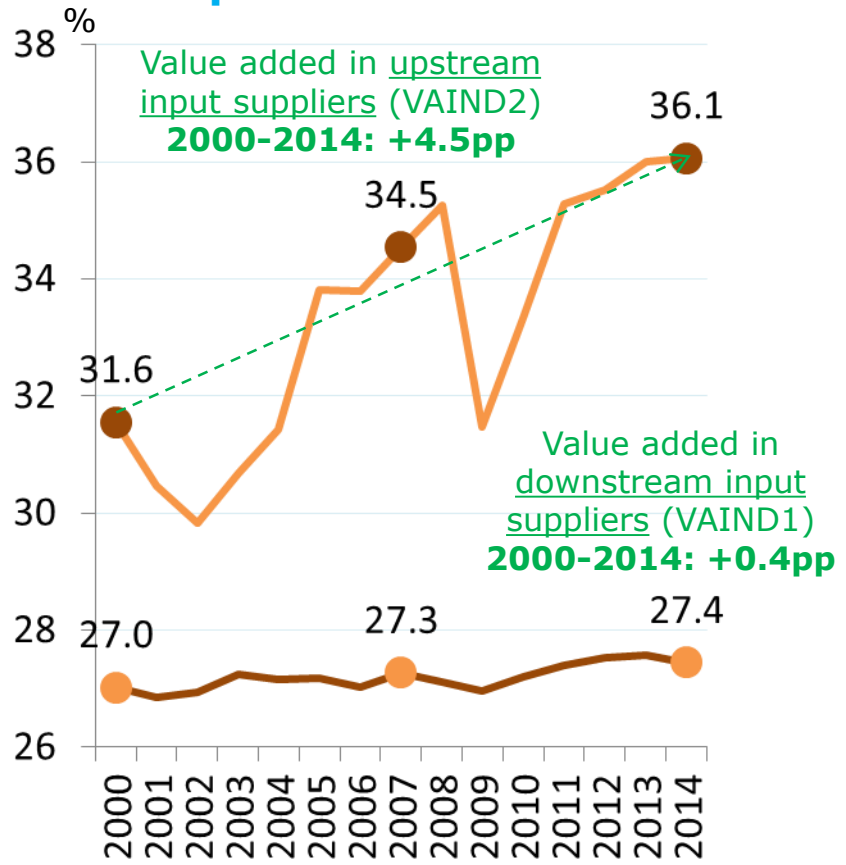


Global share of *indirect value added* embodied in final demand of C21 products (by region of final production)

Final production in EU



Final production in RoW





A few research questions (2/3)

- *How did changes in demand and production related to C21 value chain impact value generation in EU?*
- *Which industries (sub-sectors and sectors) supplying inputs for final production of C21 were the main contributors?*
- *Were factors common across industries, type of value chain and periods?*

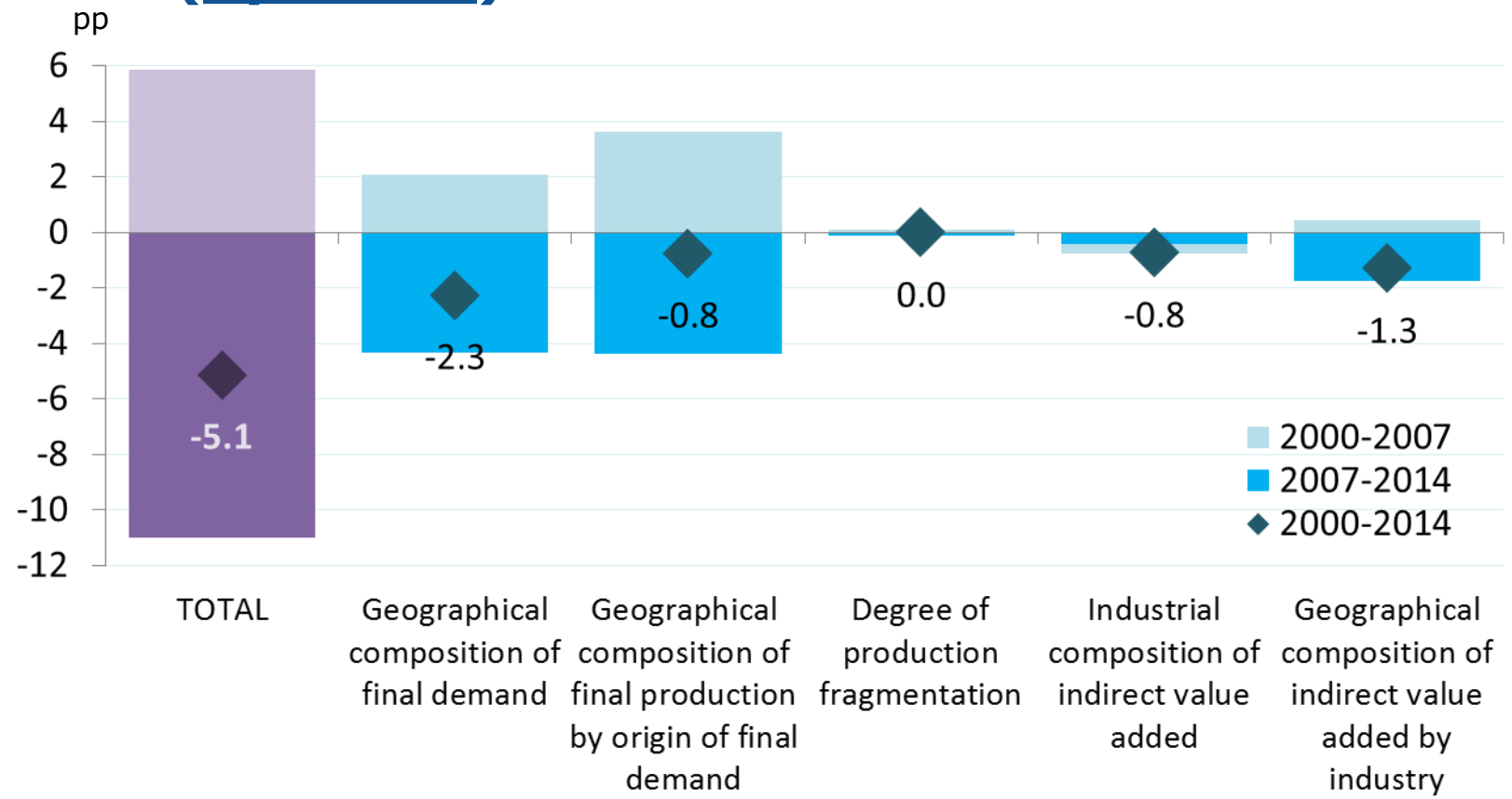


Dimensions of shift-share analysis

<p>Period</p>	<p>2000-2014 and sub-periods (2000-2007 & 2007-2014)</p>
<p>Industry coverage</p>	<p>Industries / sub-sectors and sectors of value added</p>
<p>Type of (broad-based) value chains</p>	<p>Intra-EU final demand, extra-EU final exports, intra-RoW final demand, extra-EU final imports</p>
<p>Factors (specific of the value chain supplying final C21 products)</p>	<p>Geographical composition of final demand of C21 products Geographical composition of final production of C21 products, by origin of final demand Degree of production fragmentation of the value chain supplying final C21 products Industrial composition of indirect value added embodied in final demand of C21 products Geographical composition of indirect value added embodied in final demand of C21 products, by industry</p>



Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by factor)



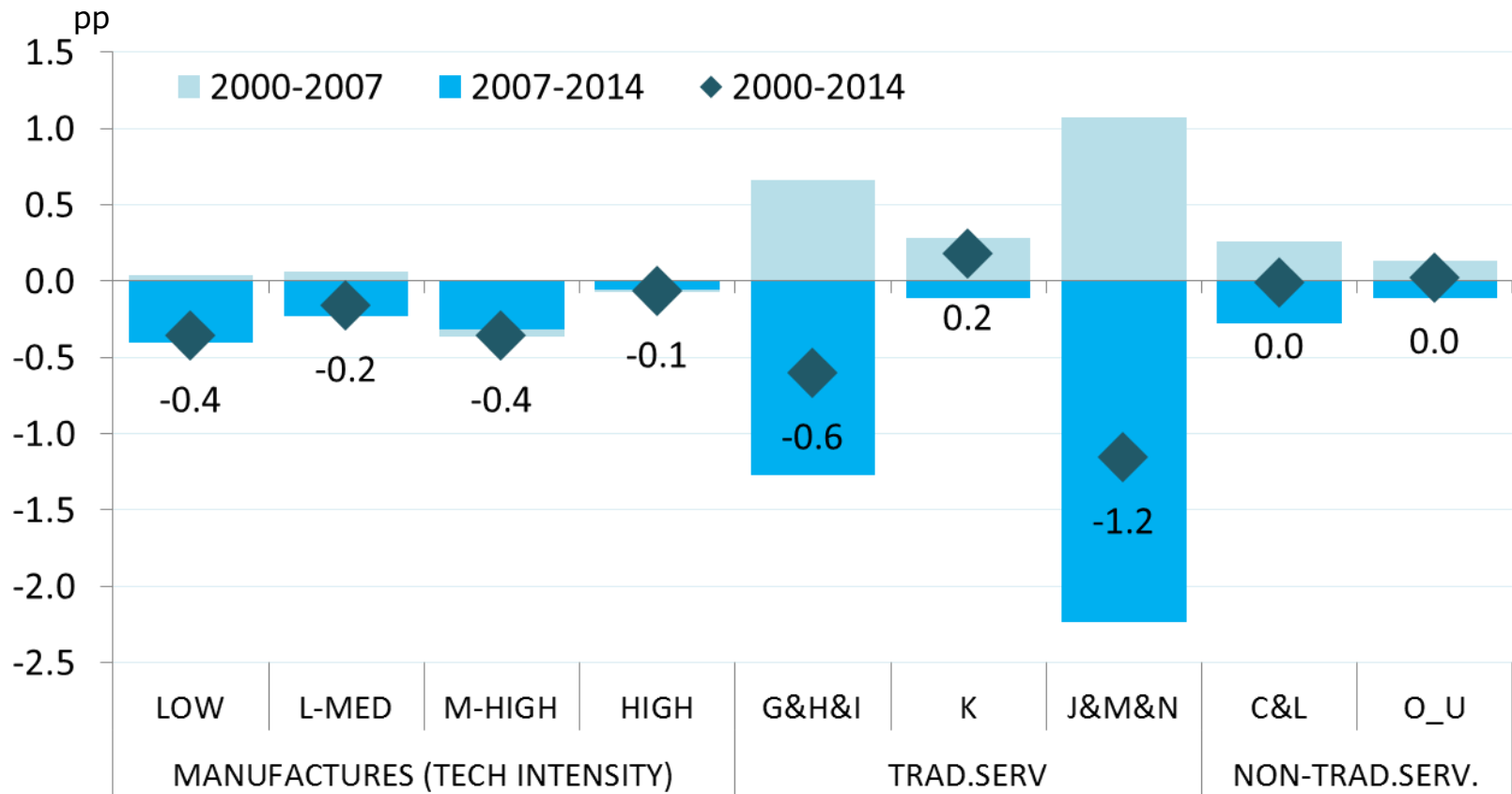


Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sector of value generation, including own industry)

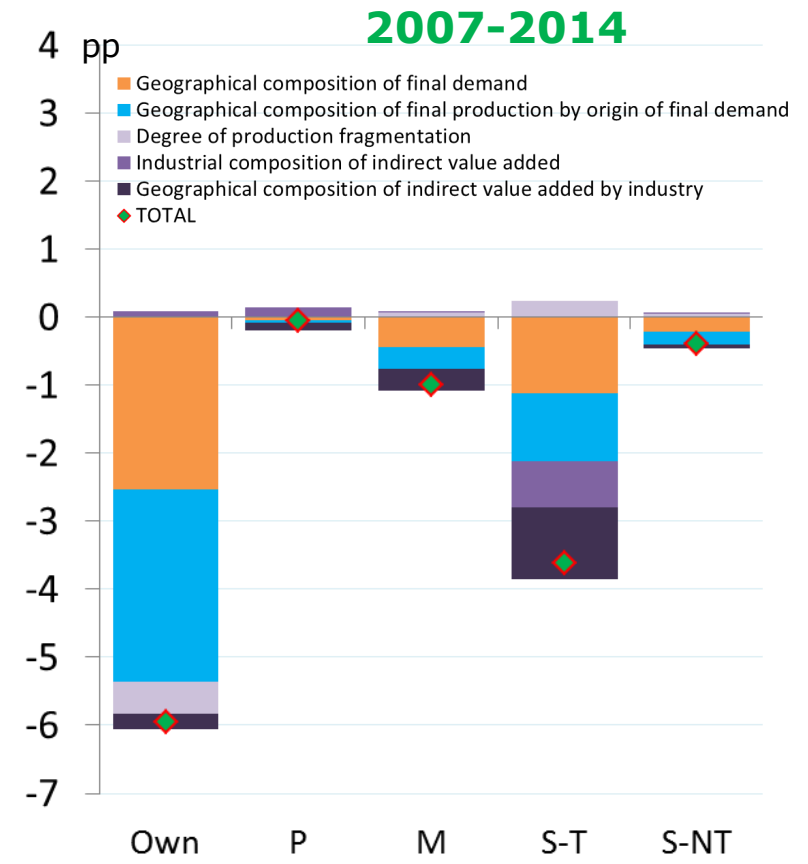
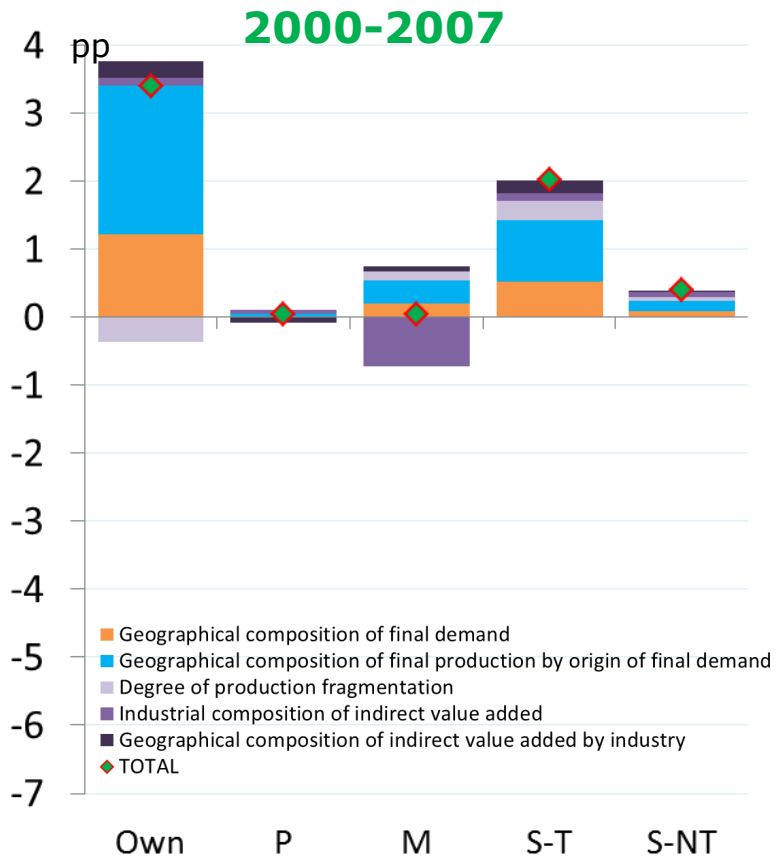




Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sub-sector of value generation, excluding own industry)

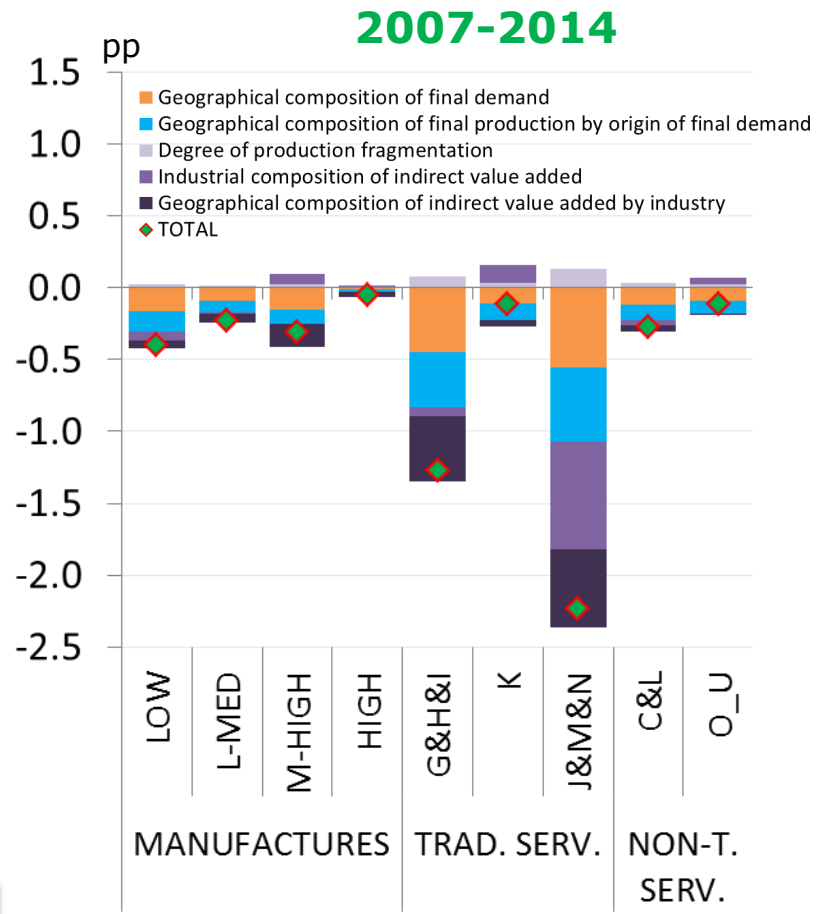
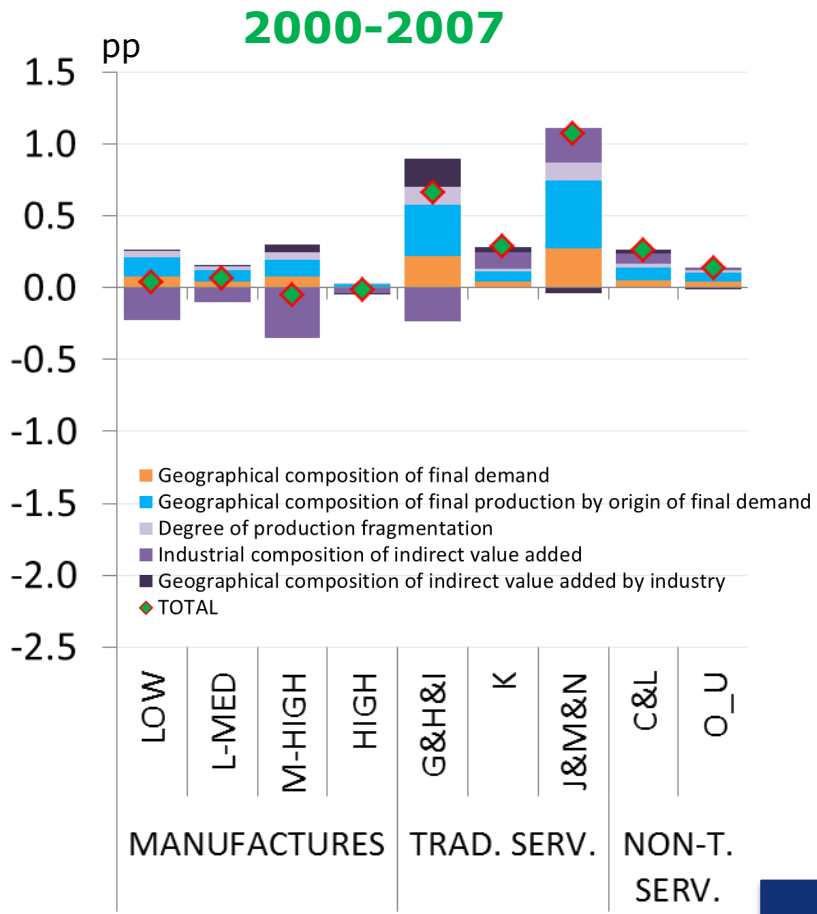


Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sector of value generation and factor)

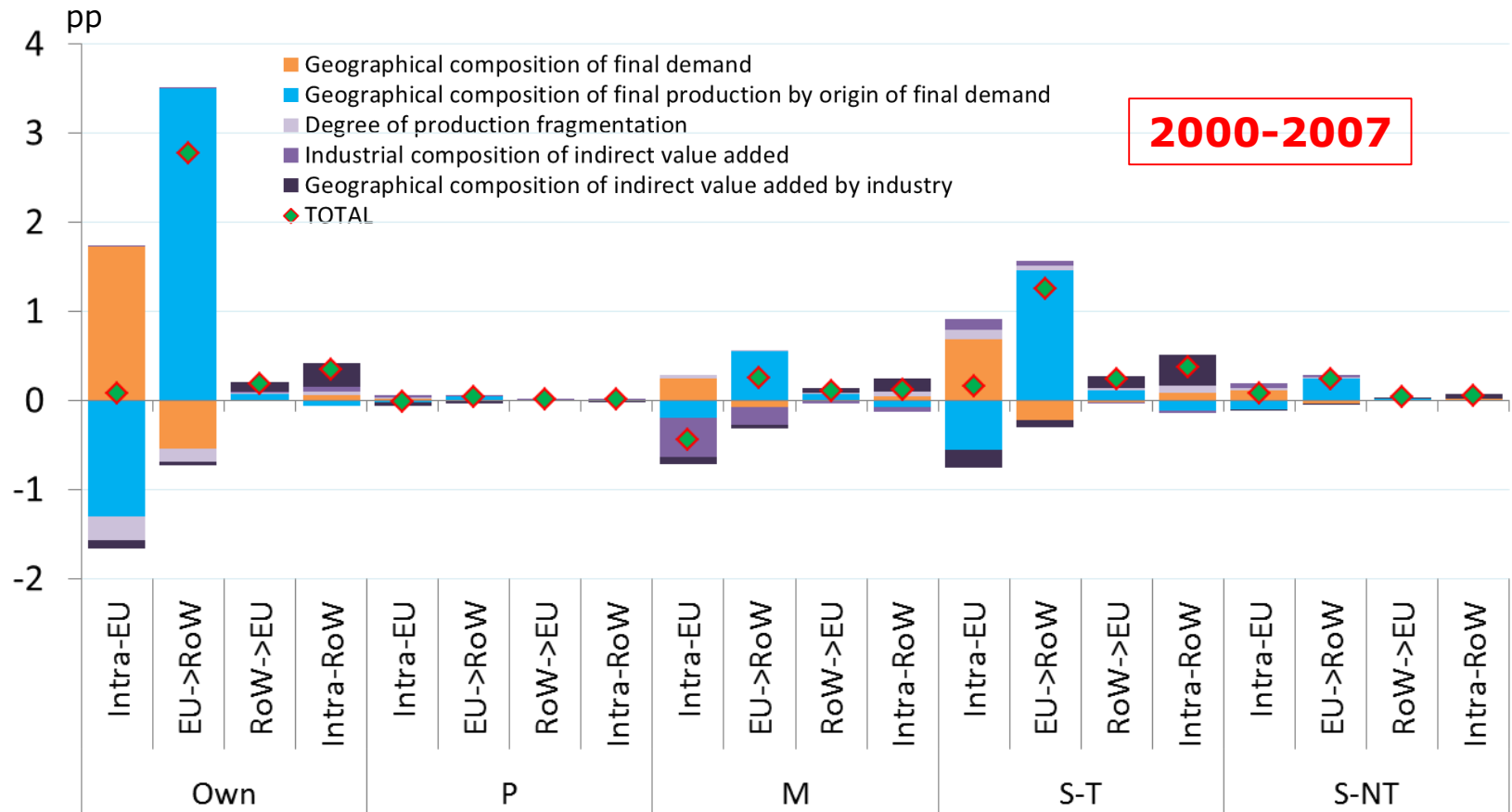




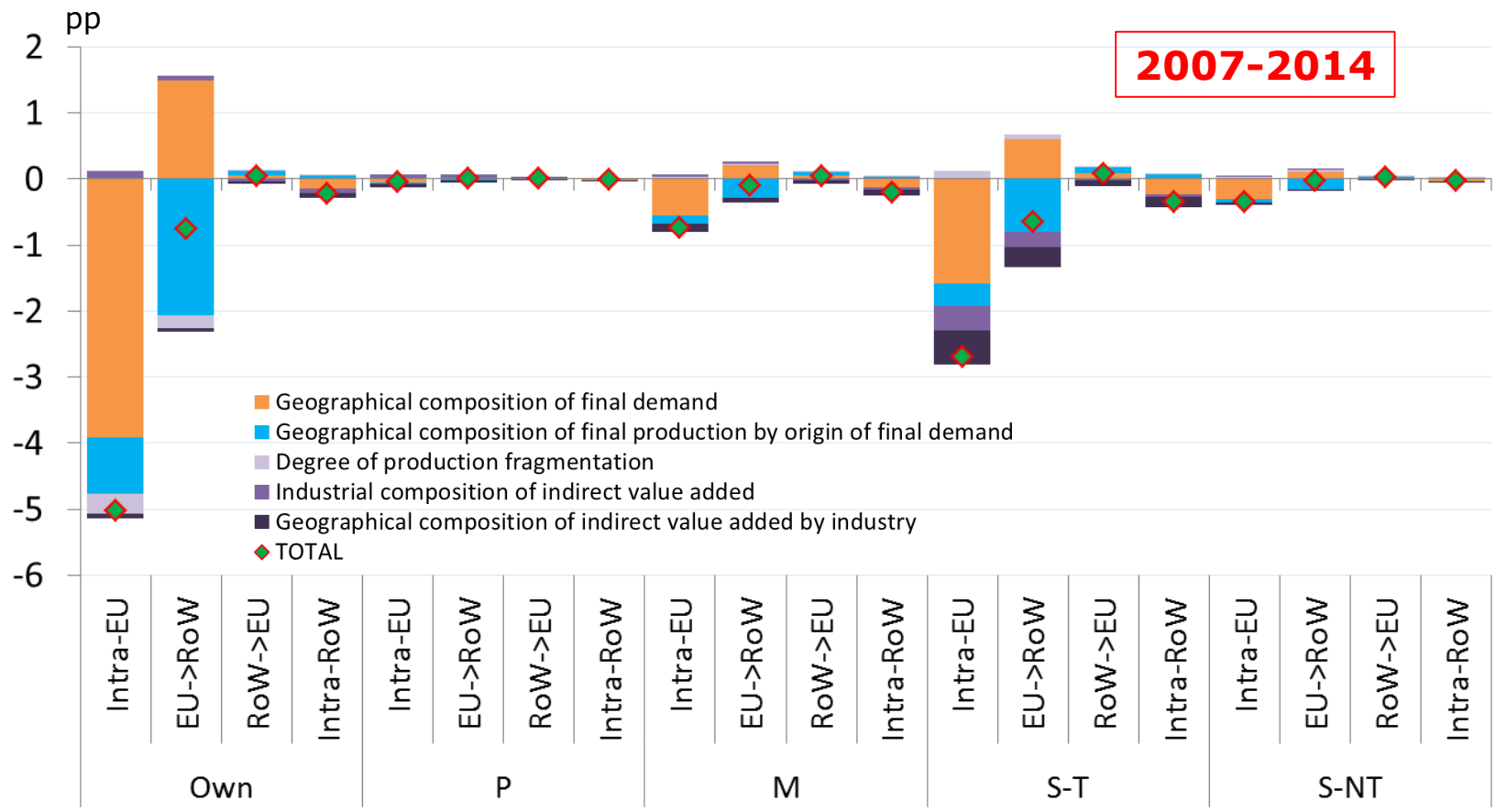
Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sub-sector of value generation and factor)



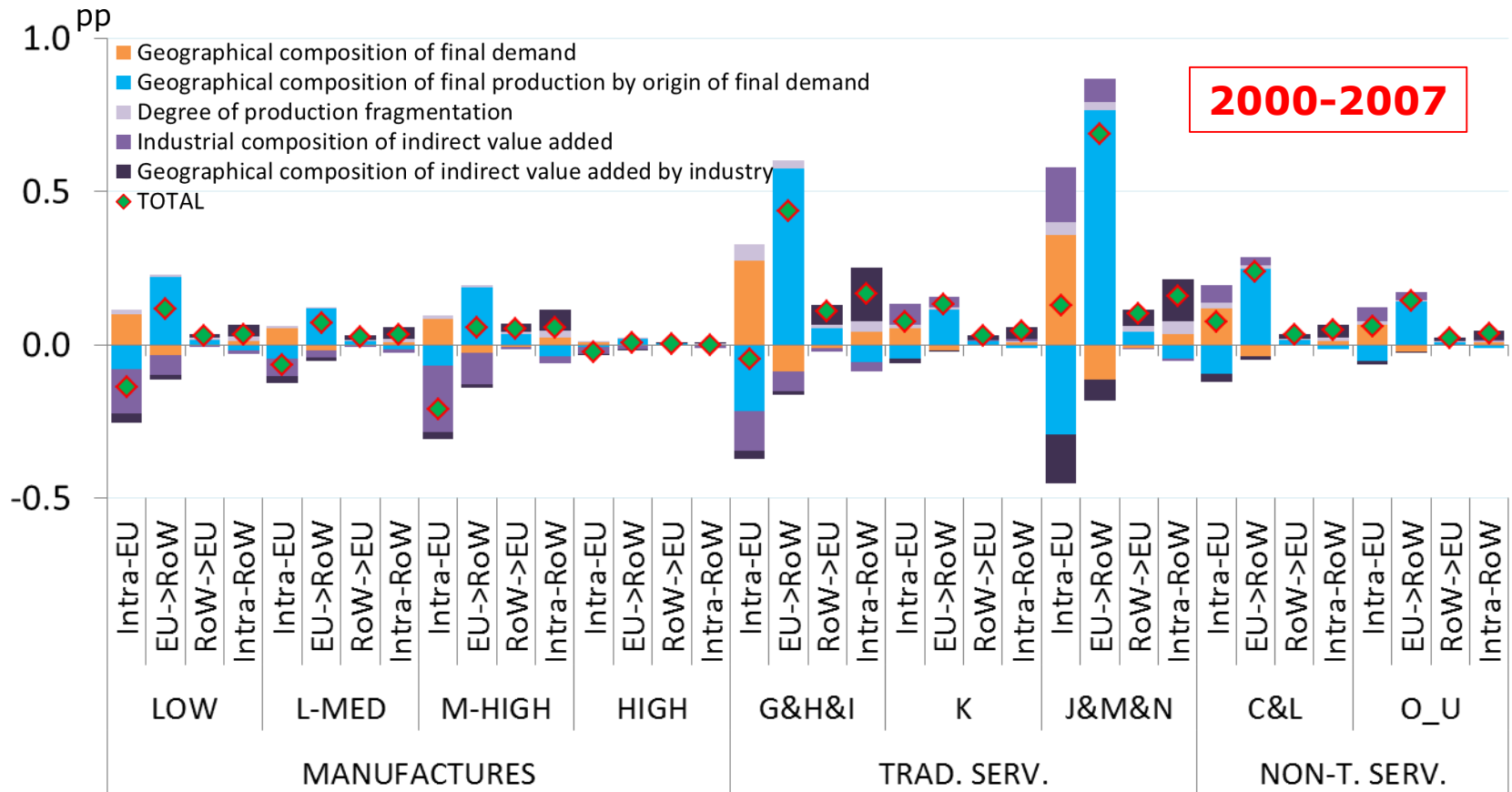
Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sector of value generation, broad value chain and factor)



Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sector of value generation, broad value chain and factor)

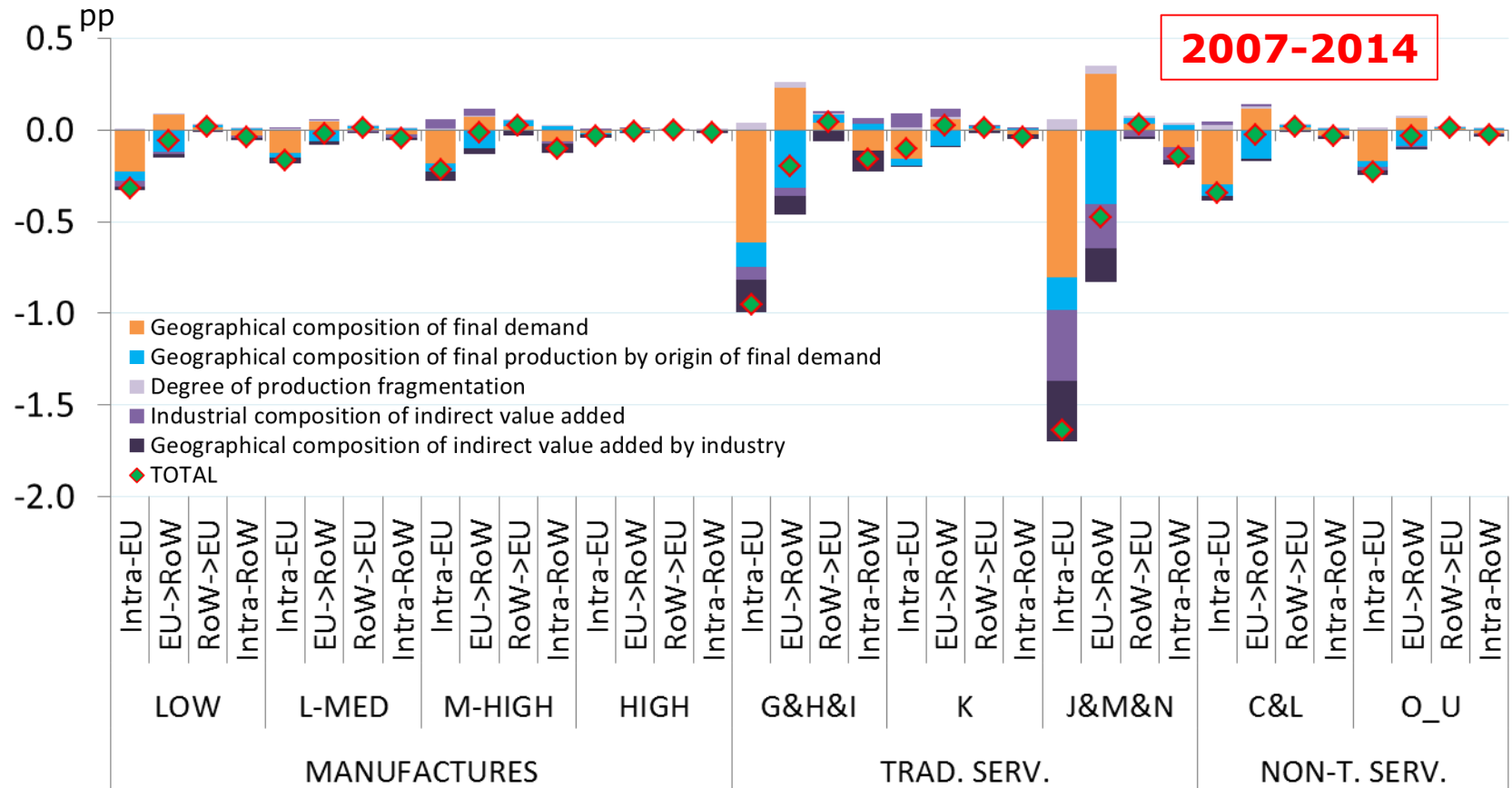


Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sub-sector of value generation, broad value chain and factor)



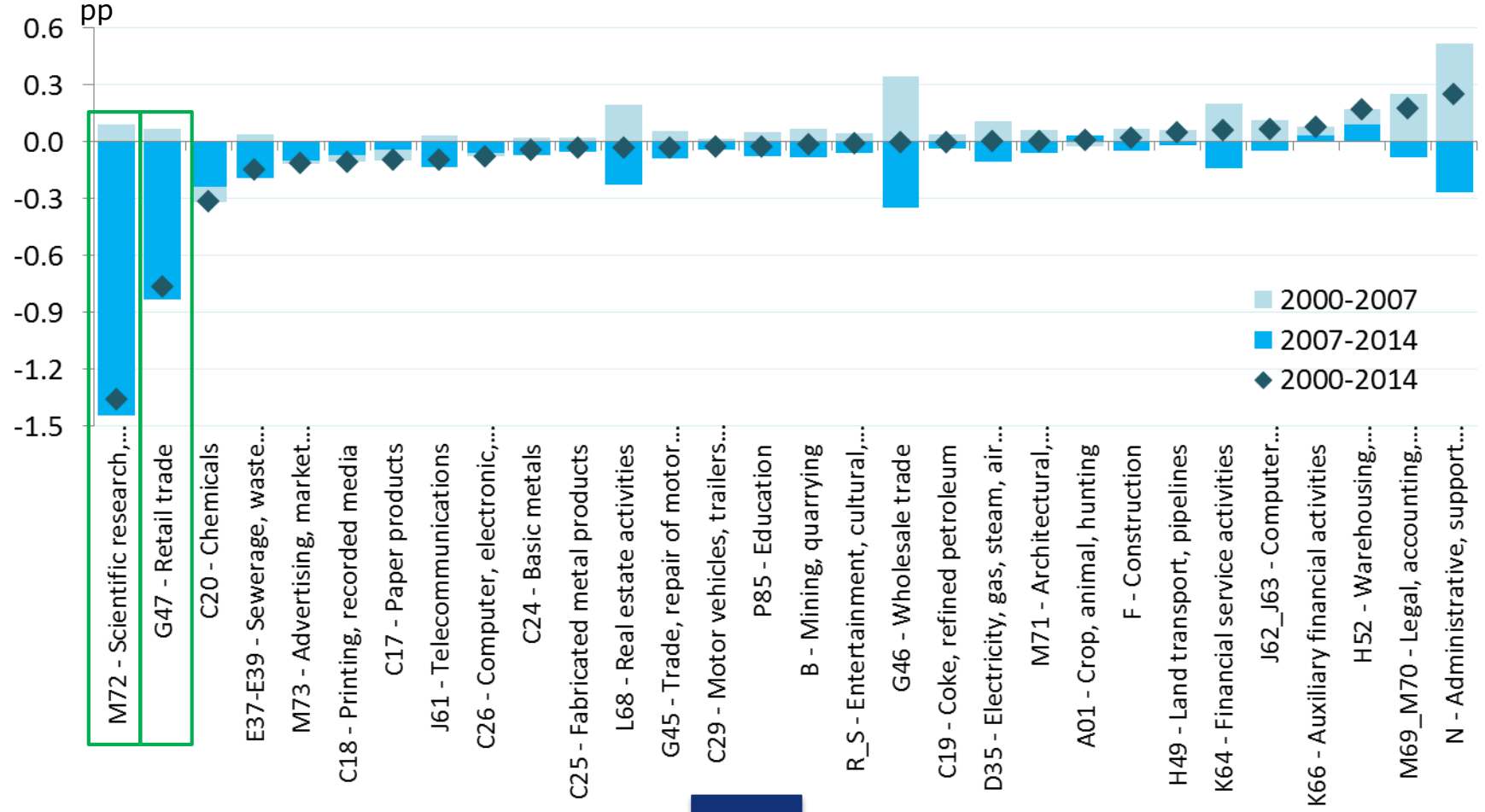


Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by sub-sector of value generation, broad value chain and factor)



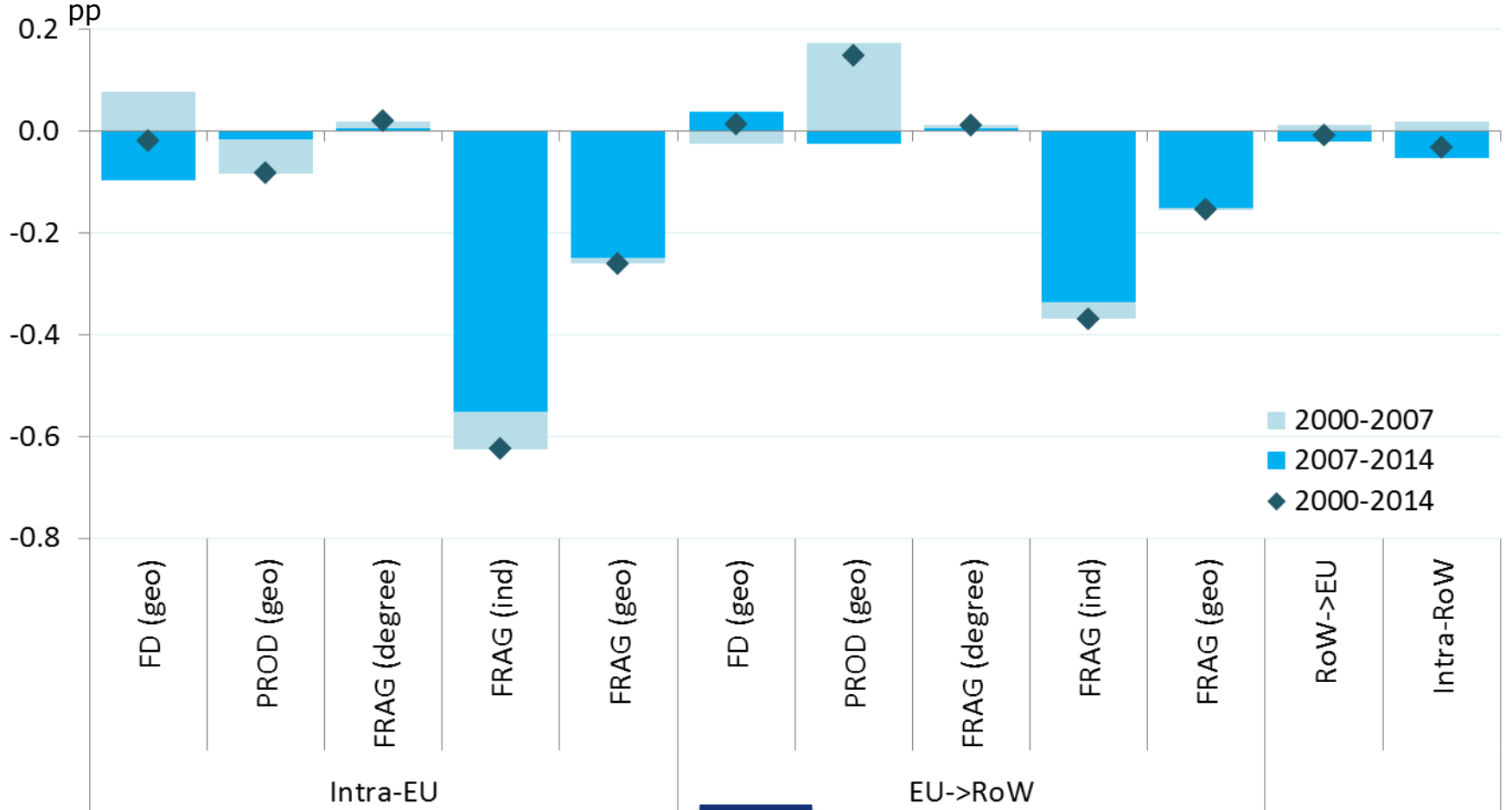


Contribution to change in global share of total value added in the EU embodied in final demand of C21 products (by industry of value generation, 30 selected industries bar own industry)





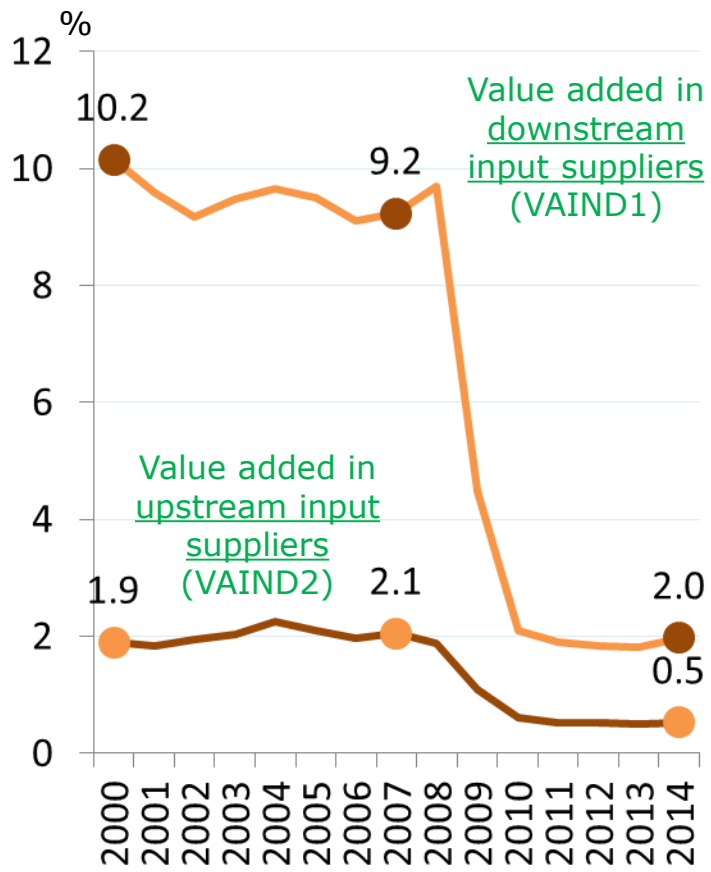
Contribution of *M72* to change in global share of total value added in the EU embodied in final demand of C21 products (by value chain and factor)



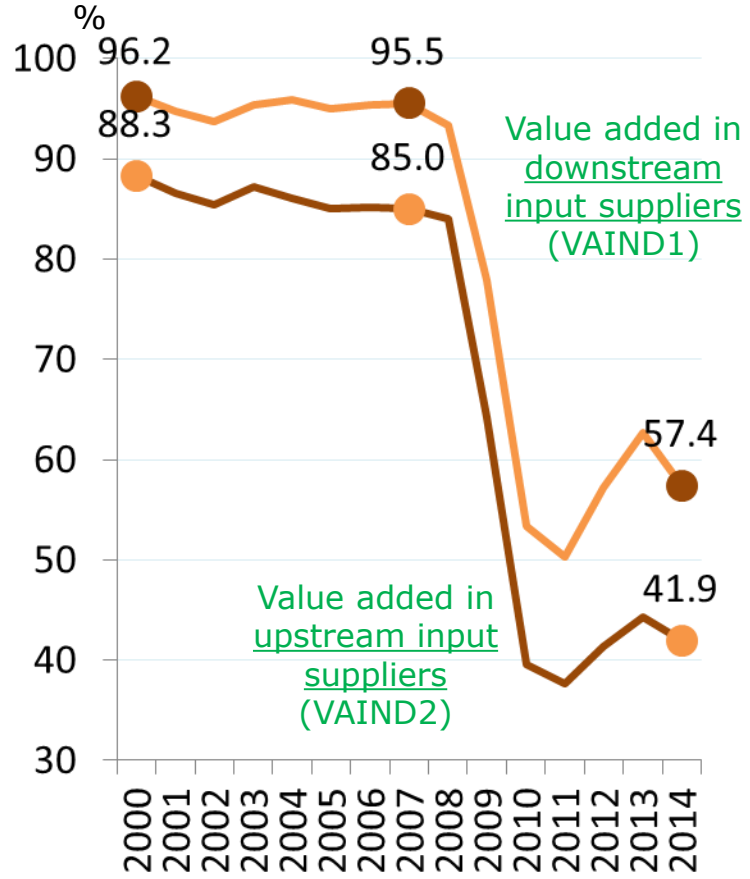


Indirect value added generated in M72 embodied in final demand of C21 products produced in the EU (by upstreamness of input supply)

Share in total value added



EU global share

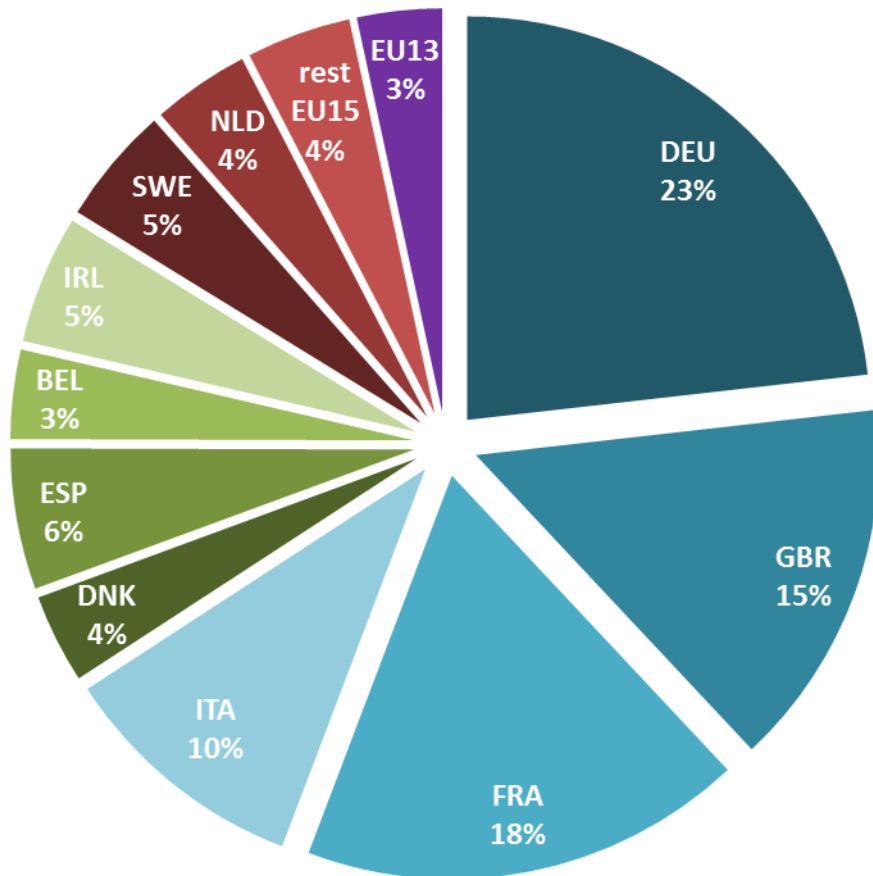


A few research questions (3/3)

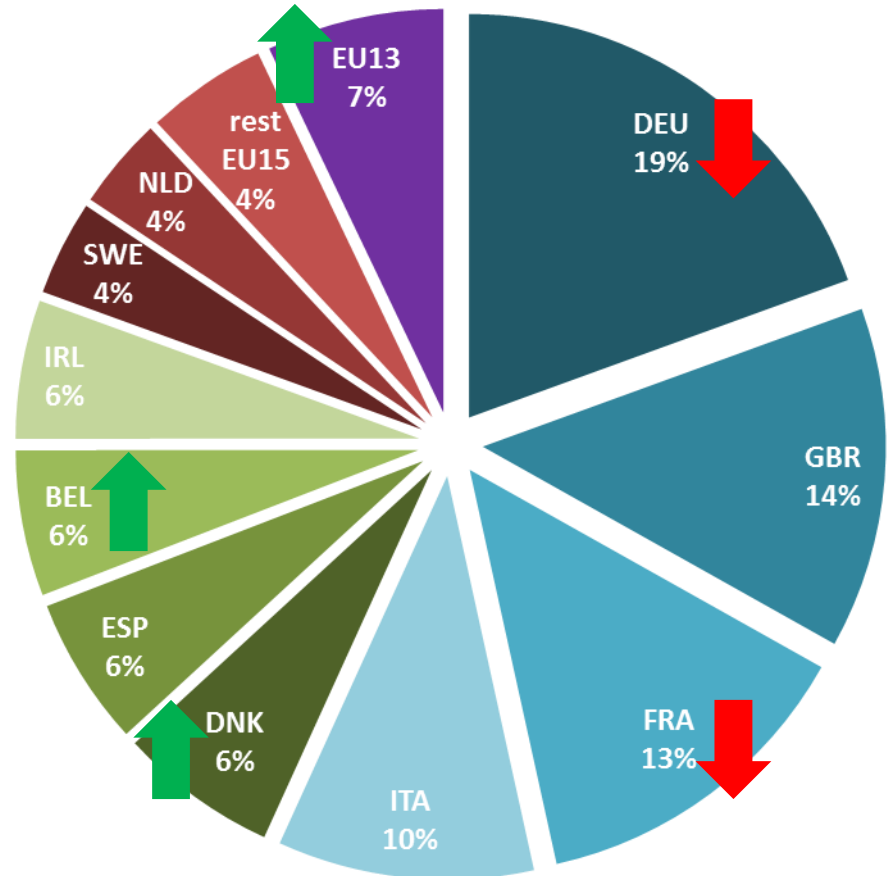
- *How did the distribution of value added embodied in final demand of C21 products evolve during the last 15 years?*
- *Was this process homogenous across stages of value generation?*
- *Did the role of new accession countries (EU-13) increase or decrease throughout this period? In which industries (sub-sectors and sectors) were the main changes recorded?*

Distribution of value added in the EU embodied in global final demand of C21 products

2000

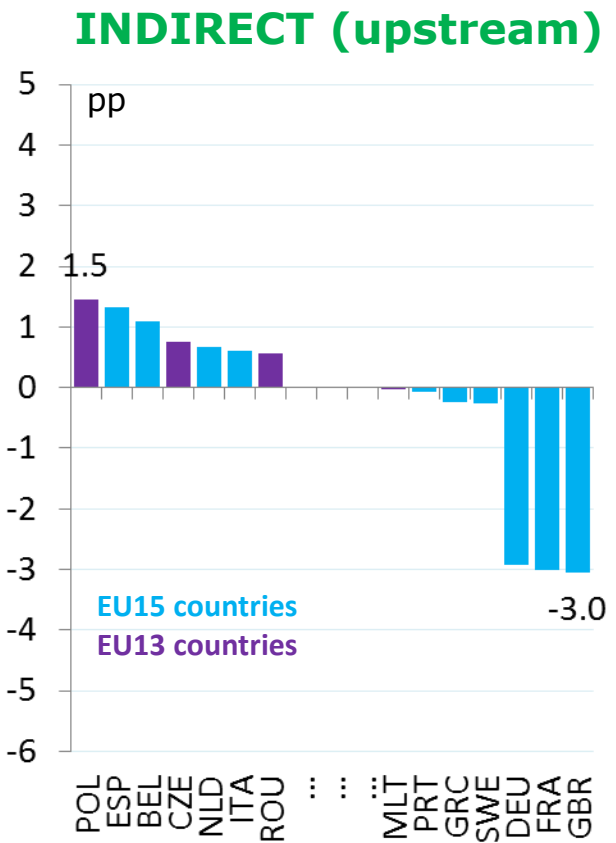
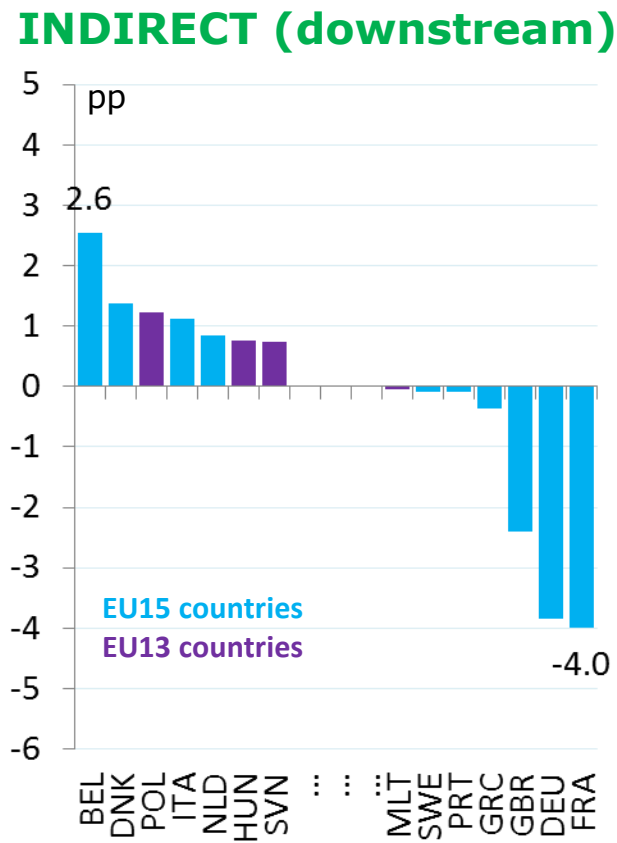
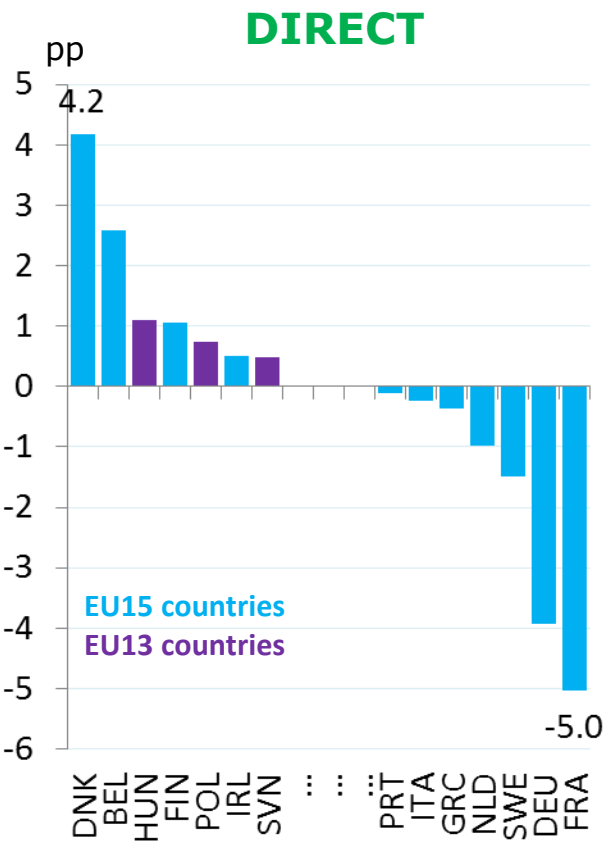


2014



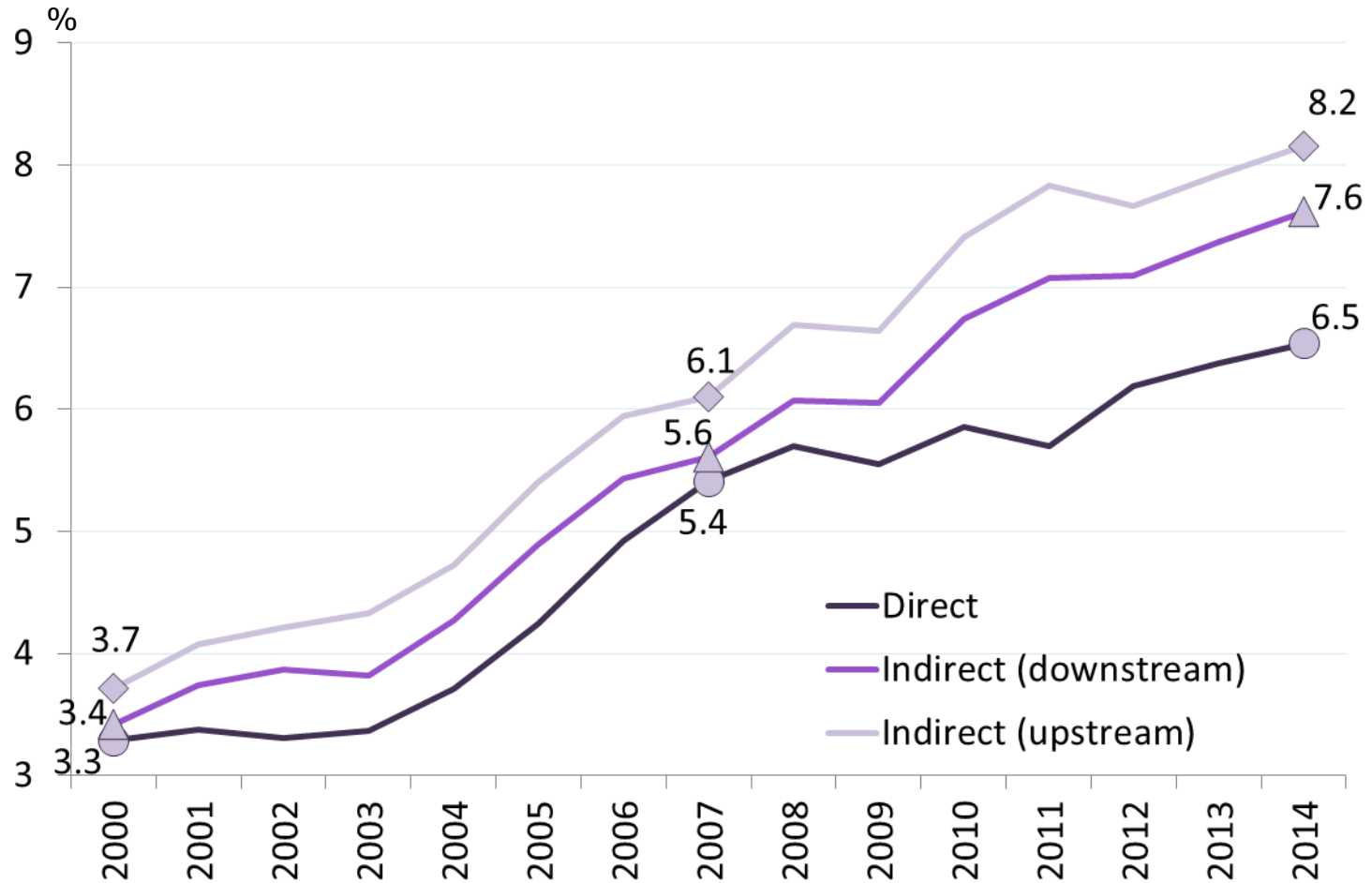


Change in share of value added in the EU embodied in global final demand of C21 products, by stage of value chain and country)



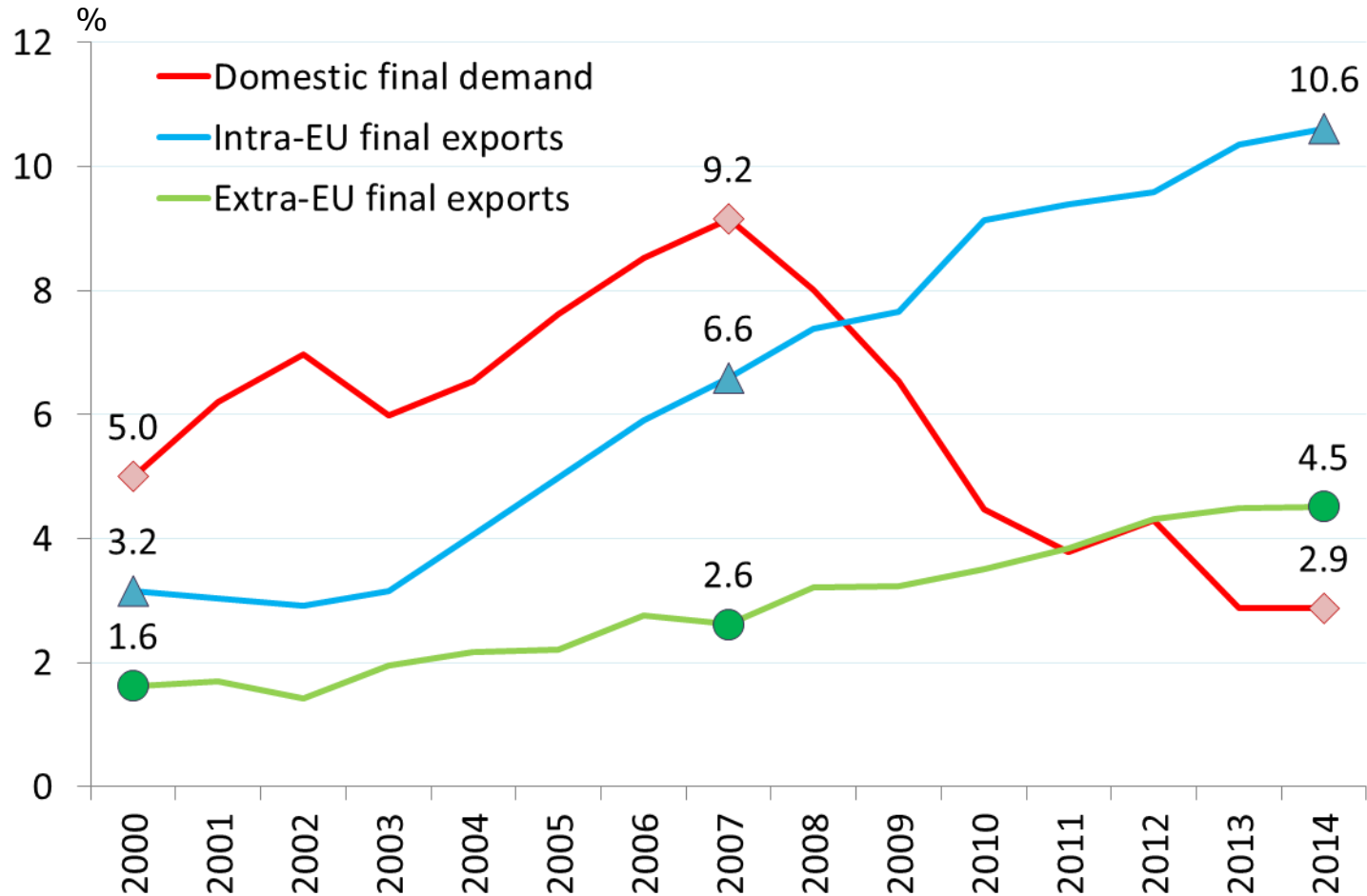


EU-13 share of value added in EU embodied in final demand of C21 products, by stage of value chain)





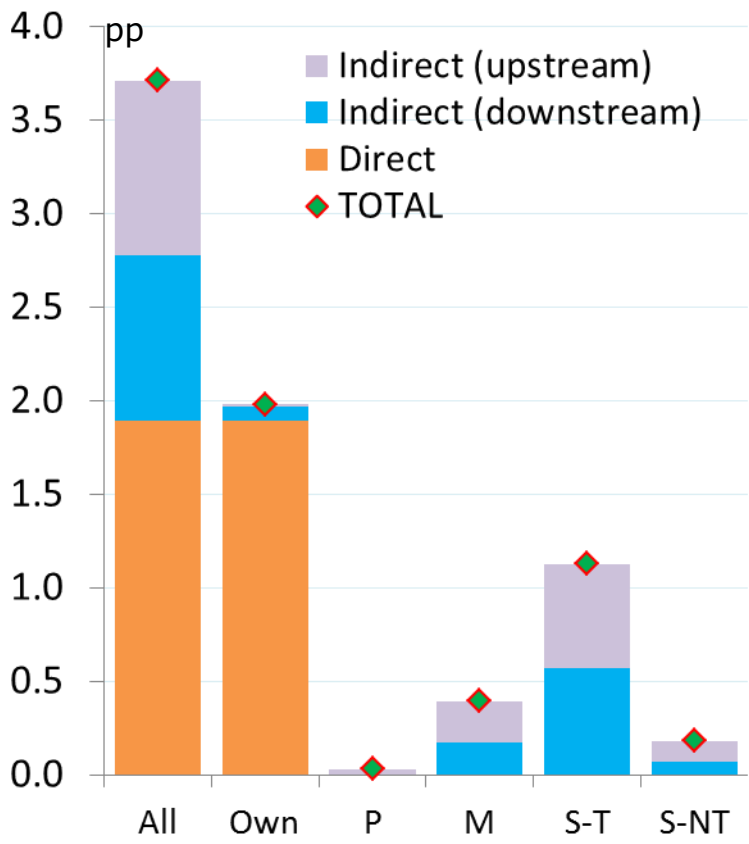
EU-13 share of value added in EU embodied in final demand of C21 products, by type of value chain)



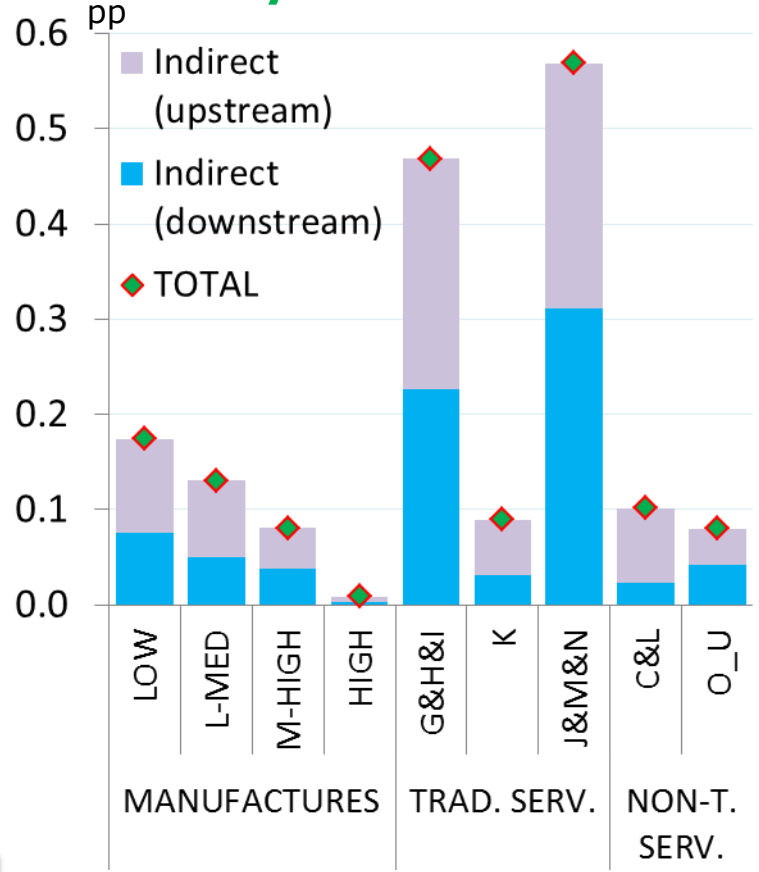


Contribution to change in EU-13 share of value added in EU embodied in final demand of C21 products, by sector/ sub-sector and stage of value chain)

By sector



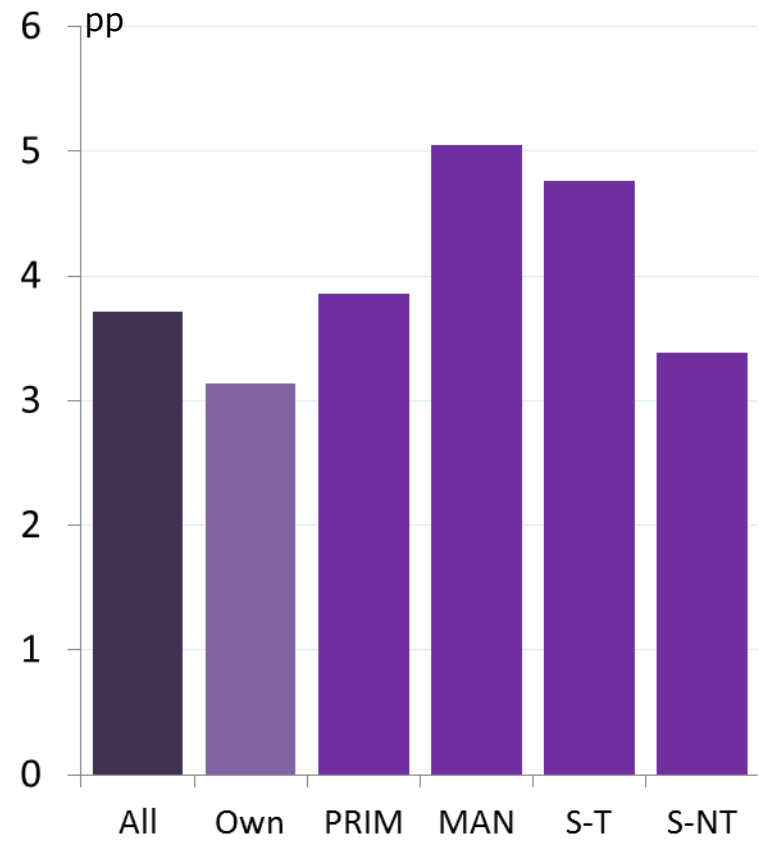
By sub-sector



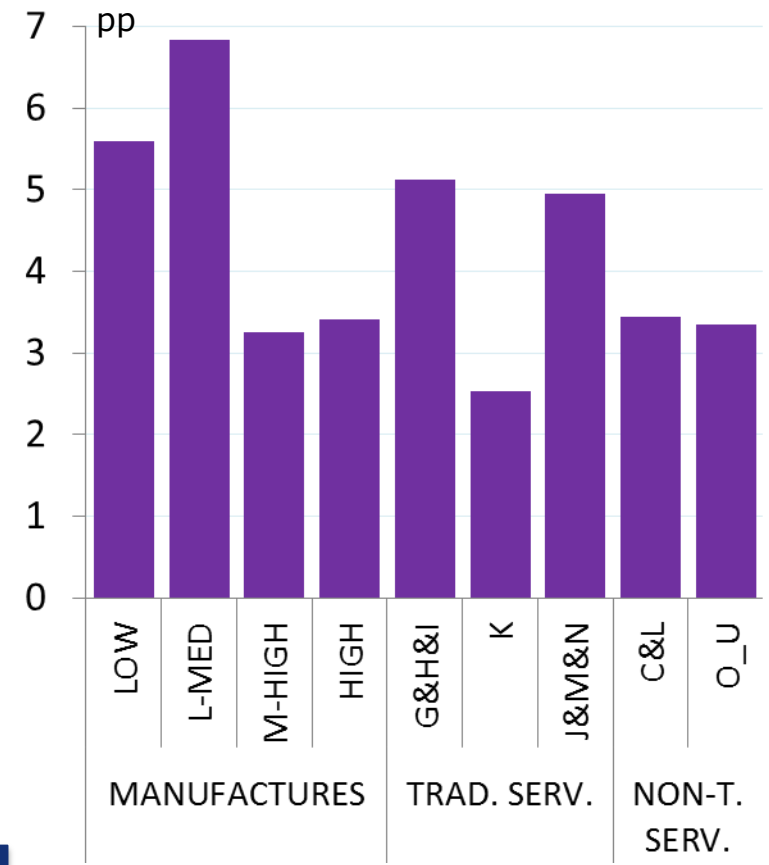


Change in EU-13 share of value added in EU embodied in final demand of C21 products, by sector and sub-sector)

By sector

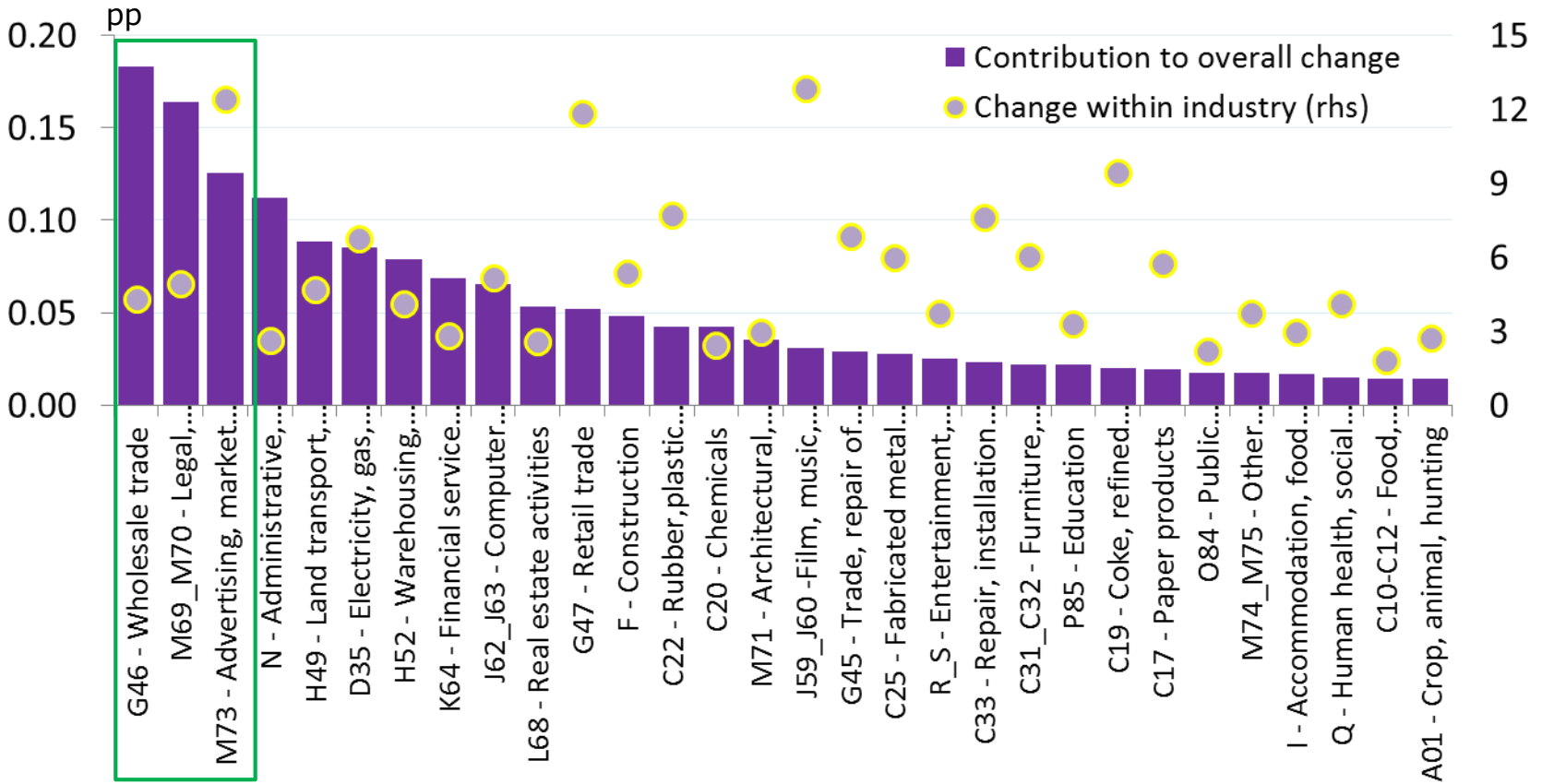


By sub-sector





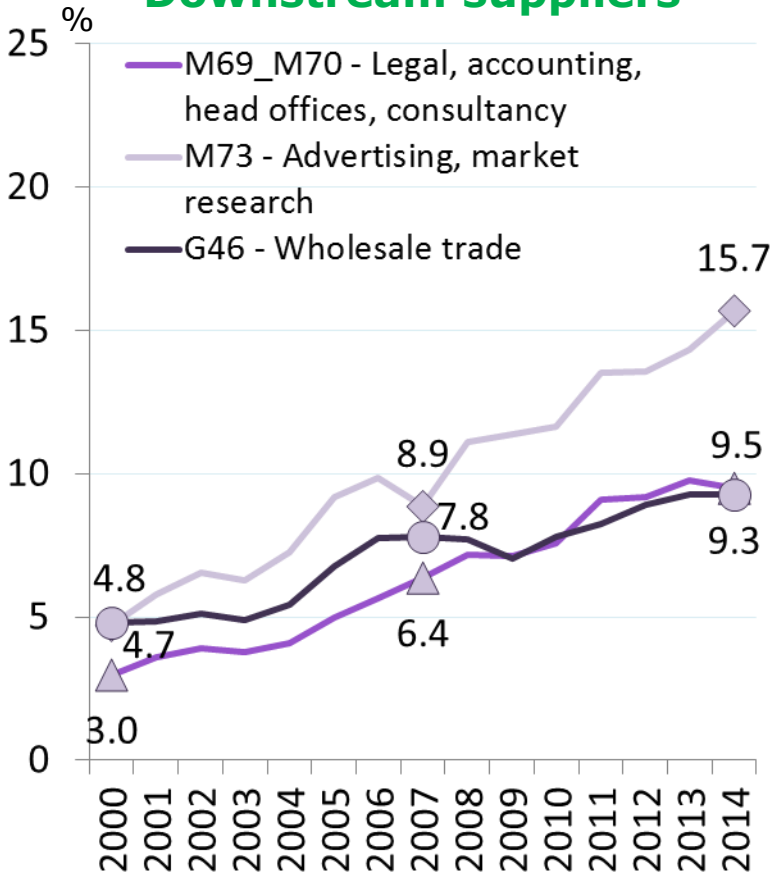
Contribution to change in EU-13 share of value added in EU embodied in final demand of C21 products, by industry, 30 selected industries bar own industry)



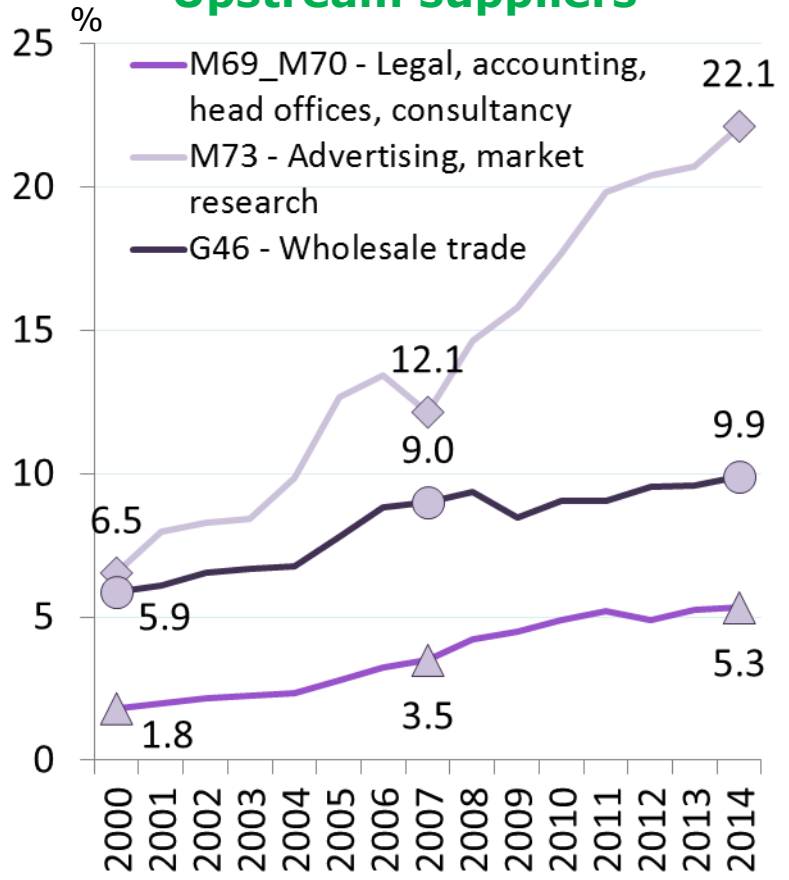


EU-13 share of *indirect* value added in EU embodied in final demand of C21 products, by stage of input supply in selected industries)

Downstream suppliers



Upstream suppliers





European
Commission

THANK YOU!

ANNEX: WIOD 2016 RELEASE

World Input-Output Database

Release 2013

World Input-Output Tables and underlying data, covering **40 countries**, and a model for the rest of the world for the period **1995-2011**. Data for **35 sectors** are classified according to the International Standard Industrial Classification revision 3 (**ISIC Rev. 3**). The tables adhere to the **1993 version of the SNA**.



Release 2016

World Input-Output Tables and underlying data, covering **43 countries**, and a model for the rest of the world for the period **2000-2014**. Data for **56 sectors** are classified according to the International Standard Industrial Classification revision 4 (**ISIC Rev. 4**). The tables adhere to the **2008 version of the SNA**.



WIOD: country coverage

+2016 release

<p>European Union 28</p>		<p>EU15</p>
		<p>EU13</p>
<p>EU neighbours</p>		<p>Russia, Turkey</p>
<p>America</p>		<p>Mexico, Brazil</p>
<p>Asia-Pacific</p>		<p>China, India, Indonesia</p>
<p>Rest of the World</p>		<p>Emerging economies</p>



WIOD: sector coverage

+2016 release

2013 release 2016 release

Primary	2	4
Manufacturing	15	20
Tradable services	10	21
Non-tradable services	8	9
	Σ 35	56

C20 Manufacture of chemicals and chemical products
C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations

C26 Manufacture of computer, electronic and optical products
C27 Manufacture of electrical equipment

C29 Manufacture of motor vehicles, trailers and semi-trailers
C30 Manufacture of other transport equipment

J62_J63 Computer programming, consultancy and related activities; information service activities

K64 Financial service activities, except insurance and pension funding
K65 Insurance, reinsurance and pension funding, except compulsory social security
K66 Activities auxiliary to financial services and insurance activities

M69_M70 Legal and accounting activities; activities of head offices; management consultancy activities
M71 Architectural and engineering activities; technical testing and analysis
M72 Scientific research and development
M73 Advertising and market research
M74_M75 Other professional, scientific and technical activities; veterinary activities



European
Commission

THANK YOU!