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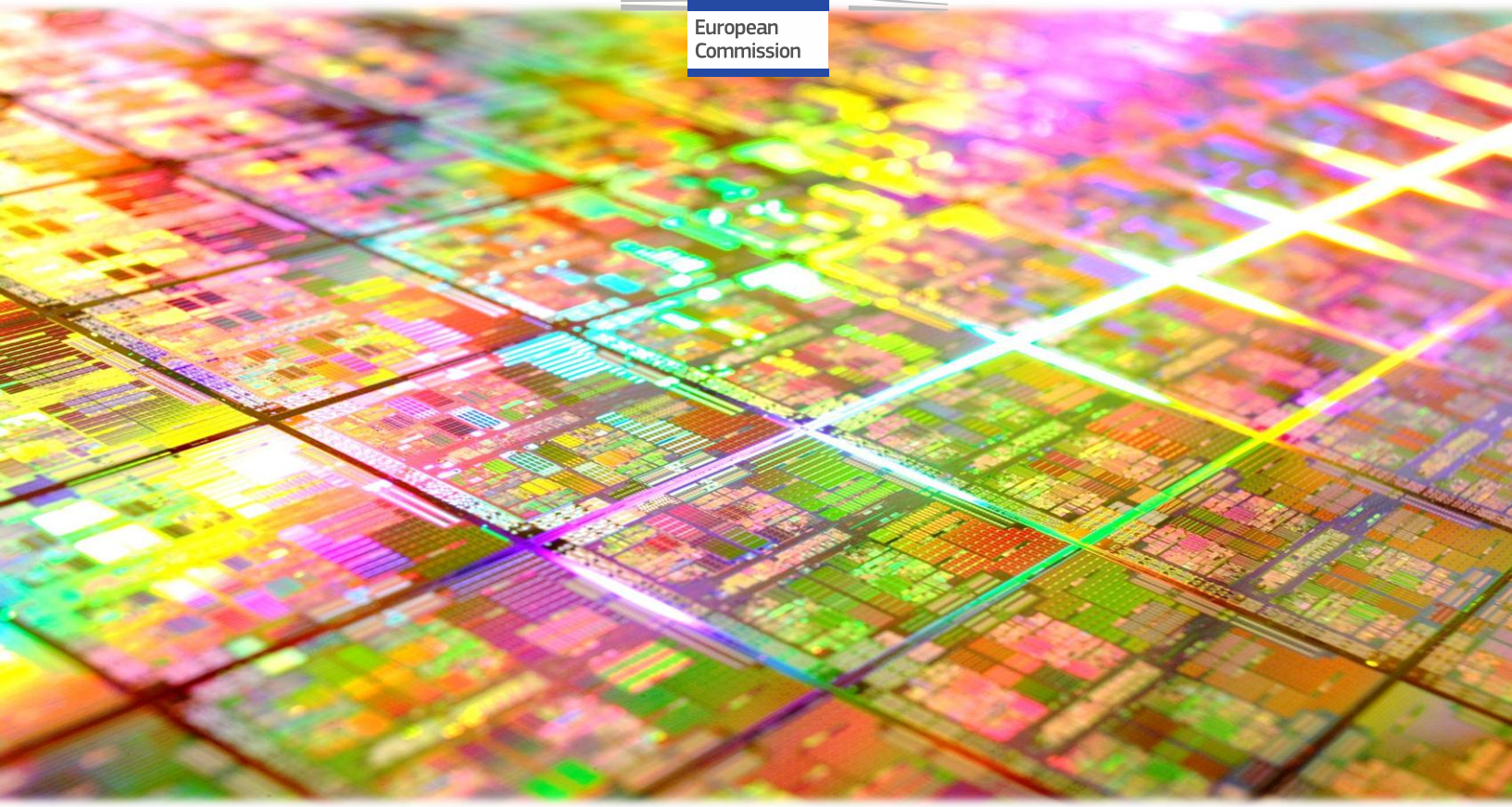

Exchange of good policy practices promoting the industrial uptake and deployment of Key Enabling Technologies

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1 Executive summary

Background and study objective

The European Commission's Communication on Industrial Policy Flagship initiative of 28 October 2010[1] and the subsequent Competitiveness Council of 10 December 2010 both highlighted the vital importance of a prosperous, innovative and sustainable European industry for the overall competitiveness of EU economy. To help formulate and implement effective structural reforms, the Council welcomed the intention of the European Commission to initiate exchanges of good practices and invited Member States to engage in closer cooperation. At the Enterprise Policy Group[2] (EPG) meeting in May 2011, DG Enterprise and Industry proposed to organize a new series of exchange of good practice in policy areas relevant for industrial competitiveness. The principal aim is to support policy development and learning among Member States through the identification and review of good practices. Based on the preferences of EPG members, the first exchange has focused on policy practices promoting the industrial uptake and deployment of Key Enabling Technologies (KETs).

In September 2009 the European Commission published its Communication "Preparing for our future: Developing a common strategy for key enabling technologies in the EU". This strategy clearly identifies the need for the EU to facilitate the industrial deployment of Key Enabling Technologies (KETs) in order to make its industries more innovative and globally competitive. Since then, the need to foster the industrial deployment of KETs in Europe has been identified as a priority in several EU policy documents. In the Communication "A European strategy for Key Enabling Technologies – A bridge to growth and jobs" of June 2012, the European Commission outlines a single strategy for KETs to allow maximum exploitation of the EU's potential in competitive markets. This Communication underlines the systemic relevance of KETs to the EU's capability to innovate and modernize its industrial base. The objective of this study is to identify a coherent mix of policy measures that support the deployment of KETs.

Selection of good policy practice cases

In the first phase of this study, a policy and performance profile of all EU27 countries and several non-EU27 countries was compiled. Based on these profiles, an

[1] An Integrated Industrial Policy for the Globalisation Era: Putting Competitiveness and Sustainability
[2] A consultative body of the Directorate-General for Enterprise and Industry

initial selection of good policy practice cases was made. This selection was further refined by the Member States experts during the expert working group meetings. The first expert working group meeting focused on the identification of key success factors and conditions of transferability of policy practices, while in the second expert working group meeting information on the selected good policy practices was exchanged. In the concluding seminar, the insights obtained in the study were disseminated to and discussed with a wider audience of policy makers.

Lessons learned

Several lessons with regard to good policy practice cases in the area of KETs deployment have been formulated.

Lesson 1: Need to cover multiple technological readiness level stages

From an emerging technology to evolve in a market-ready product and/or service, it is important to cover the subsequent stages of technology and product development, the so-called technological readiness level scale (TRL). In all EU27 countries, policy measures to support basic research (TRL 1) and technological research (TRL 2-4) are in place. The stimulation of KETs deployment regards technological readiness levels 5 to 8. In most European countries, policy measures targeting TRL 5 could be found, but only few policy measures could be identified that target TRL 6 and 7, while no policy measures were found that target TRL 8. In bringing a technology to the market, it are however these TRL phases which are the most risky and difficult to cover.

The experts agreed that it is important to cover the whole value chain, covering all stages of technology development and deployment in order to pass the valley of death, and not to stop at TRL 4 or TRL 5 as is the case in many countries. Moreover, it is beneficial if policy measures target multiple TRLs as companies and/or research institutions only need to file for a project once. An overview of policy measure that cover different phases in the technological readiness level scale enhances the clarity of filing for a particular measure by companies and research institutes, and often reduces the time to grant.

Lesson 2: Need to strengthen the demand side support

Public support to deploy KETs is often essential in order to push technologies into the market, where real added value can be created for society at large. In addition, a technology 'pull' approach (demand side measures) can also help to deploy KETs. Public procurement or demand-driven initiatives can provide a route to market to

get KETs introduced to the market. In addition, pilot plants may help companies to test and demonstrate their technology. Policy measures that provide funding for pilot plants are important to cover the gap between technology development and commercialization.

Lesson 3: Need to tap into global value and innovation chains

The deployment of KETs is not a privilege of a particular region; it is taking place at a global scale. Hence, there is a need to tap into the global value and innovation chain in order to fill in the missing parts in the chain. Especially for smaller countries, it is difficult to have an entire value or innovation chain present inside their borders. Policy measures should open up to allow international partners.

SMEs are important for the deployment of KETs but they are often too small to make a difference in a particular KETs industry. To realize an impact with regard to KETs deployment on a global scale, one needs the presence of large companies. The combination of small and large players allows for the translation of R&D results into concrete applications and for the promotion of growth and employment. In this regard it is important for policy makers to improve collaboration across borders and strengthen the complementary with value chains in other countries.

Lesson 4: Options to rethink funding strategies

Public funding to stimulate the deployment of innovation is often essential to correct for market failure. Several options can be applied to increase the budget available to provide finance to companies and institutions throughout the different stages of technology development and deployment. One solution is to use the Structural Funds**.** Another option is to trigger investment through the use of public-private partnerships, public-private funding or by using public procurement. A third option is to give grants to companies and research institutions and ask fees to companies based on the utilization rate, amortization or commercial success of developed technology/product.

Lesson 5: Options to enhance collaboration between academia and business

Traditionally there are two key constraints to enhance collaboration between academia and business: the low absorptive capacity of enterprises for research and a gap in the availability of applied research capability that enterprises can readily

access. Policy makers can assist in closing this gap by stimulating industry collaboration in small and large research programs. Also support to companies to (temporarily) employ an academic or (PhD) student can stimulate the transfer of knowledge between academia and industry.

Lesson 6: Consider making smart choices

Several European countries have a relative immature research base with regard to KETs. In order to enhance the potential to deploy KETs, it is therefore essential to enhance the critical mass in KETs. One way to address this problem is to make specific choices on research themes to support. Ideally, the choices resonate well with local industry and academic strengths. Smart choices and a focus on particular KETs can well align to the concept of smart specialization.

Conclusions

Countries should consider the stimulation of KET deployment by designing a clear strategy towards KETs deployment, subsequently translated into concrete policy measures based on the characteristics of its R&D system and industrial base. Policy makers should be clear on which actors e.g. SMEs, large companies, universities and research organizations, they believe are capable to fulfill which role. A challenge is to anchor key companies in Europe. A timely response with regard to public funding is often an important factor in companies' decision to make additional investments in particular countries. The Commission might consider revising certain framework conditions in order to reduce the administrative burden and tax.

Industry is an important actor in deploying KETs, hence the culture of doing business between academia and industry has an influence on the deployment of KETs. A good insight into the strengths and weaknesses of a regional and/or national KETs innovation system is essential to stimulate collaboration among the appropriate actors in the KETs areas of interest. As value and/or innovation chains are global, deployment is a larger issue which calls for a coordination of means and efforts. This implies that policy measures should be open towards international collaboration and there is a challenge at the European level to optimize the policy measures targeting KETs deployment.

Policy measures targeting TRL 6 to 8 have been identified as critical and problematic as a certain amount of founding is needed for these TRLs. In designing deployment

measures toward these stages of technology development and deployment, it is important to look at the function of state aid rules and framework conditions.

A focus on particular KETs may be a preferred option, especially in case of countries with smaller budgets or limited critical mass. This focus can be aligned with the smart specialization strategies that are in the process of being developed. It might be interesting to create a sort of "ERA-NET" platform (facilitated by the European Commission) focusing on KETs deployment as this might improve the coherence and coordination among different countries and stimulate the exchange of good policy practices.

A strong signal from policy makers is essential to stimulate the deployment of KETs. National, regional and European policy makers face the challenge to further sharpen and harmonize KET tailored policy support measures through close collaboration. There is a need to orchestrate (as much as possible) KET-related policies across countries in order to avoid unnecessary duplication and ensure optimal policy attention and resource allocation. Better policy coordination would enable synergies between measures at various levels and would help to complement them by well-targeted EU sponsored initiatives.

2 Introduction

The European Commission has launched a study for the exchange of good policy practices promoting the industrial uptake and deployment of Key Enabling Technologies. The final report gives an overview of the activities conducted and results obtained throughout this study.

2.1 Background of the study

The European Commission's Communication on Industrial Policy of 28 October 2010 and the subsequent Competitiveness Council of 10 December 2010 both highlighted the vital importance of a prosperous, innovative and sustainable European industry for the overall competitiveness of EU economy. To help formulate and implement effective structural reforms, the Council welcomed the intention of the European Commission to initiate exchanges of good practices and invited Member States to engage in closer cooperation. This message was further reiterated by the 2011 Communication[3] "Industrial Policy: Reinforcing competitiveness".

European Commission is organizing a new series of exchange of good practice in policy areas relevant for industrial competitiveness. The principal aim is to support policy development and learning among Member States through the identification and review of good practices. The process is expected to conclude by good practice recommendations that could serve as policy guidance or a toolkit for policy makers when designing or implementing reform measures.

This study is the first in a series of exchanges of good practices in policy areas relevant for industrial competitiveness. It focuses on policy practices promoting the uptake of Key Enabling Technologies (KETs). Key enabling technologies (KETs) open up new opportunities for the development of a wide variety of new processes, goods and services, including the development of entirely new industries. The Communication[4] "Preparing for our Future: Developing a Common Strategy for Key Enabling Technologies in the EU" identified them as potentially playing a major role in the future competitiveness of the EU. The European Commission has identified the following technologies as Key Enabling Technologies‖ (KETs):

- Nanotechnology
- Micro- and nanoelectronics
- Industrial biotechnology
- Photonics
- Advanced materials
- Advanced manufacturing systems

[3] http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/files/comm_2011_0642_en.pdf

[4] http://ec.europa.eu/enterprise/sectors/ict/files/communication_key_enabling_technologies_sec1257_en.pdf

In the Communication "A European strategy for Key Enabling Technologies – A bridge to growth and jobs" of June 2012, KETs are identified as "a key source of innovation as they provide indispensable technology bricks that enable a wide range of product applications, including those required for developing low carbon energy technologies, improving energy and resource efficiency, boosting the fight against climate change or allowing for healthy ageing". They create value along different industrial chains and sectors - from materials through equipment and devices, to products and services. Due to their cross-cutting nature and systemic relevance, KETs are instrumental for modernizing Europe's industrial base as well as driving the development of entirely new industries. However, whilst EU has an excellent R&D performance in this area, its major weakness lies in translating this knowledge into commercially successful goods and services. Hence there is a need to stimulate the deployment of KETs.

2.2 Objectives of the study

The main objective of this study was to organize an exchange of good practice exercise, whose main purpose has been to stimulate policy learning among Member States through a review of existing policy practices; and to identify a coherent mix of policy measures, which through their interaction enhance the uptake of research outcomes by industry.

As part of this overall objective, the study included the following activities:

- First phase:
  - Providing an EU27 overview of MS policies
  - Singling out leading countries outside the EU that have relevant policies in KETs
  - Performance profiles of EU27 countries and leading countries outside the EU
  - Identification of twenty good practice cases for further in-depth analysis
- Second phase:
  - Information exchange with an expert working group to identify key factors and conditions that influence the success of the selected policy practices and to look at the conditions for transferability of these practices
  - Presentation of results of the expert working group to a wider professional audience; validate the findings and exchange of views on the lessons learned

3 Policy and performance profiles of EU27 countries & leading countries outside the EU

In the first phase of this study, an overview has been provided of the policy profiles of EU27 countries and leading countries outside the EU (China, India, Israel, Japan, Korea, Switzerland, Taiwan and United States) based on desk research of available databases and literature. The inception report contained a selection of relevant policy measures with regard to the deployment of KETs for each country[5]. In the selection of policy measures, following key words were used to identify relevant policy measures:

- Commercial exploitation, commercial development, pre-competitive development, experimental development
- Business model, value chain, industrial roadmap
- Co-funding of public and private sector, public-private partnerships, public procurement
- Prototypes, proof-of-concept, industrial applications, demonstration projects, large test facilities, test environments, joint labs, development of plants

The profiles attempt to be comprehensive, although it might be possible that there exist additional measures with regard to the deployment of KETs that have not been added in the profile. For some countries, it was difficult to find policy measures that particularly target KETs. In that case, more general policy measures were examined and attention was devoted toward the technological areas they target. The expert working groups has added additional insights to this first screening of relevant policy measures.

For each EU27 country and 8 leading countries outside the EU a profile has been developed. This profile contains a general background, an overview of several policy initiatives, and data on other calls or interesting information. For countries in which no specific policy initiatives with regard to the deployment of KETs could be identified, a general background and data on other calls or interesting information is provided. Policy measures on a national level have been examined, no regional policy measures have been considered.

In addition, an overview has been provided of the performance of each EU27 country as well as eight leading countries in each of the fields of Key Enabling Technologies (KETs) in terms of technology development and deployment[6]. Patent

[5] The policy profiles of individual countries are not included in the final report in order to limit the number of pages of the final report. The policy profiles of individual countries can be obtained upon request.

data were used to investigate development activities that are linked to commercialization perspectives while trade data gave some indication of a country's position in deploying KETs by successfully commercializing KETs-based products on international markets.

3.1 Methodology for the performance profiles

The country performance in KETs has been measured by a descriptive analysis based on a set of performance indicators as well as some non-parametrical integrative analysis of patent and trade performance based on composite indicators and a 'production frontier' analysis.

3.1.1 Patent activities

Patent activities in each field of KET are identified by a combination of IPC/ECLA codes. A classification that has been developed for a background study to the 2010 European Competitiveness Report[7]was used, as it has been proven to be useful. KETs are defined by the following IPC/ECLA codes:

- Nanotechnology: B81C, B82B, B82Y
- Photonics: F21K, F21V, G02B 1, G02B 5, G02B 6, G02B 13/14, H01L 25/00, H01L 31, H01L 51/50, H01L 33, H01S 3, H01S 4, H01S 5, H02N 6, H05B 31, H05B 33
- Industrial biotechnology: C02F 3/34, C07C 29/00, C07D 475/00, C07K 2/00, C08B 3/00, C08B 7/00, C08H 1/00, C08L 89/00, C09D 11/04, C09D 189/00, C09J 189/00, C12M, C12N, C12P, C12Q, C12S, G01N 27/327 (except for co-occurrence with A01, A61 and some subclasses of C07K, C12N, C12P C12Q, G01N and except for patents applied by applicants from the pharmaceutical and seed industry)
- Advanced materials: B32B 9, B32B 15, B32B 17, B32B 18, B32B 19, B32B 25, B32B 27, B82Y 30, C01B 31, C04B 35, C08F, C08J 5, C08L, C22C, D21H 17, H01B 3, H01F 1, H01F 1/12, H01F 1/34, H01F 1/44
- Micro- and nanoelectronics: B82Y 25, H01H 57/7, H01L, H05K 1, H03B 5/32, H05K 3

[7] See Centre for European Economic Research and TNO (2010), European Competitiveness in Key Enabling Technologies, Background Report, May 2010, Mannheim and Delft.

- Advanced manufacturing technologies: B03C, B06B 1/6, B06B 3/00, B07C, B23H, B23K, B23P, B23Q, B25J, G01D, G01F, G01H, G01L, G01M, G01P, G01Q, G05B, G05D, G05F, G05G, G06M, G07C, G08C (except for co-occurrence with sub-classes directly related to the manufacture of automobiles or electronics); A21C, A22B, A22C, A23N, A24C, A41H, A42C, A43D, B01F, B02B, B02C, B03B, B03D, B05C, B05D, B07B, B08B, B21B, B21D, B21F, B21H, B21J, B22C, B23B, B23C, B23D, B23G, B24B, B24C, B25D, B26D, B26F, B27B, B27C, B27F, B27J, B28D, B30B, B31B, B31C, B31D, B31F, B41B, B41C, B41D, B41F, B41G, B41L, B41N, B42B, B42C, B44B, B65B, B65C, B65H, B67B, B67C, B68F, C13C, C13D, C13G, C13H, C14B, C23C, D01B, D01D, D01G, D01H, D02G, D02H, D02J, D03C, D03D, D03J, D04B, D04C, D05B, D05C, D06B, D06G, D06H, D21B, D21D, D21F, D21G, E01C, E02D, E02F, E21B, E21C, E21D, E21F, F04F, F16N, F26B, G01K, H05H (in case of co-occurrence with G06)

One should note that there is some overlap between KETs. Most importantly, some IPC codes in the field of nanotechnology are also assigned to micro-/nanoelectronics and new materials. There is also a minor overlap between photonics and micro-/nanoelectronics.

For each KET and country, the number of patent applications was calculated at the European Patent Office (EPO) and through the so-called Patent Cooperation Treaty (PCT procedure) at the World Intellectual Property Organisation. These patent applications are called EPO/PCT patents.

The following patent indicators were used:

- Significance (*SG*) of a certain KET *k* in total patent activities (*P*) of country *i* in year *t*: $SG_{kit} = P_{kti} / P_{it} * 100$

- Market share (*MS*) of country *i* in the global[8] production of patents for each KET *k* in year *t*: $MS_{kit} = P_{kit} / P_{kt} * 100$

- Specialisation (*SP*) of country *i* on the production of patents in a certain KET *k* in year *t* measured by revealed technological advantage (i.e. the significance of a certain KET in a country's total patent activity over the significance of that KET in global patent activity): $SP_{ki} = ln [(P_{kit} / P_{it}) / ((P_{kt} / P_t)] * 100$

- Medium-term dynamics (*MD*) in the production of KET patents uses the so-called Birch rate of growth which combines relative and absolute growth between period *p-1* and period *p*:
  $MD_{kip,p-1} = (P_{kip} - P_{ki,p-1}) * (P_{kip} / P_{ki,p-1}) * 100$
  Periods cover several years in order to avoid arbitrary results due to

[8] „Global" here refers to the sum of the 34 countries considered. These 34 countries cover well over 95% of all EPO/PCT patent applications in the six KETs.

unrepresentative events in a certain year. *p-1* represents 2000-02 and *p* 2006-08. The Birch rate of growth is preferred over the standard average growth rate since for most countries the number of annual patent applications per KET is very low, and standard growth rates would be subject to the problems of zeros in the base period and change in small numbers.

For *SG*, *MS* and *SP*, the most recent period 2005 to 2008 is considered. Data for 2009 and younger are not available due to the time lag between patent application and publication (18 months) and the time it needs to process patent application data for Patstat publication.

In order to illustrate which actors from industry and public science dominate the development of new technology in each KET, the ten largest patent applicants (excluding individuals) are reported. Applicants with less than 5 applications in the four-year period 2005-08 are ignored. For better representation of KET actors in smaller countries and countries with a low international orientation of the production and deployment of KETs, patent applications at national patent offices are considered in addition to EPO/PCT applications.

3.1.2 Trade activities

Trade in KETs-based products has been measured by exports and imports of products that may be viewed as relying substantially on KETs. Identifying such products is anything but straightforward, however, and would require substantial amount of research. Due to time restrictions in this study, a pragmatic and tentative approach was applied. Based on expert knowledge[9] SITC rec. 3 Codes on 5-digit level were assigned to KETs, producing the following list:

- Photonics: SITC codes 66595, 75133, 77318, 7742, 77637, 871, 87443, 87445, 88415, 88417, 88419, 8842, 8843
- Nanotechnology: SITC codes 5221, 5225, 5231, 5232, 5237, 5238, 5249, 5311, 5323, 5331, 5335, 5986
- Industrial Biotechnology: SITC codes 5121, 5122, 5123, 5124, 5137, 5138, 5145, 5146, 5147, 5155, 5156, 5157, 5161, 5162, 51691, 51699, 5322, 5754, 5755, 5922

[9] For this part of the project, the Lower Saxonian Institute of Economic Research (NIW) has been consulted which has substantial experience in statistical analysis of trade data for specific fields of technology and sectors.

- Advanced Materials: SITC codes 2321, 2665, 2667, 2671, 571, 572, 573, 574, 5751, 5752, 5759, 583, 6292, 6572, 6574, 65773, 66391, 6647, 6715, 6728, 675, 68214, 68312, 68412, 68612, 68712
- Micro-/Nanoelectronics: SITC codes 66741, 77625, 77627, 7763, 7764, 7768
- Advanced Manufacturing Technologies: SITC codes 731, 733, 735, 7373, 7374, 74414, 74415, 7448, 7456, 7459, 7522

There is almost no overlap between KETs, except from one subclass assigned both to photonics and micro-/nanoelectronics.

Five trade indicators were used:

- Significance (*SG*) of a certain KET *k* in total exports (*E*) of country *i* in year *t*: $SG_{kit} = E_{kti} / E_{it} * 100$
- Market share (*MS*) of country *i* in global[10] exports for each KET *k* in year *t*: $MS_{kit} = E_{kit} / E_{kt} * 100$
- Export Dynamics (*ED*) of country *i* for each KET *k* between year *t* and the previous year *t-1*: $ED_{kit,t-1} = (E_{kit} - E_{ki,t-.t}) / E_{ki,t-.t} * 100$
- Trade Balance (*TB*) of country *i* in a certain KET *k* in year *t*, i.e. the difference between exports and imports (*I*) over the sum of exports and imports: $TB_{kit} = (E_{kit} - I_{ikt}) / (E_{kit} + I_{kit}) * 100$
- Specialisation (*SP*) of country *i* on trade in a certain KET *k* in year *t* measured by revealed comparative advantage (i.e. a country's export to import relation for a certain KET over export to import relation in the country's total trade): $SP_{ki} = ln [(E_{kit} / I_{kit}) / ((E_{it} / I_{it})] * 100$

All indicators have been calculated for the period 2000 to 2010.

3.2 Data for the performance profiles

3.2.1 Patent data

Patent data are taken from the the Patstat database generated by the EPO. The study used the October 2011 edition of Patstat. Patstat is a snapshot of the EPO

[10] „Global" here refers to the sum of the 34 countries considered. These 34 countries are responsible for about 95% of total exports and imports in the six KETs.

master documentation database (DOCDB), containing 20 tables including bibliographic data, citations and family links. It covers more than 80 national patent authorities with more than 63 million patent applications and additional information on inventor and applicant addresses and standardised applicant names. Patstat data is used in the following way:

- Patent families were analyzed rather than individual patents. A patent family is a group of patent applications filed by the same applicant(s) in one or more countries that are related to a single invention. By doing this, the incidence of double-counting of one and the same invention in patent data was reduced. The term patent thus refers to one representative patent out of a certain patent family. For each patent the year of application was identified (i.e. the oldest priority year of all applications belonging to one family) and the countries for which patent protection has been sought as well as the names of the patent applicants.

- A focus on patents that include an application at the EPO or a PCT application (so-called EPO/PCT patents) was applied. These patents are likely to represent higher economic values since these applications are more costly than applying just at a single national patent office.

3.2.2 Trade data

Trade data are taken from the UN Comtrade (United Nations Commodity Trade Statistics) database which is produced under the International Merchandise Trade Statistics by the International Merchandise Trade Statistics Section of the United Nations Statistics Division. Data processing was performed by the Lower Saxonian Institute of Economic Research (NIW).

3.3 Composite indicator

A composite indicator was build using the patent and trade indicators. This indicator has the aim to provide some insight in the performance of a country. The countries on the frontier and those rather close to it are not statistically different from each other in performance. The ranking is mainly informative.

3.3.1 Methodology

Composite indicators were constructed by relating a country's value for a certain indicator (averaged over the period under consideration) to a reference value.[11] The reference value represents the unweighted average of indicator values for a reference group *r* of countries which consists of the USA, Japan, Germany, Korea, the Netherlands, Sweden and Switzerland. These seven countries are often regarded as leading in the development and deployment of KETs and represent both large and medium-sized to small countries. The composite indicators were calculated in the following way (note that all indicators are first divided by 100):

$$^{P}CI_{ki} = ln\,(^{P}SG_{ki} / {}^{P}SG_{kr}) + ln\,(^{P}MS_{ki} / {}^{P}MS_{kr}) + ln\,(e^{^{P}SP_{ki}} / e^{^{P}SP_{kr}}) + ln\,(*MD_{ki} / *MD_{kr})$$

$$^{T}CI_{ki} = ln\,(^{T}SG_{ki} / {}^{T}SG_{kr}) + ln\,(^{T}MS_{ki} / {}^{T}MS_{kr}) + ln\,(e^{^{T}SP_{ki}} / e^{^{T}SP_{kr}}) + ln\,(*TB_{ki} / *TB_{kr}) + ln\,(*ED_{ki} / *ED_{kr})$$

Asterix (*) indicates that these indicators have been linearly transformed in a way that the lowest observed value is marginally greater than zero in order to allow logarithmic transformation. This transformation is applied in order to avoid too strong impacts of extreme values on the composite indicator (e.g. if a country shows an extremely high growth rate due to a very low value in the base period). For ease of presentation, both indicators are linearly transformed to a value range that starts from zero by subtracting the observed minimum value (which is negative) from all originally calculated values of the composite indicators.

Both composite indicators combine relative performance indicators (specialisation, significance of a KET within a country's total patent and trade activities) and indicators that depend on a country's size such as the market share and the growth indicator.

The two composite indicators were then plotted in order to perform a 'production frontier' analysis (also called Free Disposal Hull analysis). This non-parametric

[11] When doing this, the two indicators on specialisation are used without logarithmising them.

analysis identified those countries that show a combination of patent and trade performance that is not outperformed by any other country (that is the countries in the plot that are on the left-upper side of the plot when patent performance is the x-axis and trade performance the y-axis).

3.3.2 Free-Disposal-Hull Analysis of Patent and Trade Performance of Countries by KETs

The results of the integrative analysis based on the Free-Disposal-Hull analysis have been contained in figures for each of the six KETs[12]. Countries on the 'production frontier' are highlighted as well as countries with a strong patent performance that are somewhat below the frontier. For these countries, high current investment in the development of KETs may be transformed in future years in a stronger trade performance (i.e. deployment of KETs) since there may be a considerable time lag between the development of new technology and the commercialisation of technical inventions in KET-based products. Countries close to the production frontier have been indicated as well. For each KET, a subsequent graph highlighted the countries that perform above or close to the average values of the two composite indicators.

3.3.3 Summary of country performance by KET

Table 1 provides an overview of the key results by country and KET. Some countries show a strong patent and trade performance in all six KETs e.g. China, France, Germany, Japan, Korea, Netherlands and US. Other countries have a focus on certain KETs, and perform particularly strong in these fields. For example, Belgium and Finland perform well in nanotechnology, industrial biotechnology and advanced materials; while Czech Republic performs well in photonics and advanced manufacturing.

[12] The graphs are not included in the final report in order to limit the number of pages of the final report. The graphs can be obtained upon request.

Table 1: Overview of performance profile per country and KET

	Photonics	Nano-technology	Industrial Biotech-nology	Advanced Materials	Micro-/ Nano-electronics	Advanced Manu-facturing
AT					Z	Z
BE		X	X	X		
BG		X				
CH	Z	Z	X		Z	Y
CN	X	Y	Z	Y	Y	Y
CY	Z		A		X	
CZ	X			Z	Z	X
DE	Y	X	Y	X	Y	X
DK		Z	Z			
EE		A				A
ES		X		Z		
FI	Z	X	X	X		
FR	Z	Y	Z	Y	Y	Y
GR						A
HU	X		Z	X	A	
IE		X				
IL	Z	Z	Z		X	
IN		Y	X	Y		
IT	Z	Z				X
JP	Y	Y	Y	Y	X	Y
KR	X	Y	Z	X	Y	Y
LT	Z			X		
LU	Z				Z	
LV	A					A
MT						
NL	Y	Y	Y	X	Y	Z
PL					X	X
PT	X				A	
RO						
SE	Z	X		X	A	X
SI		X		A	A	
SK			Z	Z	Z	
UK	X	Y	Z		Z	
US	X	X	Y	Y	X	Y

X: country is on the 'production frontier' of patent and trade performance

Y: country is below the 'production frontier' but shows a strong patent performance

Z: country is close to the 'production frontier' with medium to low patent performance

A: country is on the 'production frontier' but has no/almost no patent activity

Source: EPO: Patstat, UN: Comtrade. - ZEW and NIW calculations.

3.4 Selection of good policy practice cases

3.4.1 Initial selection procedure

In order to select good policy practice cases, the qualitative input from the policy profiles next to the quantitative input from the performance profiles and the composite indicator was used. There is no explicit causal link between the performance profiles and the good policy practice cases that were selected. Some countries perform quite well but have few policy measures that are targeted directly at the deployment of KETs e.g. Belgium. Other countries have interesting policy measures with regard to the deployment of KETs but do not demonstrate a good performance profile e.g. Denmark.

In selecting the good policy practice cases, attention was also devoted towards the specific KET the policy measures target. Several policy measures could be identified that target industrial biotechnology or nanotechnology while it was more difficult to identify policy measures targeting photonics or micro- and nanoelectronics. By taking both the qualitative and quantitative input into account, an initial list of good policy practice cases in several countries was compiled. This list of selected good policy practice cases was expanded as some countries had two good policy practice cases addressing a particular KET. **Error! Reference source not found.** gives an overview of the first selection of good policy practice cases.

Table 2: Initial selection of good policy practice cases

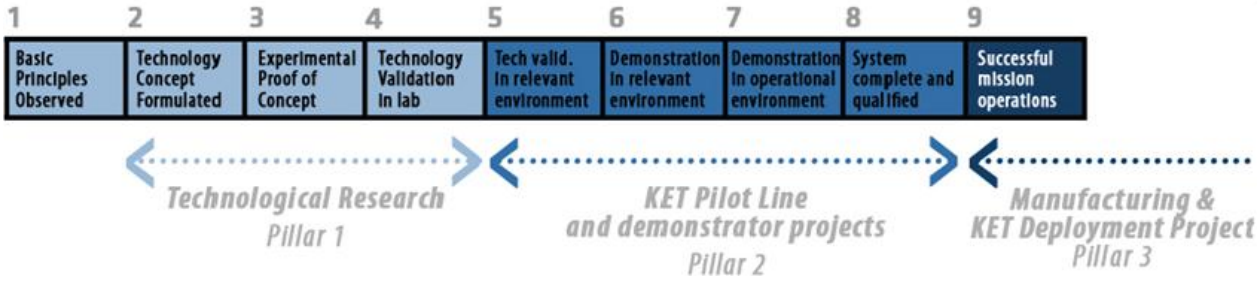
Selected policy practice	Country
Green Labs	Denmark
Functional Materials	Finland
Key technologies for Digital Economy / Nanoelectronics 1 & 2	France
Investissements D'avenir Nanobiotechnologies	France
Investissements D'avenir : Demonstrateurs Preindustriels	France
Innovation Alliance	Germany
Photonics Research Germany	Germany
BioIndustry 2021	Germany
IGF-Promotion of Industrial Collective Research	Germany

Selected policy practice	Country
Framework Programme Microsystems	Germany
Support to market-oriented R&D Activities	Hungary
Contract Research and Services Scheme	India
Technology Development and Demonstration Program	India
Nofar	Israel
Israel Nanotechnology Initiative	Israel
High Technologies Development Programme	Lithuania
Small Business Innovation Research Programme	Netherlands, UK, US
Valorization Grants	Netherlands
Measures 1.4 and 4.1 of the Operational Programme Innovative Economy	Poland
Proviking	Sweden
Multinational Innovative R&D Centers	Taiwan
Micro and Nanotechnology Manufacturing Initiative	UK
Knowledge Transfer Partnerships	UK
Small Business Technology Transfer Program	US

3.4.2 Refinement of selection procedure

The list of selected good policy practice cases has been used as direct input for the discussion during the first expert working group meeting. The objective of this meeting was to identify key factors and conditions that influence the success of the selected policy practices. Attention was also devoted towards conditions of transferability of policy practices. During the workshops, it was decided to categorize the selected good practice cases according to the technological readiness level (TRL) (Figure 1) and to select particular measures as 'ideal' cases having the aim to result in 'ideal' policy measures for TRL 4 to TRL 8.

Figure 1: Technological readiness levels scale



Source: High-Level Expert Group on Key Enabling Technologies

All Member State representatives were invited to propose additional measures if appropriate. As a result, the Christian Doppler Initiative and the COMET program have been added to TRL 4, the Tyndall and NIBRT initiative to TRL 7, and the Central Innovation Programmes SME to TRL 7. It was not possible to identify a policy measure that can be classified as TRL 8. The final selection of good policy practice cases is displayed in Table 3. This selection took place in collaboration with the experts that attended the expert working group meetings and is therefore not exhaustive. Appendix 1 gives an overview of the Member States experts that have been involved in the first and/or second export working group meeting.

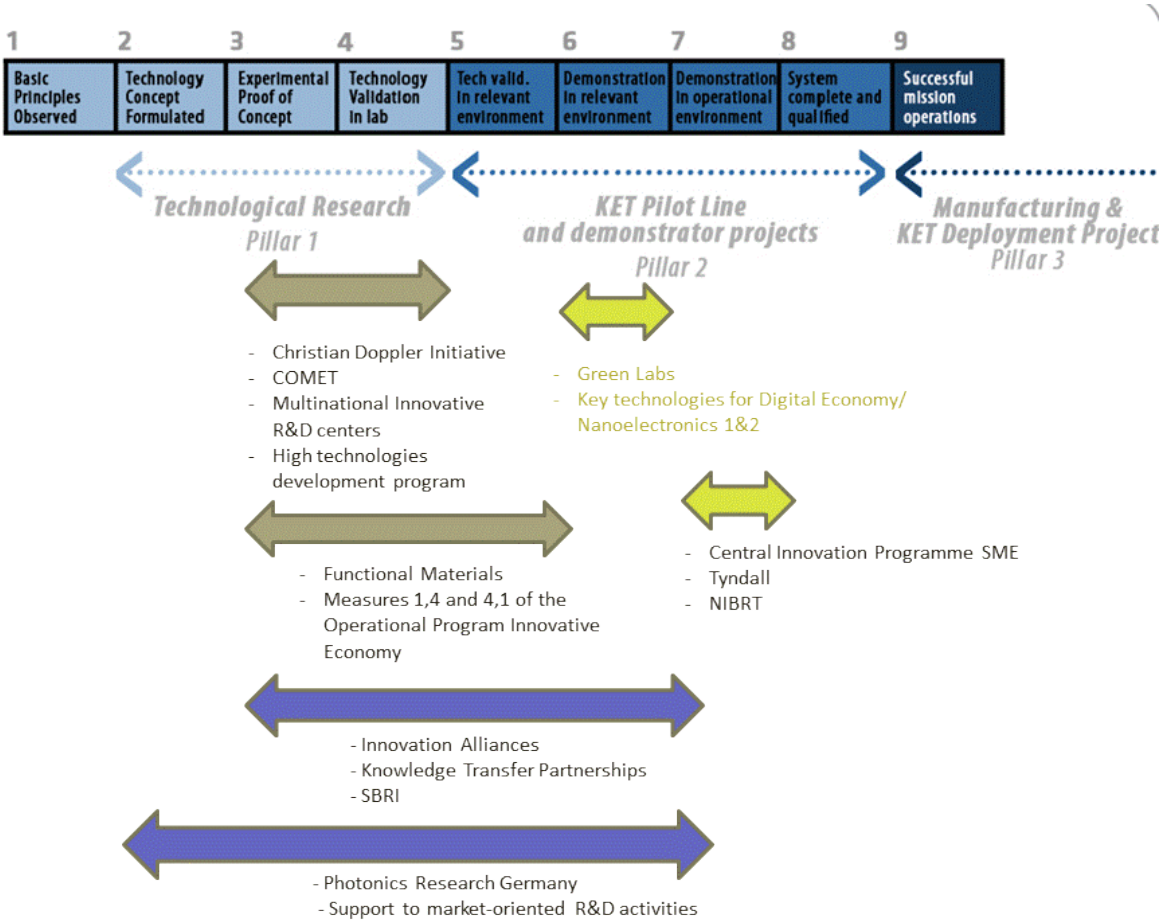
Table 3: Final selection of good policy practice cases

Selected policy practice	Country
Christian Doppler Laboratories	Austria
COMET	Austria
Green Labs	Denmark
Functional Materials	Finland
Key technologies for Digital Economy / Nanoelectronics 1 & 2	France
Investissements D'avenir Nanobiotechnologies	France
Investissements D'avenir : Demonstrateurs Preindustriels	France
Innovation Alliance	Germany
Photonics Research Germany	Germany

Selected policy practice	Country
BioIndustry 2021	Germany
IGF-Promotion of Industrial Collective Research	Germany
Framework Programme Microsystems	Germany
Central Innovation Programme SME	Germany
Support to market-oriented R&D Activities	Hungary
Contract Research and Services Scheme	India
Technology Development and Demonstration Program	India
Tyndall Institute	Ireland
NIBRT	Ireland
Nofar	Israel
Israel Nanotechnology Initiative	Israel
High Technologies Development Programme	Lithuania
Small Business Innovation Research Programme	Netherlands, UK, US
Valorization Grants	Netherlands
Measures 1.4 and 4.1 of the Operational Programme Innovative Economy	Poland
Proviking	Sweden
Multinational Innovative R&D Centers	Taiwan
Micro and Nanotechnology Manufacturing Initiative	UK
Knowledge Transfer Partnerships	UK
Small Business Technology Transfer Program	US

The objective of the second expert working group meeting was to exchange information on the selected good policy practices through short presentations of the selected measures. These presentations were followed by a discussion on the success factors and conditions of transferability. Due to time constraints, it was not possible to present all selected good policy practice cases during the workshop. Hence, a selection of policy practices was made with the aim to cover different TRL. The policy measures that were presented are displayed in Figure 2. More detailed information on the presented cases can be found in Appendix 2[13].

Figure 2: Mapping of good policy practice cases on TRL scale



[13] In Appendix 2, more detailed information on the presented cases can be found, with the exception of SBRI, Tyndall and NIBRT.

4 Main insights

During the first and second expert working group meeting, a lot of attention was devoted to identifying good policy practices and the discussion of the success factors and conditions for transferability of these policy measures. The selected measures that were presented during the second workshop, in combination with the preparatory work of all Member State experts with regard to the conditions of transferability, led to an interesting discussion among the experts, subsequently leading to a number of important KET support policy lessons. These main lessons are presented below. The selected good policy practice cases are mentioned as examples where appropriate.

4.1 Lesson 1: Need to cover multiple stages of technology development and deployment

The experts call for policy measures that cover subsequent stages of technology development and deployment and/or make it easy to go through the subsequent stages. In order to deploy KETs, the technology has to pass several stages of the technological readiness level (TRL) scale. In all EU27 countries, policy measures to support basic research (TRL 1) and technological research (TRL 2-4) are in place. When going up the TRL scale toward product development (TRL 5-8), one can identify several EU27 countries that do not have any specific policy measures in place supporting product development. In bringing a technology to the market, it is however often this phase of product development that is the most costly and risky, and thus difficult to cover.

In this study, several policy measures that target TRL 4 to 7 have been identified. The experts acknowledged that there exist several policy measures that target TRL 4 and 5, but that there was only few policy measures that target TRL 6 and 7. No policy measures were found that would target TRL 8. TRLs 8 and 9 are 'close to market' levels where activities are typically funded by business (private funds) as public funded support schemes in these levels often do not fit with the state aid framework.

The experts agreed that it is important to cover multiple TRLs in order to pass the valley of death, and not to stop at TRL 4 or TRL 5 as is the case in many countries. For some countries, especially smaller countries, it might be difficult to address TRL 6 and 7 in a broad area of technologies. These countries might consider making

smart choices in formulating policy measures to address TRL 6 and 7 (see also Lesson 6).

4.1.1 Need for policy measures to target multiple Technological Readiness Levels

In discussing policy measures, it became clear that some policy practices target a specific TRL while others cover multiple TRL (see Figure 2). Policy measures that target multiple TRLs are seen as beneficial as companies and/or research institutions only need to file for a project once, assisting them to deploy innovative products in a timely fashion. An example is the Measures 1.4 and 4.1 of the Operational Programme Innovative Economy in Poland (see Table 4).

Table 4: Measures 1.4 and 4.1 of the Operational Programme Innovative Economy

Measures 1.4 and 4.1 of the Operational Programme Innovative Economy

Measure 1.4 covers the co-financing of expenditures up to the development of the prototype. Measure 4.1 finances also further stages of R&D implementation (including consultancy with e.g. technology brokers). Both measures use a bottom-up approach and provide support for goal-oriented projects that meet the needs of particular entrepreneurs. The Measures 1.4 and 4.1 of the Operational Programme Innovative Economy in Poland have a one-step application procedure: companies have to submit only one application for two phases. The condition for obtaining investment support for the second part of the project, the implementation phase (Measure 4.1), is to complete the research phase successfully (Measure 1.4).

Conditions for transferability

These policy measures can be implemented in all EU27 countries as the core rules and principles are based on the main and common regulations resulting from the EU cohesion and science policy. They can be used to support projects with a budget adjusted to the local (regional) economic and research needs, and to the available financial resources of the local (regional) authorities without any changes of its main structure and regulations.

4.1.2 Need for policy measures to complement each other

Policy measures that complement each other are constructive in bringing new technologies to the market (e.g. a balanced 'policy mix'). An example is the Innovation Alliance in Germany, which covers TRL 3 to TRL 6 (Table 5).

Table 5: Innovation Alliance

Innovation Alliance

Innovation alliances are a new instrument of public support to path-breaking industrial innovation that provide funding for strategic cooperation between industry and public research in key technology areas that demand a large amount of resources and a long time horizon, but promise considerable innovation and economic impacts. Since innovation alliances are long-term large-scale partnerships of industry and science, they typically emerge out of previous activities, often funded under the thematic R&D programmes. Proposals and project designs are often developed jointly by the consortia and the programme administering agency that is responsible for the respective field of technology. Innovation alliances are financed out of the technology programmes in the respective area and receive funding as long as industry is ready to commit substantial private funding into research related areas (including manufacturing) in this field in Germany (expected ratio 1:5) – subsequent to the public funding phase.

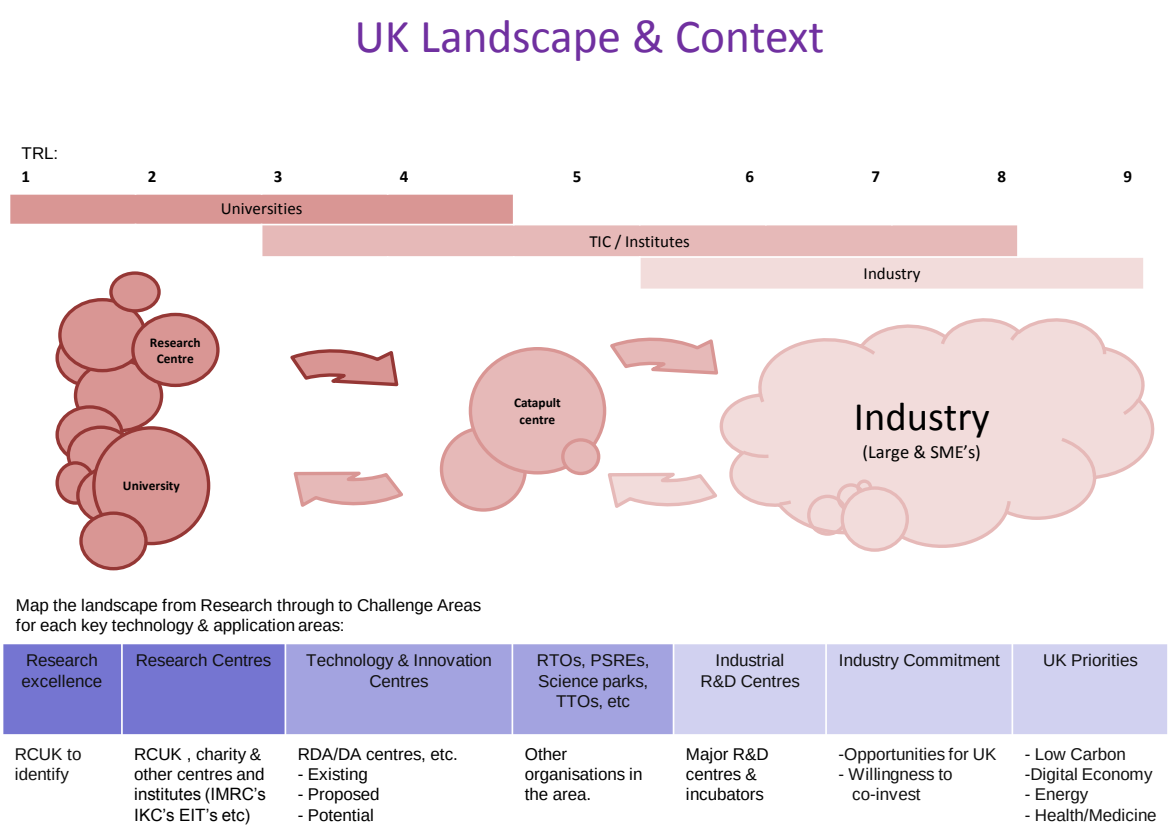
Conditions for transferability

This policy measure requires the geographical presence of a few large companies in a particular technological area. The availability of critical mass is important in the choice of key technology areas.

4.1.3 Need for clarity in the coverage of policy measures

Clarity as to which measures cover the different TRL scales, is often absent at a country level although such a picture can create clarity as demonstrated by the UK case (see *Figure 3*). An overview of which agency in a system is responsible for which policy measures at respective stages in the TRL scale, allows for a coordination among these agencies and enhances the clarity of filing for a particular measure by companies and research institutes. This coordination may result in a single window service as set up in Taiwan or in a centralization of innovation activities in a single agency, like the Technology Strategy Board in the UK. As a result, the time to grant often reduces significantly as companies know where to go with their 'needs'. A timely response with regard to public funding is an important factor in companies' decision to make additional investments in particular countries.

Figure 3: Position of UK centres against the TRL levels



Source: Technology Strategy Board

4.2 Lesson 2: Need to strengthen the demand side support

Throughout the discussion during both expert working group meetings, it became obvious that there is a lack of policy measures addressing TRL 6 and 7. Public support of the deployment of KETs is however essential in order to push technologies into the market, where real added value can be created for society at large. Besides the classical 'push' approach, a technology 'pull' approach (demand side measures) can also help to deploy KETs. Several policy measures (good practices) were identified in this respect.

4.2.1 Public procurement

One way to get KETs to the market is to provide a route to market through public procurement. Most countries do not have an active public procurement policy. Exceptions are Netherlands and the UK who are running the Small Business Innovation Research (SBIR) program (Table 6). Also Tekes in Finland has a funding instrument for public procurement in innovations. The objectives of the Tekes funding instrument are to promote innovation among bidders, to enhance diffusion of innovations and to promote the renewal of the public services. Tekes can fund, in the first phase, the planning of public contracts aiming at purchase of innovative products and services. In the second phase funding is available for research, development and innovation activities that are part of a public procurement.

Table 6: Small Business Innovation Research

Small Business Innovation Research

Small Business Innovation Research is a program that originated in the United States. The Dutch government uses this instrument to provide incentives for companies to develop and market innovative solutions to societal issues. SBIR gives the Dutch government the possibility to promote market developments by offering funds to finance the first, high-risk phases of an innovation. It accelerates the time to market as SBIR supports the development of early stage companies through providing paid contracts for the critical stage of product development. Also the UK has a SBRI program in which they launched 79 competitions since 2009 and awarded 690 contracts, totaling an investment of more than £51 M.

Conditions for transferability

For this program to succeed, it is important that there is political desire to address societal issues by procuring and stimulating the use of new technologies. This requires a willingness of the policy people/procurers in the public sector to take risks and to stimulate the development of new technologies and products. This program requires an organization that manages the process and a public sector that wants to fund research at 100% without asking intellectual property rights in return.

4.2.2 Demand-driven initiatives

Several countries are experimenting with demand side innovation policy instruments. In Czech Republic for example, some indices of starting lead market policies may be found in the National policy for research, development and innovation for 2009 – 2015, which includes priority fields of industrial research, development and innovation. In Finland, Tekes programmes include the possibility for bottom-up initiatives from industry. Also several other countries allow bottom-up initiatives that are driven by the demand of industry. Photonics Research Germany for example is a program developed by BMBF in Germany to give an answer to the memorandum for photonics that was made by the entire German photonics community (industry committed to double R&D investment in Germany between 2010-2020). In Belgium, the Flemish region has recently complemented the traditional supply-side approach of their innovation policy with a new challenge

driven approach focused on demand pull. Two examples are explained in more detail in Table 7and Table 8.

Table 7: Christian Doppler Laboratories

Christian Doppler Laboratories

Christian Doppler Laboratories in Austria support application-oriented fundamental research based on a bottom-up principle. The topics of new laboratories are always based on the demand on the industrial partner and a new laboratory requires the support of at least one industry partner. They are set up as public-private partnerships between the federal government and companies. This implies that every private Euro invested in applied basic research is doubled by a public Euro.

Conditions for transferability

As the scheme is strongly driven by the demand from industry, it is necessary that the industry-base has a concrete demand for new knowledge in basic research and the capabilities to implement the generated knowledge. There needs to be a culture of industry collaborating with universities and research institutions as a consensus has to be made between the industrial company and the academic partner with regard to outcome, budget and work plan.

Table 8: Photonics Research Germany

Photonics Research Germany Photonics Research Germany is a program developed by German policy makers to answer to the memorandum made by the national initiative Photonik 2020. The program describes the strategy for photonics research within the next 10 years. It has the aim to develop lead markets, integrated photonic systems, photonics process chains for next generation production, and emerging photonic technologies, to secure the technological leadership in photonics, and to improve the framework conditions for the photonics industry in Germany. For projects to get funding, they need to be characterized by high risk, complexity and high expenditure; have a focus on the complete value chain; and potential for high economic impact. Valorisation in Germany is mandatory. The policy initiative is mainly a technology push programme, but it is also driven by the demand of the industry. ***Conditions for transferability*** This policy measure is based on an initiative taken by the entire German photonics community. This initiative was possible thanks to the availability of a critical mass of companies active in photonics and a beneficial culture of being accustomed to a close policy collaboration between industry and policy makers.

4.2.3 Pilot plants

Pilot plants are often very costly to set up. On the one hand, companies are not willing to invest in the technology as it is not mature enough and market perspectives are uncertain. On the other hand, universities and research institutions do not have sufficient budget to invest in pilot plants and are often not interested to make this investment as this is considered to be too close to the market. In order to close this gap, several countries have developed a program that provides funding for pilot plants. Some countries are in process of installing pilot lines that will be deployed in the coming months e.g. several nanotechnology pilot installations in France, or seven Catapult centres that support where appropriate pilot plant and demonstrators in the UK. In other countries, pilot plants are already operational e.g. the living lab Electronic Vehicles (BE), Green Labs (DE), EVE System for Electrical

Vehicles (FI), High PTMET (RO), Tyndall (IE), and NIBRT (IE). A few examples are explained in more detail in Table 9, Table 10 and Table 11.

Table 9: Green Labs DK

Green labs DK Green Labs DK supports the establishment of large test facilities for the purpose of demonstration and testing of new climate technology. The business sector is to be the driving force in the development of the new Green Labs. Therefore the program aims at considerable private co-financing of at least 50 per cent. In some cases the public co-financing can even be as low as 15 per cent. The program is aiding the construction of permanent large scale facilities targeting specifically SMEs which do not have the capacity themselves to coordinate or finance the establishment of the required large scale facilities. ***Conditions for transferability*** The program is a direct result of the vision of the government to transform Denmark into a "green technology laboratory". Danish policy makers have made a choice to focus on a specific technology area in which Denmark has a clear stronghold. It aims at facilitating development of Denmark as a green laboratory for technology development to secure competitive framework conditions for enterprises active in the field of clean technology, including R&D, demonstration and marked entrance. A clear vision of the government and the availability of critical mass in the respective technological area contribute to the success of this measure.

Table 10: NIBRT

NIBRT

The National Institute for Bioprocessing Research & Training (NIBRT) has been created in Ireland in partnership with industry. Its mission is to support the development of the bioprocessing industry in Ireland and to attract additional bioprocessing companies to Ireland. It is a bioprocessing pilot plant that is funded by the Irish government, with support for academia and with revenue from industry. It operates as a non-profit making company.

Conditions for transferability

The activities of the pilot plant need to resonate with the local industry. This implies that industry can give its input in the strategic focus of public research investment. In 1990-2000, there was a strong interest from pharmaceutical industry in biotechnology that led the Irish government to invest in NIBRT as a facility to support deployment of biotechnology in a pilot line context. It also implies that Irish policy makers have made a choice with regard to the research themes they support.

Table 11: Key technologies for Digital Economy / Nanoelectronics 1 & 2

Key technologies for Digital Economy / Nanoelectronics 1 & 2

The projects funded in the Key technologies for Digital Economy / Nanoelectronics 1 & 2 in France, are expected to lead to functional proofs of concept capable of inducing future industrial development. A pilot installation is deployed through a collaborative project comprising at least one lab and one company. The industrial partners pay access fees to use the equipment of the labs and get the option for buying the equipment after the research phase is finished. In case of sale, the labs return 90% of the access fees and 85% of the sale amount to the State. Moreover, the companies pay a percentage of the revenues generated by products issued from the project back to the State. The call is expected to speed up the national strategy for research and innovation, in order to support ambitious projects in the field of nanoelectronics, with

structuring effect and high socio-economic potential. The projects should present economic spillovers for the national territory in terms of employment, investments, industrial restructuring and anticipation of economic changes.

Conditions for transferability

There needs to be willingness for the State to fund 100% of the equipment acquired by the labs. This program is not suitable for exploratory research projects that have not yet reached TRL 6. It is neither suitable for techno-push projects nor small projects. It requires policy people that want to engage in evaluation, negotiation and contract setup, and follow up.

4.3 Lesson 3: Need to tap into global value and innovation chains

There is a need to tap into global value chains[14] and innovation chains[15]. Especially small countries often do not have the entire value and/or innovation chains present inside their borders. Hence, an interesting option is to allow collaboration with international partners is order to fill in the missing parts in the value and/or innovation chain. SMEs are important for the deployment of KETs but they are often too small to make a difference in a particular KETs industry. To realize an impact with regard to KETs deployment on a global scale, one needs the presence of large companies. The combination of small and large players, as is the case in the photonics industry in Germany, allows for the translation of R&D results into concrete applications and the promotion of growth and employment in Germany. In case a combination of small and large players in a particular KET is not present in a country, there is a tendency to internationalize in order to complement for the missing parts in the value and/or innovation chain. In this regard it is important that the design of policy measures allows for collaboration across borders, in particular in cases of high complementarity with value and/or innovation chains in other countries. Networks among several actors in the value and/or innovation chain can help complement the missing parts. Especially SMEs are interesting in this regard as they are often willing to collaborate with other actors in their value chain.

4.3.1 Need for policy measures to be open to international partners

In order to deploy KETs, it is important to combine several actors across the value and innovation chain. In Germany for example, the Photonics Research Germany policy measure funds projects that focus on the complete value chain. Smaller countries often do not have the entire value and/or innovation chain present in their particular country. Therefore, they tend to open up several policy programs to international partners. The Functional Materials program in Finland for example, put high emphasis on the value chain (Table 12). Also the Christian Doppler Laboratories in Austria are open for international companies and/or universities and research institutes. International participation is assessed on a case-by-case basis and any such proposal has to justify the expected benefit for Austria as a location for R&D and industry.

[14] "Value chain": a term used mainly by industry to describe the cooperation between the relevant business sectors (from raw material to final product) to ensure delivery of products and processes. This could be said to describe the size of the bridge (i.e. the several lanes/ width mentioned) and the speed at which this bridge can be crossed. (Source: HLEG, WG2)

[15] "Innovation chain": a term used in various political debates to describe the route from research to innovation and into competitive manufacturing with players such as academia, RTOs, industry, public sector. This term effectively describes the KET Bridge across the innovation "valley of death". (Source: HLEG, WG2)

Table 12: Functional Materials

Functional Materials

The Functional Materials Programme aims to develop new applications and competitive advantage through materials technology for Finnish industrial sectors. Potential applications should identify and relate to recognized value chain(s) at an early stage to provide need-based new solutions and ensure effective implementation of the results. Despite the fact that Finland has strong research capabilities directed at functional materials, more international contacts are needed along the value chain to convert this knowledge into applicable products. One of the main objectives of the program is therefore to establish connections between Finnish researchers and international actors in the field of advanced and nanomaterials, concerning both material development and application development. The program facilitates the creation of national competence networks and globally competitive value chains.

Conditions for transferability

Finland has a lot of researchers working in materials research and a good culture of doing business between universities and companies. The Functional Materials Programme aims to enlarge this knowledge and network with international contacts to convert knowledge into applicable products. Hence, collaboration between universities and companies is an integral part of the program.

4.4 Lesson 4: Options to rethink funding strategies

Bringing KETs to the market can be very capital intensive. Especially the product demonstration and proof-of-concept phase requires substantial budget. Support for innovation projects that are closer to the market are subject to State aid rules. State aid rules have been formulated to assure that financial support does not distort competition between companies or between member states. However, in its effort not to distort competition within the Union, it is important to make sure not to end up offering lower incentives to European companies compared to non-European competitors. Several options can be applied to increase the budget available to provide finance to companies and institutions throughout the different technology development and deployment phases that are in line with the current State Aid rules.

4.4.1 Use of Structural Funds

One solution is to use the Structural Funds**.** For example in Poland, the Operational Programme Innovative Economy is financed through €8.65 billion from the European Regional Development Fund and €1.53 billion from the State budget. In Hungary, the policy measure "Support to Market-oriented R&D Activities" has a total budget of €261.5 million of which 85% comes from the Structural Funds and 15% from the State budget (Table 13). In Romania, Structural Funds are used to train specialists from industrial SMEs and large companies to deploy KETs.

Table 13: Support to Market-oriented R&D Activities

Support to Market-oriented R&D Activities
The objective of this scheme is to support R&D projects that build on research results and are expected to develop prototypes of marketable products, services or processes representing high added value. An integrated element of the supported projects is the intention of future market utilization.
Conditions for transferability
This policy measure can be implemented in other EU27 countries as there are no particular demands towards critical mass, presence of industry, and business culture.

4.4.2 Use of public-private partnerships

Another option is to trigger investment through the use of public-private partnerships. For example, every private euro invested in applied basic research is doubled by a public euro in the Christian Doppler Laboratories. Another example is the Innovations Alliances in Germany.

4.4.3 Use of grants and fees

A third option is to give grants to companies and research institutions and ask fees to companies based on the utilization rate and the amortization. In France, the policy measure "Key technologies for Digital Economy/ calls for proposals on Nanoelectronics" provide 100% funding for pilot installations. Industrial partners get access to the equipment and labs by paying an access fee. In case of economic success, a return fee is paid to the State.

4.4.4 Use of public procurement

A fourth option is to trigger investment by using public procurement**.** SBRI can be considered as a start-up fund as it supports the development of early stage companies. Since April 2009, more than 690 contracts have been awarded for a total amount of £51 million.

4.4.5 Use of public-private funding

In the field of Photonics in Germany some pilot production lines have been or will be established subsequent to Photonics funding programme R&I projects. Policy makers expect the results of successful projects to be included in pilot lines 1-2 years after the project has been finalized. These pilot lines are not financed by the funding programme, but by the companies themselves. Some examples of pilot production lines in the field of Photonics that are present or planned in the near future are:

1. OLED – Philips
2. OLED – OSRAM
3. Photovoltaics – Centrotherm
4. Photovoltaics – Avancis
5. Free form Optics – Carl Zeiss
6. Fibre Production for High Power Lasers – Fibre & Technology
7. High Power Diode Lasers – Jenoptik
8. Quantum Cascade Lasers – Nanoplus
9. Optical Networks for Communication – Adva

4.5 Lesson 5: Options to enhance collaboration between academia and business

Traditionally there are two key constraints to enhance collaboration between academia and business: the low absorptive capacity of enterprises for research and a gap in the availability of applied research capability that enterprises can readily access. In Ireland, policy makers have tried to close this gap by requiring that large research programs and most of their smaller programs involve industry collaboration. Scientific applications are more competitive for funding if they include some commitment to collaboration with industry. Many investments in KETs made by the Science Foundation Ireland such as in nanotechnology, advanced materials, microelectronics and biotechnology are strongly aligned with industrial partners interested in deploying these technologies in areas such as semiconductors, sensors, medical devices and biocatalysis/food processing.

4.5.1 Need for companies to be open for collaboration with academia

Companies should also be open for collaboration with academia. In some countries, for instance Estonia, this is not straightforward as its industry sector is driven by subcontracting manufacturing and therefore has limited efficiency and skills for carrying out R&D projects. In the UK, the Knowledge Transfer Partnerships are set up to increase interactions between the knowledge base and companies through the mediation of an associate (Table 14). Also Spain has set up a program, the INNCORPORA Programme, which provides support to private companies in order to contract highly qualified workers, thus fostering knowledge and technology transfer and business innovation.

Table 14: Knowledge Transfer Partnerships

Knowledge Transfer Partnerships

Knowledge Transfer Partnerships (KTPs) is a programme led by the Technology Strategy Board where three-way partnerships are formed between a business (the company partner), one or more recently graduated people (associates) and a senior academic acting as a supervisor (knowledge base partner). The aim of KTPs is to increase interactions between the knowledge base (University, Research Organisation and Further Education Colleges) and companies through the mediation of the associate who during the period of staying in the company will work on a project developed in collaboration with and co-supervised by the partners for a period of 12 or more months and attend to further training.

Conditions for transferability

This programme requires research organisations that are willing to act as supervisor of the associate, a good supply of highly qualified graduates and a brokerage between academia and business.

4.5.2 Need to stimulate the collaboration between industry and academia

Recently, the importance of research-industry R&D co-operation is emphasized in several national strategic documents. For example, in Czech Republic, the National RDI Policy 2009-2015 entails some concrete measures to stimulate public-private R&D collaboration. In Spain, Technological Innovation Support Centers has been set up to facilitate the application of knowledge generated in research organizations, including technological centres, by intermediating between centres and companies through providing innovation support services. In Poland, measure 1.4 and 4.1 were created to increase the uptake of research results by the private sector. Most EU27 countries have policy measures that stimulate the cooperation between industry and university.

4.6 Lesson 6: Consider making smart choices

Several small countries have a relative immature research base with regard to KETs. In order to enhance the potential to deploy KETs, it is therefore essential to enhance the critical mass in KETs. Irish policy makers have addressed this problem by making specific choices on research themes to support and on the scale of intervention. As they have a smaller budget, they decided to go for a tighter focus with more coordination between infrastructure investments and project investments. They focus on initiatives that resonate well with local industry and they are currently witnessing an increase in industry-academic collaboration. In Denmark, policy makers have decided that one of the focus areas should be on new climate technologies. Therefore, the main objective of Green Lab DK is to ensure development and demonstration of new technologies for the purpose of supporting energy-policy objectives on security of supply, independence from fossil fuels, consideration of the global climate, a cleaner environment, and cost efficiency. Smart choices are linked to the concept of smart specialization.

5 Conclusion

Underlying study has the aim to exchange good policy practices promoting the industrial uptake and deployment of KETs. The experts agreed that interesting policy initiatives addressing the deployment of KETs were identified in this study. These policy measures have several success factors in common: they are well-prepared; they resonate with the strengths of the local industry and innovation system; they stimulate the transfer of knowledge between academia and industry; and they focus on the valorization aspect by covering several stages of technology development and deployment.

In the discussions with the experts from several Member States, it became obvious that in order to deploy KETs, innovation governance and system innovation composition (with respect to KETs) are of utmost importance. Countries should start thinking about the stimulation of KET deployment by designing a clear strategy towards KETs deployment, subsequently translated into concrete policy measures based on the characteristics of its R&D and industrial system. In view of the importance of industry involvement, this strategy should be designed in a collaborative manner. A strong signal from policy makers is essential to stimulate the deployment of KETs.

On the innovation system level (the actors in the innovation system), policy makers should be clear on which actors they believe are capable to fulfill which role e.g. who is funding what and how are responsibilities distributed. Also the required degree of valorization needs to be defined. Moreover, it is important to understand the characteristics (strengths and weaknesses of the system) in order to develop effective KET deployment policies. SMEs for example are important to deploy KETs but they are often too small to make a difference in a particular KETs industry. To realize an impact with regard to KETs deployment on a global scale, one needs the (local) presence of large companies or being able to tap into other global value and/or innovation chains necessary for deployment.

Industry is an important actor in deploying KETs and countries differ in the way they approach this actor. Several large countries have formulated national research strategy frameworks (e.g. the High-Tech Strategy 2020 for Germany, the Italian Network for Innovation and Technology Transfer to SMEs, the Spanish National Plan for R&D&I: Strategic Action on Nanotechnology, New Materials and New Industrial Processes). Smaller countries tend to favor bottom-up programs (e.g. Fuel Cell and FinNano in Finland, Intelektas LT in Lithuania, WIST and WALEO in Belgium–Wallonia). One challenge is to anchor key companies in Europe. A timely response with regard to public funding is often an important factor in companies' decision to make additional investments in particular countries. The Commission might consider

revising certain framework conditions in order to reduce the administrative burden and tax.

Also the culture of doing business between academia and industry, influence the deployment of KETs. This can be stimulated through the use of collaboration criteria or by putting emphasis on covering the entire value and/or innovation chain in the calls for projects. Collaboration can also be promoted by means of networks among different actors, not only at a specific stage but along the entire value chain. Collaboration is especially important for SMEs. Having a good insight into the strengths and weaknesses of a regional or national KETs innovation system, is thus important.

Most policy measures target the lower TRLs, few policy measures have been identified that target TRL 6 and 7, while no policy measures were identified that cover TRL 8. Policy measures targeting TRL 6 to 8 have been identified as critical and problematic as a certain amount of founding is needed for these TRLs. The Commission can play an important role in this regard for example by supporting international projects such as ENIAC-JU that has launched a call that focuses on the development of pilot lines in TRL 5 to 8. Broader support for TRL 7 and 8 in Europe is needed as it does exist in other countries such as the US and China. Also framework conditions play a crucial role in addressing TRL 6 to 8.

In designing deployment measures toward the higher TRLs, it is also important to regard the function of state aid rules, as they may hamper the deployment of KETs. For example, in France, for the policy measure "Key technologies for Digital Economy/Nanoelectronics 1 & 2", six notifications are made to DG Competition which irrespective of their outcome take a lot of time and do not match the high innovation dynamics of the private sector. Structural funds can play an important role in stimulating KETs deployment. In applying these funds, it is important to keep in mind that it is not only about industrial excellence, but also about cohesion. Moreover, supporting the deployment of KETs is not only a matter of budget, also the availability of human resources, the acceptance of the technology, and skill developments are important in this respect.

Some countries focus on particular KETs in order to stimulate KETs deployment (the issue of specialisation). This seems to be a preferred option, especially in case of countries with smaller budgets or limited critical mass (either in funding, R&D, production or market capabilities). A focus on particular KETs is also taking place in US and several Asian countries. DG Competition however tends to be less in favour of selection particular sectors. Nevertheless, it might be interesting to make the state aid rules easier for SMEs as they do not have the power to distort competition. A focus on particular KETs can also align with the smart specialization strategies that are in the process of being developed.

There is also a need for policy coordination at regional, national and EU level with regard to the deployment of KETs as better policy coordination would enable synergies between measures at various levels and would help to complement them by well-targeted EU sponsored initiatives. Moreover, policy measures should be open towards international collaboration as KETs value and/or innovation chains are global. It might be interesting to create a sort of "ERA-NET" platform (facilitated by the European Commission) focusing on KETs deployment as this might improve the coherence and coordination among different countries and stimulate the exchange of good policy practices.

The purpose of the exchange of good policy practices has been to facilitate a learning experience among several Member State experts. Valuable inputs have been received from government and industry representatives. Based on the discussions during the workshops and seminar, it is clear that policy measures with regard to the deployment of KETs should be stimulated and a clear strategy towards KETs deployment should be designed. National, regional and European policy makers face the challenge to further sharpen and harmonize KET tailored policy support measures through close collaboration.

6 Appendix 1: List of Member States experts

Country	Member State expert	Institution
AT	Stefan Richter	Federal Ministry of Economy, Family and Youth (BMWFJ)
AT	Bruno Lindorfer	OÖ Technologie- und Marketinggesellschaft (Upper Austria's location and innovation agency)
BE	Marc Meeus	Enterprise Flanders Agency
BE	Didier Paquot	Union Wallonne des Entreprises
BE	Vincent Lepage	Direction Générale Operationnelle de L'Economie, de l'employ et de la recherche
BE	Paul Mijlemans	Umicore
BE	Gernot Klotz	CEFIC
BE	Sophie Wilmet	CEFIC
CZ	Janošec Jiří	Technology Centre ASCR
DE	Markus Wilkens	VDI Technologiezentrum GmbH Project management agency of the Federal Ministry of Education and Research (BMBF)
DE	Claudia Flügel	Bundesministerium für Wirtschaft und Technologie
EE	Kaie Nurmik	Ministry of Economic Affairs and Communications
ES	Fernando Rico	Directorate of Global Innovative Programs of CDTI
ES	Almudena Huidobro	Ministry for Economy and Competitiveness
ES	Igor Idareta	Zabala Innovation Consulting
FI	Kirsti Vilén	Ministry of Employment and the Economy

FI	Juha Saarnio	Federation of Finnish Technology Industries
FR	Michel Lemonier	Ministry of Economy, Industry, and Employment (MINEFI) Head of Nanoelectronics Unit
HU	Ildiko Lesko-Kecskes	Ministry for National Economy
HU	Zoltan Horvath	Ministry for National Economy
IE	Barry Heavey	Industrial Development Agency (IDA) Ireland
IE	Leonard Hobbs	Intel
IT	Antonello Lapalorcia	Ministry of Economic Development Directorate-General for Industrial policy and Competitiveness
IT	Cesare Salvatore Comi	Direzione Generale per la Politica Industriale e la CompetitivitàUfficio XIII - Programmazione delle Politiche Industriali Comunitarie
IT	Angelo Castaldo	Rome University
LT	Natalija Koseleva	Agency for Science, Innovation and Technology
LT	Dr. Inga Matijošytė	Lithuanian Biotechnology Association
LU	Arnaud Duban	National Agency for Innovation and Research LUXINNOVATION GIE
PL	Justyna Gorzoch	Ministry of Economy
PL	Piotr Skurzyński	Polish Chamber of Commerce for High Technology (IZTECH)
PT	Helena Santana	Laboratório Nacional de Energia e Geologia (LNEG)
RO	Liliana Linculescu	Ministry of Economy, Trade and Business Environment; Dir. Gen. Industrial Policy & Business Environment

RO	Dan Dascalu	National Institute for Research and Development in Microtechnologies
RO	Dr Radu Piticescu	IMT- Bucharest
RO	Dana Cristea	National Institute for Research and Development in Microtechnologies
UK	David Golding	Technology Strategy Board (TSB)

Table 15: List of expert that attended the first and/or the second expert working group meeting

7 Appendix 2: Profile of selected good policy practice cases

For each selected good policy practice case, a template has been compiled by the consultant with input from the Member States representatives. Especially with regard to the purpose of the policy measure, the integration in the broader policy mix, and the conditions of transferability; the input provided by the Member States representatives was essential. For India, Israel, Netherlands and US no additional information was collected as no experts were available to provide the required information.

7.1 Austria

Austria
1. Title of policy measure **Christian Doppler Research Association (CDG)**
2. Implementing body The general secretariat of the CDG acts as an administrative body carrying out and coordinating all work concerning the selection, setting up, monitoring and accountancy of funds of CD laboratories, on behalf of the Federal Ministry of Economy, Family and Youth (BMWFJ) and the CDG member companies.
3. Targeted KETs The establishment of CD laboratories is based on a strict "bottom-up" principle, meaning that applications may result from any thematic field, addressing a demand on high quality research from industry and being evaluated by scientific criteria. Whereas in the past the research focus has been a rather narrow one (almost exclusively material sciences) this has been considerably broadened during the recent years with CD laboratories nowadays addressing a wide range of research fields, mostly related to natural and engineering sciences: • mathematics, computer science, electronics, • metals and alloys, • non-metallic materials, • engineering and instrumentation, • chemistry and • medicine and life sciences.

4. General description

- The CDG was one of the first initiatives that explicitly addressed the improvement of science-industry linkages as its core ambition. The established governance structures are an interesting example of how to keep industry involved in decision-making. This is secured at several levels: on a formal level, the initiative for establishing new laboratories has to come from industry. Furthermore, industry partners become member of the Christian Doppler Association, which gives them a say in the overall orientation of the operating agency.
- The Christian Doppler Research Association (CDG) supports the establishment of temporary laboratories at universities that work on "application-oriented fundamental research". The programme is unique for several reasons:
  - A precondition for establishing a new laboratory is the support of at least one industry partner;
  - The industry partner(s) has/have to contribute 50% of the laboratory's budget in cash (a reduction of industry partner's contribution for SMEs is possible); the other 50% are publicly funded, mainly by the Federal Ministry of Economy, Family and Youth (BMWFJ);
  - The lifetime of a laboratory is strictly limited to 7 years. The yearly budget per laboratory ranges from €0,11million (minimum budget) to €0.6million (maximum budget);
  - The selection process puts a strong emphasis on the scientific competence of the prospective head of the laboratory
  - Public funding is allocated through the CDG - the Christian Doppler Research Association. Industry is strongly involved in the Executive Board and the Scientific Board of the Association.
- The scheme was introduced in 1989. Up to now about 130 laboratories have been established and around 65 CD-Labs are active at the moment. Thematic coverage has been fairly small during the first years where material sciences (mostly steel research) and chemistry dominated. In recent years, the range of research has broadened considerably.
- Initiating a CD-Laboratory is usually a bottom-up process, stimulated either by an industrial partner or a university member or both.
- The applicants must submit an appropriate research plan; the quality and feasibility of this proposed plan will then be reviewed anonymously, by international peers. If the project is accepted, an initial contract is concluded for 2 years. If progress is evaluated positively in an intermediate evaluation, the contract will be prolonged for a maximum of 5 more years.

5. Purpose of the policy measure

- The Christian Doppler Research Association is non-profit oriented. Its

aim is the promotion of innovative research in the areas of natural sciences, technology and economics and of their application in the private sector and for the general good.

- The main focus is the scientific research in universities or non-university research institutions. The promotion of research activities will advance and improve the state of the art of fundamental research in various research areas essential to the company members of the CDG. Scientific research in cooperation with industry should thus contribute to the strengthening of the innovative potential and the overall competitiveness of Austrian companies and of global companies with substantial research activities in Austria.

- As a result, the Association's goals are both to support application-oriented basic research in Austria and to utilize the knowledge housed in university research establishments for industrial innovation and for solving industrial problems. The Association is thus both a facility for effecting knowledge transfer between universities and industry and an instrument for funding application-oriented basic research.

6. Integration in broader "policy mix"

- *Critical mass*
  - *# graduate students*
  - *# PhD*
- *Business culture within the particular country*
  - *Info on collaboration willingness between universities and companies*
  - *Possibility of bottom-up initiatives from industry*
- *Taxation climate*
- *Lead market initiatives, public procurement*
- *State aid framework within the particular country*
- *Related policy measures that are key in supporting KETs deployment*

- CDG can be classified as a measure in the Austrian RTDI policy addressing the improvement of industry-science linkages and promotion of human capital, both goals for compensating partly long-lasting weaknesses of the Austrian innovation system.
- The main objectives of CDG are the strengthening of application-oriented basic research, knowledge and technology transfer and creating awareness for research in order to pursue the strengthening of Austria as a location for private companies, strengthening of universities and research institutions and promoting of young scientists.
- Via the CD-Labs the CDG enables talented scientists in renowned

research centres to achieve high-quality research and knowledge transfer in line with the demands and to the advantage of the CDG member companies.

- The existing competence of the CDG in strengthening the industry-science linkages shall be extended further via the new Josef Ressel Centers. This new programme within the CDG has started in 2012 and is especially addressing the cooperation between companies and universities of applied sciences.
- The CDG does neither address topics of taxation climate nor of the Lead Market Initiative or public procurement. As the beneficiaries of the incentive are solely universities or research institutions it is compliant with the relevant State Aid Frameworks.

7. Date of implementation

1994 - ongoing (in its current form)

8. Target group(s)

- Funding recipients for CD-Labs may be universities and extra-university research institutions.
- The companies collaborating with the funding recipient are not themselves funding recipients but instead contribute (generally) 50% of the funds that are channelled into the research institution.
- The CDG is open to the participation of companies, research institutes and universities from Austria as well as abroad. International participation is assessed on a case-by-case basis and any such proposal has to justify the expected benefit for Austria as a location for R&D and industry. In practice, a number of foreign companies as well as research institution participate (mainly from Germany) and there are also examples of CD-labs located abroad.
- Setting up of CD laboratories is based on a strict "bottom-up" principle, meaning that applications may result from any thematic field, just including a demand on high quality research from industry and being evaluated by scientific criteria.

9. Overall budget

- 2011 : €22.3 million
- In general CD laboratories are built up as public-private partnership (PPP) between federal government and companies, whereby CDG as a non-profit making association is conducting research as such but accomplishes particular tasks in research management, like establishment, evaluation and support of CD laboratories.
- Taken the overall income of CDG as association, around five percent

are taken for administrative overhead costs – equally shared between ministry (BMWFJ) (which can be seen as a kind of public institutional funding) and companies (which may be seen as membership fees).

- The rest of approximately 95 per cent of the income is allocated for the laboratories. Again the shares for financing the CD laboratories are split equally between public funding (being kind of project-based grant) and company funding (contracted).

10. Output indicators

- *Average size of the project (budget)*
  - Annual Budget CD-Labs 2010:
  - 13 Labs: ≤ €150.000
  - 12 Labs: € 150.001 - € 300.000
  - 22 Labs: € 300.001 - € 450.000
  - 14 Labs: ≥ € 450.000

- *Number of funded projects/companies*
  - 2011: approx. 65 CD-Labs including 650 employees and 120 company partners

- *Number of applications versus potential beneficiaries*
  - Due to an interactive process with feedback loops and an already high threshold for applying the ratio of failing an application is quite low. Definitive numbers have not been collected since they were not considered a helpful criterion.

- *Budget distributed to beneficiaries versus matching funds*
  - cf. question below

- *Financial commitment from industry*
  - Industry Partners in general pay 50% of eligible costs, (SMEs pay 30%)
  - in cash; in the form of a CDG-membership fee
- *Deployment mechanism*
  - *Pilot plant, demonstration plants*
  - *Proof of concept*
  - *Matchmaking between universities and companies*
  - The linkage structure of CDG is determined by its general setup, with CD laboratories as embedded units in hosting research organizations – whether being universities or other public research organizations – and being financed by a public-private partnership arrangement between companies and public government.
- *Funding modalities*
  - *Nature of financial contribution*
    - *Matching fund*
    - *Loans*

- *Grants*
- *Financial guarantees*

- *Funding and co-funding levels*
- The laboratories are settled with funding, split almost equally between industrial partners (in cash in the form of a CDG-membership fee) and public grants. Financing from public sector accounts for 50% of eligible costs (70% if SMEs are involved)

- *Eligible cost basis*
- Eligible costs for CD-Labs include all expenditure and costs that result directly, actually and in addition (to the normal operational costs) for the duration of the supported research activities. Costs for researchers, technicians and others as well as costs for equipment (instruments and apparatus) are eligible, provided they are directly involved or deployed in the CD-Lab.

- *Collaboration modalities*
  - *National versus international*
  - The work of each CD Lab is organized into modules and collaboration with the industrial partners takes place at the level of modules.
- *Application complexity and 'time to grant'*
- Requests for funding have to follow the guidelines for application for a CD-Lab. Applications will be submitted to a formal check by the general secretariat of the CDG and forwarded to the Scientific Board of the CDG, which is entrusted with the scientific assessement. This assessment of the Scientific Board is based on at least three reviews from external international experts (peer review).

- Two aspects are primarily considered in assessing whether an application merits funding:
  - the scientific quality of the research work as described in the application
  - the scientific qualification of the planned head of the CD-Lab and the ability to lead a research group

11. Impact

- The programme has been evaluated in 2012. The evaluation confirmed that the programme has a unique position in the Austrian funding system, even though in recent years a number of new schemes have been implemented to support science-industry co-operation. The specific model proved to be effective as both industry partners and research partners seem satisfied with produced outcomes. Taking into account that firms do not receive funding but contribute in cash proved to put industry partner in a strong and demanding position.

Programme management received good grades with respect to efficiency, transparency and flexibility.

- Taking the increasing number of CD-Labs and a broadening spectre of thematic research areas as a proxy for acceptance of the model, it appears as a success story. In the context of a recent study, interviewees from companies acknowledged it as good opportunity, also for SMEs to participate in stable collaboration and get access to global state of the art research, while representatives from ministries justify the model as quite adequate regarding incentive structures, funding and scientific results. Thus an annually option for companies to quit the collaboration and funding combined with the public grant being drawn on the sum of private funds and evaluations of scientific excellence after 2 and 5 years assure high performance. Overall, the acceptance of the model and the results are indicating a tight fit of activities and the mission, which is supported by statements of interviewees.
- Success of CDG-sponsored research can be measured by two core criteria: the benefit to member companies and the progress made in science. As far as the former criterion is concerned, success has been evidenced by a rising number of companies applying for membership in CDG and their willingness to contribute financially. Progress in science has been shown by an impressive publication record by most of the CDL. More importantly, CDG enjoys high reputation within academia at the national and international level.
- Based on a longterm growth path the CDG listed 65 CD-Labs with around 650 empolyees and approx. 120 company partners in 2011. (Due to the 7 year period for each CD-Lab and a permanent opening and completion/phasing out of CD-Labs a minor permanent fluctuation has to be considered for the statistical figures.)
- Scientific Output - CD-Labs (2010):
  - 427 publications (231 of those peer reviewed)
  - 866 paper presentations or posters
  - 15 patents (12 registered, 3 filed)

12. Conditions of transferability

The scheme itself seems transferable provided an already established culture of research intensive industry collaborating with universities and research institutions. Since the scheme is strongly driven by demand from industry the industry-base should have a critical mass already - at least in relevant sectors.

13. Information sources

- http://www.cdg.ac.at/

Austria

1. Title of policy measure

COMET- Competence Centers for Excellent Technologies

2. Implementing body

Austrian Research Promotion Agency (FFG) on behalf of the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economy, Family and Youth (BMWFJ)

3. Targeted KETs

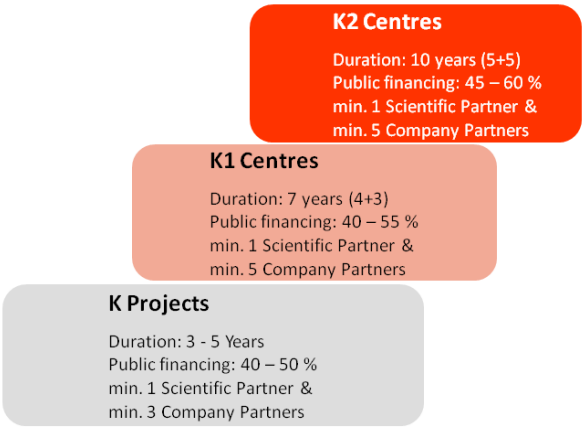
Nanotechnology
Micro- and nanoelectronics
Industrial biotechnology
Photonics
Advanced materials
Advanced manufacturing technologies

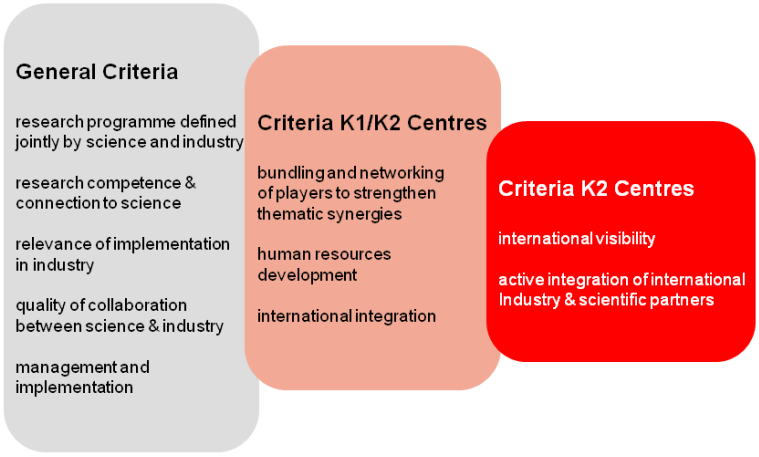
4. General description

- Competence Centers for Excellent Technologies (COMET) is the competence centre programme established in 2007, which aims to intensify and concentrate cooperation between science and industry. By establishing and exploiting joint research expertise, Austrian companies will be able to expand and secure their technological leadership, strengthening Austria as a research location. The programme's most ambitious task is to support research programmes of international excellence and to encourage the involvement of companies and scientists operating world-wide.
- The following objectives are derived:
  - Further strengthening the new culture of cooperation between science and industry to achieve joint strategic top-level research.
  - Aligning strategic interests between industry and science, thus enabling joint research expertise, initiating new scientific and technological developments and preparing implementation.
  - Bundling of players by using thematic synergies, thereby preparing involved players for increasing international competition.
  - Establishing a number of centres, which achieve international visibility through top level research as well as by integrating researchers and companies of international renown, thus strengthening Austria as a research location.
  - Strengthening human resources by attracting outstanding researchers, supporting the transfer of expertise to industry, and creating attractive career opportunities for research staff to be used in science and industry.
- The programme consists of the three lines "K1-Centres", K2-Centres"

and "K-Projects". The lines differ according to their international visibility, volume of project and duration.

- K1 centres implement top-level research with a focus on scientific and technological developments to qualify for the markets of the future. This K1 centers are closest to the established Kplus and K_ind centers.
- K2 centers are characterized by a very ambitious research program and are therefore particularly high risk in the development and implementation. They are linked to a particularly high extent internationally visible and internationally.
- K-line projects are the newcomers in the COMET program and provide space for new ideas in the area of collaborative research, with future development potential. In the consortia must be at least three companies represented. Their strategic objective is the sustainable profile development in the medium term. The projects can be designed as preparation for an application for a K1 center. This program line promotes cooperation between science and industry with "multi-firm" character. Projects, both the preparation of new initiatives (such as future centers of excellence) and the cross-border cooperation centers serve.
- The COMET programme is open to any field of research, as have been the preceeding programmes. However, the vast majority of all competence centres are active in various fields of technology and natural sciences, which is mainly due to the focus on science-industry-co-operation (rather than a more open understanding of 'practice partners').





5. Purpose of the policy measure

The first generation of competence centre programmes in Austria - Kplus, K_ind and K_net - were initiated in 1998 to provide answers to obvious problems of the Austrian innovation system in the late 1990s with systematic approaches. The development of a new cooperative culture can be assessed as one of the main successes of the "K-programmes". The programmes contributed crucially to the main objective, the broadening and formalisation of the cooperation structures between industry and science. Based on an evaluation of the K-programmes in 2004, the COMET program has been designed to further intensify and concentrate cooperation between science and industry by merging and improving the preceding competence centre programmes.

6. Integration in broader "policy mix"

Critical mass: about 1.500 researchers

7. Date of implementation

2007 –2017

8. Target group(s)

The programme addresses existing competence centres and networks, as well as new consortia with participants from science and industry. All three programme lines are thematically open. However, every centre must have a jointly defined research topic.

9. Overall budget

- Public grants available during the duration of the initiative (2006-2017) will be EUR 500 million.
- The amount of federal funding for the first funding period of the 21 centres and 25 projects approved is about 220 million Euro.

10. Output indicators

- Average size of the project (budget)
  K1: 3 Mio. per year; K2: 7 Mio. per year
- Number of funded projects/companies
  16 K1 centers, 5 K2 centers
- Financial commitment from industry
  40 - 60% of eligible costs
- Deployment mechanism
  - Pilot plant, demonstration plants: No
  - Proof of concept: Yes
  - Matchmaking between universities and companies: Yes
- Funding modalities
  - Nature of financial contribution; Grants
  - Funding and co-funding levels
    K1: 2,25 Mio. per year (including provincial funding), 40-55% of eligible costs
    K2: 7,5 Mio. per year (including provincial funding); 45-60% of eligible costs
- Collaboration modalities
  - K1 centers are aimed at international cooperation, at K2 centers international cooperation is mandatory (see chart above)
- Application complexity and 'time to grant'
  until now: two-stage application; future: one-stage application
  time to grant: until now: 12-16 months, future: 5-9 months

11. Impact

- Number of start-ups, spin-offs emerging from the program: none, not intended
- Evaluation of measure: no evaluation yet
  - Attention to deployment in unexpected areas
  - Impact of current measure and possible results it may contribute to
- The centres & projects established between 2008 and 2010 are 5 K2-Centres | 16 K1-Centres | 25 K-Projects.
- An interim evaluation of the COMET programme is scheduled to take place no later than 6 years after the launch of the programme (the start of the first K-Centres). The indicators for this evaluation have been published in June 2008 in the programme evaluation concept .The quantitative indicators will mainly be derived from the individual projects and centers, e.g. publications, patents, increase in R&D

intensity, trends in the qualification of researchers etc.
12. Conditions of transferability -
13. Information sources • http://www.ffg.at/program/comet-competence-centers-excellent-technologies • http://www.competence-research-centres.eu/countries/austria/country/37/topic/0/cat/37/?tx_kecrcs_pi1%5Bfundingscheme%5D=0 • http://www.era.gv.at/space/11442/directory/11857.html

7.2 Denmark

Denmark
1. Title of policy measure **Green Labs DK**
2. Implementing body • Launching agency: Danish Energy Agency. • Administering and granting body: The independent secretariat and board for GreenLabs DK (appointed by the government). • Funding: The Ministry of Climate, Energy and Buildings.
3. Targeted KETs Industrial biotechnology
4. General description • Green Labs DK is a relatively new Danish aid programme supporting the establishment of large test facilities for the purpose of demonstration and testing of new climate technology. • The main goal is to facilitate the development of Denmark as a green laboratory for technology development to secure competitive framework conditions for enterprises active in the field of clean technology, including research and development, demonstration and marked entrance. ○ Green Labs DK has following sub-goals: ○ to achieve independence from fossil fuels; ○ to create a better climate and cleaner environment;

- to get clean technologies more cost effective;
- to secure supply of energy.

- Green Labs DK provides funding for large technology test facilities based on annual calls for proposals; competitive grants will be given based on an objective and impartial evaluation of the proposals.
- The evaluation is performed by external experts. The final decision is made by an independent board comprised of renowned technology experts and executives from the energy technology industry.
- The aid is only provided for the establishment - and not the running - of the new facilities.
- Selection criteria:
  - Alignment with the goals of the programme is central. However, there will be different focus in different years. In the call for 2010/2011 and 2012 the focus was on renewable energy to replace fossil fuels based energy production.
  - Denmark must have a clear stronghold in the specific technology area of the new Green Lab.
  - The business sector is to be the driving force in development of the new Green Labs. Therefore the programme aims at considerable private co-financing of at least 50 per cent. In some cases the the public co-financing can even be as low as 15 per cent.
  - New green labs should operate on a national basis and strive to become international centers of excellence. The goal is to attract activities from the rest of the Community and other regions.
  - Fair, open and non-discriminatory access to facilities must be ensured for all enterprises in Denmark and abroad. The organisation of the facilities must guarantee a high degree of openness, particularly in relation to small and medium-sized enterprises.
  - It is possible to give private contributors particularly favourable terms in relation to obtaining access to using the facilities, e.g. in the form of pre-emptive rights to use the facilities. However, the extent of any preemptive rights is strictly limited by regulations.
  - Applicants must provide a convincing business plan which demonstrates the capacity to finance the running of the new facilities for the next 5-10 years. This includes the capacity to develop and market new innovation advisory services.
  - The programme supports only legal entities, which operate on a non-profite basis. This includes independent institutions and foundations, universities or technological service institutes (GTS's).
  - The program has been notified to the EU-Commission in accordance with the state aid rules on innovation within the framework for state aid for research and development and innovation, cp. Case N 301/2010: "Aid for innovation advisory services and innovation support services" (cp. Article 5.6) and "Aid for innovation clusters" (5.8). This means among other things that in certain cases aid must be passed on to the users in the form of

discounts.

5. Purpose of the policy measure

- Green Labs DK calls for applications for setting up new large-scale test facilities for tests and demonstration of new climate technologies. The programme is a direct result of the vision of the government to transform Denmark into a "green technology laboratory".
- The programme is aiding the construction of *permanent* large scale facilities and as such complements other national project-based aid programmes such as the The Energy Technology Development and Demonstration programme (EUDP).
- While the programme aims at attracting both large and small enterprises (which are often connected through either regional or national cluster initiatives), the programme - in conjunction with the underlying state aid rules - is particularly targeting SME's.
- The lack of test facilities is particularly perceived as a problem for SMEs which do not have the capacity themselves to coordinate or finance the establishment of the required large-scale facilities.
- Green Labs DK" targets and corrects this specific market failure as it helps financing and coordinating the establishment of new and permanent large-scale test facilities open for all parties, including in particular SMEs. By being able to develop and test their components independent of a single manufacturer it will increase the market reach and possibility to innovate at a larger scale.

6. Integration in broader "policy mix"

-

7. Date of implementation

2010-2012

8. Target group(s)

- All clean tech companies
- Consultancies and other private service providers (non-profit)
- Higher education institutions research units/centres
- New technology based firms/new knowledge intensive service firms
- Other non-profit research organizations (not HEI)
- Technology and innovation centres (non-profit)

9. Overall budget

€ 28 171 710

- 2010: € 8 049 060
- 2011: € 9 390 570
- 2012: € 10 732 080

10. Output indicators

The following numbers are based on the prososals received in 2010 and 2011 (the call for 2012 is still not completed):

- Average size of the project (budget): € 10 Mill.
- Number of funded projects/companies: 4.
- Number of applications versus potential beneficiaries: 4/12.
- Budget distributed to beneficiaries versus matching funds: 129/130.
- Financial commitment from industry: 60-70 per cent of the budget on average.
- Deployment mechanism: Test facilities
- Funding modalities
    - Nature of financial contribution:
        - Grants, including the obligation in some cases to channel the grant to the users in the form of discounts over a period of say 10 years.
    - Funding and co-funding levels: State level, but regional funding play a role as part of the private financing of the facilities.
    - Eligible cost basis: Buildings, machines and equipment, personnel, and permits.

- Collaboration modalities
    - National versus international:The beneficiary must be located in Denmark. However, international cooperation is an integrated and vital part of the business plan of the 4 new Green Labs.
- Application complexity and 'time to grant': Application complexity is high in terms of the considerable amount of research and coordination that is prerequisite to sending a qualified application. However, estimated "time to grant" is normally only 4-6 months depending on the complexity of the application.

11. Impact

- 4 projects received funding in the latter part of 2011. It is therefore still premature to measure their impact. During 2012 and 2013 the first Green Labs will have started their operations. An annual reporting system ensures that the authorities are able to measure their progress on an annually basis.

12. Conditions of transferability

-

13. Information sources

- ERAWATCH Research and Innovation Inventory
    - http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/dk/supportmeasure/supportmeasure_0033

- Green Labs DK:
  - http://www.ens.dk/da-DK/NyTeknologi/greenlabs/indkaldelser_af_ansoegninger/Documents/Call_for_applications.pdf

7.3 Finland

Finland
1. Title of policy measure **Functional Materials 2007–2013**
2. Implementing body Finnish Funding Agency for Technology and Innovation (Tekes)
3. Targeted KETs Advanced Materials

4. General description
• The Functional Materials Programme aims to develop new applications and competitive advantage through materials technology for Finnish industrial sectors. The main research areas of the programme are understanding materials and their features, tailoring functionality, and the control, production, application and disposal of materials. The properties of functional materials are designed to serve a specific purpose in a controlled way e.g. for special or challenging environmental conditions.
• Construction, packaging, machinery, biotechnology and communications are only a few examples of industries that benefit from the new properties that functional materials can provide. Drivers of Functional Materials programme:
  ○ International cooperation
  ▪ Programme: Frame agreements with selected partner countries to enable/facilitate cooperation
  ▪ New projects: Each project includes international cooperation (high-level research partners and/or companies needed to complement global value chain)
  ○ Commercialization of research results
  ▪ Programme: Provide assistance to projects to accelerate technology transfer to industry and commercialization of research results
  ▪ New projects: Research plan shall describe how the

results are planned to be utilized by Finnish industry or by new business (spin-offs, start-ups)
    - Environmental issues and life cycle analysis
        - Programme: Provide guidance to projects and increase general awareness of life cycle issues
        - New projects: Research plan must take into account environmental aspects based on life cycle thinking and materials & energy efficiency
    - Value chains
        - Programme: Facilitate creation of national competence networks and globally competitive value chains – Work of Thematic groups (miniclusters)
        - New projects: Potential applications should be identified and related value chain(s) recognized at early stage to provide need-based new solutions and ensure effective implementation of results
- There are four focus areas, based on strategy work done 2009-2010:
    - Biomaterials for medical use for tissue regeneration, implants and controlled drug release
    - Material and processing solutions leading to cost effective mass-manufacturable intelligent structures for printed electronics, thin film deposition techniques, roll-to-roll processes
    - Novel materials for energy technologies for solar energy, batteries and supercapacitors
    - Advanced materials enabling new applications with controlled/tailorable properties, externally controllable/responsive materials, materials from renewable sources

5. Purpose of the policy measure

- In Finland, there are currently over 4,000 researchers working with material research, mainly in electronic, forest, machinery and energy sectors. Despite the fact that Finland has strong research capabilities directed at functional materials, more international contacts are needed along the value chain to convert this knowledge into applicable products. One of the main objectives of the program is to establish connections between Finnish researchers and international actors in the field of advanced and nanomaterials, concerning both material development and application development. See also the "General description of the measure".
- Materials technology is an interdisciplinary and cross-sectional field. It is a fast-developing area that created opportunities for innovations in different industrial sectors.
    - Renewal of existing industry clusters
        - Materials for demanding conditions and life-cycle management

- Use of renewable materials and natural resources
- Material solutions for mass-manufactured electronics
- Materials for optoelectronics and photonics

- Enabling new business opportunities
  - Polymer technology for tailored functions
  - Biocompatible and bioactive materials and interdisciplinary healthcare solutions
  - Nanostructured and intelligent materials, composites and coatings
  - Nanoscale mechanisms, self-organisation and bioinspired processes
- Innovation environment development
  - Technology transfer and innovation chains
  - Interdisciplinary and cross-industry co-operation

6. Integration in broader "policy mix"

- Critical mass
  - 4000 researchers working with the material research
- Business culture within the particular country
  - Tekes programmes always include the activation of contacts and co-operation between universities and companies as an integral part of the programme
  - Tekes programmes also include possibility for bottom up initiatives from industry

- Lead market initiatives, public procurement
  - Demand side innovation policy has been developed in Finland during the past couple of years (e.g. Tekes financing instrument for innovative public procurement since 2009) but they are not part of this programme
- Related policy measures that are key in supporting KETs deployment
  - Innovation policy in general as well as Tekes and other instruments emphasize the commercialization of products and services, and lately more emphasis on experimentation, demonstrations and piloting.

7. Date of implementation

2007 – 2013

8. Target group(s)

- All companies
- Higher education institutions: research units/centers
- Other non-profit research organizations (not HEI)

Companies operating in Finland can apply for funding at any time.

Research organizations may apply funding on specific application periods.

9. Overall budget

€ 150 000 000

10. Output indicators

- Average size of the project (budget)
  - research project € 640 000
  - company project € 1 185 000
- Number of funded projects/companies: 138 / 66
- Number of applications versus potential beneficiaries: 178 / 72
- Budget distributed to beneficiaries versus matching funds: -
- Financial commitment from industry: € 48 000 000
- Deployment mechanism
  - Pilot plant, demonstration plants: The programme supports demonstrations and non commericial piloting and demonstarion environments
  - Proof of concept: The programme grants commercialication of research findings and innovations
  - Matchmaking between universities and companies: Yes, targeted work-shops and seminars in national and international level
- Funding modalities
  - Nature of financial contribution
    - Matching fund: € 58 000 000
    - Loans: € 13 730 000
    - Grants: € 52 830 000
    - Financial guarantees: -
  - Funding and co-funding levels: 35% - 70%
  - Eligible cost basis
- Collaboration modalities
  - National versus international: int.co in research project 90%; company project 50 %
- Application complexity and 'time to grant': approx. 80 days

11. Impact

- Overall results have not been reported yet, as the programme is still ongoing.
- Project portfolio on 07/03/2012:
  - 48 ongoing research projects (since 2007 tot. 72)
  - 24 ongoing company projects (since 2007 tot. 68)
  - Over 100 companies involved (e.g. OneMed, FibroGen, Savcor, UPM, MikTech, Wärtsilä, Ovako, Kemira, Beneq, Picosun, VTI Technologies, REKA...)

- Examples of research and company projects:
  - Solar energy
    - ”Solar III-V: Development of dilute nitride semiconductor materials for multi-junction solar cell systems” , Tampere Univ. of Technology
    - “Materials for metallic energy roof”, Aalto University
    - ”SOLARCO, Solar Thermal Collectors”, Savo Solar
    - ”Roll-to-Roll Atomic Layer Deposition (for photovoltaics)”, Beneq
  - New batteries and capacitors
    - ”Active Nanocomposite Materials (for Li ion batteries)”, Univ. of Eastern Finland
    - “Novel Electrode Materials for Li-ion Battery”, Aalto University
    - e.g. “High Energy Large Scale Lithium-ion ironphosphate battery” , + 2 other projects European Batteries
    - “Novel methods to formulate polymer nanocomposites and tailor their dielectric properties (for e.g. capacitors)”, Tampere Univ. of Technology
  - EHS issues
    - “Life Cycle Assessment Framework and Tools for Finnish Companies”, SYKE
    - ”Environmentally Compatible Bearing Materials”, Metso
    - ”Recycling process for batteris”, Akkuser
  - Innovation and Competitiveness from Nanocellulose: The Finnish Centre for Nanocellulosic Technologies, founded by VTT, the Aalto University and UPM develop an industrial-scale production process for nanocellulose and to develops new uses for cellulose as a material. UPM started pre-commercial production of fibril cellulose in 2011 and is currently developing new fibril cellulose applications with industrial partners.
  - Canatu develops new carbon nanomaterial for touch screens, sensors, photovoltaics...
    - flexible, transparent, conductive films replacing ITO
    - cost effective manufacturing concept
  - Savo-Solar’s nano coated solar thermal collector tolerates hundreds of degrees of heat

    Solarco project develops new absorber coating and industrial coating process for mass production

- Examples of Actions for international cooperation:
  - Europe: M-ERA-NET (www.m-era.net) and MATERA (www.matera.fi; terminated y. 2011), topics:
    - 1) Value-added materials;
    - 2) Bio-based materials
  - Japan Science and Technology Agency (JST), focus on Biomaterials for medical applications and Printed Functionality

- NAMI (materials and nanotechnology) Agreement with China
- Cooperation mode with Russia (materials and nanotechnology)
- USA: Biomaterials cooperation with Akron to be activated 2011

12. Conditions of transferability

- Scalability issues:
  - Size of the country: 5,3 million
  - Presence of industry base in the country with regard to KETs: Forest-based cluster is a good example: Finnish forest-based cluster has good pole position with (1) large and successful companies in pulp and paper, mechanical wood working, bioenergy and biofuels production, technology suppliers, chemical companies, automation and ICT; (2) education, R&D, good track record; (3) good image and well recognized know how among the professionals globally)
  - Maturity of the industry base: transformation from traditional forest sector towards forest-based bioeconomy cluster is underway
  - Budget available: In 2011 overall Tekes funding for SHOK (Strategic Centers for Science, Technology and Innovation) - research programmes 81 M€ and Tekes programmes 203 M€.
- Culture of doing business e.g. collaboration between universities and companies: Collaboration between universities, research organisations and companies is an integral part of Tekes and other innovation programmes
- Demand-driven aspect of policy measures: Demand side measures are not part of the programme
- Examples of recent industrial investments in biofuel pilot plants and production plants:
  - *UPM Oyj - the Biofore Company*
    - Biofore: Bio stands for future orientation, sustainable solutions and good environmental performance. Fore stands for forest and the company's position at the forefront of development. The company has just announced 150 M€ investment in BioVerno biorefinery for traffic biofuels.
  - *Stora Enso Oyj - Rethink*
    - Rethink: Stora Enso's new identity symbolizes the company's commitment to creating a sustainable future for our planet by developing innovative solutions based on renewable materials. The company announced in May 2011 the investment in Microfibrillated cellulose (MFC) pre-commercial plant
  - *Neste Oil Oyj – Refining the future*
    - Neste Oli is an oil industry pioneer in refining and marketing removable traffic fuels. The Company has 3 NExBTL renewable refineries. Joint Venture Company

with Stora Enso Oyj (NSE). Pilot BTL plant in Varkaus
- *Fortum Oyj - Next generation energy company*
  - The company invest 20 M€ by building a bio-oil plant connected to the Joensuu power plant. The integrated bio-oil plant, based on fast pyrolysis technology, is the first of its kind on an industrial scale.

13. Information sources

- Ministry of Employment and the Economy/Innovations: http://www.tem.fi/index.phtml?l=en&s=2069
- Action Plan on Demand and User Driven Innovation Policy 2010-2013: http://www.tem.fi/index.phtml?l=en&s=2382
- Person in charge of the program: Mr Markku Lämsä, email: markku.lamsa@tekes.fi
- (http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/fi/supportmeasure/support_mig_0012)
- Tekes (http://www.tekes.fi/programmes/Materiaalit)
- Functional Materials Programme Brochure - Key themes and result highlights 2011 (pdf)

  http://www.tekes.fi/en/gateway/PTARGS_0_200_403_991_2092_43/http%3B/tekes-ali1%3B7087/publishedcontent/publish/programmes/materiaalit/documents/uutisia/fmesitepainoon_pdf.pdf

7.4 France

France

1. Title of policy measure

Key Technologies for Digital Economy / Nanoelectronics 1 & 2

2. Implementing body

Commissaire général à l'investissement (This fund is a pillar of the "Programme d'Investissements d'avenir" (a € 35 billion national loan and public investment))

3. Targeted KETs

Nanoelectronics

4. General description

- With the "Programme d'investissements d'avenir", national government dedicated € 4.25 billion to the development of digital economy through the National Fund for Digital Society (aforementioned FSN). This call for projects is part of the section 2 of the FSN. It aims at supporting R&D in the field of nanoelectronics by promoting collaborative projects. The objective of this call is to select projects with potential industrial outcome, leading to a relevant renewal of research issues and have effects on suppliers and client users collaboration of key enabling technologies. It also aims at strengthening partnerships and transfer of ideas and people, by creating interactions between the academic and private spheres.

- Two complementary modalities were expressed in the terms of reference:
  -Aid to collaborative R&D projects
  -Aid, for public labs only, to acquire expensive research equipment
- The industrial partners must support the major part of the expenses; co-funding by local authorities was encouraged but not required. The candidate projects must be not incremental, and go further simple enhancements of techniques. A strong innovative content was required, as well as a strong collaboration between project partners (knowing that one private company was expected to be in the lead). The project had to involve at least one company and one research centre. The project could aim at developing new materials, components or processes with an important spill over potential for the industrial areas dealing with micro and nanoelectronics.
- The possibility of software-material integration and validation was mentioned (as far as relevant with regard to the criteria already mentioned). The R&D activities were to be implemented in France, and had to be either "industrial research" or "experimental developments".
- To be selected, a project had to demonstrate its potential impact on industry players' behaviour (through increases in R&D activities of clients/suppliers etc.) and had to provide arguments for the necessity of public intervention (market failure, incentive effect, non negative impact on competition…).
- The call for projects targeted nanoelectronics. It is included in a global numeric strategy that targets the 'next generations of nanoelectronic technologies'. The projects would deal with at least one of the following domains:
  - Digital circuits;
  - Embedded memory;
  - Digital imaging;
  - RF board;
  - Analog components;
  - Components mixed analog / digital;
  - Power components;
  - Materials and substrates for micro-nanoelectronics and

optoelectronics;
- LED and integrated optoelectronic devices;
- MEMS / NEMS;
- Integrated passive;
- "Systems in Package"
- Integrated micro-sources of energy

5. Purpose of the policy measure

- Strengthen industrial competitiveness through innovation and PPP in the nanoelectronics field
- Stimulate industrial initiatives to invest on R&D with direct product innovation
- Stimulate collaboration between academics and industries

6. Integration in broader "policy mix"

-

7. Date of implementation

The deadline for submission was 5th of March 2011 (call 1) and 28th of October (call 2)

8. Target group(s)

- companies (and especially SMEs)
- research centres

9. Overall budget

- Section 2 of the FSN represents € 2.25 billion for supporting numeric uses, services and innovative contents. € 1.4 billion is focused on traditional funding of innovative projects (risk capital, development capital, loans) while € 850 million supports R&D through subsidies or refundable loans.
- The maximum rate for eligible expenses was 25%. If proved collaborative, a 15% additional increase could be expected. SMEs (according to the EU standards) could receive an additional bonus of 10% (maximum rate of 50%).
- For research centres, the rate was up to 40% (pilots installations excluded) of subsidies. Some research centres could choose the option of additional costs (100% of only additional costs (excluding salaries and personnel or other elements related to their status)).
- The overall acquisition of pilot installations by a research centre could be 100% funded by the FSN (100% of the costs, including the setting up and the maintenance of the installation). The installations are expected to be used by both the company(ies) and the research centre, with a payment of access fees at market price based on equipment depreciation by the company for using the pilot

installation. The company would benefit from a first option to buy the installation after the implementation of the R&D project (market value + minimal margin). The revenues are returned to the state by the laboratories.

10. Output indicators

- Average size of the project (budget) : 300 M€
- Number of funded projects/companies :
  - 19 projects funded
  - 30 companies (14 SME)
  - 28 academics
  - some contribute to several projects (accounted for 1)
- Number of applications versus potential beneficiaries : 37/19
- Financial commitment from industry : justify activities and costs
- Deployment mechanism
  - Proof of concept
  - Matchmaking between universities and companies
- Funding modalities
  - Nature of financial contribution
    - Grants with upside payments for companies according to economic results
  - Funding and co-funding levels :
    - up to 50 % for SMEs
    - up to 40 % for large companies
    - up to 40% for academics (or 100% of additional costs)
  - Eligible cost basis ; R&D costs
- Collaboration modalities
  - National versus international : Open, only R&D activities located in France can be funded
- Application complexity and 'time to grant'
  - 4 months for decision + 6 months for contracting
  - complementary delay when aids are submitted for CE agreement (6 cases) (+6-12 months)

11. Impact

- Type of instrument : support to industrial innovation
- Number of start-ups, spin-offs emerging from the program : none yet
- Valorization requirements/results : industrial deployment of product innovation
- Evaluation of measure
  - Attention to deployment in promising but risky areas
- The project should present economic spillovers for the national territory in terms of employment, investments, industrial restructuring and anticipation of economic changes. The project should be part of a multi-year (5 years) industrial and technological roadmap.

12. Conditions of transferability

- Scalability issues:
  - Critical mass available within the country with regard to KETs
  - Presence of industry base in the country with regard to KETs
  - Maturity of the industry base
  - Budget available
- Compatibility with other Member States
- Culture of doing business e.g. collaboration between universities and companies
- Demand-driven aspect of policy measures

13. Information sources

- http://investissement-avenir.gouvernement.fr/
- Links to relevant documents e.g. policy documents, evaluation reports : closed
- http://www.rhenaphotonics.fr/fr/content/eric-besson-ministre-charg%C3%A9-de-lindustrie-appelle-la-commission-europ%C3%A9enne-%C3%A0-miser-sur-les-%C2%AB
- Arrêté du 20 juillet 2011 relatif à l'approbation du cahier des charges « Technologies de base du numérique — Nanoélectronique — Appel à projets n° 2 » NOR: PRMX1120213A
- Investissements d'Avenir, Développement de l'Economie Numérique,« TECHNOLOGIES DE BASE DU NUMERIQUENANOELECTRONIQUEAPPEL A PROJETS N°1 », investissements d'avenir – Fonds national pour la société numérique

7.5 Germany

Germany

1. Title of policy measure

Innovation Alliances (Innovationsallianzen)

2. Implementing body

Federal Ministry of Education and Research (BMBF)

3. Targeted KETs

Nanotechnology
Nano- and microelectronis
Photonics
Advanced manufacturing technologies

4. General description

- Innovation alliances are a new instrument of public support to path-

breaking industrial innovation that provide funding for strategic cooperation between industry and public research in key technology areas that demand a large amount of resources and a long time horizon, but promise considerable innovation and economic impacts. Through a public-private partnership, the Federal Government provides funding for R&D and other innovation-related activities for specific, long-term co-operative R&D projects. R&D activities can range from fundamental research to prototype development. Each innovation alliance is set up through an industry initiative, is organized as a long-term co-operative research project and involves several industry partners as well as public research organizations. Each innovation alliance focuses on the development of new path-breaking technologies in specific sectors or for cross-cutting areas.

- Each innovation alliance (project) is managed by a 'Projektträger' (programme management agency) which is specialized in the respective field of technology.
- Projects can be submitted by consortia of public and private actors at any time. Since innovation alliances are long-term large-scale partnerships of industry and science, they typically emerge out of previous activities often funded under the thematic R&D programmes. Proposals and project designs are often developed jointly by the consortia and the programme administering agency that is responsible for the respective field of technology.
- Projects are selected based on a quality assessment of the new technology to be developed (i.e. it has to be a break-through technology of global impact that will strengthen the competitiveness of the German economy) and a high-level of commitment of the industrial partners. Innovation alliances will receive funding as long as industry is ready to commit substantial private funding into research related areas (including manufacturing) in this field in Germany (expected ratio 1:5) subsequent to the public funding stage. Innovation alliances are financed out of the technology programmes in the respective area (e.g. Optical Technologies programme). The same funding rules and conditions apply.
- Each of the (currently) nine innovation alliances target a specific field of technology:
    - EENOVA innovation alliance for automotive electronics
    - OLED initiative for organic light emitting diodes
    - Organic photovoltaics for the use of renewable energy
    - Lithium-ion batteries for the storage of energy
    - Molecular imaging for medical engineering
    - European Initiative 100 GET for digital product information
    - CNT carbon nano tubes
    - Applied virtual technologies for product cycles
    - Virtual/Ethernet transport technologies

5. Purpose of the policy measure

The emphasis in these strategic alliances between science and business is

in all cases toward specific application areas or future markets. Innovation alliances exercise a particular economic leverage effect.

The target is: One euro from the Federal Government, five euros from business (subsequent research related investment of industry in this field (including manufacturing) in Germany)

6. Integration in broader "policy mix"
Part of the High-Tech Strategy 2020 for Germany

7. Date of implementation
2007 – 2012

8. Target group(s)
- All companies
- Higher education institutions: research units/centres
- Other non-profit research organization (not HEI)

9. Overall budget
€500 million provided by the Federal Government, more than €3 billion by industry

Each Innovation alliance: ~5 years duration/30-120 mio. funding (depending on the commitment)

10. Output indicators
- Subsequent research related Investment of Industry in this field in Germany

11. Impact
- Since the programme started in 2007 and will run at least until 2012, no final results are available yet. The contribution of € 600 million from the Federal Government has attracted more than € 3 billion from business.

- So far, nine Innovation Alliances and a large number of "strategic partnerships" were created by the BMBF, the scientific community and industry. Each alliance is a large-scale, long-term R&D and innovation project involving several actors from industry and science. One prominent example is the Innovation Alliance "Molecular Imaging for Medical Engineering" (nanotechnology) formed by Bayer Schering Pharma AG, Boehringer Ingelheim Pharma GmbH & Co. KG, Carl Zeiss AG, Karl Storz & GmbH Co. KG and Siemens AG. This alliance has set its sights on creating new diagnostic agents and imaging procedures for clinics and the development of pharmaceuticals. Molecular imaging

technologies aim at detecting biological processes at the cellular and molecular level. They offer an opportunity to detect diseases earlier and more specifically, thereby improving current procedures of medical imaging and therapy control.

12. Conditions of transferability

-

13. Information sources

- http://www.hightech-strategie.de/en/693.phpERAWATCH Research and Innovation Inventory (http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/de/supportmeasure/support_mig_0018)
- Research in Germany about Innovation Alliances (http://www.research-in-germany.de/research-landscape/rpo/networks-and-clusters/41832/10-3-innovation-alliances.html)
- Federal Government on innovation alliances and strategic partnerships (http://www.hightech-strategie.de/en/693.php)
- Information on carbon nano tubes Innovation Alliance (http://www.inno-cnt.de/en/)
- Information on organic photovoltaics Innovation Alliance (http://www.fona.de/en/9986)

Germany

1. Title of policy measure

Photonics Research Germany (Follow-up of "Optical Technologies – Made in Germany)
Part of "High-Tech Strategy for Germany"

2. Implementing body

Federal Ministry of Education and Research (BMBF)

3. Targeted KETs

Photonics

4. General description

- The programme is part of the "High-Tech Strategy for Germany".
- Optical technologies have a key function in the solution of important societal challenges. Hence the BMBF funds projects in the realm of health care systems and biotechnology, environment, traffic and mobility, nano-electronics, information and communication. The programme aims at developing scientific-technical bases,

strengthening innovation and competitiveness and supporting education and retraining. Topics and structural challenges are subdivided into three fields of action: next generation optical systems, innovative applications of light for humans, production and the environment, creation of favorable start and general conditions. The main instrument for funding optical technologies is cooperative projects.

- Recent research findings even lead to the conclusion that the significance of optical technologies will even surpass that of electronic engineering, which they also supplement. The trend is to perform as many tasks as possible with light. The new dimension of light provides elegant, gentle technical solutions. Lasers are capable of machining, shaping and refining many different materials in all branches of industry, from automotive via textiles to printing. On the other hand, light offers options for which there are no role models in the past, such as the production of tiny structures in future generations of chips, the transfer of huge quantities of data via fibreglass cables for the information highway of the multi-media society, rapid drug research with optical biochips for diseases previously thought to be incurable, or the use of optical screening methods for controlling food products.
- The selection process is two-fold:
    - In the first step, project outlines for cooperative projects can be submitted to the appropriate project operating organization. Proposals have to build on the international state-of-the-art of research and technology and consider relevant outcomes of former BMBF funding. Project outlines are reviewed by BMBF and the operating organization and based on the following criteria:
        - societal requirement
        - economic and technical importance, traceability of the realization-concept
        - scientific-technical quality
        - novelty and plausibility of the method of resolution
        - qualification of partners
        - project management and project structure
        - scientific-technical and economic risk
    - If selected, in a second step the partners of selected projects have to present a formal, more detailed claim for funding.
- Topics and structural challenges of the programme are subdivided into three fields of action:
    - optical systems, especially next generation optical systems
    - innovative applications of light for humans, production and the environment
    - creation of favorable start and general conditions.
    - Basic research highlights are quantum optimal engineering, new optical functions through micro- and nano-structuring of optical materials, optical technology based on organic materials,

Femto-biology etc.

5. Purpose of the policy measure

- Addressing societal challenges, e.g Health, Mobility etc. as well as manufacturing and competitiveness.

6. Integration in broader "policy mix"

Part of the High-Tech Strategy 2020 for Germany

7. Date of implementation

2002 – 2011 Optical Technologies
2012 - Photonics Research Germany

8. Target group(s)

- All companies involved in research and innovation
- Scientists / researchers (as individuals)
- Higher education institutions: research units/centers
- Other non-profit research organizations (not HEI)
- Higher education institutions (education function)
- Private institutions for education / lifelong learning
- Technology and innovation centers (non-profit)
- New technology based firms

Cooperative projects with industry and research institutions are the main funding instrument. Young scientists should be part of these networks and should have an opportunity to gain better qualifications in order to establish spin-offs.

9. Overall budget

2002-2011: € 75 Mio /year
(Subsequent "Photonics research Germany" designed to 10 years (starting 2012): € 100 Mio/year)

10. Output indicators

- Average size of the project (budget): 3 million (average 6 partners)
- Number of funded projects: 30 per year
- Number of applications versus potential beneficiaries: 1:4
- Financial commitment from industry: minimum 50% of project costs
- Deployment mechanism
  - Pilot plant, demonstration plants – no
  - Demonstration projects - yes
  - Proof of concept - yes
  - Matchmaking between universities and companies: yes
- Funding modalities
  - Nature of financial contribution
    - Grants

- Funding and co-funding levels
- Eligible cost basis: standard

- Collaboration modalities
  - National versus international: under certain circumstances (e.g. through subcontracting)
- Application complexity and 'time to grant': 6-9 month

11. Impact

- Utilization plan of research results: Yes
- Number of start-ups, spin-offs emerging from the program : Yes, program level
- Valorization requirements/results
  - Uptake by industry: yes, utilization plan
- VDI Technologiezentrum, the administrating agency, states that the programme has been successful. The competitiveness of the German industry has been strengthened. The public-private partnership scheme has led to increases in private investment in R&D.
- In 2010 the global turnover of optical technologies was about € 250 billion of which German companies held a nine percent share with an export ratio of nearly 70 percent. These around 1000 predominantly medium-sized photonics enterprises show a sustainable annual growth rate of about eight percent. Optical technologies represent an impressive branch of industry with a workforce of around 125000 employees in 2010 in Germany which is about to grow by another 20000 until 2015.
- A recent study of the leveraging impact of photonics says that optical technologies underpin at least 10 percent of the European economy. Its enormous growth potential is mainly based on the innovation power as a result of well educated staff and investments in research and development of 13.4 percent of the 2010 turnover. Due to this strong R&D focus the cooperation between science and industry is of highest importance for photonics. This is why the photonics industry has committed itself to invest approximately € 30 billion in R&D over the next 10 years in Germany, to create economic growth and jobs.
- The German Competence Networks for Optical Technologies unite companies, research and education institutions, technology transfer agencies, business development companies, investors and public-law corporations. Their common aim is to support the development and application of Photonics (http://www.optecnet.de/). OptecNet Deutschland has more than 500 members, divided into nine regional Competence Networks for Optical Technologies in Germany: bayern photonics, HansePhotonik, OpTecBB, OpTech-Net, Optence, OptoNet, PhotonAix, PhotonicNet and Photonics BW.

12. Conditions of transferability

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13. Information sources

- http://www.photonikforschung.de
  http://www.hightech-strategie.de/en/350.php Dr.-Ing. Holger Junge
  Abteilungsleiter
  Laser- und Optikforschung
  Projektträger des Bundesministeriums für Bildung und Forschung

  VDI Technologiezentrum GmbH
  VDI-Platz 1, 40468 Düsseldorf
  Tel.: +49 2 11 62 14-5 45
  Fax: +49 2 11 62 14-1 59
  junge@vdi.de
- ERAWATCH Research and Innovation Inventory (http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/de/supportmeasure/support_mig_0029)
- Research in Germany on Optical Technologies (http://www.research-in-germany.de/optical_technologies)

Germany

1. Title of policy measure

Central Innovation Programme SME (ZIM)
ZIM – Zentrales Innovationsprogramm Mittelstand

2. Implementing body
AiF-Projekt GmbH, VDI/VDE-IT, EuroNorm GmbH

3. Targeted KETs
All technologies by a bottom up approach

4. General description

- The Central Innovation Programme SME (ZIM) promotes research and development projects in SMEs. ZIM is an application-oriented funding programme that aims to reduce the risks of R&D-projects by funding a share of the costs. It provides grants to small and medium-sized enterprises (SMEs) to help them finance research and innovation projects. Applications can be submitted in all technologies, sectors and topics. So SMEs can carry out R&D projects in the field of their business. Therefore the results are very fast transferred into marketable products. The programme places a particular priority on supporting collaboration between businesses and research organizations in order to accelerate the transfer of cutting-edge technologies into marketable products.

- Criteria's for funding are the innovative content and good market opportunities of the funded projects.

5. Purpose of the policy measure

ZIM is embedded in the High-Tech Strategy of the Federal Government. It is the basic programme of the Federal Ministry of Economics and Technology (BMWi) for market-driven technology support of the innovative SME economy in Germany. SMEs are to be supported to advance their research and innovation efforts to intensify the development of new products, processes and services in order to meet the challenges of global competition and to grow faster and create new jobs.

6. Integration in broader "policy mix"

- Business culture within the particular country
  - Info on collaboration willingness between universities and companies -> major contribution
  - Possibility of bottom-up initiatives from industry -> R&D project ideas come from SMEs. Research Organization can only submit an application in collaboration with a SME.
- Priorities of innovation- and technology policies of the Federal Ministry of Economics and Technology are:
  - improvement of innovation oriented framework conditions
    - adaptation of technical standards, patents, standardization to research results
    - reduction of the skilled labour lack in research and innovation
    - promotion of venture capital financing
    - intellectual property
    - accreditation
  - initiatives to increase technical education, raise kid‛s and youths‛ enthusiasm for technology (e.g.: "School-Labs" by DLR)
  - well structured research landscape
  - competitive conditions for public research institutes: more flexibility in personal and budget regulations
  - technology-specific support programmes e.g. biotech, nanotech, aviation, transport, energy, environment, IT
  - orientation towards social challenges:
    - Health/Food
    - Energy/Climate
    - Security
    - Mobility

- Communication
  - innovation and technology support for SMEs and promotion of their innovation competence
  - promotion of clusters
  - promotion of high-tech start ups

7. Date of implementation

2008

8. Target group(s)

SMEs

Research Organisations

9. Overall budget

Yearly budget of about 500 million Euro

10. Output indicators

- Average size of the project (budget): 125.299 Euro per beneficiary
- Number of funded projects/companies: 13.000 projects, 9.500 companies
- Number of applications versus potential beneficiaries: There are about 100.000 innovative SMEs in Germany
- Financial commitment from industry: About 60 % of the R&D project costs
- Deployment mechanism
  - R&D projects
- Funding modalities
  - Nature of financial contribution: Grants
  - Funding and co-funding levels: SMEs max. of 50% of their part of the project costs, Research Organizations max. 100 %
  - Eligible cost basis: max. 350.000 Euro of each participant of the consortium and innovation support services of max. 50.000 Euro
- Collaboration modalities
  - National versus international: there are also international cooperation. The international partners finance the project either by themselves or they are supported by funds of their national government
- Application complexity and 'time to grant'
  - uncomplicated terms of support
  - applications can be submitted at any time and the procedure is comparatively simple
  - the R&D-project can start immediately after receipt of the application has been confirmed
  - SMEs can start developing their new ideas immediately and can

react directly to recent market demands.
11. Impact • In the innovation reports of the German Chamber for Industry and Commerce (DIHK) the ZIM scheme is regularly named as „best practice". The German Institute for Inventions honoured ZIM as "Best Innovation Support" in 2011
12. Conditions of transferability -
13. Information sources • Links to websites in German: www.zim-bmwi.de -> on the site there are evaluation reports available. Partly the reports have summaries in English. • ERAWATCH Research and Innovation Inventory • Evaluation report 2010 in English

7.6 Hungary

Hungary
1. Title of policy measure **Support to market-oriented R&D activities** *(Piacorientált kutatás-fejlesztési tevékenység támogatása)*
2. Implementing body • Managing Authority of the National Development Agency (Economic Development Operating Program Managing Authority) • Intermediary Organisation, the Hungarian Economy Development Centre (MAG Zrt.)
3. Targeted KETs Biotechnology Advanced Material Nanotechnology Micro- and nanoelectronics

4. General description

- The objective of this scheme is to support R&D projects that build on research results and are expected to develop prototypes of marketable products, services or processes representing high added value. The measure aims to foster the feedback from business demand towards R&D and strengthen technology transfer by stimulating co-operation between the actors of the innovation system, especially between publicly financed R&D organisations and businesses.
- The main objective of this scheme is to support R&D projects that are likely to result in prototypes. Further, it also aims at fostering business-academia R&D co-operation.
- The scheme is implemented through single-round calls for proposals, with calls launched annually. It provides support via competitive grants.
- Eligible applicants must be registered in Hungary or in an EEA member state and operate a branch office in Hungary.
- Special preference is given to fields of strategic importance to the competitiveness of the Hungarian economy: medical sciences, pharmaceuticals, biotechnology, agricultural sciences, health sciences, energetics, transport, electronics, control systems, waste management, environmental protection, waste water treatment, environmental safety, chemistry, IT hardware, database management, digital systems, IT programming, telecommunications, material technologies, nanotechnology etc.

5. Purpose of the policy measure

To be able to utilise marketable knowledge it is crucial to support the R&D projects that have first of all business purposes, however greater risks of return, to encourage the applied research and experimental developments that have been carried out with the leading role of enterprises in the cooperation of universities and research institutes, and later on to market the results. Therefore the objective of the measure is to support first of all those research projects that have been carried out in cooperation, and that based on the research results contribute to the development of up-to-date, high value added, marketable products, procedures and services.

6. Integration in broader "policy mix"

- Critical mass # graduate students:
  - Since 2012, a marked promotion of S&E students has been introduced as part of the financing reform of higher education. Previosuly no measure was in effect in this field.
- # PhD - the employment of young graduates is favoured horizontally throughout the grant system (eg. by extra

points in the project selection process)

- Business culture within the particular country
  - Info on collaboration willingness between universities and companies
    : - collaboration willingness is generally low in Hungary, although it correlates with the company size. Numerous measures are targeted towards enhanced collaboration. In 2012, however, a powerful tax measure (the tax relief from the innovation tax after the company's own or extramural R&D activities) was abolished.
    - Possibility of bottom-up initiatives from industry : - horizontal tax measures and grant schemes are typical in Hungary, however, cluster and technology platform schemes are also in place, which help to generate bottom-up, industry wide initiatives. A few sectors are more active in this respect, especially the automotive and the pharmaceutical industry.
- Taxation climate taxation climate is generally favourable with numerous types of R&D tax reliefs (however, the tax relief from the innovation tax after the company's own or extramural R&D activities has been abolished since 2012)
- Lead market initiatives, public procurement no measures in place
- State aid framework within the particular country- fully harmonized with the EU framework (although not all available R&D aid measures [as defined in the Commission Regulation (EC No 800/2008] are applied in practice)
- Related policy measures that are key in supporting KETs deployment: currently no such measures are in place

7. Date of implementation

2007 - 2013

8. Target group(s)

- Since projects must be based on the direct needs of businesses, only firms are eligible for support.
- Higher education institutions research units/centre and other non-profit research organisations can receive funding via partnerships with businesses.

9. Overall budget

- 95,200,000 Euros (In 2012 GOP-2011-111 were announced again with a budget of HUF 45 billion. So the total budget of the program is 261,500,000 euro)

10. Output indicators

- Average size of the project (budget): 390 000 - 600 000 euro
- Number of funded projects/companies: 264 projects
- Number of applications versus potential beneficiaries: 678 versus 264
- Budget distributed to beneficiaries versus matching funds: 70% - 30 %
- Financial commitment from industry: 30%
- Deployment mechanism
  - **Pilot plant, demonstration plants**
  - **Proof of concept**
  - **Matchmaking between universities and companies**
- Funding modalities:
  - Nature of financial contribution
    - Matching fund
    - Loans
    - **Grants**
    - Financial guarantees
  - Funding and co-funding levels: Structural Funds
  - EU share: 85%
  - National share: 15%
  - Eligible cost basis
    R&D project (basic research, industrial research, experimental development),
    Trade law protection of SMEs,
- Collaboration modalities
  - National versus international: National
- Application complexity and 'time to grant'
  - After the application administration the decision making process is about 60-90 days. The Intermediate Body with independent expert keep a check on the form and on the content of the application. The committee makes a proposal about the decision for the Director General of the Managing Authority. The decision-maker is the Director General of the Managing Authority.

11. Impact

- Type of instrument
- **Name of indicator is the Operational PROGRAMME:**
- The increase of enterprise R&D expenditures as a result of priority axis 1
- The increase of registration of given EPO patents, utilization and design patents as a result of the programme
- The increase of calculated research workforce as a result of the programme

- **Relevant EU core indicators:**
- Number of RTD projects
- Number of cooperation projects enterprises – research institutions
- Research jobs created
- Number of start-ups, spin-offs emerging from the program
- Start-ups and spin-offs can't apply in the program.
- Valorization requirements/results
  - Uptake by industry
  - An integrated element of the supported projects is the intention of future market utilization. This is why independent applications can only be presented by enterprises, and co-operation for the purpose of submitting applications can only be managed by enterprises. At the evaluation of the projects, the aspects of **usefulness**, effectiveness, and performance have high priority.
- Evaluation of measure
  - Attention to deployment in unexpected areas
  - Impact of current measure and possible results it may contribute to
- The scheme itself has not been evaluated. However, two ex-ante evaluations have been carried out in relation to the Community Support Framework for 2007-2013 in relation to innovation promotion: one for assessing horizontally the New Hungary Development Plan across its Operational Programmes (stating that there is a trade-off between its measures and STI) and one for explicitly evaluating the Economic Development Operational Programme as such. As part of the latter, the appropriateness and the expected impact of the discussed scheme has been briefly analysed. The report concludes that there is indeed a need for state support in this area, and that both the Hungarian weaknesses and international good practices justify the existence of the scheme. Among several risks, the evaluation points out that one of the possible bottlenecks might be the scarcity of available qualified human resources capable of implementing the projects, and more generally the absorption capacity of the targeted groups.
- Altogether 220 projects received funding from this measure in 2007-2010.
- Altogether 264 projects received funding from this measure in 2007-2011.

12. Conditions of transferability

- Size of the county: 93 027,44 km²

13. Information sources

- Links to websites
  http://www.nfu.hu/
  http://ujszechenyiterv.gov.hu/
  http://ujszechenyiterv.gov.hu/science_innovation_programme
  http://en.magzrt.hu/
- Links to relevant documents e.g. policy documents, evaluation reports
  http://www.nfu.hu/doc/4
- http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/hu/supportmeasure/support_mig_0029
- http://www.nfu.hu/?lang=en

7.7 Lithuania

Lithuania

1. Title of policy measure

High technology development programme for 2011-2013
Aukštųjų technologijų plėtros 2011–2013 metų programa

2. Implementing body

- Launching agencies: Lithuanian Ministry of Education and Science, in cooperation with the Lithuanian Ministry of Economy
- Administering agency: Agency of Science, Innovation and Technology (MITA)

3. Targeted KETs

- Biotechnology
- Mechatronics
- Laser technology
- Information technology
- Nanotechnology and Electronics

4. General description

- Program is administered by Agency of Science, Innovation and Technology (MITA) according to the 4th of January, 2011 order No.V-1/4-2 by Ministers of Science and Education, and Economy „For the approval of High technology development programme for 2011-2013".
- Growth of economy can be achieved only by using high-tech

production, based on research and development. At the moment such kind of production reaches only 0.8 %.

- Program fosters collaboration between science and business, shows their productivity and profit of investments.

- Program develops high-tech manufacturing and production, which is competitive in the global market.
- Program creates new work places for the most qualified scientists, and solves the emigration of these specialists.
- Program foster foreign investments into high-tech sector.

5. Purpose of the policy measure

The aim of the program is to promote the development of current fields of high-tech, which have the best perspective and scientific potential in the global market, to make the production competitive worldwide.

6. Integration in broader "policy mix"

- Critical mass
  - graduate students

    In 2010, 28 % of residents of Lithuania aged 25–64 had higher education (in 2009, 25 %).

  - PhD

    At the beginning of 2010, there were 9.6 thousand doctorate holders aged under 70, accounting for 0.5 % of the total population aged 25–70.

- Business culture within the particular country
  - Info on collaboration willingness between universities and companies

    In order to develop collaboration between science and business, to expand the infrastructure for scientific researches and to increase its application effectiveness, five integrated science, education and business centers (valleys) were established in different regions in Lithuania. These centers have to foster collaboration between science and business, to join the scientific potential, and to attract high-tech companies to work together with Lithuanian researchers.
  - Possibility of bottom-up initiatives from industry

    Science and/or technology parks are the main source of promoting innovations, by fostering establishment of new innovative companies, the expansion of current innovative companies and developing collaboration between science and business, through providing services for innovations support.

    Also clasterization is an opportunity for Republic of Lithuania to achieve economic growth, as the established cluster allows

companies to carry out various experiments with low costs and to share ideas among clusters members.

- Taxation climate
  There are 3 types of tax concessions to increase the level of R&D being conducted by companies in Lithuania:

  1) R & D tax concession. The costs of R&D, except for depreciation or amortization costs of fixed assets, shall be deducted three times from income for the tax period during which they are incurred where the scientific research and/or experimental development works carried out are related to the usual or intended activities of the entity which generate or will generate income or economic benefit.
  2) Accelerated depreciation on fixed assets for R&D. Depreciation or amortization costs of fixed assets used to carry out R&D shall be deducted from income in accordance with the procedure laid down in Law on Corporate Income Tax of the Republic of Lithuania.
  3) Investment project tax concession. The entity carrying out an investment project may reduce the taxable profits by the amount of the actual costs incurred for the acquisition of the assets during the tax period. Taxable profits calculated for each tax period may be reduced by 50 %.

- Lead market initiatives, public procurement
  Cooperation between science and business is important part of innovations in Lithuania, which aims that students education, scientific researches and business would all be orientated towards innovations.
  The Ministry of Economics and the Ministry of Education and Science are the main institutions responsible for the formation and the implementation of innovation policy in Lithuania:
  - the Ministry of Economics manages the policy for the development of the innovation environment;
  - the Ministry of Education and Science manages the policy for the research and development.

  The innovation policy is implemented in Lithuania by Agency for Science, Innovation and Technology (MITA).

- State aid framework within the particular country
  Lithuania has various national programs that cover the state aid including KETs:
  Top Down Thematic Programme
  - High-tech development programme 2011 – 2013

  (Cover the areas of: Biotechnology, Mechatronics, Laser technology, Information technology, Nanotechnology and Electronics)
  - Industrial biotechnology development programme 2011 – 2013

  (Applied researches initiated by SME together with research institution)

Bottom Up Programme

- Intelektas LT (Dedicated for the R&D activities in companies in various areas)
- Inoklaster LT+ (Dedicated for the R&D activities in clusters of companies and universities in various areas)

Cooperation Industry – Universities

- Innovation vouchers (Small credit that entitles SME's to buy R&D expertise or knowledge from research and educational institutions)
- Joint Research Programmes (High quality R&D where companies collaborate with research institutions. Cover the areas of: Natural resources and agriculture; Biomedicine and biotechnology; Material science, physical and chemical technology; Engineering and information technology.)

Infrastructure (pilot, demonstration plant)

- Intelektas LT+ (For investments into R&D equipment)
- Inoklaster LT (For clusters investments into R&D equipment)

Valorization (proof of concept, business plan, co-funding of public and private sector)

- Idėja LT (For technical studies of innovative ideas)

- Related policy measures that are key in supporting KETs deployment
  Lithuanian Innovation Strategy for the year 2010-2020 is the main document setting the strategy, vision, objectives, goals and results to be achieved in the field of Lithuanian Innovation up to 2020. The objective of this strategy is to build a creative society and create the conditions for the development of entrepreneurship and innovation.
  Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) is the document regulating developed of the Integrated Science, Studies and Business Centres (Valleys) with a view to building up research, studies and knowledge economy clusters of the international level in Lithuania, accelerating the development of knowledge society and consolidating the long-term foundation for the competitiveness of Lithuania's economy. The Valleys' development programmes are designed including their objectives, tasks and establishment conditions as specified under the Concept and approved by the Government of the Republic of Lithuania.

7. Date of implementation

2011-2013

8. Target group(s)

- Project can be carried out by Lithuanian research centre (university, institute and etc.) and small, medium enterprise (SME).
- At least two partners have to participate in the project: one scientific

and academic institution, the other – company.

9. Overall budget

€ 2 230 000

10. Output indicators

- Average size of the project (budget) – **€** 150 000 – 200 000
- Number of funded projects/companies - 31
- Number of applications versus potential beneficiaries – 4:1
- Budget distributed to beneficiaries versus matching funds – all planned budget is distributed to the beneficiaries
- Financial commitment from industry about 10 %
- Deployment mechanism
  - Pilot plant, demonstration plants – project is focused on developing new, innovative products or technologies
  - Proof of concept – project idea has to meet program priorities and themes.
  - Matchmaking between universities and companies – both university and company has to participate in the project
- Funding modalities
  - Nature of financial contribution
    - Grants
  - Funding and co-funding levels – 100 % funding for research institutions, 50-75 % for SMEs.
  - Eligible cost basis – personnel costs, long and short term assets, subcontracting, materials, travel, indirect costs.
- Collaboration modalities
  - National versus international – all projects involve only national organizations
- Application complexity and 'time to grant' – application not complex, filled in national language and in English, submitted electronically. Evaluation is done during 50 work days.

11. Impact

- Type of instrument – national programme
- Number of start-ups, spin-offs emerging from the program – none (projects from the 1st call are not finished yet)
- Valorization requirements/results
  - Uptake by industry – industry participates in every project, therefore project is dedicated to meet the needs of the industry
- Evaluation of measure
  - Attention to deployment in unexpected areas – projects are evaluated every year to control their implementation
  - Impact of current measure and possible results it may contribute to – projects of the 1st call are not finished yet, therefore it is difficult to measure results

12. Conditions of transferability

- Size of the country
  Lithuania is rather small country, with area of 65 000 sq. kilometers and population of 3,2 million people.
- Critical mass available within the country with regard to KETs
  In 2010, 18.3 thousand employees were engaged in R&D activities, of whom 6.3 thousand – researchers with a scientific degree or an academic title (of whom 2.8 thousand – women). In the institutions of the higher education and government sectors, the number of employees engaged in R&D activities amounted to 15.4 thousand, of whom 6.2 thousand – researchers with a scientific degree or an academic title. In the business sector, the number of employees engaged in R&D activities amounted to 2.9 thousand, of whom 163 – researchers with a scientific degree (PhD degree).
- Presence of industry base in the country with regard to KETs
  Industry base with regard to KET is not very wide in Lithuania. There are only 20 of world-class players and many small and medium enterprises in areas of biotechnology, IT, laser technology.

- Maturity of the industry base
  Some of the companies are developing hi-tech products that are well recognized worldwide, but the large part of KET industry base in Lithuania consists of small and young enterprises, especially in IT sector.
- Budget available
  In 2010 Lithuania's expenditure on R&D reached 219 million EUR (0.79 % of GDP).

- Compatibility with other Member States
  Lithuania does not have any national programmes or initiatives that would be aimed at increasing innovations, especially in the KETs area that would include other Member States members. In case of collaboration with foreign researchers or companies institutions in Lithuania have to use EU directly funded programmes.

- Culture of doing business e.g. collaboration between universities and companies
  Collaboration between universities and companies is encouraged by various national R&D support programs, integrated science, education and business centers (valleys), and clusters, however the level of collaboration is not sufficient. Big part of the universities in Lithuania lack of applied researches that would be interesting for the business sector.

- Demand-driven aspect of policy measures

The main policy measures are set by the Government of Republic of Lithuania in consultation with leading universities, innovation centers, agencies in Lithuania. Although some demand-driven aspects in setting policy are possible, the main is political decision on particular policy measures.

13. Information sources

- Links to websites

  - High-tech development programme 2011 – 2013

  http://www.mita.lt/en/general-information/national-programmes/high-tech-development-programme/about/
  http://www.mita.lt/lt/nacionalines-programos/aukstuju-technologiju-programa/apie/

- Statistical information:
  Statistical Yearbook of Lithuania (2011 catalogue)
  http://www.stat.gov.lt/en/catalog/list/?cat_y=2&cat_id=1&id=2039
  National Integrated programs:
  http://www.smm.lt/en/smt/nip.htm
  - Industrial biotechnology development programme 2011 – 2013
    http://www.mita.lt/en/general-information/national-programmes/industrial-biotechnology-development-programme/about/
  - Intelektas LT
    http://www.lvpa.lt/Puslapiai/Priemone.aspx?prid=10
  - Inoklaster LT+
    http://www.lvpa.lt/Puslapiai/Priemone.aspx?prid=13
  - Innovation vouchers
    http://www.mita.lt/en/general-information/innovations/innovation-vouchers/
  - Joint Research Programmes
    http://www.mita.lt/en/general-information/innovations/joint-research-programmes/
  - Intelektas LT+
    http://www.lvpa.lt/Puslapiai/Priemone.aspx?prid=11
  - Inoklaster LT
    http://www.lvpa.lt/Puslapiai/Priemone.aspx?prid=12
  - Idėja LT
    http://www.lvpa.lt/Puslapiai/Priemone.aspx?prid=9
- Links to relevant documents e.g. policy documents, evaluation reports
  4th of January, 2011 order No.V-1/4-2 by Ministers of Science and Education, and Economy „For the approval of High technology development programme for 2011-2011"
  http://www.mita.lt/lt/nacionalines-programos/aukstuju-technologiju-programa/dalyvavimo-taisykles/
  Lithuanian Innovation Strategy for the year 2010-2020:
  http://www.mita.lt/uploads/documents/innovation_en/strategy_20102020.pdf

Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys):
http://www.smm.lt/en/smt/docs/valleys/concept%20of%20valleys.pdf

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7.8 Poland

Poland
1) Title of policy measures **Measures 1.4 – "*Support for goal-oriented projects*" and 4.1 – "*Support for the implementation of results of R&D works*" of the Operational Programme Innovative Economy (2007-2013) (POIG)**
2) Implementing body Initially the implementing body for these two measures was the Polish Agency for Enterprise Development (PARP), however acc. to decision of the Ministry of Regional Development (MRR) and Ministry for Science and Higher Education (MNiSW), the last call within the measure 1.4 will be launched in 2012 by the executive agency of the MNiSW – i.e.: the National Centre for Research and Development (NCBR). The budget for the measure 4.1 was already completely exhausted. Therefore selected projects (winning) within the call in the measure 1.4 may not be any more recommended to be founded within the measure 4.1. For these projects there is a need to create a new mechanism that will allow for their continuity (most of these projects will finish in 2015 and acc. to the new financial perspective 2014-2020 there might be a new measure applied in order to support commercialization and implementation of the final results of these projects – this decision shall be taken by the MNiSW and NCBR).

3) Targeted KETs

- No particular KETs are targeted as such. Yet within these measures KETs development and deployment may be promoted and facilitated. For example: measure 1.4, 4.1 & 4.2 under OP IE Polish Agency for Enterprise Development supported 47 projects related to KETs areas (overall budget: 171 mln PLN) – 31 projects in industrial biotechnology, 9 projects in nanotechnologies and 4 in micro- and nanoelectronics. Moreover there is a tendency to use measure 3.1. of OP IE to create new companies which activities are based n KETs: in 2011 there were created 3 companies in nanotechnology field (2.870.250 PLN engagement) and 1 company in biotechnology field (799.150 PLN engagement).
- The agency – NCBR, which is responsible for implementing the call within the measure 1.4 in 2012, determined among the evaluation criterions the following one: "*the outcome of the project is from the group of high and medium-high technology".* This criterion will be met by the applicant if the results of the R&D activities within a project will belong to minimum one of the area defined by EUROSTAT as a high and medium-high technology based on a typology of the high-tech industry and knowledge-intensive services[16].
- Among the group of the high-tech industry there are mentioned several branches that relate to KETs like e.g.: production of the electronic elements, production of the optical instruments, production of the basic pharmaceutical substances, production of the IT equipment, production of the irradiation devices etc. Therefore it should be assumed that among the projects that will have been selected for funding in 2012 by NCBR within the measure 1.4 there will be those dealing with technologies from the KET's group.

4) General description

- Measure 1.4.: "*Support for goal-oriented projects*" is a part of the priority axis No. 1 in POIG entitled: "Research and development of modern technologies".
- Measure 4.1.: "*Support for the implementation of results of R&D works*" is a part of the priority axis No. 4 in POIG entitled: "Investments in innovative undertakings".
- The measures 1.4 / 4.1 were implemented as the support tools for

[16] For more information visit EUROSTAT:
http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/htec_esms.htm

scientific research and development works that will contribute to the establishment of a knowledge-based economy.

- In the measures 1.4 / 4.1 support will be provided for projects aimed at practical application for the needs of the sector/branch of the economy or of a great importance to the society (measure type*: bottom-up approach*).
- Funds granted within the measure 1.4 / 4.1 may be used for goal-oriented projects which are based on R&D works conducted for satisfying the particular needs of a given entrepreneur (measure type: *bottom up-approach & market pull*).
- Measure 1.4 covers the co-financing of expenditures up to the development of the prototype.
- Measure 4.1 finances also further stages of R&D implementation (including consultancy with e.g. technology brokers).
- Entrepreneurs are able to decide about a contractor of R&D work - they can conduct it on their own, or they can contract it out to a scientific institution, a scientific network or a scientific and industrial consortium or to a non-for-profit company (measure type: *cooperation industry – universities*).
- One interesting aspect of these measures is that companies only have to submit *one application* for the two stages, research (i.e. 1.4) and its implementation (i.e. 4.1). The condition for obtaining investment support for the second part of the project is to successfully complete the research stage, which offers funding up to the development of a prototype, and this should offer a chance of market success for the new product.

5) Purpose of the policy measure

Some key reasons why the measures 1.4 / 4.1 were implemented and are of a great importance:

(1) The general conclusions of the evaluation studies are that the support for Polish enterprises under the Operational Programmes leads to increasing innovation in Poland. Information obtained from the beneficiaries of projects suggests a generally positive impact of such support on the condition and functioning of companies benefiting from the EU funds.

(2) The experience in the implementation of Operational Programs shows that it should consist of two components: R&D facilities and development of innovative technologies, products and services:

- the R & D component should be developed by reforming science and research institutions and putting more emphasis on providing useful

know-how to entrepreneurs basing on the market demand and technology trends.

- the analysis show that the creation of instruments to develop and promote innovation should correspond to existing support measures in the Operational Programme, above all, 1.4 - 4.1 and 4.2 measures

(3) There is a need to develop a system of support for Polish entrepreneurs which would encourage them to invest in innovative undertakings, which are usually risky and expensive, including particularly these on the basis of R&D works (the cooperation between business and science should be reinforced). Despite low expenditures on R&D the macroeconomic analysis show that productivity in Poland is increasing and Polish products are competitive. Apparently, due to the absorption of technology Polish enterprises were able to compete with foreign companies. Their willingness to risk should increase with the depletion of simple and competitive advantages, along with the rising awareness that innovation is an opportunity for rapid and significant development of competitiveness for companies.

(4) At the moment Polish Ministry of Economy is under preparation of Enterprise Development Programme which will be a basis to create new Operational Programmes under the new financial perspectives 2014-2020. The experience that comes from evaluations of the Operational Programmes (including 1.4 and 4.1 measures) will be taken into account during designing new instruments. For example, according to the current experiences it is considered to propose the requirement of greater financial contribution to the project by the beneficiary so it would ensure that the project will be implemented and will result in development of his company.

(5) Due to rare use of R&D results in economic practice, it is essential to apply instruments increasing supply of new, innovative solutions useful for entrepreneurs (bottom-up approach in R&D programming should be emphasized).

(6) Poland is the seventh-largest economy in the EU and therefore has a significant potential for the development of R&D sectors, but same basic framework conditions must be introduced, especially regarding the real needs of high-innovative enterprises.

(7) Over the past 20 years Polish science and higher education system has been completely restructured, in 2010 a package of 6 new laws for amendment of the science system was implemented (including the Act on the Principles of Financing Science) – therefore new supporting instruments are expected to be implemented, especially those for increasing the cooperation between science and business sectors.

(8) Acc. to the Global Innovative Index in 2011 Poland was ranked at the

43-rd position – it means a rise since 2009 by 13 positions, but with 0,76% of the GDP as the level of R&D expenditure (for 2009) the innovativeness of Polish economy will not increase in a rate adequate to the changes on the global market – new tools in order to encourage entrepreneurs to undertake R&D activity are of a great need.

6) Integration in broader "policy mix"

Both measures were created in order to increase an uptake of the research results by the private sector (**especially SMEs**) that may play the key role in the social and economic development of the country. The main aspect accompanying these initiatives refers to the establishment of an **innovative and knowledge-based economy**. This objective may be achieved by increasing the level of competitiveness of Polish enterprises through **application of new solutions and technologies**. Presumptions accepted within the measure 1.4 / 4.1 correspond with some directions included in other framework programmes and initiatives established by the Polish government e.g.:

1) ***The National Cohesion Strategy 2007-2013*** (**NCS**) [17] - this document lists the national priorities, where the main stream of the European funds is to be allocated in 2007–2013 programming period. The Strategy assumes reducing the civilization gap and spatial developmental disproportions, as well as establishing a modern, competitive and innovative economy. This Strategy constitutes the strategic reference framework for undertakings that should contribute to achievement of the priority objectives, which two of them refers strongly to **the measures 1.4 / 4.1**: 1) "*Improving the competitiveness and innovativeness of enterprises, including in particular the manufacturing sector with high added value and development of the services sector* [18] "; 2) "*Increase of the competitiveness of Polish regions and preventing their social, economic and territorial marginalization*".
2) ***National Research Programme*** (**NRP**) – a nationwide governmental document determining research and development directions which should be financed from the public funds and which are considered as directions with the biggest impact on the social and economic development of the country. NRP is an instrument which simplifies conducting scientific, technological and innovation policy, adapted to the European and world

[17] Strategy (in English) may be found at: http://www.funduszeeuropejskie.gov.pl/WstepDoFunduszyEuropejskich/Documents/NSRO_an_20_07.pdf

[18] It must be mentioned that app. 20 % of the whole budget (European funds) dedicated for the implementation of this Strategy (NCS) was allocated for the horizontal objective which is "*an increase of the competitiveness and innovativeness of enterprises"*.

standards. The NRP document emphasizes an importance of a cooperation between the science and the economy, as well as necessity for a creation of the conditions for entrepreneurs to invest in research – hence there is a connection to the program assumptions underlying the establishment of **the measure 1.4 / 4.1** under the POIG. An assumption concerning further continuation of activities increasing funds from the business allocated to the science is convergent with the goals pointed by the POIG. Currently financing is about 30%, and 70% comes from the national budget. In accordance with the assumptions of the Europe 2020 Programme the level of the entrepreneurs' participation in the financing of science should reach 50% in 2020 – such a goal is also set for initiative being conducted under the NRP. The NRP covers seven strategic interdisciplinary scientific research and development works to be undertaken in Poland in the coming years. These are:

1. New technologies in power engineering.
2. Civilization diseases, new drugs and regenerative medicine.
3. Advanced information, telecommunication and mechatronic technologies.
4. New technologies of materials.
5. The natural environment, agriculture and forestry.
6. Social and economic development of Poland in global market's conditions.
7. Security and national defence.

The subject of R&D and implementation undertakings being carried out under projects selected in POIG calls within **the measure 1.4 / 4.1** fall in the scope of the priority (strategic) research directions pointed also in the NRP (**a synergy effect** between the programme – financed primarily from the structural funds (POIG) and which is focus mainly on enhancing the competitiveness and innovativeness of the Polish economy – and the research programme – financed primarily from the national budget (NRP) and which is focused mainly on increasing the research results in new technological solutions, number of patents and development of the innovative economy – is achieved.

3) ***Regional Operational Programme*** (**ROP**) [19] – R&D results, new products, technologies and services obtained in the projects funded within **the measures 1.4 / 4.1** may be also implemented in other research activities financed by the structural funds within the initiatives established in the framework of the ROPs. ROP was created for each of the 16 Polish

[19] See more (in English):
http://www.funduszeeuropejskie.gov.pl/English/RPO/Strony/About_ROP.aspx

voivodeships separately, and at the local scale is the main instrument for implementing the regional development policy (between 2007 and 2013), which reflects the voivodeship development strategy (usually with a scope till 2020). Measures reflecting the objectives of **the measure 1.4 / 4.1** were implemented in most of the ROPs in order to improve the regional competitiveness and increase its socio-economic and cohesion [20], like e.g. measures for creating new conditions for development of innovative enterprises, accelerating the e-development of private companies, strengthening endogenous factors for the development of the regional high-technology market etc.

Technological Initiative Programme (**TIP**) [21] – R&D results of a project funded within the measure 1.4 may be implemented and commercialized not only during the project conducted as a next step within the framework of the measure 4.1, but also as a separate project funded in the TIP. This Programme was initially introduced by the Ministry of Science and Higher Education, and then in 2010 it was commissioned the National Centre for Research and Development. TIP is (like **the measure 1.4 / 4.1**) oriented towards development (by the business sector) of new and innovative products and technologies based on Polish scientific and technological achievements. Similarly to **the measure 1.4 / 4.1** TIP allows to create better conditions to introduce R&D results into the economy and on the other hand facilitates conducting R&D and deployment projects within the companies. In contrary to **the measures 1.4 / 4.1** TIP is funded completely by the national budget.

It is also worth mentioning that Polish Ministry of Economy completed the analysis ***Technology Foresight of Polish Industry – InSight 2030*** [22], which main objective was to identify competitive industrial areas and key future technologies of strategic importance, which development in the next 20 years shal be a priority for Polish industry.

The choice of competitive areas has been done by taking into account factors such as: global challenges, environmental factors, natural resources, geopolitical factors, business environment etc.

[20] App. 25% (i.e. € 4.2 billion) of the whole sum of the European funds dedicated for 16 ROPs was allocated for the improvement of the R&D sector and innovative deployments on the market at the regional level.

[21] Acc. to the Ministry of Science and Higher Education: " *PLN 47 million [app. € 11 million] was spent by the National Centre for Research and Development in 2011 on the Technology Initiative Programme for entrepreneurs and scientific entities, and its continuation, IniTech Programme*" – see: "*More than PLN 1.2 billion spent on innovation this year"* published at: http://www.nauka.gov.pl/scientific-research/polish-science/science/science/artykul/more-than-pln-12-billion-spent-on-innovation-this-year/

[22] The English version of the short version of final report of Technology foresight for Polish Industry – InSight2030 is available on the Ministry of Economy webpage: http://www.mg.gov.pl/files/upload/15048/Summary - Technology foresight for Polish industry - InSight 2030.pdf

The researches were made in Grand Panels which identified 10 general areas of biggest potential in Polish industry (5 out of them are KETs), which are:

1. Industrial biotechnologies
2. Nanotechnologies
3. Advanced manufacturing systems
4. IT technologies
5. Microelectronics
6. Photonics
7. Development of Clean Coal Technologies
8. Rationalization of Energy Utilization
9. Modern Equipment for the Mining Industry
10. Innovative technologies of acquiring natural resources

During the detailed analysis of mentioned 10 areas experts identified 127 key technologies and 35 competitive areas, which were identified as most competitive and prospective for Polish industry and should be developed to increase the competitiveness of Polish economy.
During the project realization there were also prepared: development scenarios, roadmaps of development for each Grand Panel and interactive technology maps identifying key actors in Poland leading in identified key technologies.

Polish Ministry of Economy has initiated the public consultation process (till the end of April) to verify the outcomes of the project. In May the Ministry of Economy is going to have the draft version of the implementation programme for InSight 2030 project with the list of financial and non-financial deployment instruments and institutions which are responsible for the development of concrete technology or industrial area. According to that the data to be collected in May on good practices in development of key technologies (including KETs) and identification of the deployment measures could be a very useful input for the European Commission and Idea Consult project running at the moment.

Other measures:
Polish Agency of Enterprise Development supports development of technologies (also KETs) also by:

- **Measure 3.1 OP IE**: Initiating of innovative activity – supporting the incubation and investment in the newly created innovative companies (also based on technology innovation) (in 2011 4 companies were created: in nanotechnology: Lipid Systems, Nanovectors, Hybrid Glass Technologies Poland, Novel-Id and biotechnology: Ekoinwentyka)
- **Measure 4.2 OP IE**: Supporting investments in R&D – indirect support of R&D activities in companies to develop a concrete technology (co-investments needed to run the business i.a. infrastructure investments)
- **Measure 4.4 OP IE**: New investments of a high innovation potential:

focused on investment projects (purchasing or implementation of new technological solution in production and services sector) applied for no longer than 3 years or with the degree of spread not exceeding 15 %

- **Support for the implementation of innovative invention in business** – a new pilot project under axis 4 OP IE – supporting first implementation of the invention on the EU territory (also in the form of specific technology solution)
- **Voucher for innovation** – supporting services related to the implementation or product/technology development, provided by the scientific body (developing new or refining existing product/technology in the company)
- **Large bon (working title)** – a new instrument designed for scientific bodies for development a new product/technology for a company, enabling raising its potential and competitiveness in the market (including holding the testes and deployment of this product/technology)

7) Date of implementation

2007-2013 (the last call was launched only for measure 1.4 on 2-nd of April 2012 r. – the call is managed by the National Centre for Research and Development [23]).

8) Target group(s)

SMEs and large enterprises that have been established in Poland.

9) Overall budget

For the measures 1.4 and 4.1 virtually € 780 million has been earmarked. Most of this amount consists of the EU input in the form of structural funds (from the European Regional Development Fund).

For the call in 2012 implemented by the NCBR the total budget is € 166.892.601,00, including:

a) for SMEs - € 108.481.191,00;
b) for other companies – € 58.412.410,00[24].

Measure 1.4 co-finances industrial research in a range starting from 70% for micro- and small enterprises to 50% for large companies. The co-financing share for development work is lower: 45% in the case of micro- and small enterprises, 35% for medium-sized enterprises and 25% for

[23] For more details see (*only in Polish*).: http://www.ncbir.pl/fundusze-europejskie/program-operacyjny-innowacyjna-gospodarka/konkursy/konkurs-14-2012/

[24] For more details see (*only in Polish*): http://www.ncbir.pl/gfx/ncbir/userfiles/_public/fundusze_europejskie/innowacyjna_gospodarka/konkurs_1.4_2012/ogloszenie_o_konkursie_1.pdf

large companies.

Measure 4.1 co-finances investments for 50-70% for small and micro enterprises, depending on location, 40-60% for medium sized ones, and 30-50% for large companies. Consultancy is co-financed for 50% irrespective of company size and firm location.

The upper limit for funding is € 7.5 million for the research stage (stage I) and € 4.5 million for the implementation stage (stage II).

10) Output indicators

- It was set that 60% of the budget allocated for the measures 1.4 / 4.1 must be reserved for SMEs projects.
- Funding modalities: beneficiaries receive non-returnable aid. The form of payment used for the measures is advance payment for the upcoming year and refunding of the costs made during the last year.
- In 2015, i.e. two years after the current financial perspective where the budget for measures 1.4 and 4.1 is provided, the following indicators shall be used to monitor the success of these instruments (in brackets the estimated value of indicator in the target year 2015 was mentioned):

For measure 1.4:

- Number of target projects co-financed under the measure 1.4 (1400)
- Number of enterprises cooperating with scientific units for the implementation of target projects co-financed under measure (800)
- Number of implementations as a result of implementation of co-financed target projects (1100)
- Increase of employment in R&D in enterprises implementing co-financed target projects (500)
- Increase of expenditure on R&D in enterprises co-financed under measure (PLN 600 million, i.e. app. € 143 million)
- Number of inventions filed for patent protection as a result of implementation of target project supported under measure, including patents in the scope of high technologies (100)

For measure 4.1:

- Number of projects supported under Measure 4.1.(1100)
- Number of entrepreneurs supported (1050)
- Number of SMEs supported (800)
- Value of private resources mobilized for the implementation (€ 260

million)

- Number of new products or technologies placed on the market by entities which obtained support (800)

11) Impact

- Acc. to the state of funding use as of 22/October/2010 for the measure 1.4 the rate of the number of the projects approved for funding (after evaluation) in relation to the number of applications submitted correctly for the calls was app. 52 %. It means that enterprises applied at that time for the amount of app. € 285 million, but € 122 million were finally granted for beneficiaries. It indicates that these two particular measures were very popular amongst the Polish companies and they should be recognised as a very useful and well-prepared instrument matching the needs of the innovative sector of Polish enterprises[25].
- Acc. to the Accero Taxand and Polish Information & Foreign Investment Agency report [26] the measures 1.4 / 4.1 were important instruments for supporting Polish business in undertaking the R&D works. Acc. to the state of implementation of these measures as of 15/July/2011 there were 595 financial agreements with enterprises signed of the cumulative value amounts app. 2 billion PLN (i.e. 476 million euro). It means that after 5 announced application calls the total contracted allocation for the measure 1.4 / 4.1 amounts 97,6% of the total budget.
- Within the whole pool of the agreements signed till 15/July/2011 the greatest number was contracted in the following sectors: IT (140 agreements), machinery (52), construction (46), electronics (41) and pharmaceutical (34).

12) Conditions of transferability

The measures 1.4 / 4.1 may be recognised as a multi-purpose (universal) tool regarding the implementation possibility in other countries of the EU. This financial instrument might be useful especially for these countries where the improvement of a collaboration between science and industry sectors, as well as a tendency to direct the research works for the needs of industry are the main priorities within the framework of the R&D and innovative policy. There are several aspects make this assumption well-based including inter alia:

[25] See: OP Innovation Economy (POIG): "*A Bridge between Science and Business*", http://en.parp.gov.pl/

[26] Report: „*R&D market in Poland. Support for research and development activity of enterprises*" is available (*in English*) at: http://www.paiz.gov.pl/publikacje/publikacje_partnerow_paiiiz

1) The measures 1.4 / 4.1 turn the research activities in the specific direction of current needs of the main economic branches, which determine the competitiveness and innovative potential of the national (regional) knowledge-based industry. Thanks to the implementation of the bottom-up approach with regard to the subject (matter) of a project, the measures 1.4 / 4.1 may be used in various EU regions that are diverse regarding not only a development stage of the economy, but also in respect of the accepted priorities and trends within the science-technological policy. The measures 1.4 / 4.1 allow supporting these branches of the industry and services which may strongly affect the competitiveness of the national (regional) economy. It depends on the decision of the local (regional) authority what scientific or/and industrial domain will be supported by use of the measures 1.4 / 4.1.
2) The measures 1.4 / 4.1 may be implemented in all countries (regions) of the EU as the core rules (principles) are based on the main and common (*acquis communautaire*) regulations resulting from the EU cohesion policy (as regulations for a use of the structural funds in different countries are similar and relate to the same EC ordinances and directives).
3) In Poland these measures were dedicated for the projects with a budget from € 0,7 till € 12 million, however without changing the main regulations within the measures 1.4 / 4.1 they may be simply use to support R&D and deployment activities of a grater budget adjusted on the one hand to the local (regional) economic and research needs, and on the other to the available financial resources.
4) What is more, the measure 1.4 / 4.1 directly reflects the EU (EC) attitude to SMEs' needs and role in the European economic development – therefore almost 60% of the total funds allocated for these measures were reserved only for micro-, small- and medium companies. However, this proportion may be further increased if the SME sector plays the crucial role in the local (regional) market.
5) The approach mentioned above regarding the setting of the objectives of a project through the "*bottom-up way*" is further strengthened by the "*market-pull*" methodology, which are of a great importance for the changes acceleration both in a science sector and in the industrial branches.
6) Regarding the regulations on a state aid the measures 1.4 / 4.1 are composed in a way that allow for:
    1. in the case of dissemination of the research results during some scientific or economic conferences or through publications in the scientific journals, technical or commonly available databases where results (raw research data) may be obtained, or through free or open

software license, the applicants of the measures 1.4 / 4.1 may obtain greater intensity of public support (even by 15 percentage points [27]),

2. in the case of an effective collaboration with other unrelated entrepreneur(s) or research organization(s) within one specific project (with the exception of subcontracting), the applicants of the measures 1.4 / 4.1 may obtain an increased intensity of support (even by 15 percentage points [28]).

13) Information sources

- Polish Agency for Enterprise Development (PARP): http://en.parp.gov.pl
- European Funds Portal Poland: http://www.poig.gov.pl/english/Strony/Introduction.aspx
- Polish Technology Platforms : http://www.kpk.gov.pl/en/potential/platforms/index.html
- Polish Centres of Excellence : http://www.kpk.gov.pl/en/potential/coe/index.html
- National Centre for Research and Development: http://www.ncbir.pl/en/
- National Cohesion Strategy 2007-2013 http://www.funduszeeuropejskie.gov.pl/WstepDoFunduszyEuropejskich/Documents/NSRO_an_20_07.pdf
- Report: *„R&D market in Poland. Support for research and development activity of enterprises*": http://www.paiz.gov.pl/publikacje/publikacje_partnerow_paiiiz
- Article: "*More than PLN 1.2 billion spent on innovation this year"*: http://www.nauka.gov.pl/scientific-research/polish-science/science/science/artykul/more-than-pln-12-billion-spent-on-innovation-this-year/
- Regional Operational Programmes: http://www.funduszeeuropejskie.gov.pl/English/RPO/Strony/About_ROP.aspx
- Technology foresight for Polish industry – InSight2030 http://www.mg.gov.pl/files/upload/15048/Summary - Technology foresight for Polish industry - InSight 2030.pdf

[27] But the total amount of a state aid may not exceed 80% of the project costs eligible for being refunded.

[28] *a.m.*

7.9 Taiwan

Taiwan

1. **Title of policy measure**

   Multinational Innovative R&D centers

2. **Implementing body**
   Ministry of Economic Affairs

3. **Targeted KETs**
   Micro- and nanoelectronics

4. **General description**
   - This measure aims to create synergies and complementarities between local and multinational companies from abroad. The aim is to get multinational corporations collaborating with local Taiwanese firms so that Taiwan can establish itself as a regional R&D center within the Asia Pacific region. This in turn will help to support multinational production activities, thereby enhancing the role which Taiwan plays in global R&D, giving the R&D activity of Taiwanese industry greater depth and encouraging Taiwanese companies to focus on cutting-edge research. Taiwan aims at becoming a main technology partner for worldwide companies in order to develop its own industry.

   - The measure consists in a governmental subsidy. Different types of support are presented:
     - Subsidy for Operating Capital
     - Salaries of Local R&D personnel
     - Consultant fees
     - Remunerations of overseas R&D personnel
     - Travel expenses
     - Rent
     - Expenses for collaborations with local business, academic, and research communities
     - Expenses for collaborations with foreign companies
     - Overseas training expenses
     - Equipment use fees
     - Equipment maintenance fees
   - The Ministry of Economic Affairs offers its assistance to the R&D centers in order to recruit staff and to introduce foreign "talents", including Chinese ones. The maximum duration of the project is 3 years.
   - Among the evaluation criteria established for the project selection

process, benefits and impacts for local industries are on the top of the list, as well as the size of investment from the multinational. Participants are expected to support Taiwan in upgrading its R&D status at an international scale, and to develop local capabilities in advanced technologies in this regard.

5. Purpose of the policy measure

- To push Taiwan's industry to progress from manufacturing towards innovation, R&D and service, and in line with the national policy of transforming Taiwan into a global center of innovation.
- To create positive and complementary effects to local industries while establishing the synergy between local and multinational companies.

6. Integration in broader "policy mix"

- Comprehensive industrial systems
  - Deep industrial base and strong vertical integration in ICT and electronics sectors
  - Solid industrial infrastructure and high volume manufacturing capacity
  - Strong industrial research and development capability and abundant experience in global operations.
- High quality human resources
  - Excellent technical and engineering manpower with highly educated workforce, and recognized talents.
  - Well-experienced operation in global market
- Close collaboration among various sectors
  - Mature B2B infrastructure
  - Entrepreneurial and innovative corporate sector
  - Government's sound technology development policies
  - Dynamic academic & research institutes R&D capabilities
- Supportive legal framework for high-tech R&D activities
  - Favorable legal conditions for developing industrial technology
  - Healthy legal environment for R&D-based multinationals
- Tax incentives
  - The taxation environment in Taiwan is sound and friendly.
  - Taiwan government keeps enforcing tax reforms, such as to lower down the corporate income tax from 20% to 17% which make Taiwan investment environment more and more attractive in Asia-Pacific region.
  - A company set up in accordance with the company law of ROC can have a tax credit of up to 30% of the amount invested in R&D against its business income tax payable.
- Single window service

  single window have been set up to provide foreigners not only the consulting services about the subsidy but also the recruiting, the R&D center location evaluation, tax ruling…etc in order to elimination the investment barriers.

7. Date of implementation
2002 –

8. **Target group(s)**
- The measure targets foreign companies and Taiwan branches of foreign companies.
- Applicants are expected to be equal to at least one half of its paid-in capital.

9. **Overall budget**
-

10. Output indicators
- Since its initiation in 2002, the Program has received highly positive responses from Multinational companies. It has been widely reported in the media, and leading multinationals such as HP, Sony, Dell, IBM and Intel.
- There are 38 multinational enterprises with 54 R&D centers have been introduced to the program and established in Taiwan to date.
- Among these companies, many found that the industrial environment and infrastructure here are much better than what they had expected, and some even expanded the scale of their R&D centers. This proves Taiwan to be an ideal location for multinational corporations to establish their R&D bases for innovative R&D activities.
- The average size of the projects is around 596,193K NT, the average subsidy of the project is around 109,688 K NT.
- There are going to be 890 joint research and development projects, facility more than 580 critical technologies licensed, and about 6,500 foreigner expertises join the research and development project in Taiwan.

11. Impact
- The introduction of key technology by these R&D centers will help Taiwan to become a valued partner to the world's multinational corporations in the area of technology, and will contribute to the further development of Taiwanese industry.
- With high efficiency and proactive services, MOEA will continue to provide foreign corporations with information related to investment and business environment in Taiwan and to assist them in solving problems encountered in the process
- There are 38 multinational enterprises with 54 R&D centers have been introduced to the program and established in Taiwan to date. Among these companies, many found that the industrial environment and infrastructure here are much better than what they had expected, and some even expanded the scale of their R&D centers. This proves Taiwan to be an ideal location for multinational corporations to establish their

R&D bases for innovative R&D activities.

12. Conditions of transferability

- The impact of current measure has responded by upgrading the Taiwan economic and industrial development from the high-tech industries, export-oriented industries to the expansion of high-tech industries exports, and knowledge-intensive service industries. Furthermore, it has been gradually establishing the international alignment of economic and trade systems, and repositioning the core competitive advantages in Taiwan.

13. Information sources

- Ministry of Economic Affairs, Multinational Innovative R&D center in Taiwan:
- http://doit.moea.gov.tw/doiteng/contents/g_nws/show.aspx?sn=64
- Contact window : Project Office of Technology Development Program fro Enterprise
  - TEL: +886-2-2341-2314 Ext.220
  - FAX : +886-2-2341-2094
  - E-mail: yiin1104@iii.org.tw
  - Address: 7F, No. 51, Sec. 2 ChungChing S. Rd., Taipei 10075, Taiwan
  - http://innovation5.tdp.org.tw

7.10 United Kingdom

United Kingdom

1. Title of policy measure

Knowledge Transfer Partnerships (KTP)

2. Implementing body

Technology Strategy Board

3. Targeted KETs

Nanotechnology
Micro- and nanoelectronics
Industrial biotechnology
Photonics

Advanced materials
Advanced manufacturing technologies

4. General description

- KTP is a programme led by the Technology Strategy Board where three-way partnerships are formed between a business (the company partner), one or more recently graduated people (associates) and a senior academic acting as a supervisor (knowledge base partner). The aim of KTPs is to increase interactions between the knowledge base (University, Research Organisation and Further Education Colleges) and companies through the mediation of the associate who during the period of staying in the company will work on a project developed in collaboration with and co-supervised by the partners for a period of 12 or more months and attend to further training.
- KTP is a programme that was active in the UK since 1975 under the name of Teaching Companies Scheme. In 2003, KTP replaced TCS and, after the Innovation Nation White Paper and the Annual Innovation Report the scheme is led by the Technology Strategy Board (the main funding body) and sponsored by other 17 public bodies including the Research Councils, DEFRA, DH, until recently the Regional Development Agencies of England (now abolished) and the Devolved Administrations of Northern Ireland, Scotland and Wales. The European Union through the European Social Fund is also a sponsor organisation and member of the Management board
- This measure provides a grant (to the academic partner) to cover part of the cost of employing a recently graduated person to transfer and embed knowledge into a business from the UK knowledge base via a strategic project.
- Each Partnership employs one or more high calibre associates for a project lasting 6 months to three years, transferring the knowledge the company is seeking into the business. Each associate works in the company on a project which is core to the strategic development of the business. Associates are jointly supervised by a senior member of the business and an academic or technical staff from the partnering knowledge base organisation. Through contact with businesses, the knowledge base partner is also provided with a relevant and improved understanding of the challenges companies encounter, and their business requirements and operations.
- KTPs are a three-way partnership targeting the collaboration of knowledge base organisations (universities, further education institutes and research organisations), businesses of any size and recently graduated people.
- A KTP lasts at least 6 months and a minimum of 10% of the associate's time should be dedicated to further study and training.

5. Purpose of the policy measure

- KTPs was originally established over 30 years ago as the Teaching Company Scheme which was designed to 'teach' or provide recently qualified graduates with business skills and knowledge about working in a business environment. At the same time the graduate could pass on their knowledge of a specific field of technology learnt in a research environment, often a University, into the business. The KTP scheme still operates along similar lines to when it was first established.

6. Integration in broader "policy mix"

- Critical mass
- There is a need to have a flow of recently qualified graduates (associates) and academic or research organisations willing to act as the advisor for that person. It is also necessary to have companies will to act as hosts for the associate.
- Business culture within the particular country
- There needs to be collaboration willingness between universities and companies or willingness for the companies to work with organisations with research capability
- KTPs are fairly self standing. The Partnerships are often formed with the help of regionally based advisors, but the advisors work purely on KTPs.

7. Date of implementation

2003 –

Prior to 2003 the scheme operated as the Teaching Company Scheme and in total has been running for over 30 years. The change from TCS to KTPs was mainly a name change rather than any major change to the scheme.

8. Target group(s)

- All companies (more recently large companies have had to involve SMEs in their supply chain to qualify)
- Scientists / researchers (as individuals)
- Higher education institutions research units/centres
- Other non-profit research organisations (not HEI)
- Higher education institutions (education function)
- Other public education institutions (secondary,etc...)
- Technology and innovation centres (non-profit)

9. Overall budget

€ 35 000 000 annual budget

10. Output indicators

- Average size of the project is in the region of €120,000 with the company providing 50% (budget)
- Number of funded projects/companies – about 400 new partnerships are started each year with 800-1000 live projects at any one time
- Number of applications versus potential beneficiaries – The KTP advisors who help to broker the partnerships between academia and business help to filter potential applications so by the time a company applies they have an 85% rate of being successful.
- Budget distributed to beneficiaries versus matching funds. The funding for KTPs goes to the academic partner. The company does not receive any grant funding.
- Financial commitment from industry: The company has to contribute 50% of the cost.
- Collaboration modalities
  - National versus international: The company has to be based in the UK to participate. About 30% of the graduates participating in KTPs are overseas students who have been studying in the UK
- Application complexity and 'time to grant': KTP advisors who are based regionally help the company and research organisation to construct the application. Time to grant is 2-3 months.

11. Impact

- The main findings published in the 2007/08 annual report show that in 83% of the cases, the participants have benefited from the scheme and that such benefits will positively influence the future performance of the company. In more detail, such improvements are in the areas of new markets creation, increased sales, improved quality, and improved operations. The scoring ranged between 41% and 61% with an average of 52% overall improvement in the four areas.
- The knowledge base partners have also expressed a positive outlook on the partnership. 91% of the knowledge base partners declared that they have benefited through staff development, 83% reported benefits to research, and 84% reporting benefits to teaching.
- The KTP Strategic Review states:
  - KTP has generated high levels of satisfaction amongst businesses, academics and associates. The impacts on business performance are significant. Although fairly diffuse, they appear

to align reasonably well with firms' motivations. KTP is an important tool to help academics engage with business and a key vehicle to develop their understanding of industry. A large amount of the impacts that were achieved would not have happened without KTP assistance. Nevertheless more attention could be focused on partnerships which can demonstrate the greatest levels of additionality. Associates value the practical experience they gain through KTP but are less positive about some of the training they receive.

- On average, each partnership has created (or expects to create) 3 additional jobs excluding that of the associate. Return on investment is positive, at around £4.70 - £5.20 of net additional GVA per £1 public money invested by sponsors. KTP has been generating jobs at a cost per job of about £56,000 to £61,500. Overall returns could be lifted if the program prioritized higher impact partnerships

12. Conditions of transferability

- Scalability issues:
  - Size of the county – the way KTPs currently operates is scaleable. The KTP advisers operate on a regional basis which may present issues for larger countries in terms of sizeCritical mass is needed in terms of Universities and research organizations supporting the graduate. The model however is generic and can be applied to most technology areas.
  - Budget available – Size of budget can be variable. Possible to run a few partnerships or thousands.

13. Information sources

- Knowledge Transfer Partnerships website - (http://www.ktponline.org.uk/)
- Knowledge Transfer Partnerships Strategic Review (http://www.innovateuk.org/_assets/pdf/corporate-publications/ktp%20strategic%20review%20feb%202010.pdf)
- Programme Annual Reports : (http://www.ktponline.org.uk/annualreports/)
- ERAWATCH Research and Innovation Inventory (http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/gb/supportmeasure/support_mig_0005)
- Programme Manager – Debbie Buckley-Golder – Debbie.buckley-golder@tsb.gov.uk

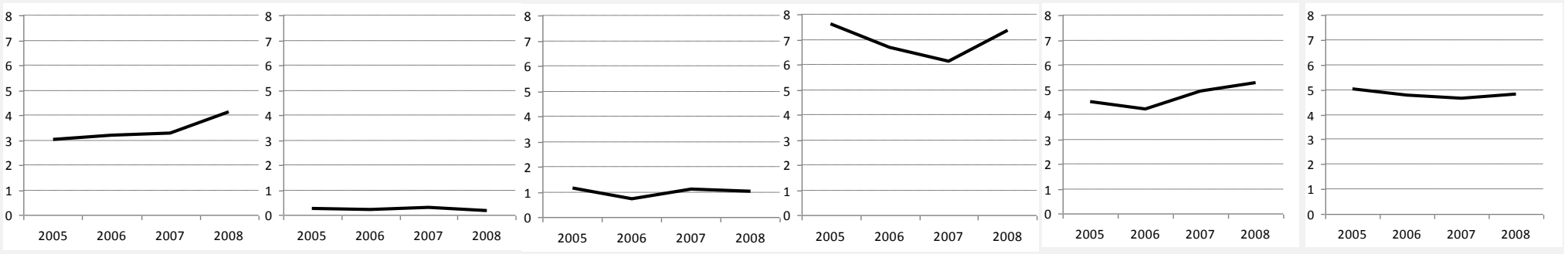
8 Appendix 3: Performance profiles of EU27 countries and leading countries outside the EU

8.1 Austria

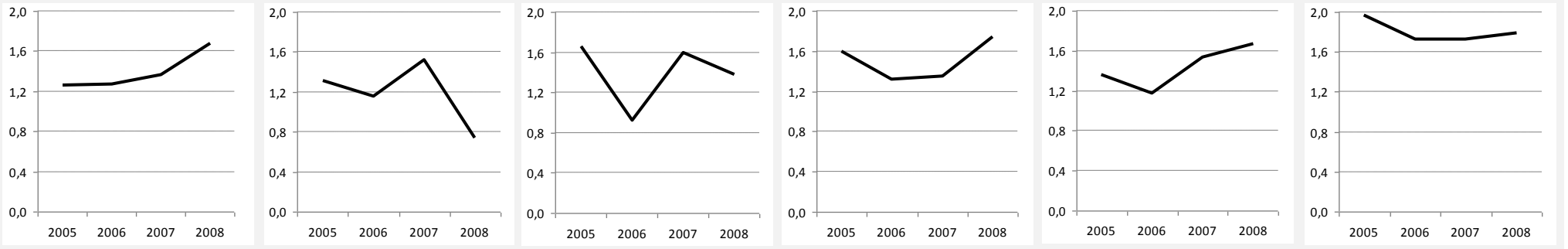
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

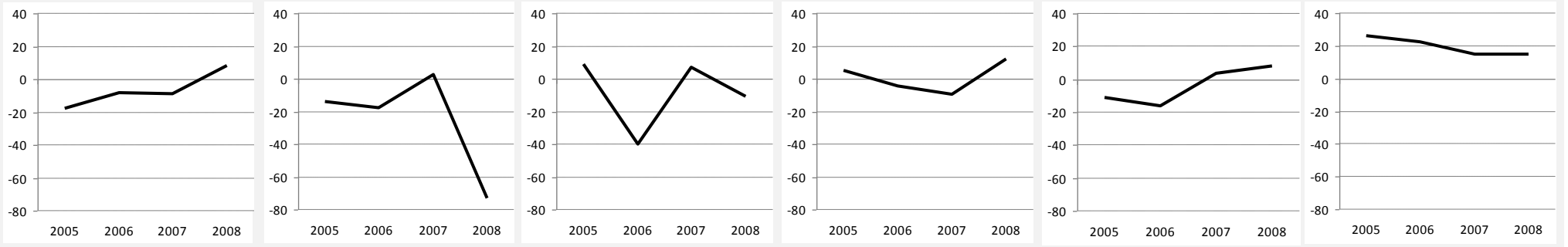
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (In*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
49	60	85	1	5	5	15	20	22	125	138	155	60	78	114	75	90	113

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

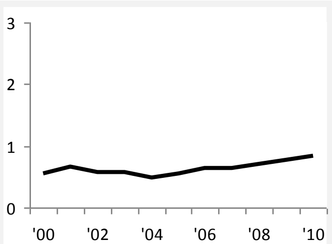
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Zumtobel Lighting GmbH	AUSTRIAMICROSYSTEMS AG	DSM FINE CHEMICALS AUSTRIA NFG	Borealis AG	AUSTRIAMICROSYSTEMS AG	FRONIUS INT GMBH
AUSTRIAMICROSYSTEMS AG		NOVARTIS PHARMA GMBH	REFRACTORY INTELLECTUAL PROPEI	SEZ AG	AVL LIST GMBH
ISOVOLTA AG		UNIVERSITAET WIEN	AUSTRIAMICROSYSTEMS AG	Lam Research AG	AUSTRIAMICROSYSTEMS AG
NOVARTIS PHARMA GMBH		TECHNISCHE UNIVERSITAET GRAZ	Miba Gleitlager GmbH	Tridonic Jennersdorf GmbH	SIEMENS AG OESTERREICH
TRIDONICATCO GMBH & CO. KG		Gruene-Bioraffinerie.At Gmbh	Lam Research AG	ISOVOLTAIC AG	FRANZ PLASSER BAHNBAUMASCHIN
NANOIDENT TECHNOLOGIES AG			SEZ AG	NANOIDENT TECHNOLOGIES AG	MAGNA STEYR FAHRZEUGTECHNIK A
SIEMENS AG OESTERREICH			CYTEC SURFACE SPECIALTIES AUSTR	INFINEON TECHNOLOGIES AUSTRIA	BINDER + CO AKTIENGESELLSCHAFT
FEMTOLASERS PRODUKTIONS GMBH			AMI AGROLINZ MELAMINE INTERNA	SIEMENS AG OESTERREICH	VOEST-ALPINE INDUSTRIEANLAGEN
Zizala Lichtsysteme GmbH			CERATIZIT AUSTRIA GESELLSCHAFT I		TECHNISCHE UNIVERSITAET GRAZ
WIEN KANAL ABWASSERTECHNOLOGIE			Hueck Folien Ges.m.b.H.		TRIDONICATCO GMBH & CO. KG

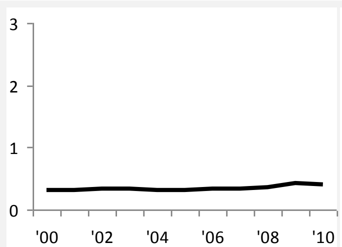
Source: EPO: PATSTAT / ZEW calculation.

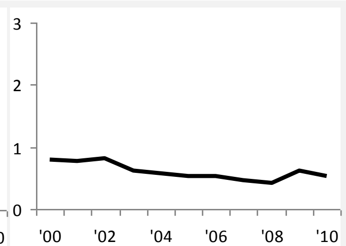
3) Trade

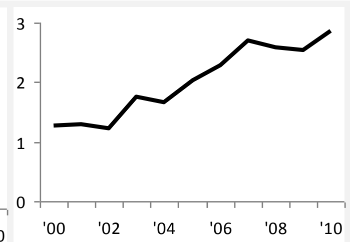
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

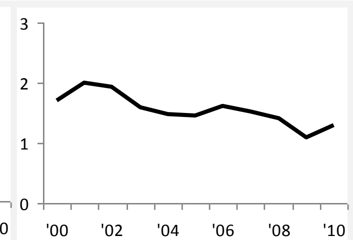
a) Significance: Share in the country's total exports (%)

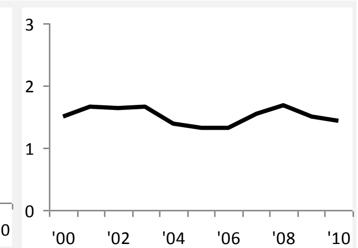




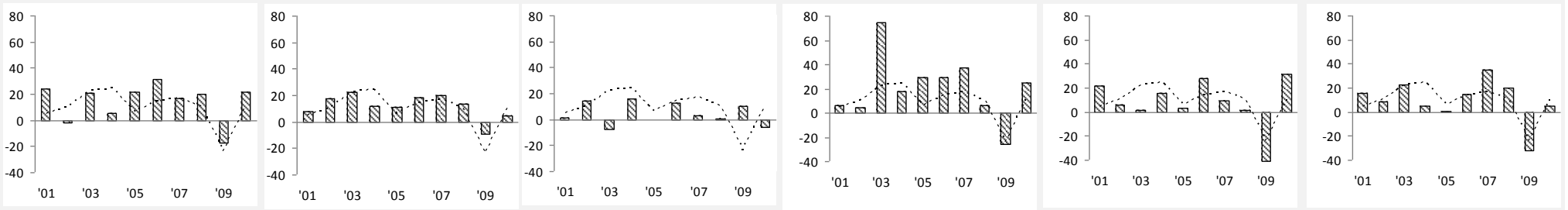




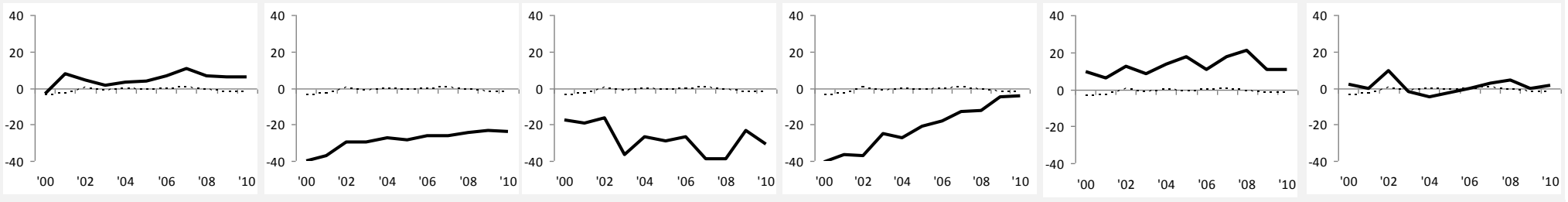




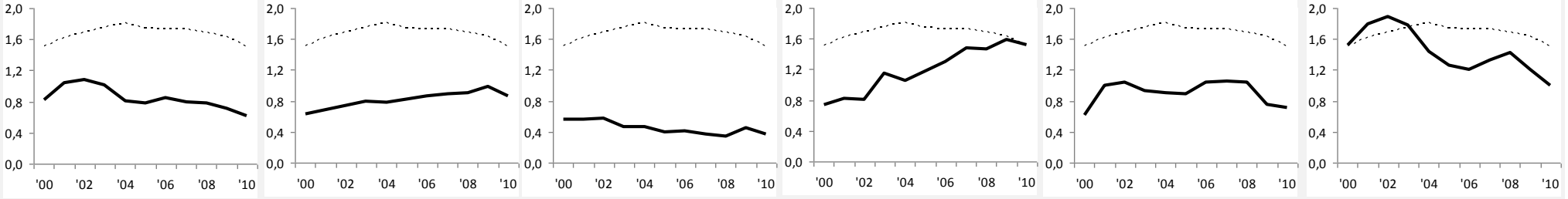
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



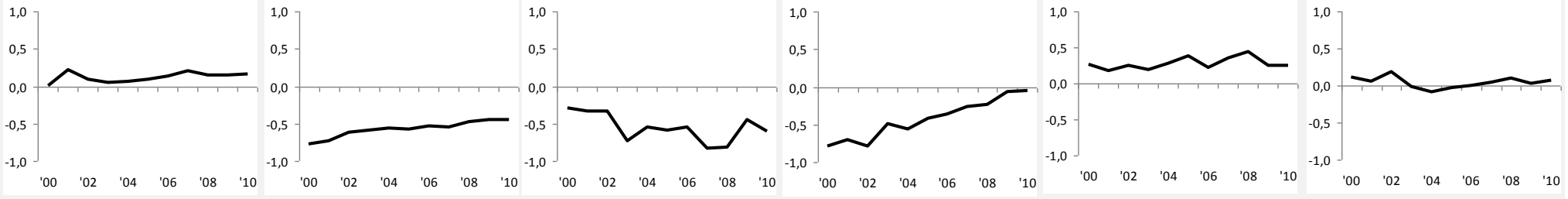
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



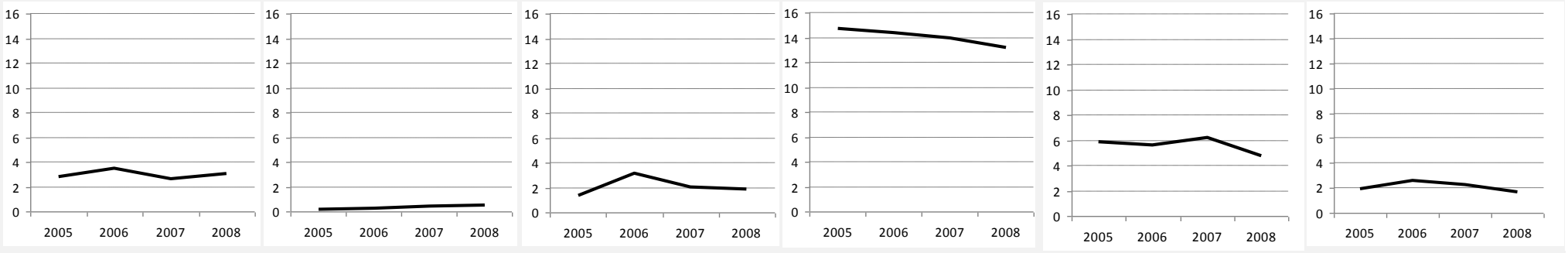
Source: UN: COMTRADE / ZEW and NIW calculation.

8.2 Belgium

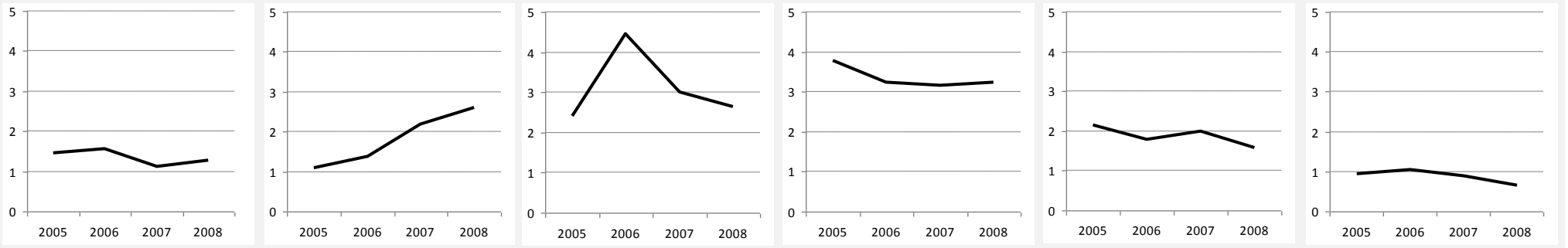
1) Patent Performance

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

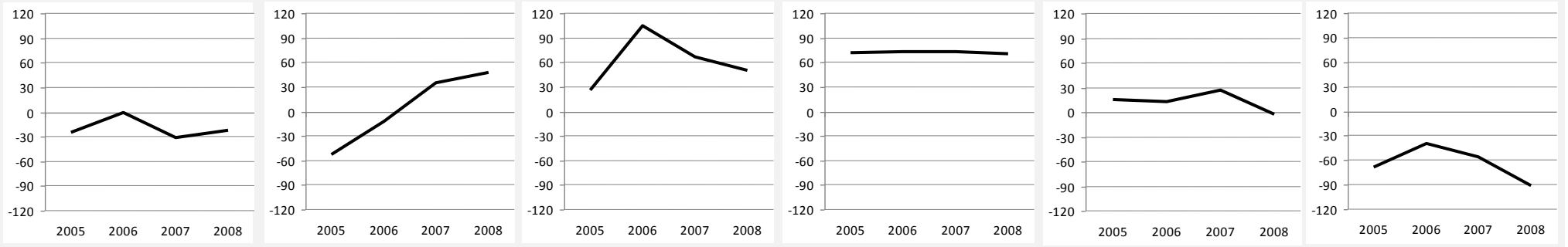
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing	
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
51	67	77	2	4	10	31	36	59	243	330	344	69	140	140	40	41	54

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

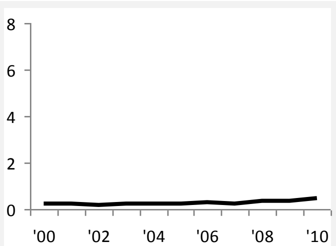
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Tyco Electronics Raychem BVBA	IMEC	AGFA GRAPHICS NV	TOTAL PETROCHEMICALS RESEARCH FEL	IMEC	ELECTROLUX HOME PRODUCTS CORPOR
IMEC	KATHOLIEKE UNIVERSITEIT LEUVEN	SOLVAY (SOCIETE ANONYME)	Solvay (Societe Anonyme)	KATHOLIEKE UNIVERSITEIT LEUVEN	INERGY AUTOMOTIVE SYSTEMS RESEAR(
SOLVAY (SOCIETE ANONYME)	SOLVAY (SOCIETE ANONYME)	Janssen Pharmaceutica N.V.	IMEC	SOLVAY (SOCIETE ANONYME)	TOTAL PETROCHEMICALS RESEARCH FEL
AGC Flat Glass Europe SA	INTERUNIVERSITAIR MICROELEKTRONIC	CYTEC SURFACE SPECIALTIES, S.A.	INEOS MANUFACTURING BELGIUM NV	Universität Libre de Bruxelles	THE EUROPEAN ATOMIC ENERGY COMM
BARCO NV		Universiteit Gent	Cytec Surface Specialties S.A./N.V.	Melexis NV	HERAEUS ELECTRO-NITE INTERNATIONA
GLAVERBEL			GLAVERBEL	SARNOFF EUROPE BVBA	Visys NV
INTERUNIVERSITAIR MICROELEKTRONI(			AGC Flat Glass Europe SA	AGC FLAT GLASS EUROPE SA	Agfa HealthCare NV
Universität Libre de Bruxelles			Agfa Graphics N.V.		Techspace Aero SA
NV BEKAERT SA			KATHOLIEKE UNIVERSITEIT LEUVEN, K.U.		Janssen Pharmaceutica N.V.
Universiteit Gent			NV BEKAERT SA		LayerWise N.V.

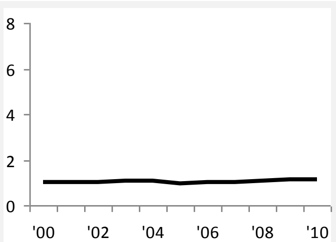
Source: EPO: PATSTAT / ZEW calculation.

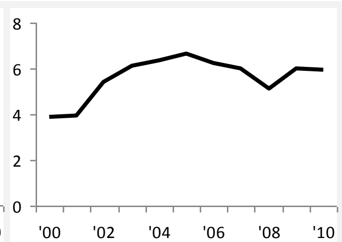
3) Trade

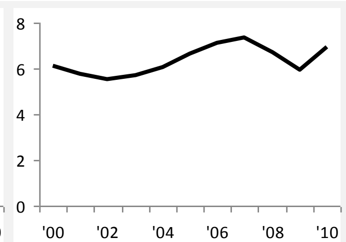
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

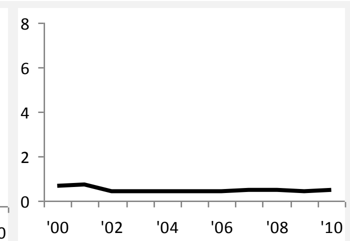
a) Significance: Share in the country's total exports (%)

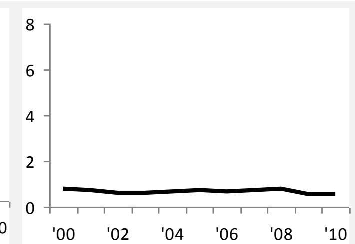




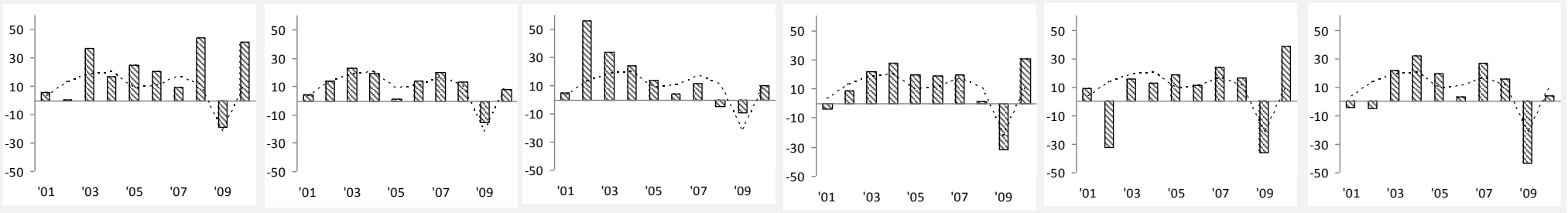




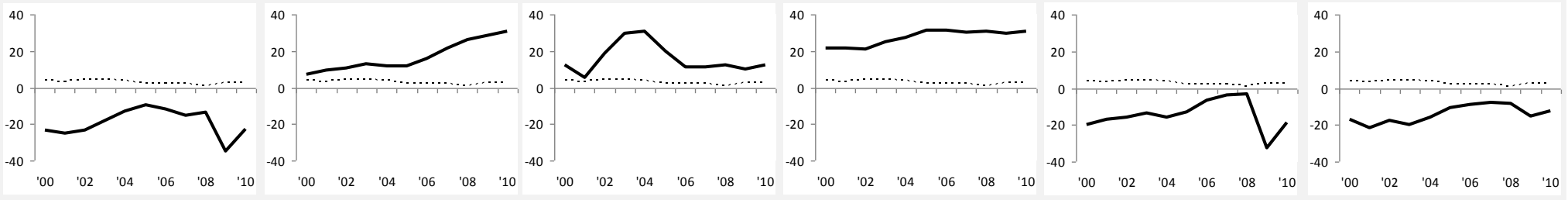




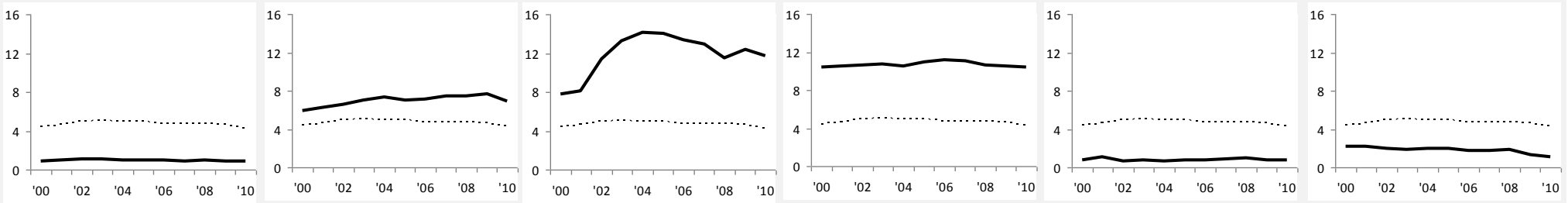
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



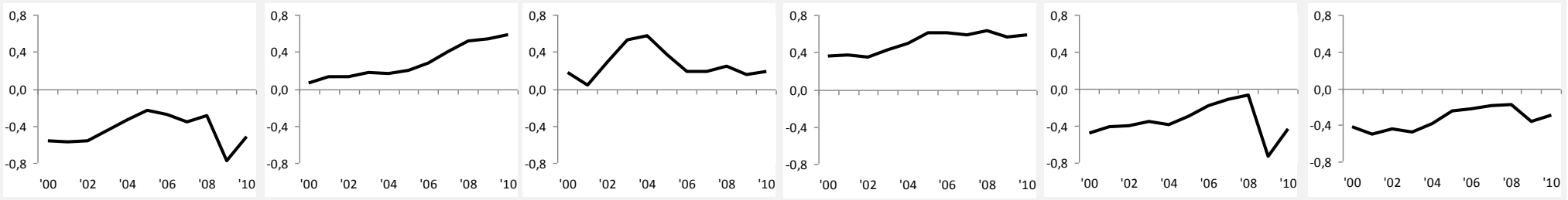
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



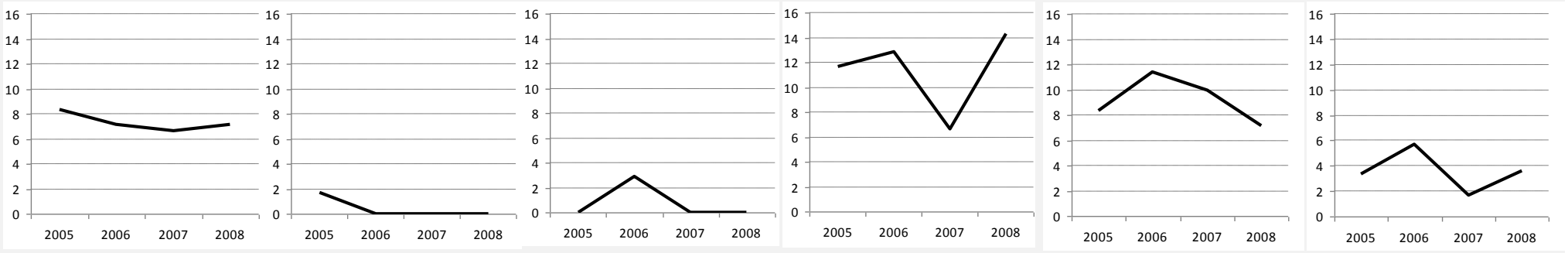
Source: UN: COMTRADE / ZEW and NIW calculation.

8.3 Bulgaria

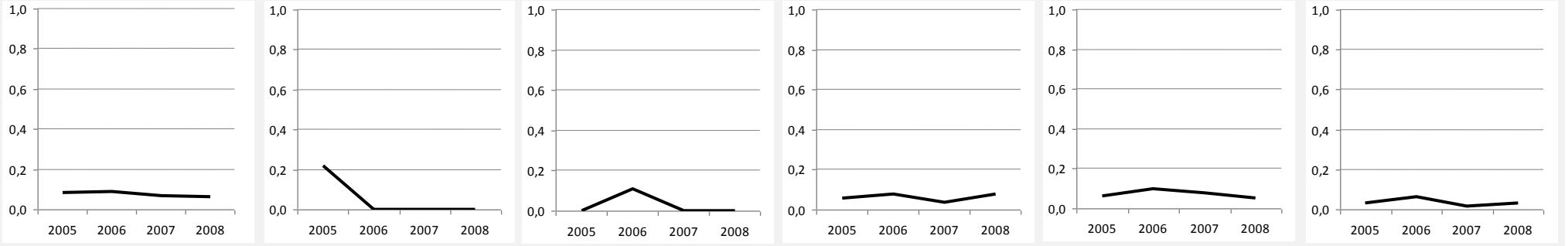
1) Patent Performance

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

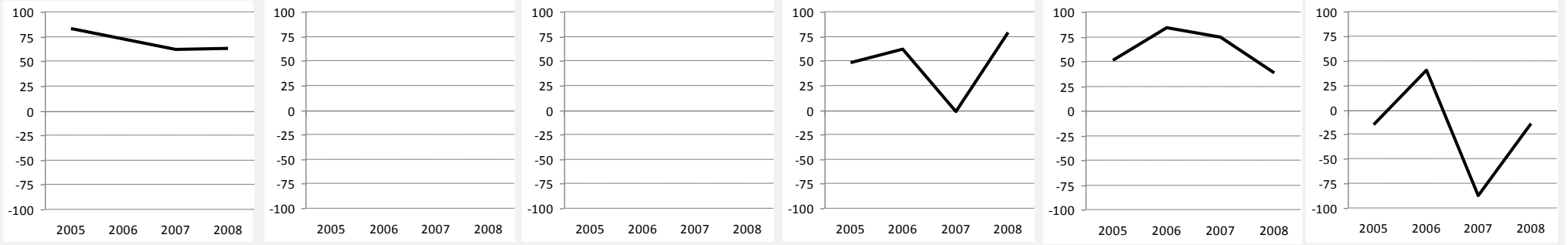
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
	1	3	4	0	0	0	1	0	1	3	5	7	3	4	6	2	2	2

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

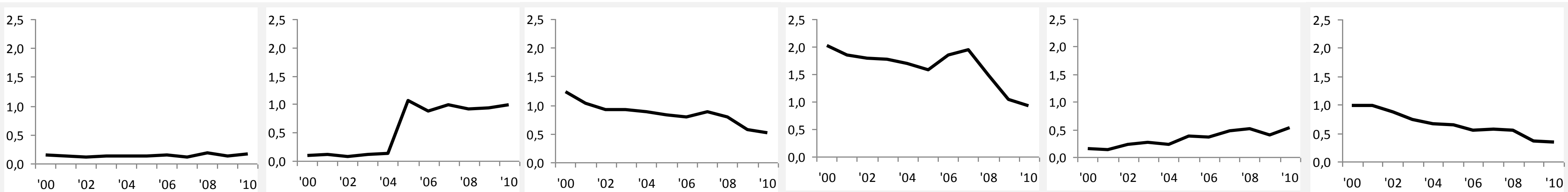
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

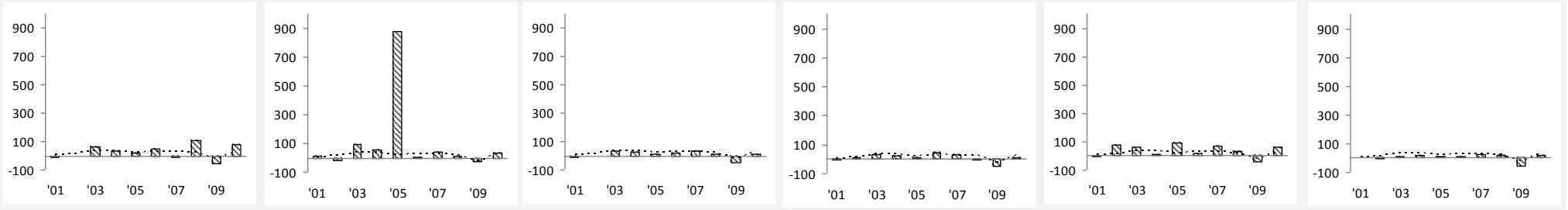
3) Trade

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

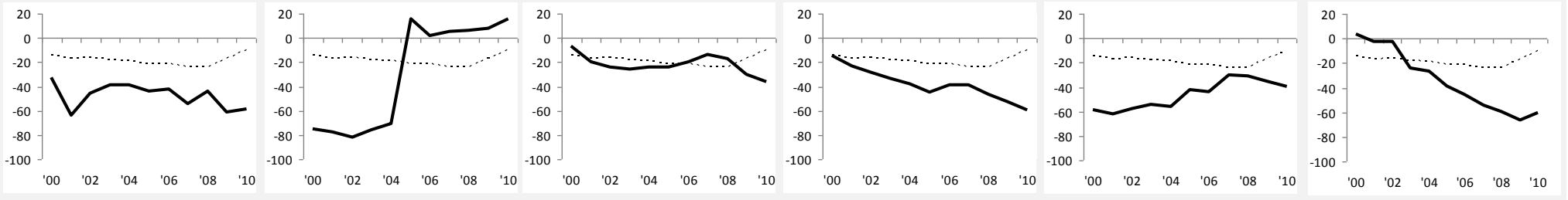
a) Significance: Share in the country's total exports (%)



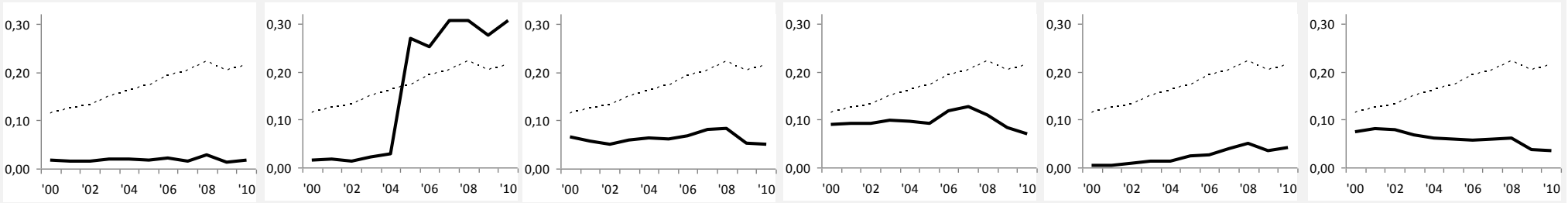
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



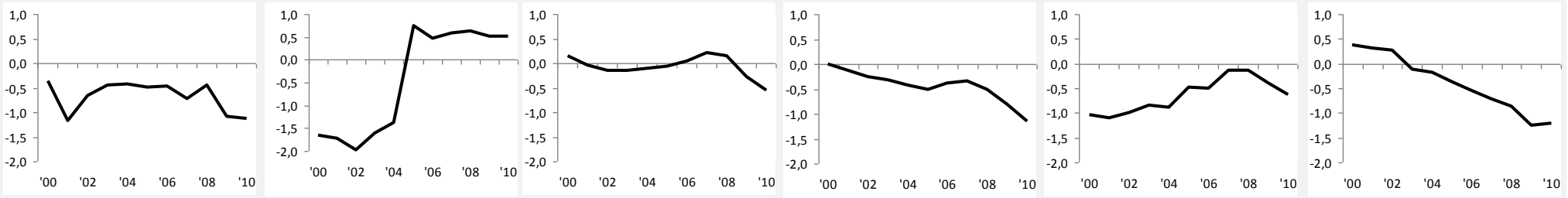
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



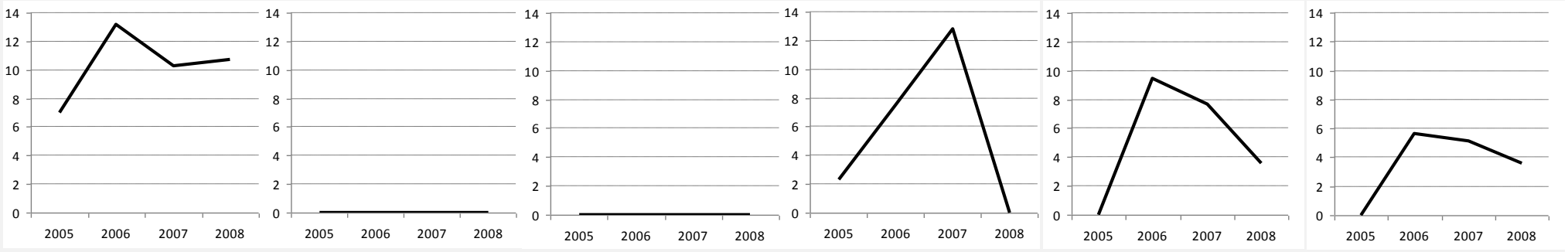
Source: UN: COMTRADE / ZEW and NIW calculation.

8.4 Cyprus

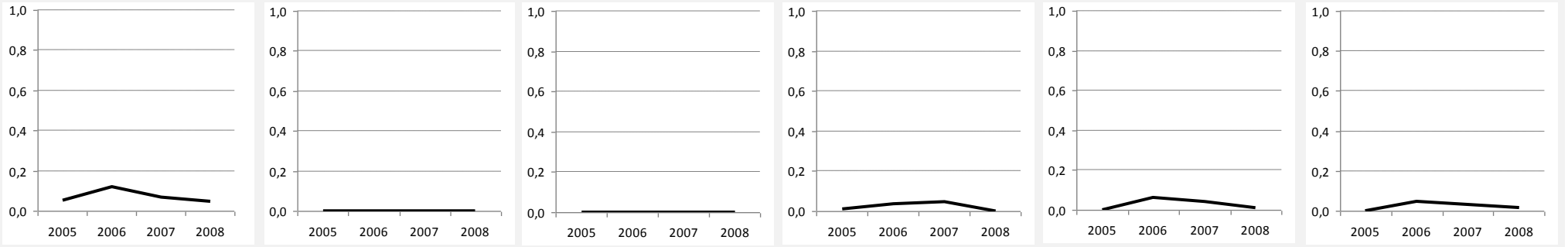
1) Patent Performance

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

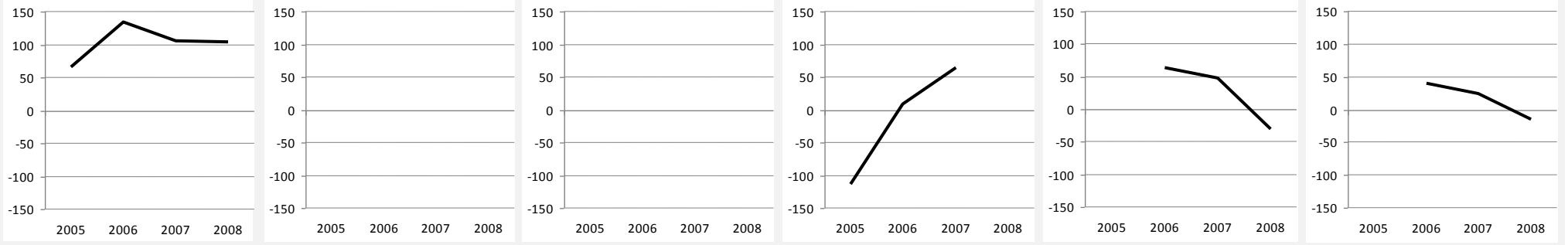
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Field	00/02	03/05	06/08
Photonics	0	3	5
Nanotechnology	1	0	0
Industrial Biotechnology	0	1	0
Advanced Materials	1	2	3
Micro-/Nanoelectronics	1	1	3
Advanced Manufacturing	0	0	2

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

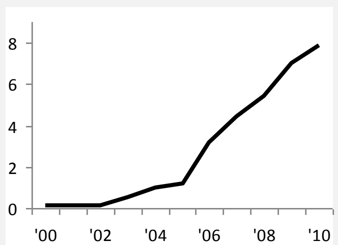
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
General Nano Optics Limited	No organisations with >4 EPO/ PCT or national patents in 2005patents in 2005	Seng Enterprises Ltd.	lo organisations with >4 EPO/ PCT or national patents in 2005patents in 2005	GENERAL NANO OPTICS, LIMITED	No organisations with >4 EPO/ PCT or national patents in 2005patents in 2005

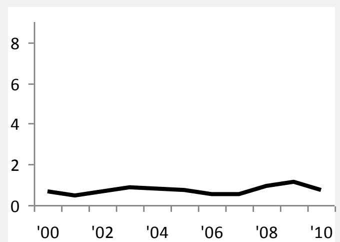
Source: EPO: PATSTAT / ZEW calculation.

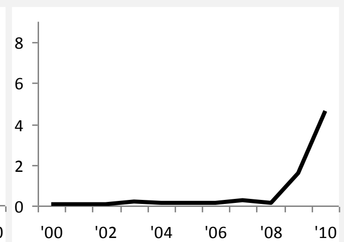
3) Trade

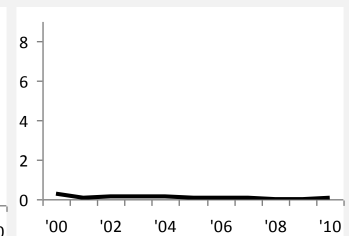
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

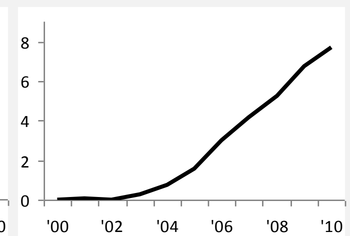
a) Significance: Share in the country's total exports (%)

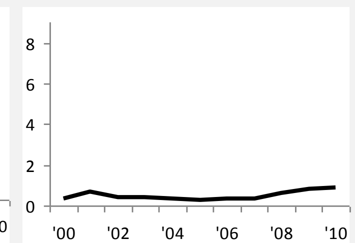




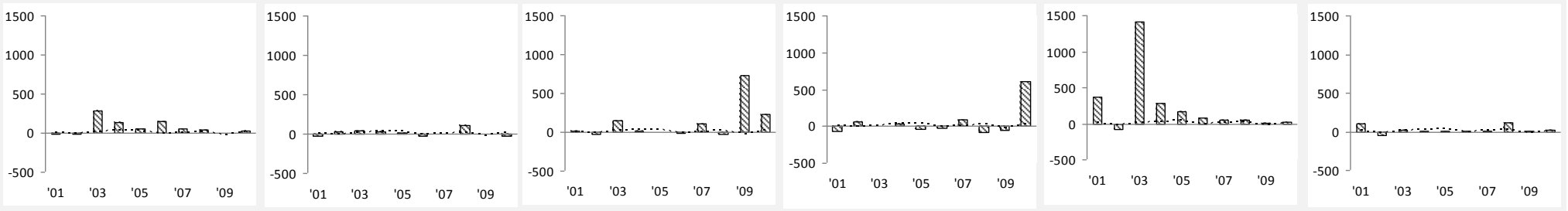




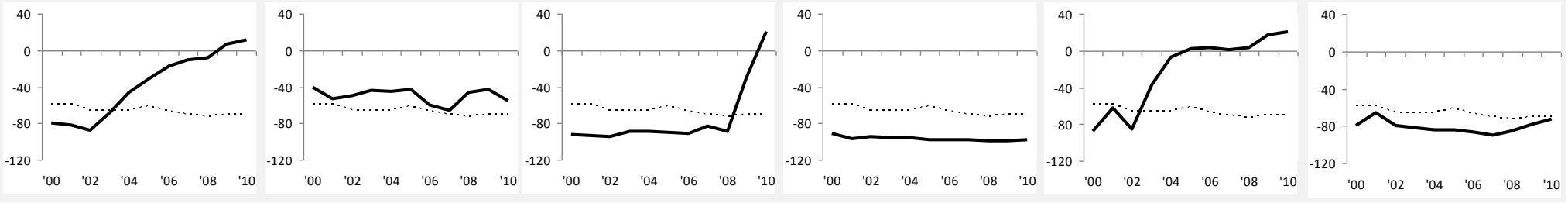




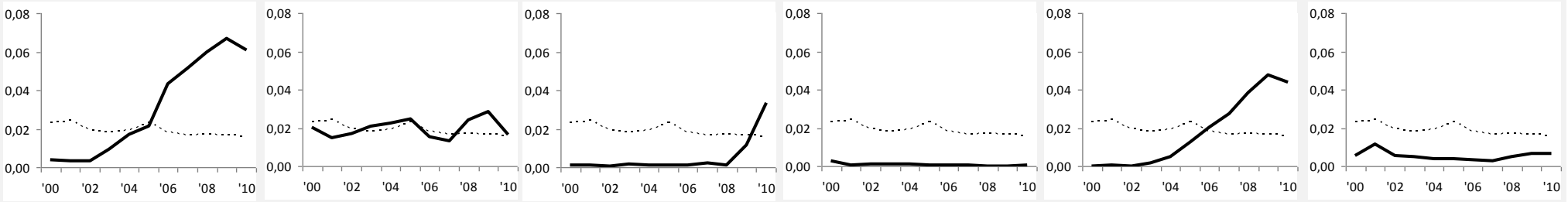
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



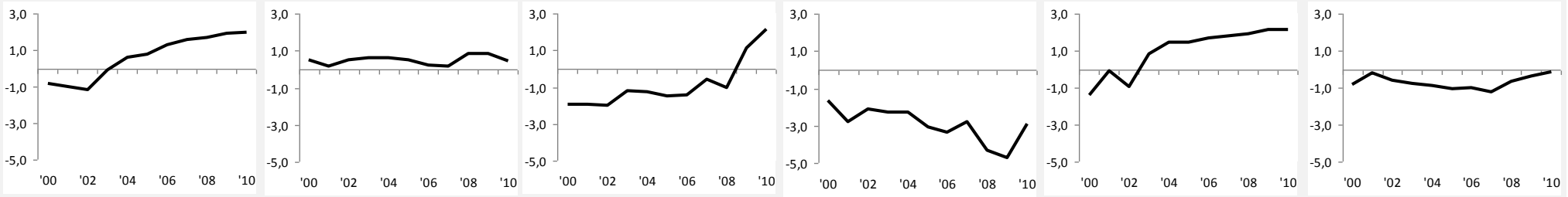
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



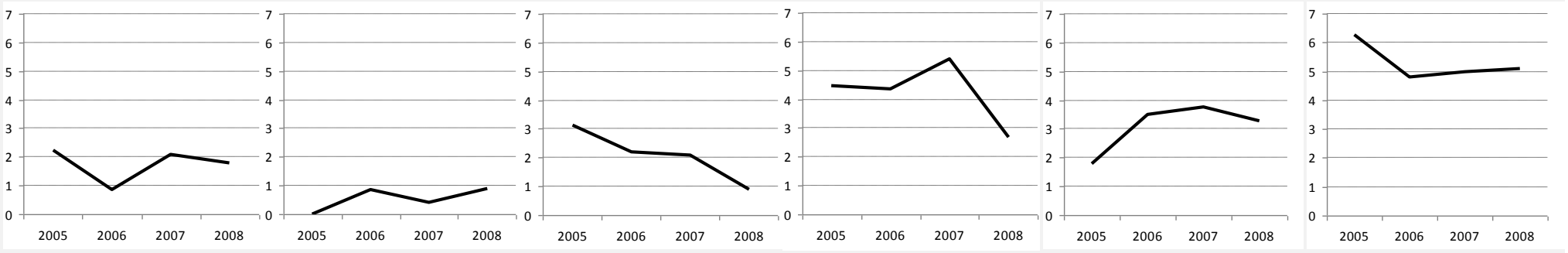
Source: UN: COMTRADE / ZEW and NIW calculation.

8.5 Czech Republic

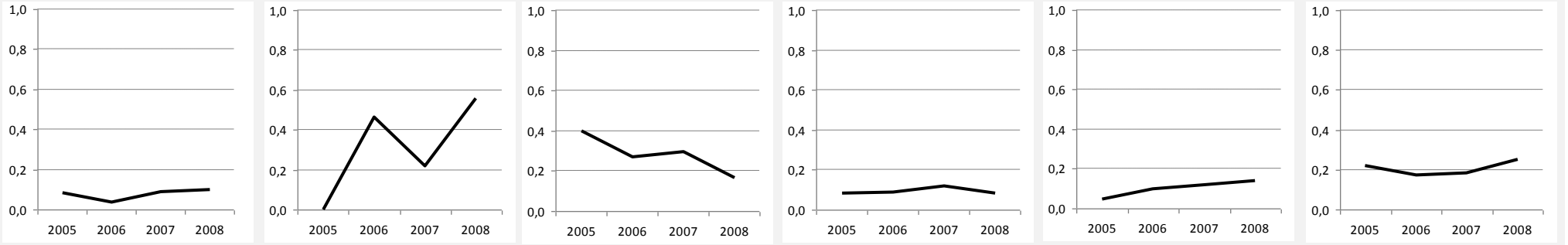
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

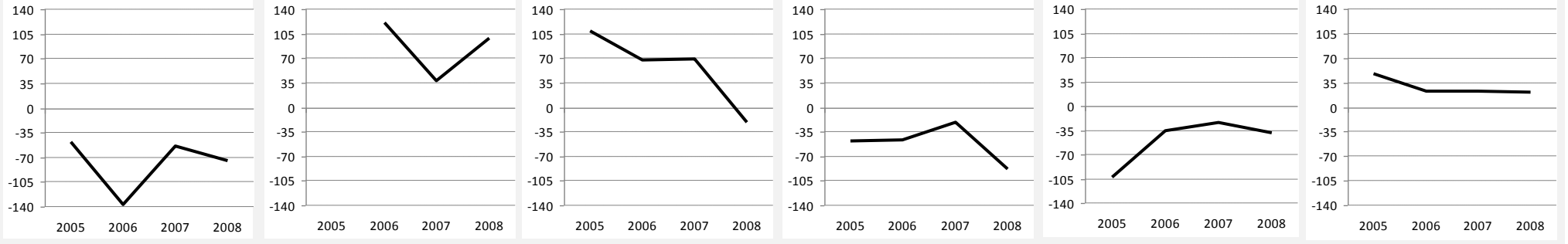
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
7	4	4	0	0	2	1	3	4	6	7	11	2	4	9	4	8	13

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

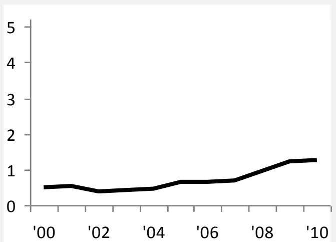
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
HELLA AUTOTECHNIK, S.R.O.	ELMARCO S.R.O.	Ivax Pharmaceuticals S.R.O.	ASTAV MAKROMOLEKULARNI CHEMIE A	ELMARCO, S.R.O	STMicroelectronics Design and Applicat
OPTAGLIO SRO	ASTAV ANORGANICKU CHEMIE AV CR, V			POLOVODICE, A. S.	CESKU VYSOKU UCENI TECHNICKU V PRA
ROBE SHOW LIGHTING S. R. O.				ASTAV ANORGANICKU CHEMIE AV CR, V	TAJMAC - ZPS, A. S.

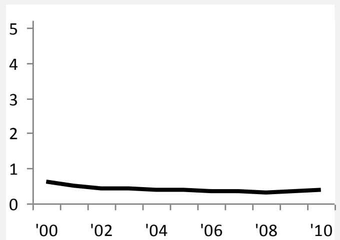
Source: EPO: PATSTAT / ZEW calculation.

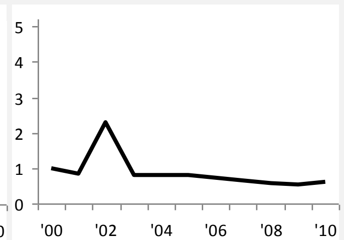
3) Trade

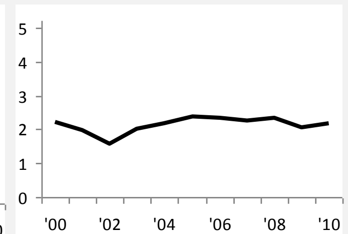
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

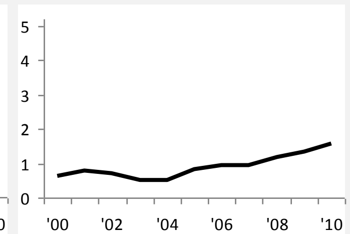
a) Significance: Share in the country's total exports (%)

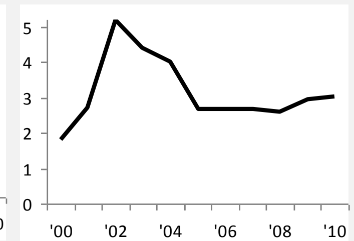




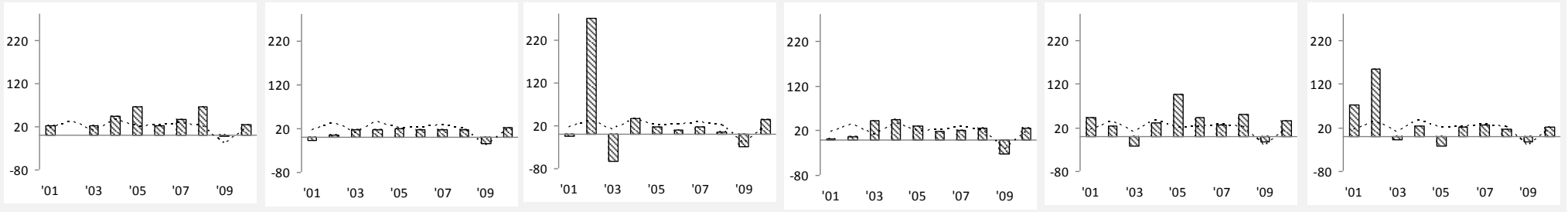




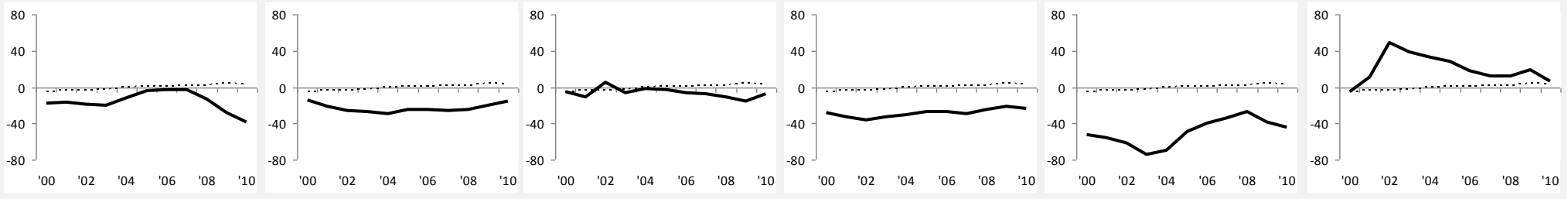




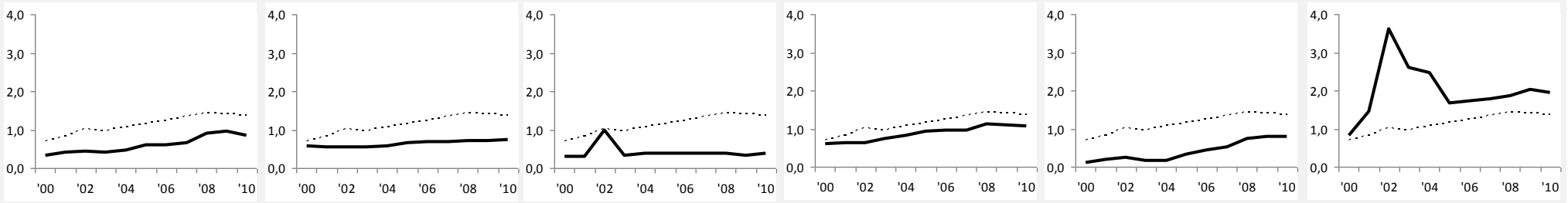
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



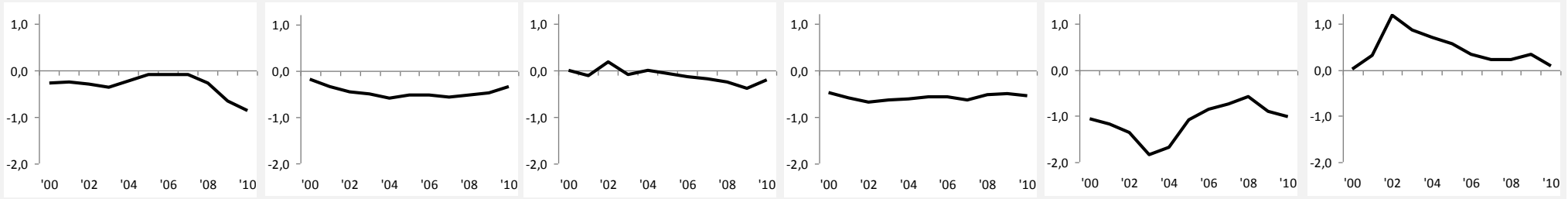
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



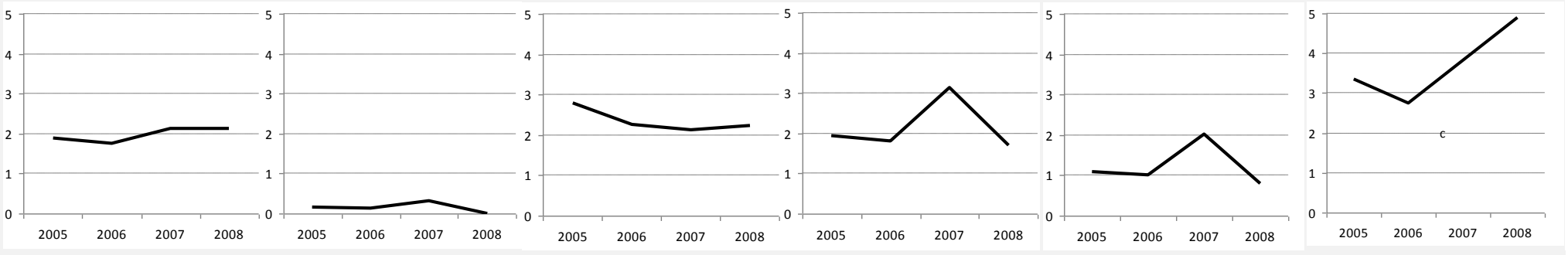
Source: UN: COMTRADE / ZEW and NIW calculation.

8.6 Denmark

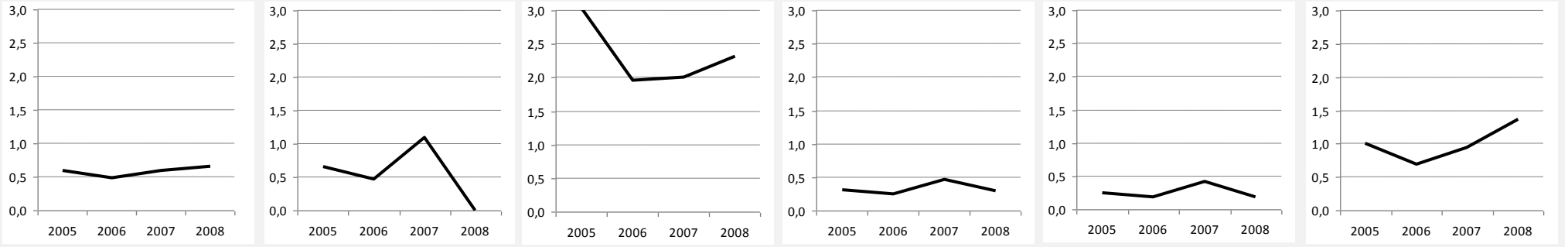
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

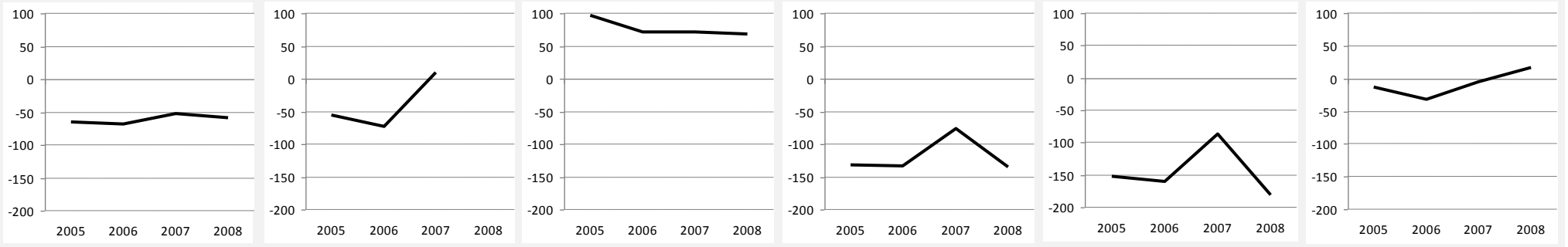
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics 00/02	Photonics 03/05	Photonics 06/08	Nanotechnology 00/02	Nanotechnology 03/05	Nanotechnology 06/08	Industrial Biotechnology 00/02	Industrial Biotechnology 03/05	Industrial Biotechnology 06/08	Advanced Materials 00/02	Advanced Materials 03/05	Advanced Materials 06/08	Micro-/Nanoelectronics 00/02	Micro-/Nanoelectronics 03/05	Micro-/Nanoelectronics 06/08	Advanced Manufacturing 00/02	Advanced Manufacturing 03/05	Advanced Manufacturing 06/08
29	37	33	2	2	3	29	34	36	28	34	36	11	14	21	42	48	64

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

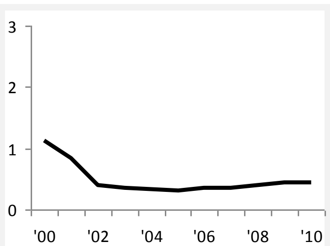
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Rohm and Haas Denmark Finance A/S	Hymite A/S	Novozymes A/S	COLOPLAST A/S	Hymite A/S	VESTAS WIND SYSTEMS A/S
Martin Professional A/S	NIL Technology APS	DANISCO A/S	The Technical University of Denmark	Danfoss A/S	Danfoss A/S
Crystal Fibre A/S		Novo Nordisk A/S	DANFOSS A/S	ROHM AND HAAS DENMARK FINANCE A	VKR HOLDING A/S
Danmarks Tekniske Universitet		HALDOR TOPSOE A/S	ROCKWOOL INTERNATIONAL A/S	Noliac A/S	GRUNDFOS MANAGEMENT AS
KOHERAS A/S		Fluxome Sciences A/S	Novo Nordisk A/S	GRUNDFOS MANAGEMENT A/S	Novo Nordisk A/S
NKT Photonics A/S		DAKO DENMARK A/S	HYMITE A/S	OTICON A/S	LM GLASFIBER A/S
HYMITE AS		ELSAM ENGINEERING AS	Rohm and Haas Denmark Finance A/S	NKT CABLES ULTERA A/S	KAMSTRUP A/S
EASTMAN KODAK CO		RADIOMETER MEDICAL APS	HALDOR TOPSOEE A/S	NOISE LIMIT APS	Danmarks Tekniske Universitet
Alight Photonics ApS		DONG Energy Power A/S	NANON A/S	Aarhus Universitet	LINAK A/S
		ChemoMetec A/S	NOVOZYMES BIOPOLYMER AS	NIL TECHNOLOGY APS	COLOPLAST AS

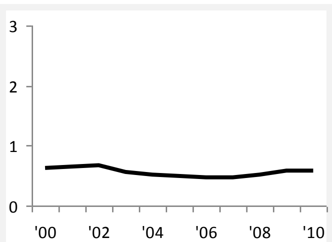
Source: EPO: PATSTAT / ZEW calculation.

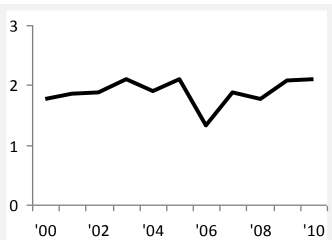
3) TRADE

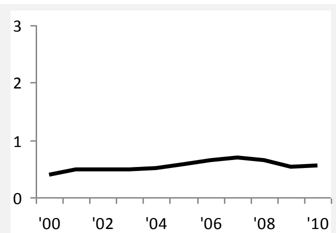
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

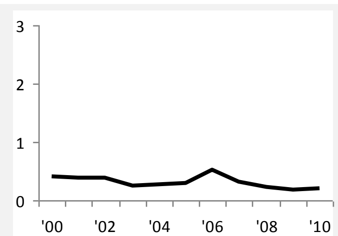
a) Significance: Share in the country's total exports (%)

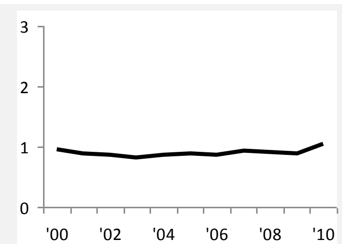












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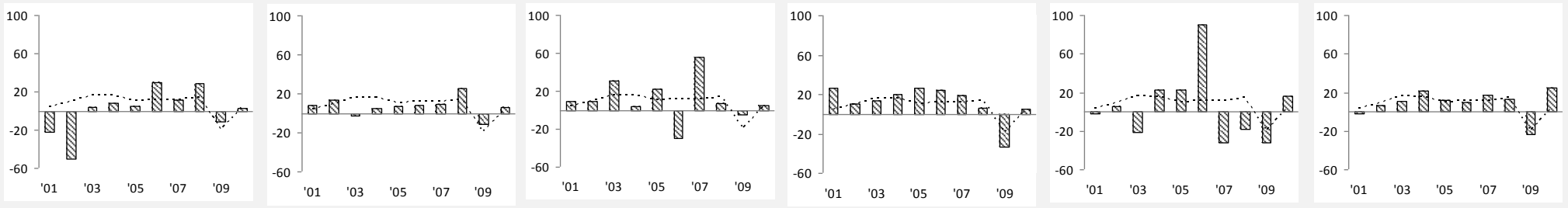
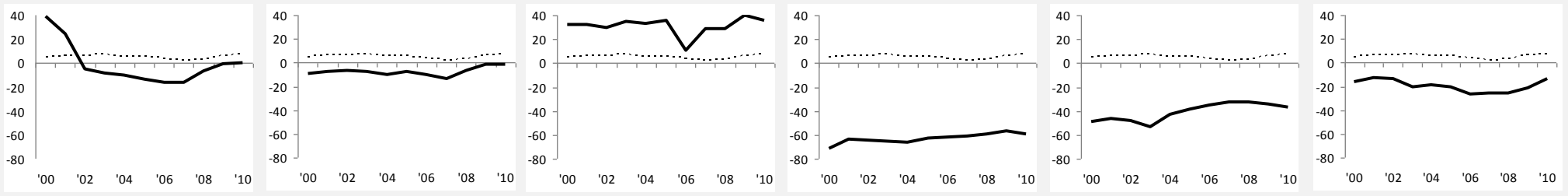
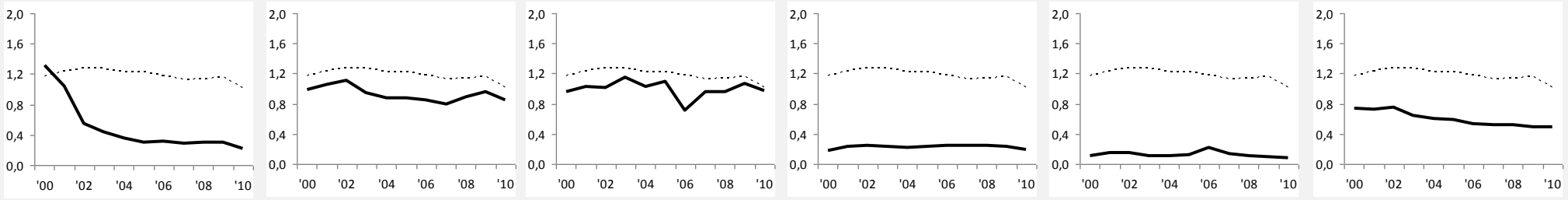
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



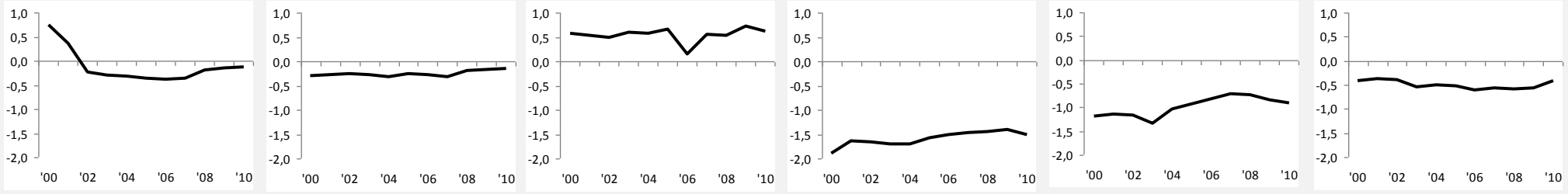
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



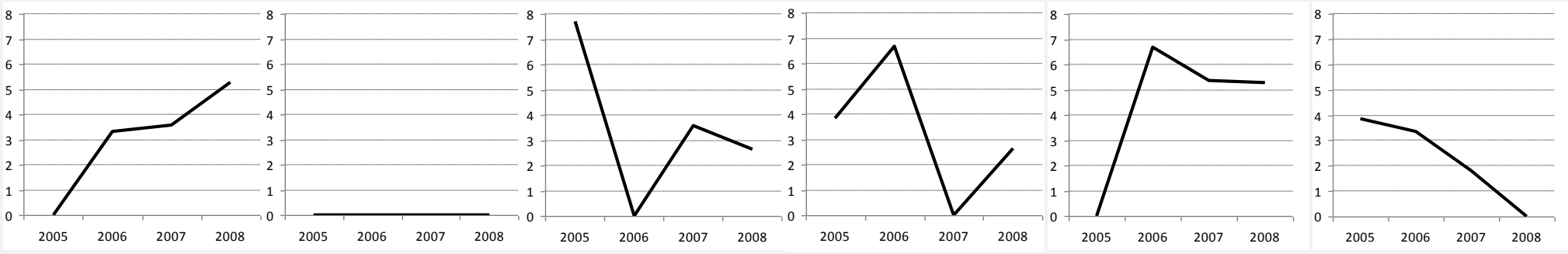
Source: UN: COMTRADE / ZEW and NIW calculation.

8.7 Estonia

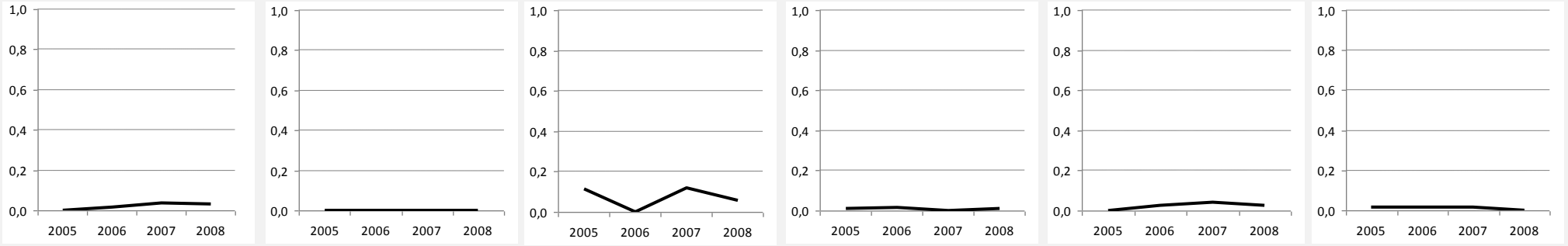
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

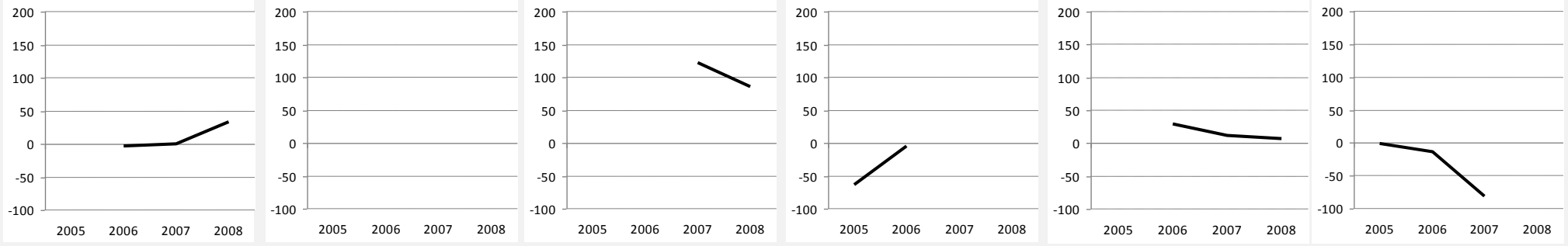
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics 00/02	Photonics 03/05	Photonics 06/08	Nanotechnology 00/02	Nanotechnology 03/05	Nanotechnology 06/08	Industrial Biotechnology 00/02	Industrial Biotechnology 03/05	Industrial Biotechnology 06/08	Advanced Materials 00/02	Advanced Materials 03/05	Advanced Materials 06/08	Micro-/Nanoelectronics 00/02	Micro-/Nanoelectronics 03/05	Micro-/Nanoelectronics 06/08	Advanced Manufacturing 00/02	Advanced Manufacturing 03/05	Advanced Manufacturing 06/08
0	1	1	0	0	0	0	1	1	0	0	1	0	1	1	0	0	1

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

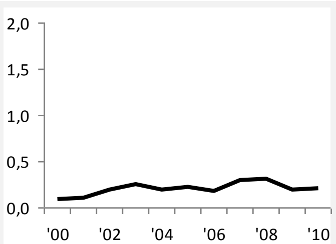
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	TALLINN UNIVERSITY OF TECHNOLO	No organisations with >4 EPO/ PCT or national patents in 2005

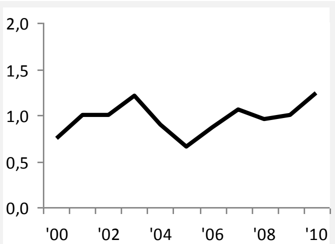
Source: EPO: PATSTAT / ZEW calculation.

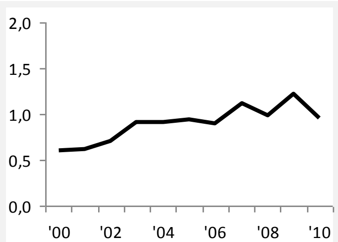
3) Trade

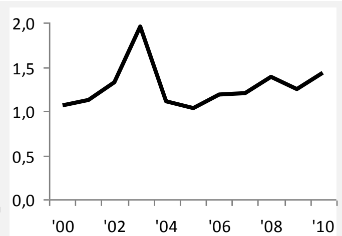
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

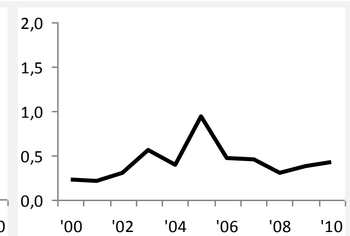
a) Significance: Share in the country's total exports (%)

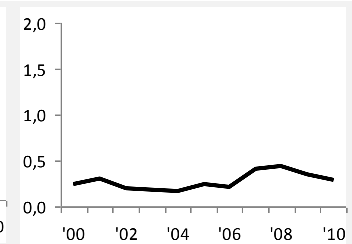




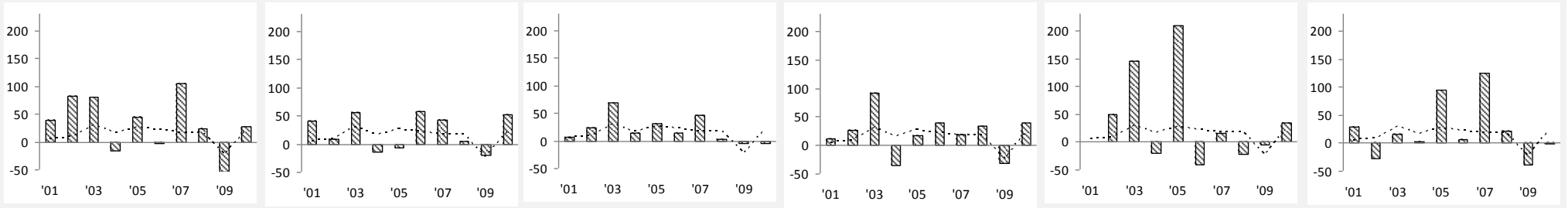




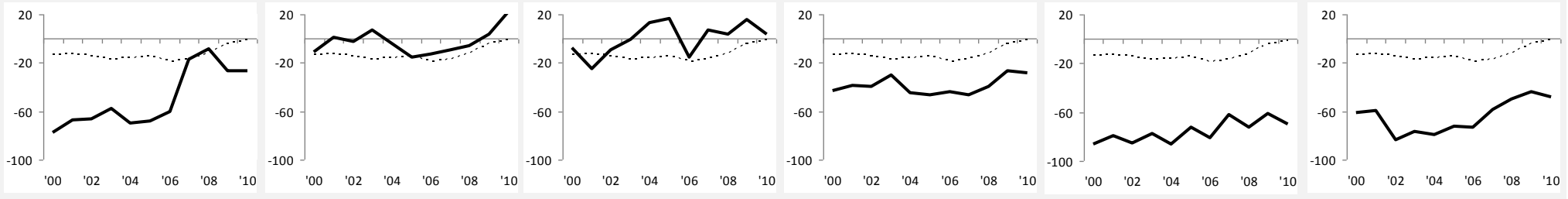




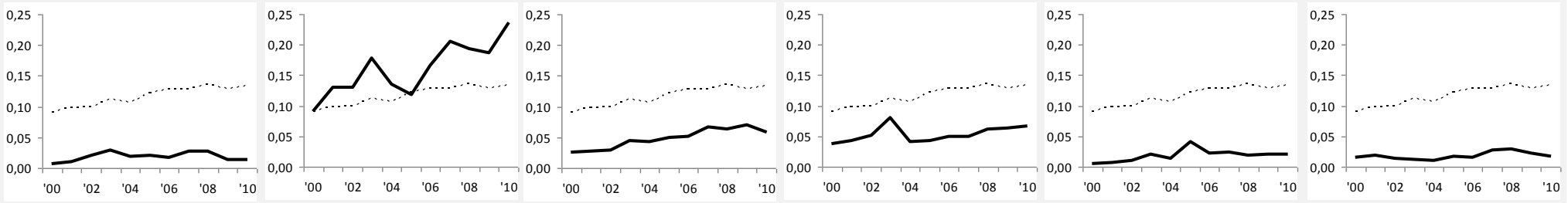
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



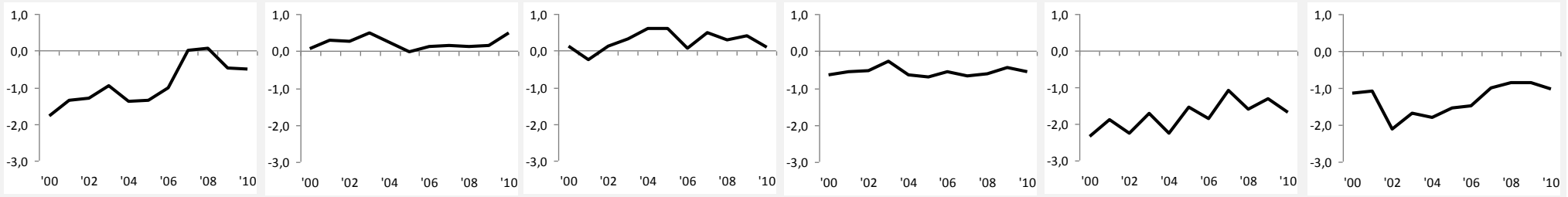
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



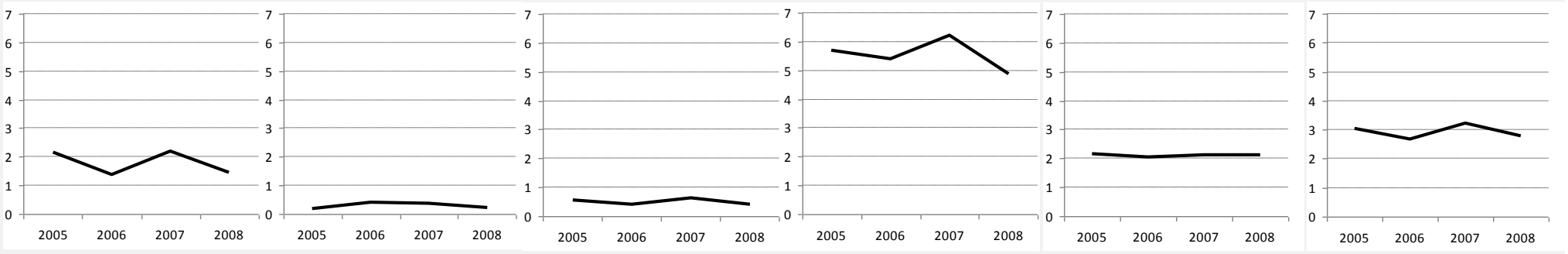
Source: UN: COMTRADE / ZEW and NIW calculation.

8.8 Finland

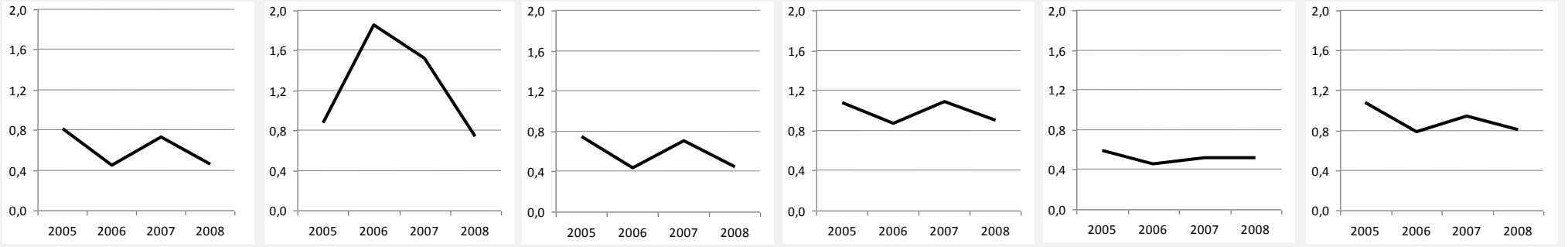
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

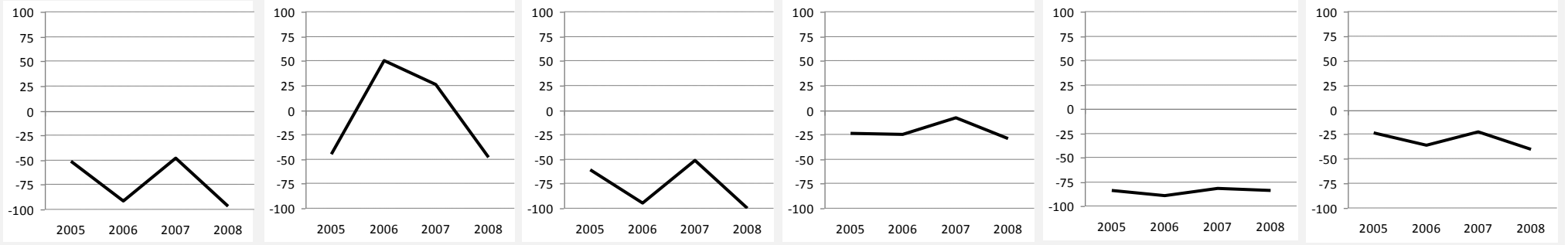
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
20	33	31	3	2	6	7	8	10	58	79	107	19	30	39	46	47	57

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

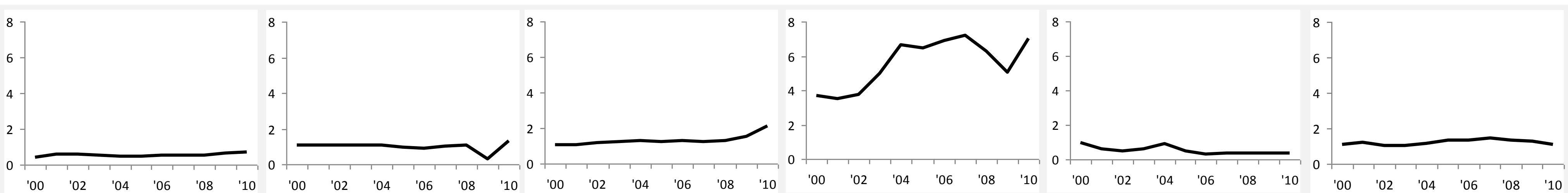
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
NOKIA CORPORATION	Canatu OY	VALTION TEKNILLINEN TUTKIMUSKESKU	BOREALIS TECHNOLOGY OY	NOKIA CORPORATION	Nokia Corporation
Imbera Electronics Oy	VTI Technologies Oy	CHIP-MAN TECHNOLOGIES OY	KEMIRA OYJ	Imbera Electronics Oy	ABB OY
HEPTAGON OY	BENEQ OY	Dynea OY	M-REAL OYJ	VALTION TEKNILLINEN TUTKIMUSKESKU	VTI TECHNOLOGIES OY
Picodeon Ltd Oy	Valtion Teknillinen Tutkimuskeskus	ORION DIAGNOSTICA OY	VALTION TEKNILLINEN	Heptagon Oy	Kone Corporation
LIEKKI OY		M-REAL OYJ	Dynea OY	Braggone Oy	VALTION TEKNILLINEN TUTKIMUSKESKU
ARTTO AUROLA		ST1 BIOFUELS OY	IMBERA ELECTRONICS OY	CANATU OY	Outotec Oyj
CORELASE OY		AB Enzymes Oy	STORA ENSO OYJ	VTI TECHNOLOGIES OY	WAERTSILAE FINLAND OY
EPICRYSTALS OY			TAMGLASS LTD OY	Optogan OY	Metso Automation OY
CANATU OY			BRAGGONE OY	BENEQ OY	Picodeon Ltd Oy
NOKIA SIEMENS NETWORKS OY			OUTOKUMPU OY	SILECS OY	POLAR ELECTRO OY,

Source: EPO: PATSTAT / ZEW calculation.

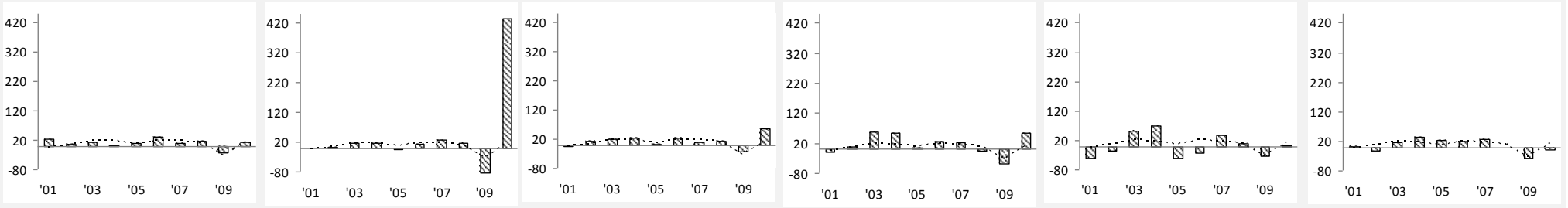
3) Trade

Photonics | Nanotechnology | Industrial Biotechnology | Advanced Materials | Micro-/Nanoelectronics | Advanced Manufacturing

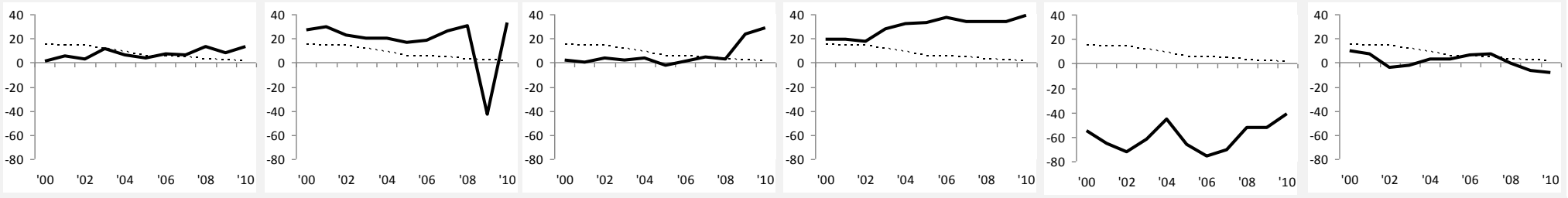
a) Significance: Share in the country's total exports (%)



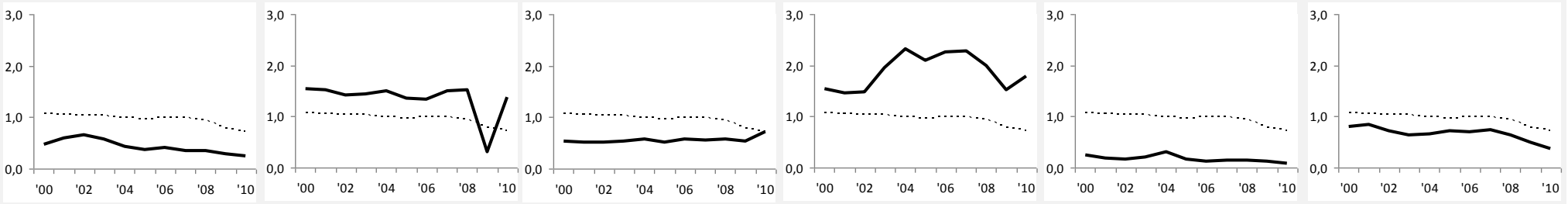
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



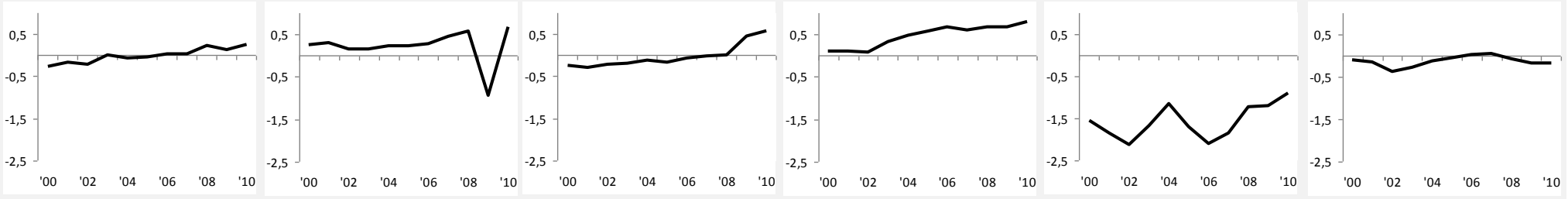
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



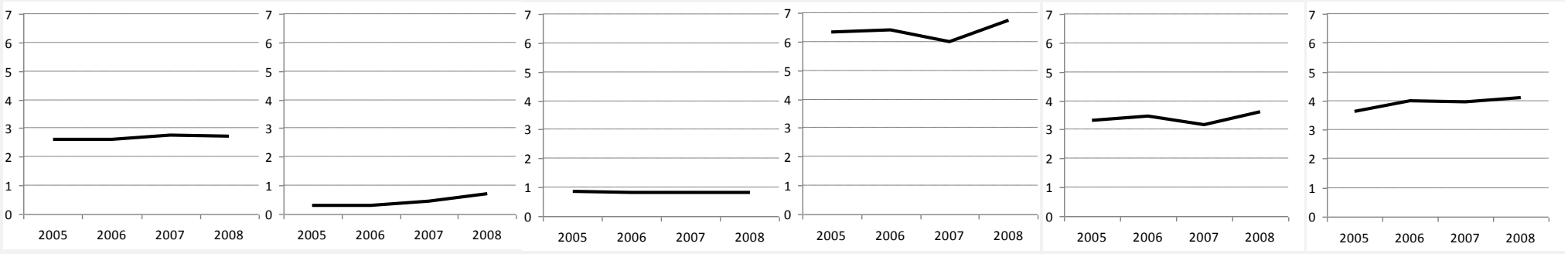
Source: UN: COMTRADE / ZEW and NIW calculation.

8.9 France

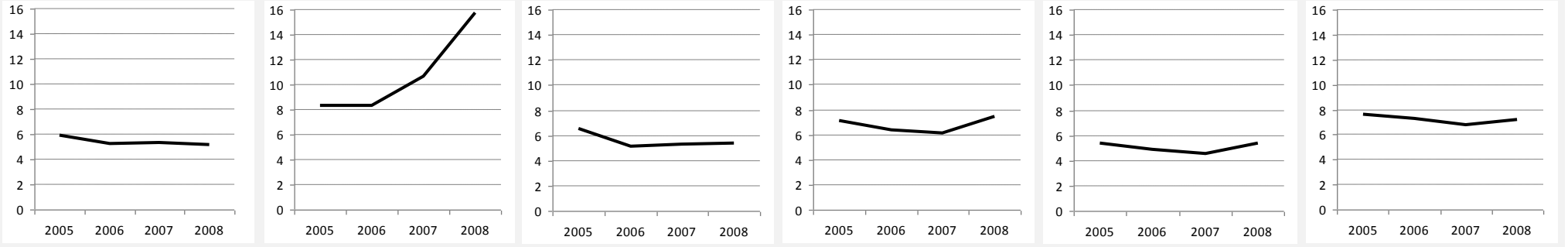
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

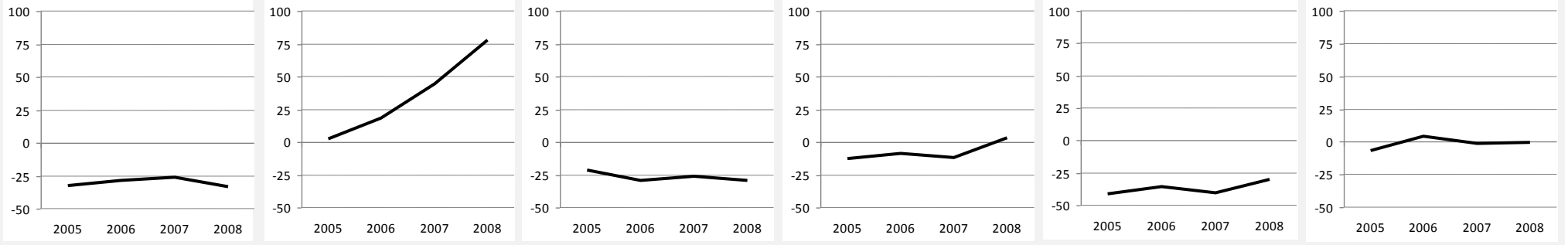
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
288	310	303	10	26	56	78	86	89	643	709	705	250	363	383	312	389	452

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics | **Nanotechnology** | **Industrial Biotechnology** | **Advanced Materials** | **Micro-/Nanoelectronics** | **Advanced Manufacturing**

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

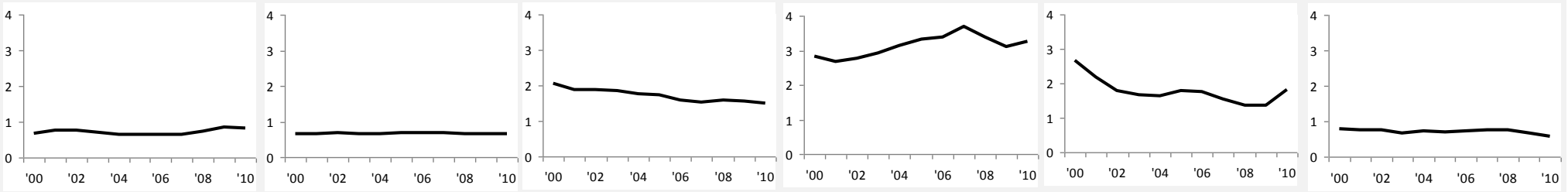
Commissariat a l'Energie Atomique	COMMISSARIAT ENERGIE ATOMIQUE	BIOMERIEUX	COMMISSARIAT A L'ENERGIE ATOMIQUE	COMMISSARIAT A L'ENERGIE ATOMIQUE	Commissariat a l'Energie Atomique
Essilor International (Compagnie Gener	CENTRE NATIONAL DE LA RECHERCHE SC	Centre National de la Recherche Scienti	ARKEMA FRANCE	S.O.I. TEC SILICON ON INSULATOR TECHI	L'AIR LIQUIDE SOCIETE ANONYME A DIR
VALEO VISION	Arkema France	ARKEMA FRANCE	CENTRE NATIONAL DE LA RECHERCHE SC	STMicroelectronics S.A.	Thales
THALES	S.O.I.TEC SILICON ON INSULATOR TECHI	INSTITUT FRANCAIS DU PETROLE	S.O.I.TEC SILICON ON INSULATOR TECHN	CENTRE NATIONAL DE LA RECHERCHE SC	SNECMA
SAINT-GOBAIN GLASS FRANCE	STMICROELECTRONICS SA SOCIETE ANO	COMMISSARIAT A L'ENERGIE ATOMIQUI	SAINT GOBAIN CENTRE DE RECHERCHES	STMICROELECTRONICS CROLLES 2 SAS	PEUGEOT CITROEN AUTOMOBILES SA
CENTRE NATIONAL DE LA RECHERCHE SC	THALES	COMPAGNIE GERVAIS DANONE SOCIETI	STMICROELECTRONICS SA SOCIETE ANO	SAINT-GOBAIN GLASS FRANCE	SOMFY SAS
THOMSON LICENSING	Tracit Technologies	INSTITUT NATIONAL DE LA RECHERCHE A	SOCIETE DE TECHNOLOGIE MICHELIN SO	THALES	RENAULT S.A.S.
VALEO VISION SOCIETE ANONYME	L'AIR LIQUIDE SOCIETE ANONYME POUR	INSTITUT NATIONAL DE LA SANTE ET DE	SAINT-GOBAIN GLASS FRANCE	L'AIR LIQUIDE SOCIETE ANONYME A DIR	société de technologie michelin
Alcatel Lucent	Essilor International	UNIVERSITE DE LA MEDITERRANE E AIX-I	RHODIA RECHERCHES ET TECHNOLOGIES	THOMSON LICENSING	CENTRE NATIONAL DE LA RECHERCHE SC
ST MICROELECTRONICS S.A.	STMICROELECTRONICS (CROLLES 2) SAS	UNIVERSITE PIERRE ET MARI RAMBACH A	L'OREAL SOCIETE ANONYME	Alcatel Lucent	ST MICROELECTRONICS S.A.

Source: EPO: PATSTAT / ZEW calculation.

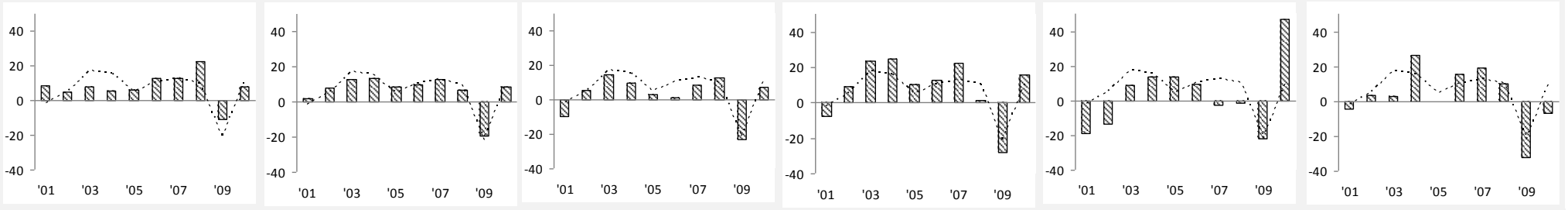
3) TRADE

Photonics | **Nanotechnology** | **Industrial Biotechnology** | **Advanced Materials** | **Micro-/Nanoelectronics** | **Advanced Manufacturing**

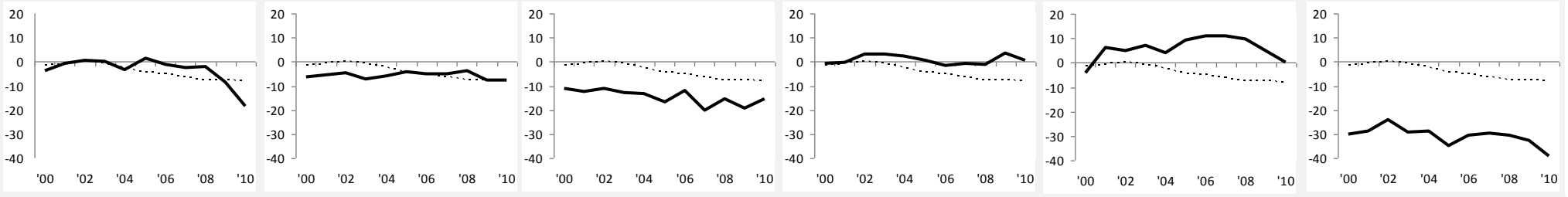
a) Significance: Share in the country's total exports (%)



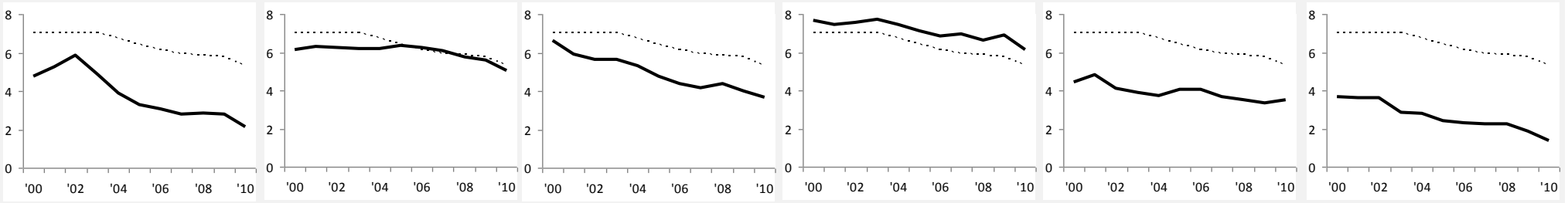
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



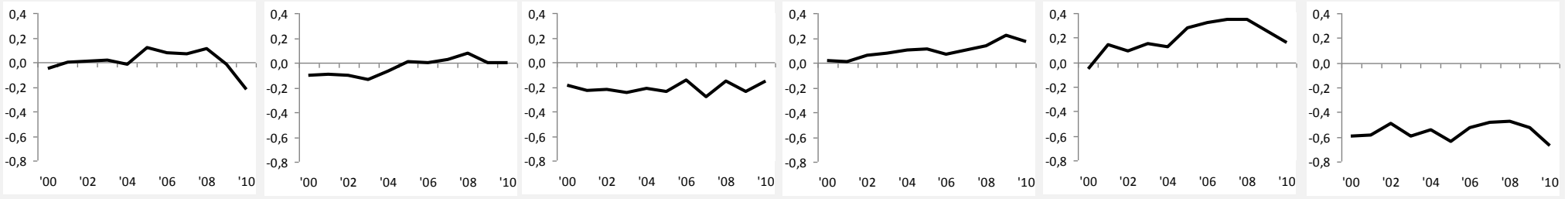
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



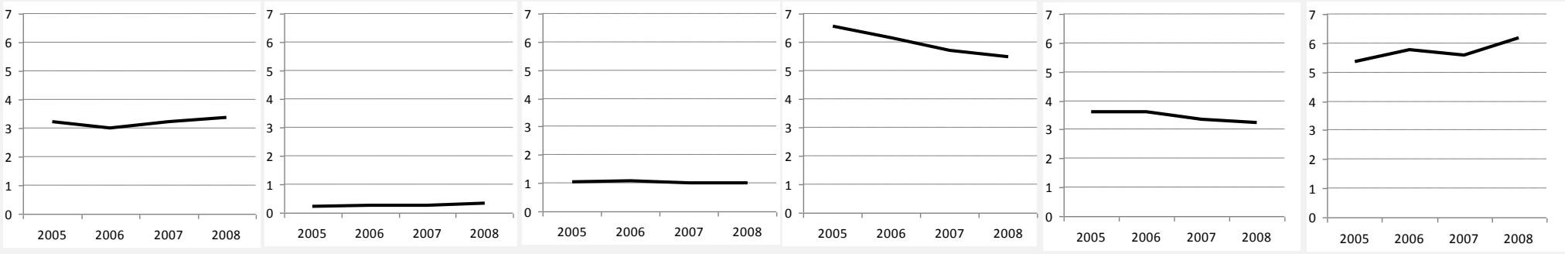
Source: UN: COMTRADE / ZEW and NIW calculation.

8.10 Germany

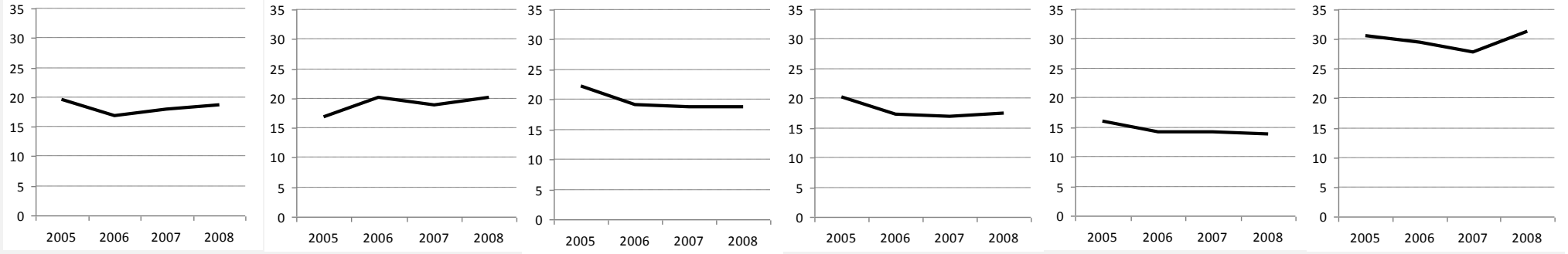
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

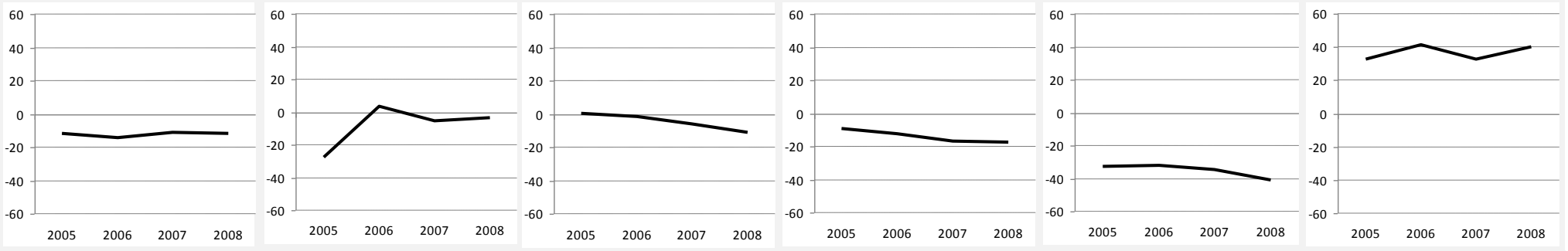
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
744	879	1026	42	56	96	310	300	323	2075	1860	1832	986	1012	1088	1444	1552	1891

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

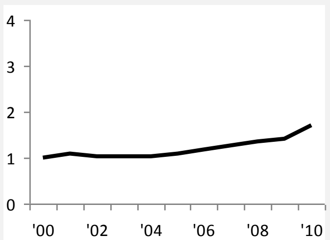
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Osram (part of Siemens)	Bosch	BASF	BASF	Siemens	Siemens
Merck	Fraunhofer	Evonik	Bayer	Osram (part of Siemens)	Bosch
Siemens	Siemens	Dystar	Siemens	Infineon	Endress & Hauser
Philips Germany	Bayer	Fraunhofer	Infineon	Bosch	Fraunhofer
Fraunhofer	Max Planck	Roche Diagnostics	Wacker	Fraunhofer	MTU Aero Engine
Carl Zeiss	BASF	Cognis (now BASF)	Evonik	Merck	Heidenhain
Bosch	Sony Germany	Merck	Fraunhofer	Carl Zeiss	Grieshaber
BASF	Infenion	Clariant Germany	Basell Polyofine	Philips Germany	Continental
Schott	Karlsruhe Inst. of Tech.	Oxeno	Lanxess	Semikron	Daimler
Infenion	X-Fab Semicon Foundrie:	Max Planck	Carl Zeiss	Epcos	ZF

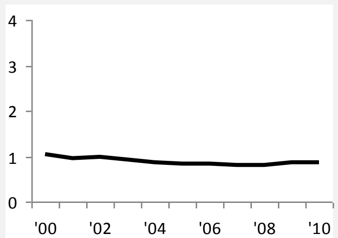
Source: EPO: PATSTAT / ZEW calculation.

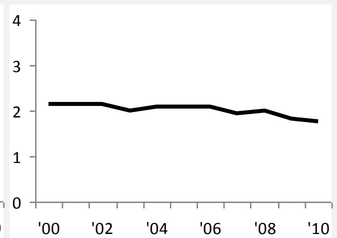
3) Trade

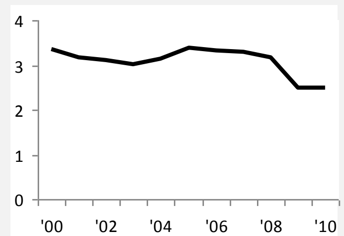
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

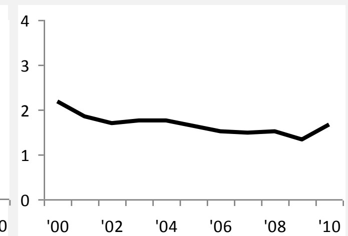
a) Significance: Share in the country's total exports (%)

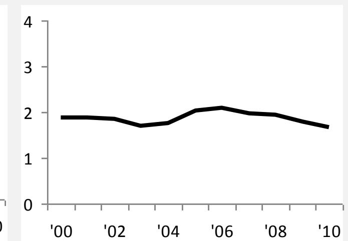




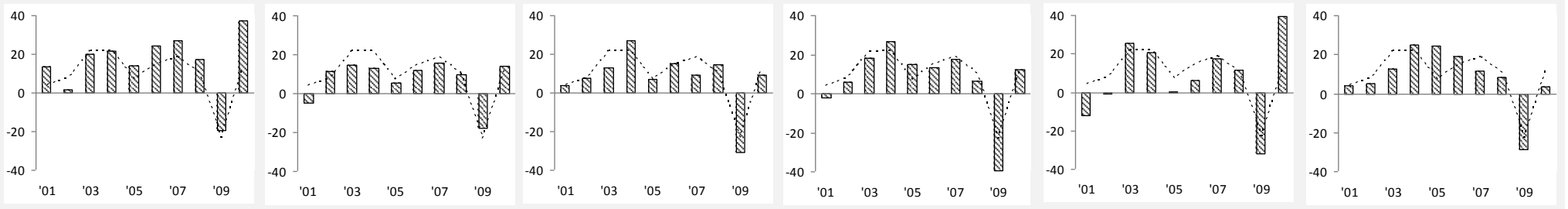




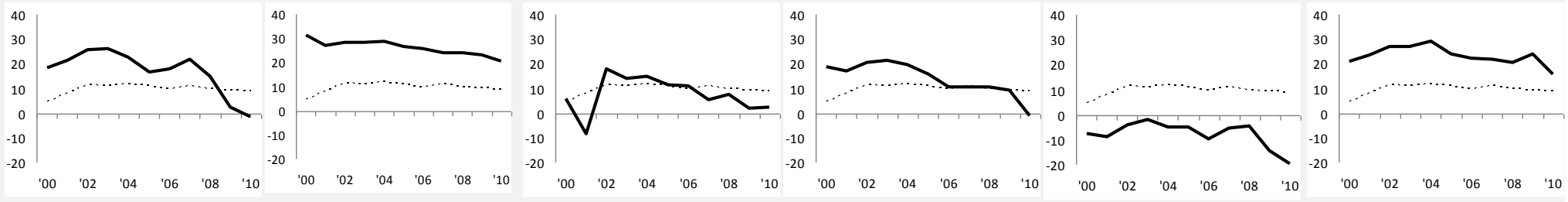




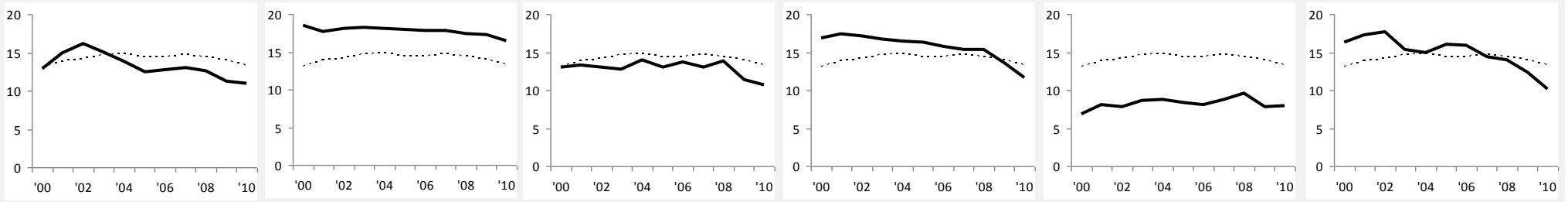
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



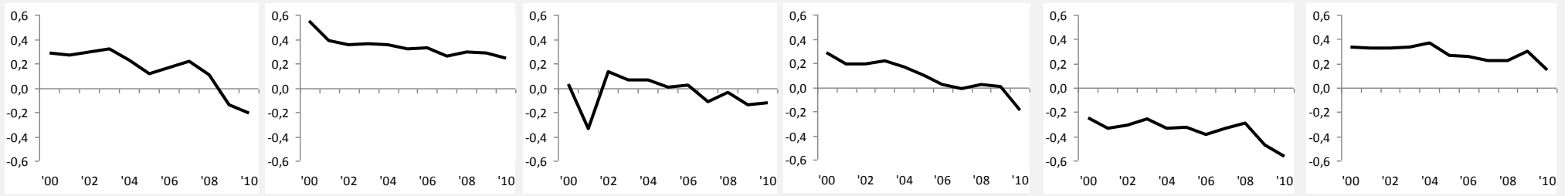
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



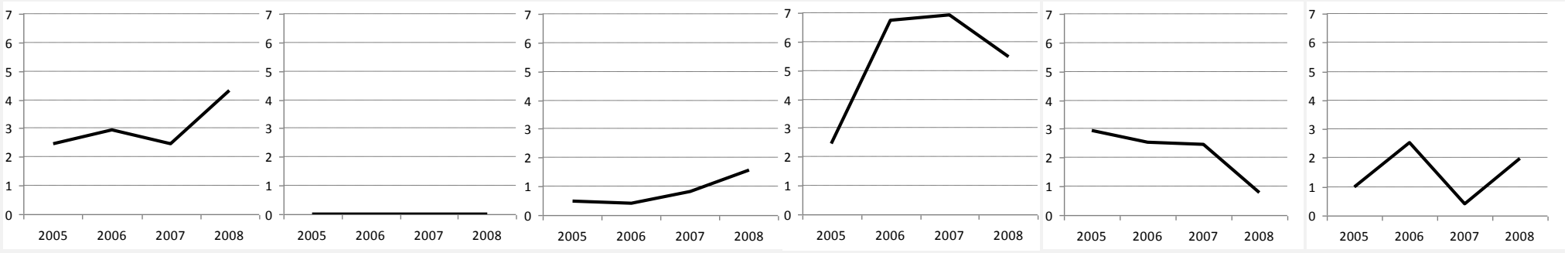
Source: UN: COMTRADE / ZEW and NIW calculation.

8.11 Greece

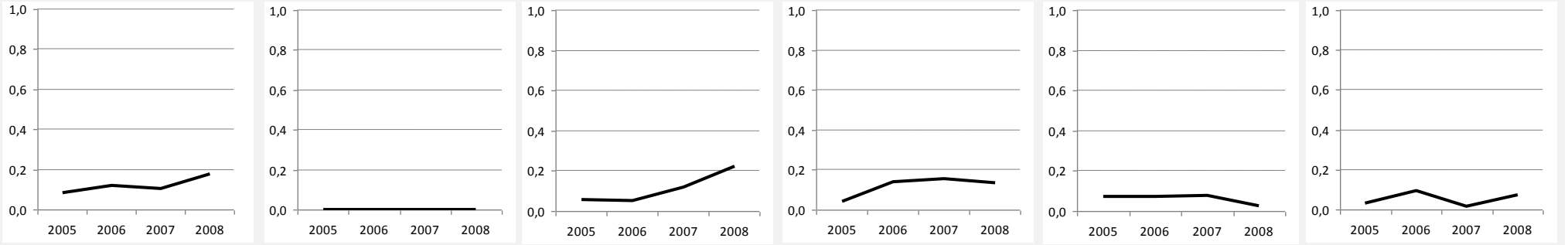
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

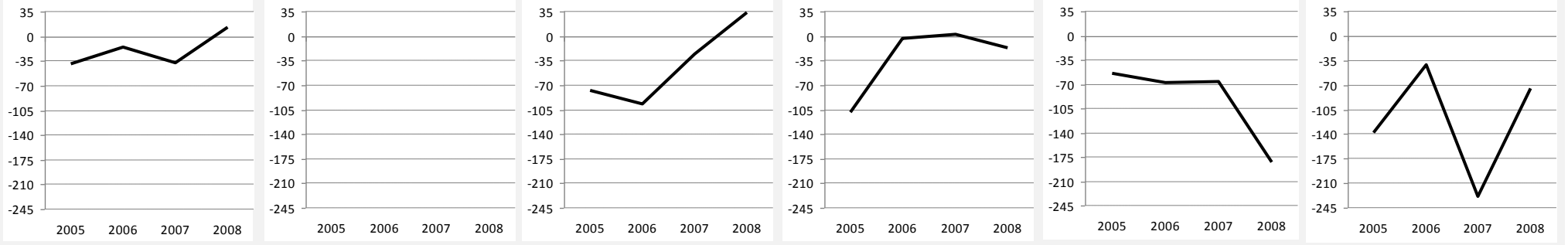
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	00/02	03/05	06/08
Photonics	5	6	8
Nanotechnology	0	1	0
Industrial Biotechnology	1	2	2
Advanced Materials	9	10	15
Micro-/Nanoelectronics	5	8	5
Advanced Manufacturing	5	4	4

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

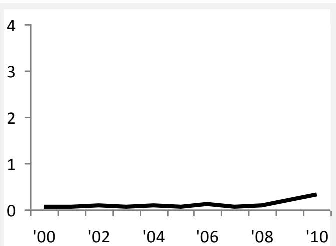
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)					
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

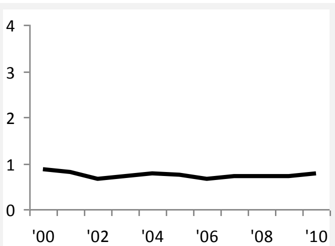
Source: EPO: PATSTAT / ZEW calculation.

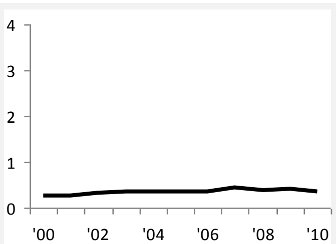
3) Trade

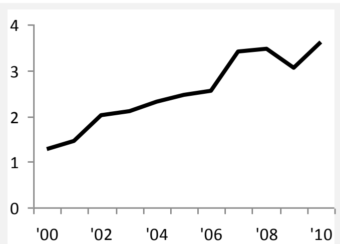
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

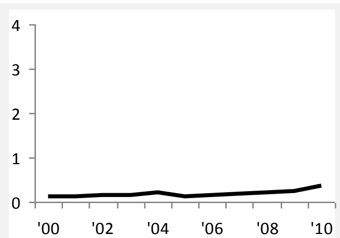
a) Significance: Share in the country's total exports (%)

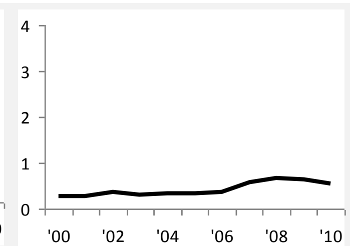




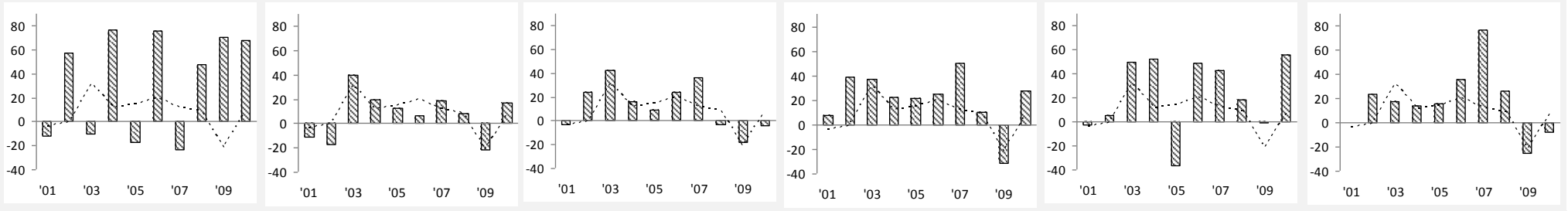




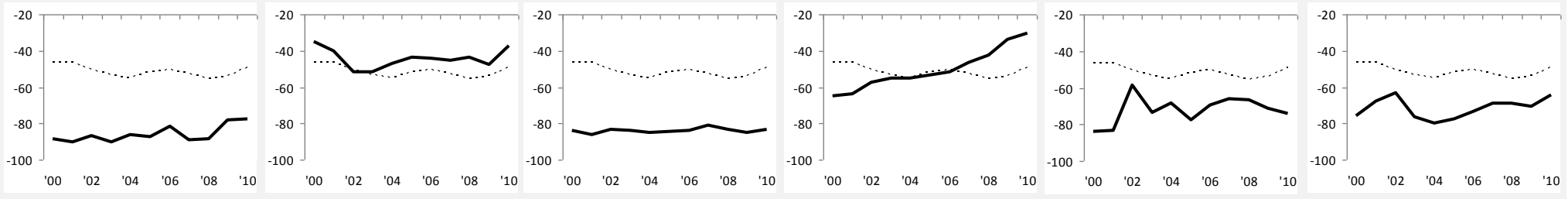




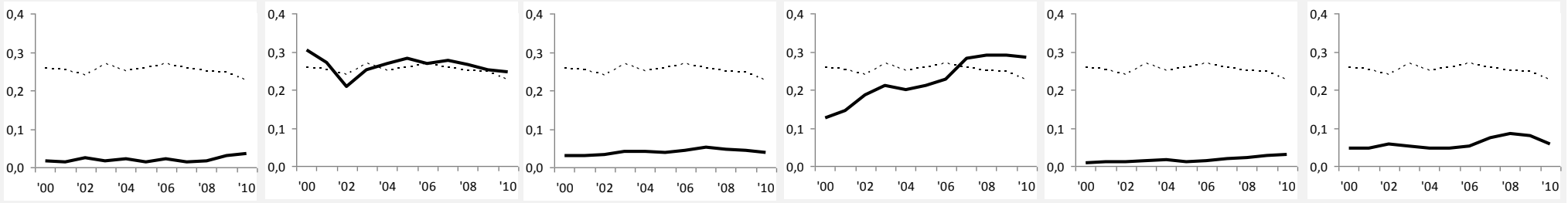
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



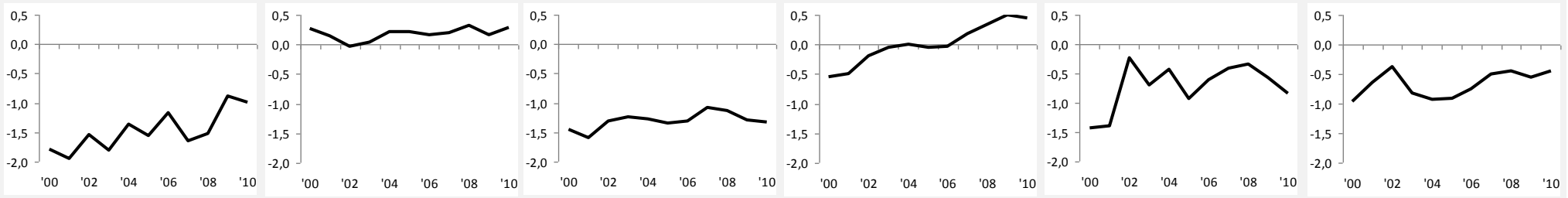
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



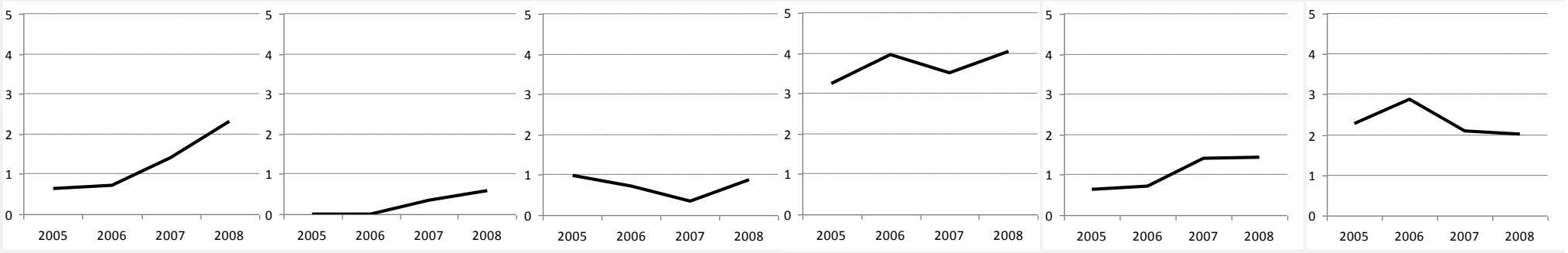
Source: UN: COMTRADE / ZEW and NIW calculation.

8.12 Hungary

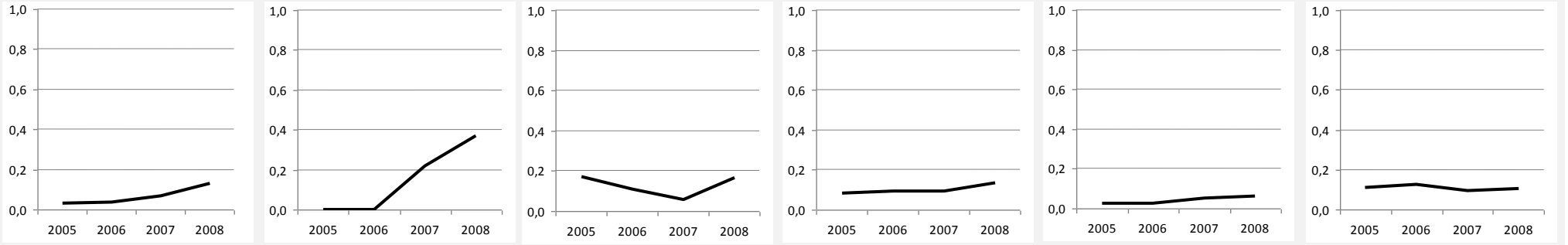
1) Patent Performance

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

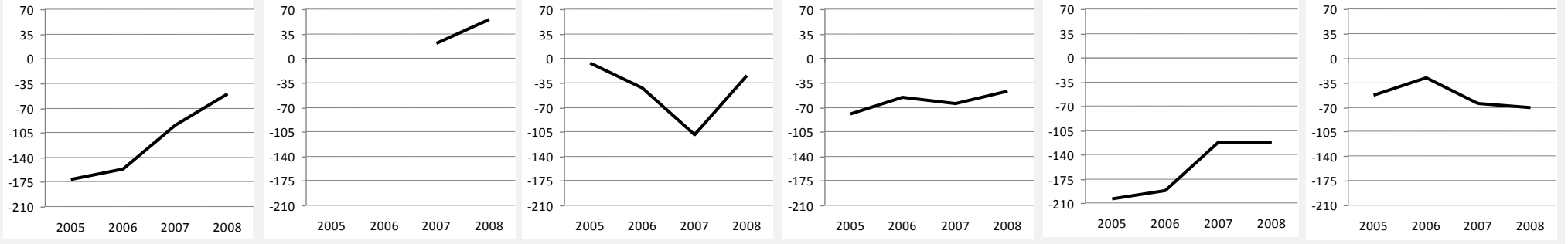
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
4	4	5	0	0	1	6	4	2	5	7	12	1	3	4	7	5	7

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

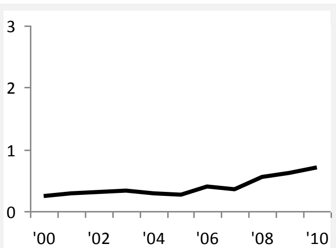
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	RICHTER GEDEON NYRT. SZEGEDI TUDOMANYEGYETEM	NOVEKO TRADING 2008 LLC Tessera Technologies Hungary Kft.	TESSERA TECHNOLOGIES HUNGARY KG	No organisations with >4 EPO/ PCT or national patents in 2005

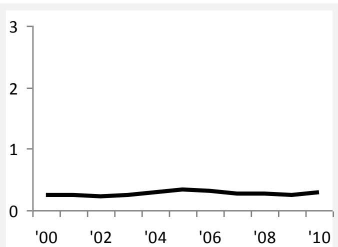
Source: EPO: PATSTAT / ZEW calculation.

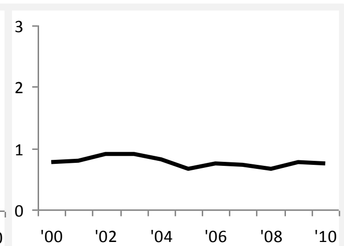
3) TRADE

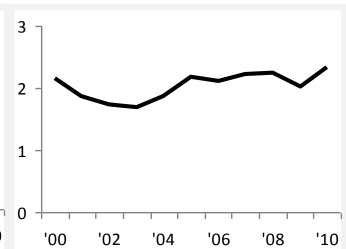
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

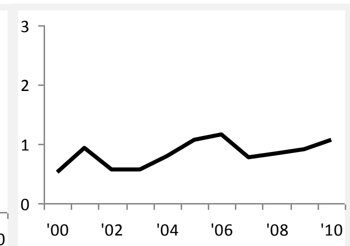
a) Significance: Share in the country's total exports (%)

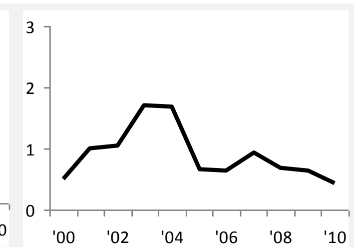




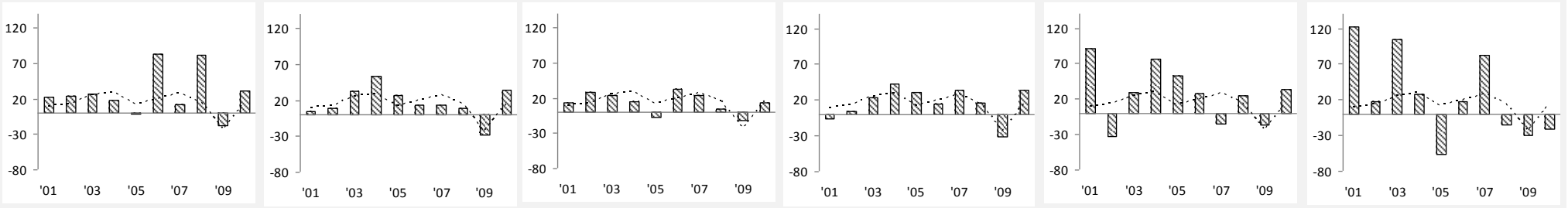




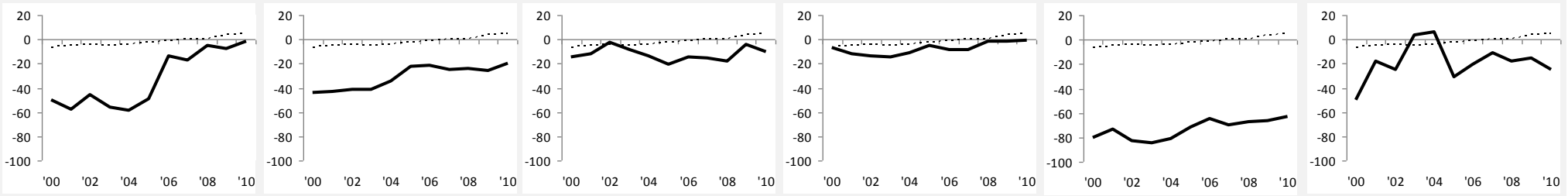




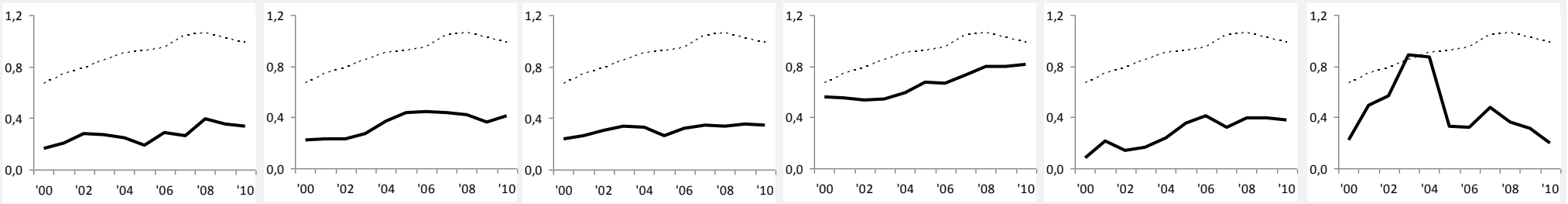
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



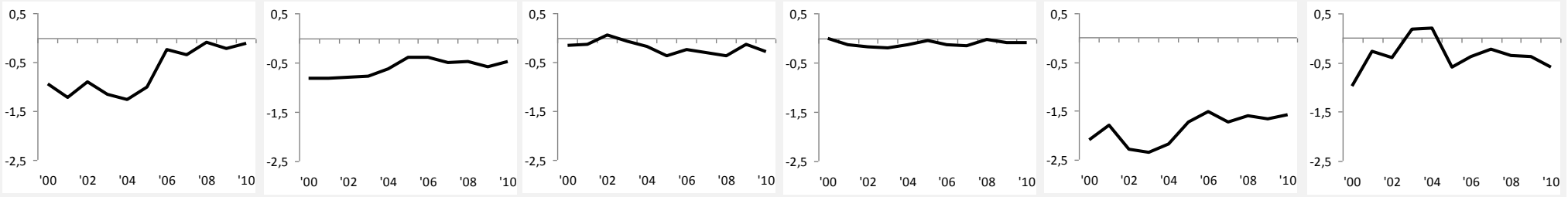
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



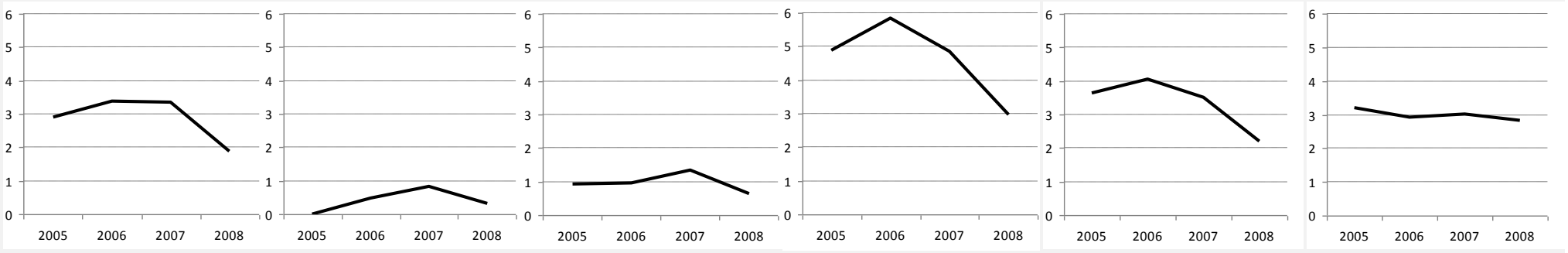
Source: UN: COMTRADE / ZEW and NIW calculation.

8.13 Ireland

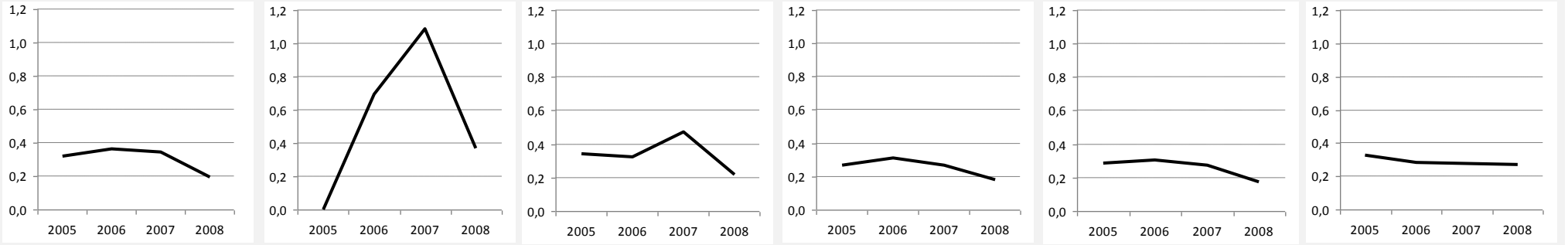
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

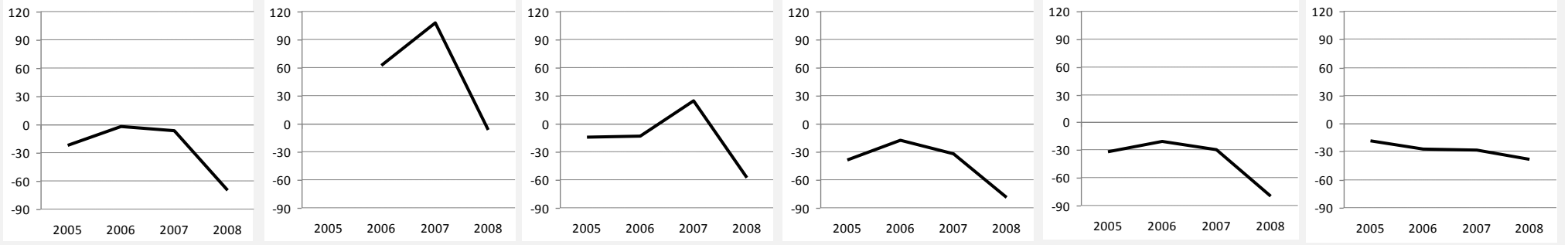
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
12	18	16	0	0	3	4	4	6	19	33	27	17	25	20	13	14	18

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

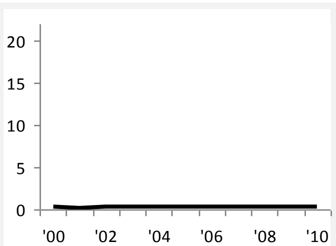
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Firecomms Limited	No organisations with >4 EPO/ PCT or national patents in 2005	TIBOTEC PHARMACEUTICALS LTD.	LOCTITE (R & D) LIMITED	University College Cork - National Unive	Saeco IPR Limited
UNIVERSITY COLLEGE CORK-NATIONAL U		Lifestyle Foods Limited	KINGSPAN HOLDINGS IRL LTD.	SENSL TECHNOLOGIES LTD	BRIAN FRANCIS MOONEY
EBLANA PHOTONICS LIMITED		National University of Ireland Galway	The Provost, Fellows and Scholars of the	THE PROVOST, FELLOWS AND SCHOLARS	Accenture Global Services Limited
NUALIGHT LTD.		Dublin City University	ELEMENT SIX LIMITED	Firecomms Limited	XSIL TECHNOLOGY LTD.
GERARD FRANCIS HAMILTON		WYETH RESEARCH IRELAND LIMITED	XSIL TECHNOLOGY LTD., DUBLIN	XSIL TECHNOLOGY LTD.	Scientific Games Holdings Limited
THE PROVOST, FELLOWS AND SCHOLARS			UNIVERSITY COLLEGE CORK - NATIONAL	Tessera Technologies Ireland Limited	
Sensl Technologies Ltd.			ELAN PHARMA INT LTD.	GloNav Limited	
BASIC HOLDINGS			CROWNSTONE LIMITED		

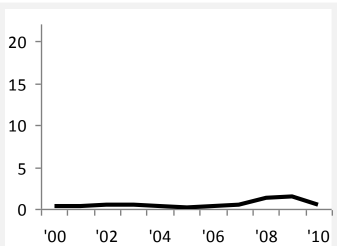
Source: EPO: PATSTAT / ZEW calculation.

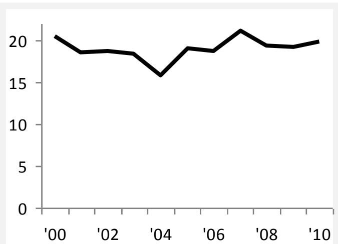
3) Trade

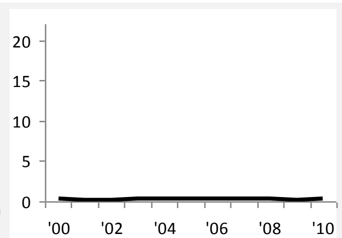
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

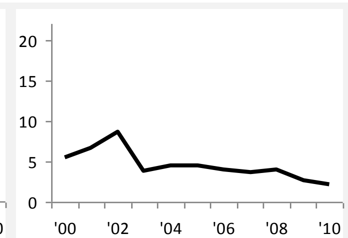
a) Significance: Share in the country's total exports (%)

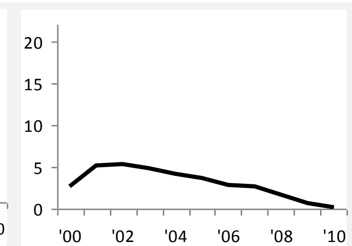




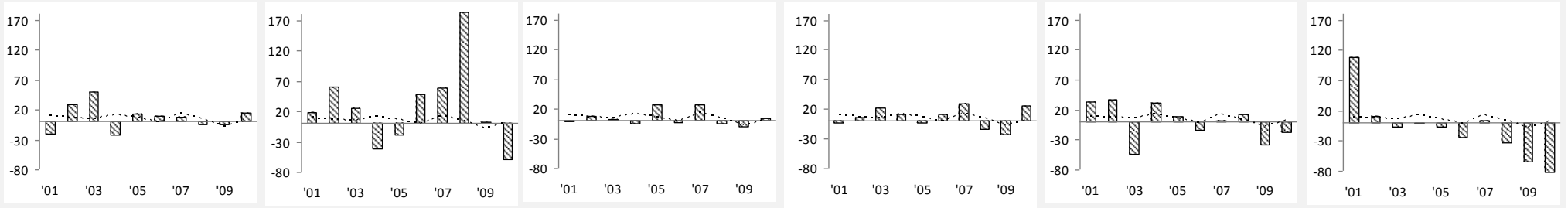




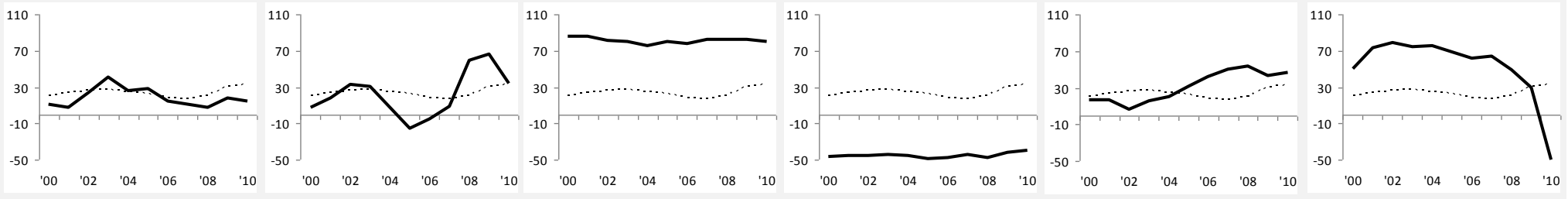




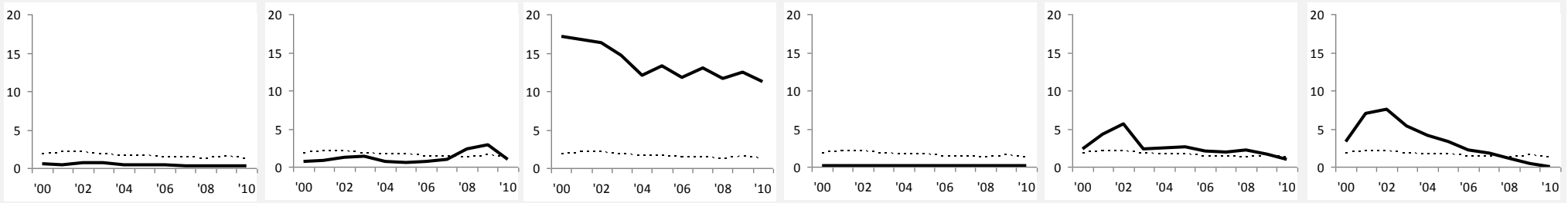
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



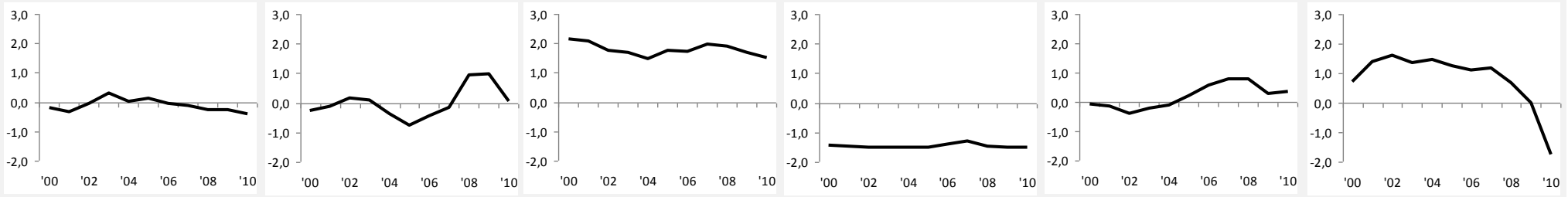
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



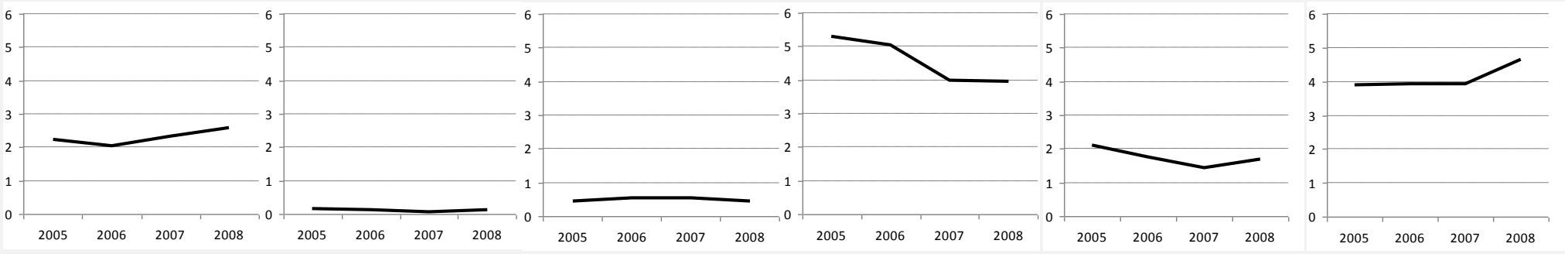
Source: UN: COMTRADE / ZEW and NIW calculation.

8.14 Italy

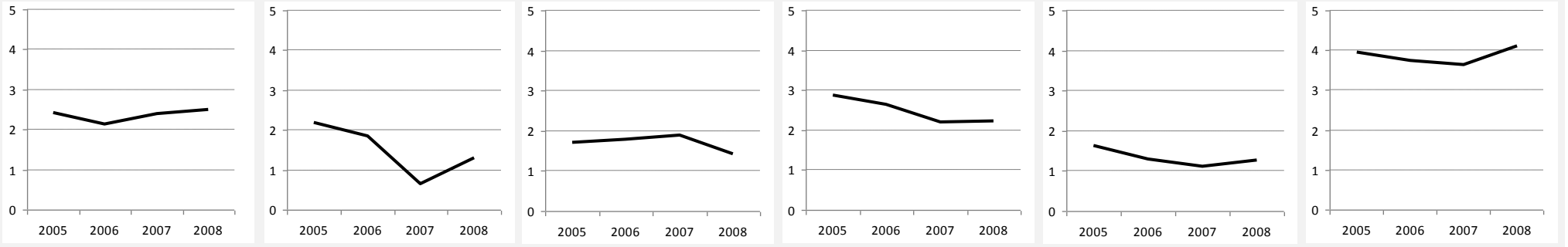
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

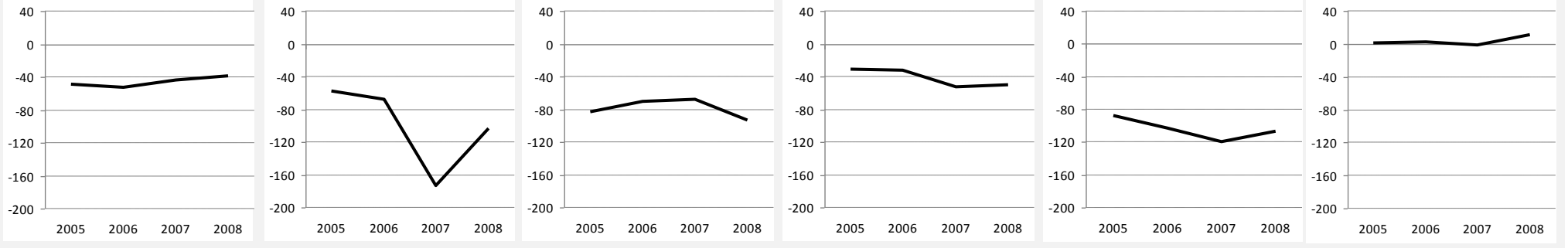
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing	
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
137	129	137	4	7	6	17	28	29	256	266	253	83	107	96	165	213	248

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

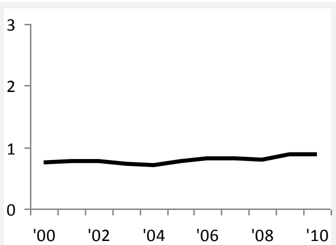
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
IGUZZINI ILLUMINAZIONE S.P.A., RECAN	STMicroelectronics S.r.l.	ISTITUTO DI RICERCHE DI BIOLOGIA MOI	BASELL POLIOLEFINE ITALIA S. R.	STMicroelectronics S.r.l.	STMicroelectronics Srl
FIAT RICERCHE	SAES GETTERS S.p.A.	ADORKEM TECHNOLOGY SPA	Solvay Solexis S.p.A.	C.R.F. Societa Consortile per Azioni	Campagnolo S.r.l.
PIRELLI & C. S.P.A	COLOROBBIA ITALIA S.P.A.	Dipharma Francis s.r.l.	STMICROELECTRONICS S.R.L.	SAES Getters S.p.A.	C.R.F. SOCIETA CONSORTILE PER AZIONI
OSRAM S.P.A. - SOCIETA' RIUNITE OSRAI		Consiglio Nazionale delle Ricerche	Polimeri Europa S.p.A.	Consiglio Nazionale Delle Ricerche	COMAU S.P.A.
STMicroelectronics, S.r.l.		Polimeri Europa S.p.A.	Pirelli Tyre S.p.A.	OSRAM S.P.A. - SOCIETA' RIUNITE OSRAI	Snap-on Equipment Srl a unico socio
GETTERS SPA		KIIAN S. P. A.	GETTERS SPA	LPE SPA	MAGNETI MARELLI POWERTRAIN SPA
PGT PHOTONICS S.P.A.		LAMBERTI SPA	Novamont S.p.A.	PELTECH S. R. L.	MARPOSS SOCIETA' PER AZIONI
BEGHELLI S.P.A.		Antibioticos S.p.A.	FIAT RICERCHE	POLITECNICO DI MILANO	POLITECNICO DI MILANO
Prysmian Cavi e Sistemi Energia S.R.L.		Universita' Degli Studi Di Udine	LAMBERTI S.P.A.	Solvay Solexis S.p.A.	ANSALDO ENERGIA S.P.A.
Consiglio Nazionale delle Ricerche		POLI IND CHIMICA SPA	M & G POLIMERI ITALIA S.P.A.	Esaote S.p.A.	Pirelli Tyre S.p.A.

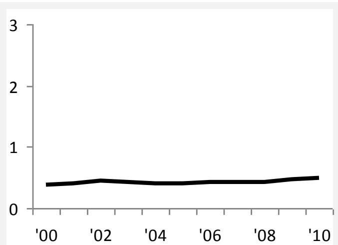
Source: EPO: PATSTAT / ZEW calculation.

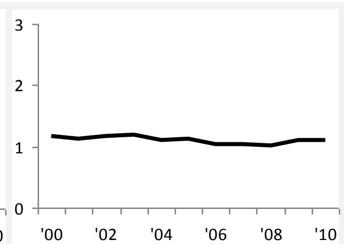
3) Trade

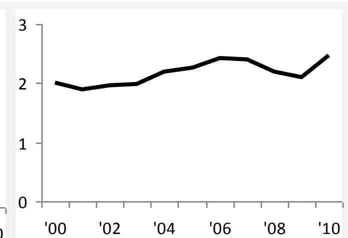
Photonics | Nanotechnology | Industrial Biotechnology | Advanced Materials | Micro-/Nanoelectronics | Advanced Manufacturing

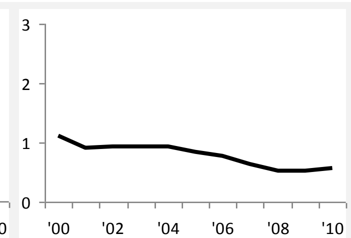
a) Significance: Share in the country's total exports (%)

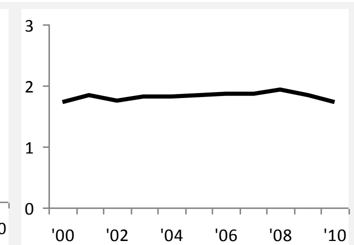




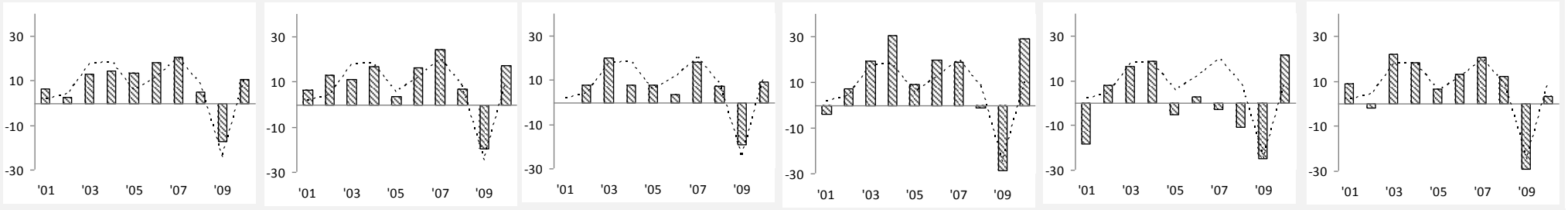




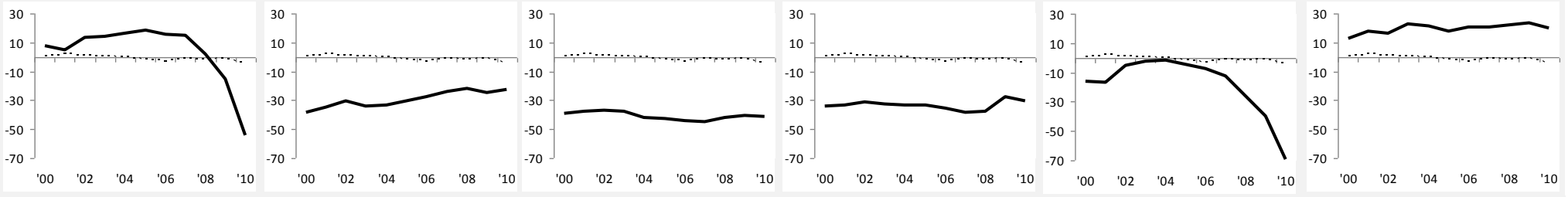




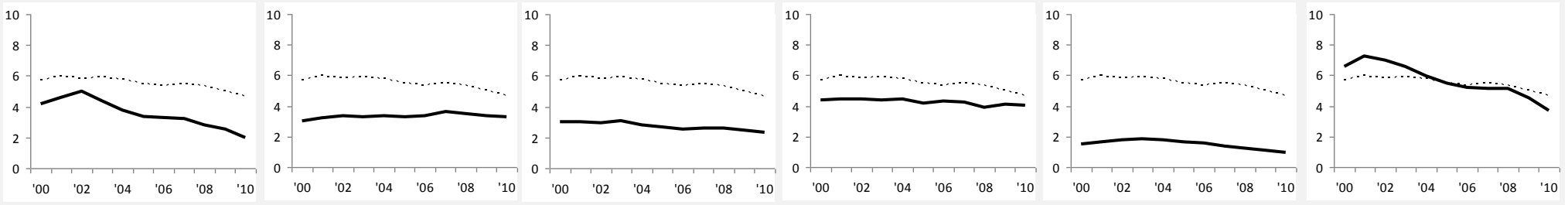
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



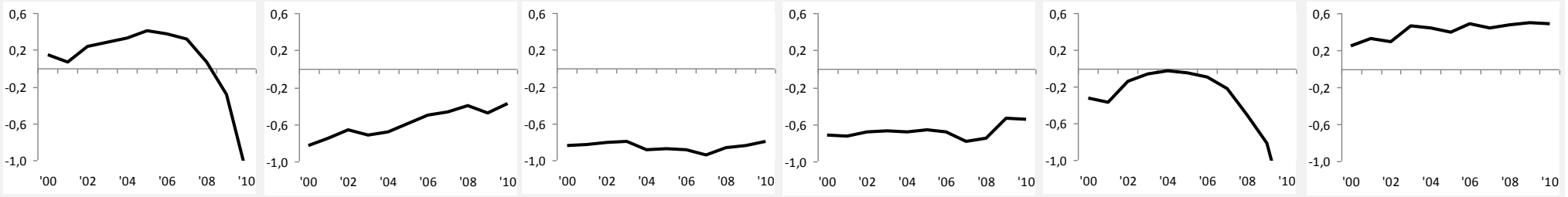
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



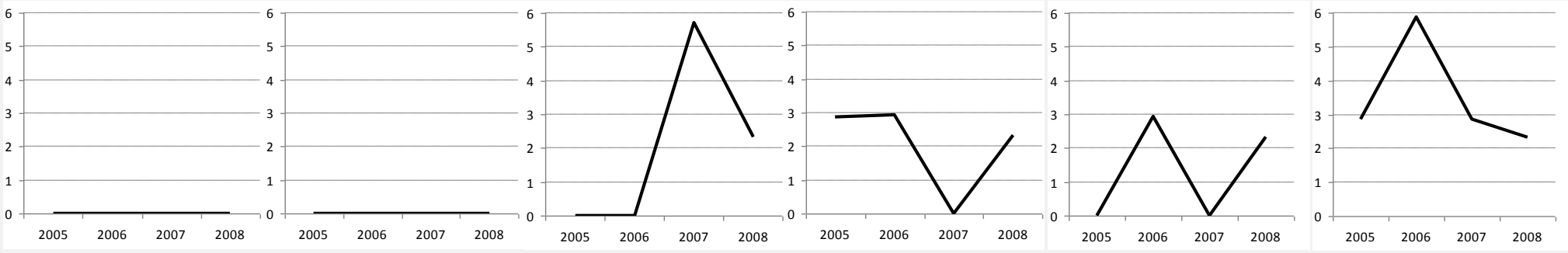
Source: UN: COMTRADE / ZEW and NIW calculation.

8.15 Latvia

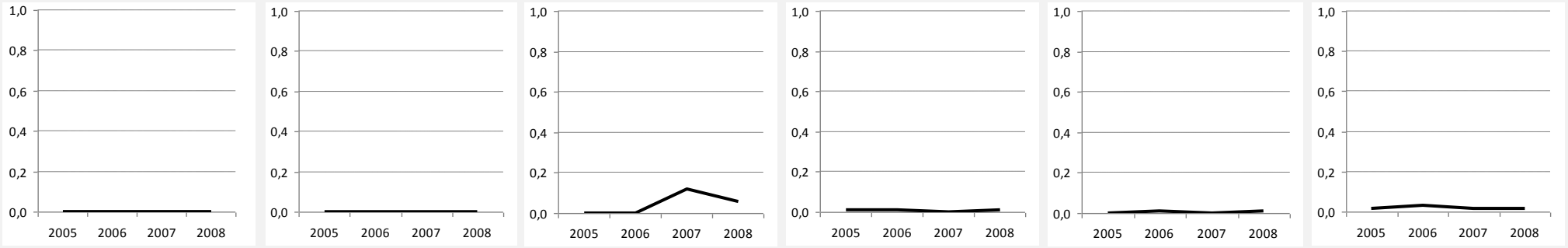
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

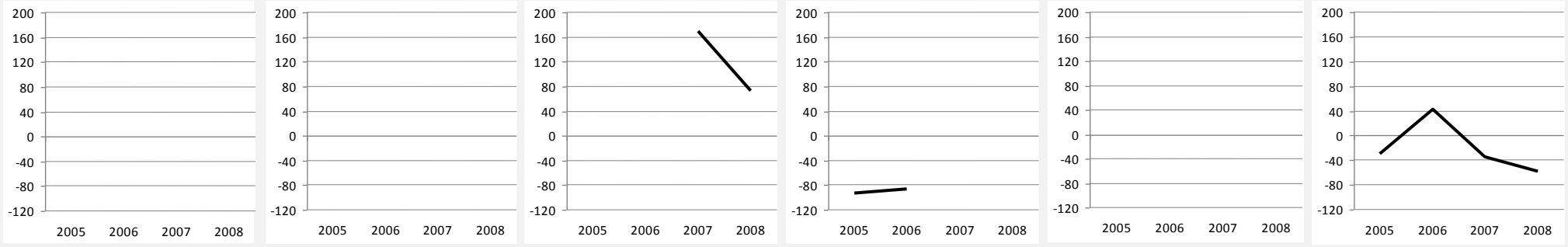
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (In*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	00/02	03/05	06/08
Photonics	0	0	0
Nanotechnology	0	0	0
Industrial Biotechnology	0	0	1
Advanced Materials	1	1	0
Micro-/Nanoelectronics	0	0	0
Advanced Manufacturing	1	0	1

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

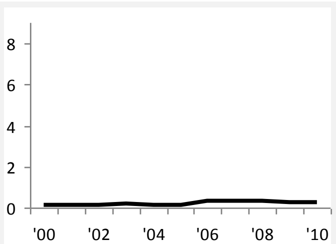
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

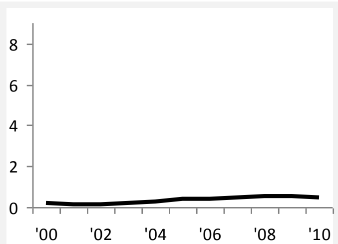
Source: EPO: PATSTAT / ZEW calculation.

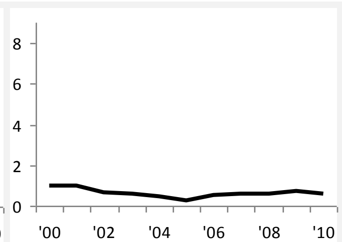
3) Trade

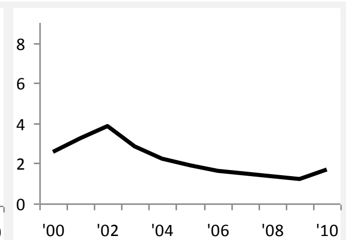
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

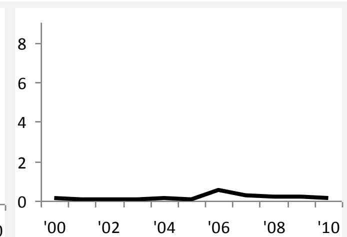
a) Significance: Share in the country's total exports (%)

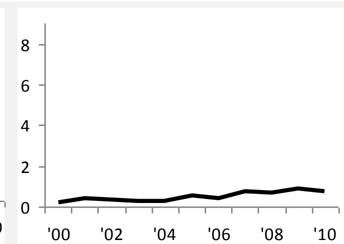




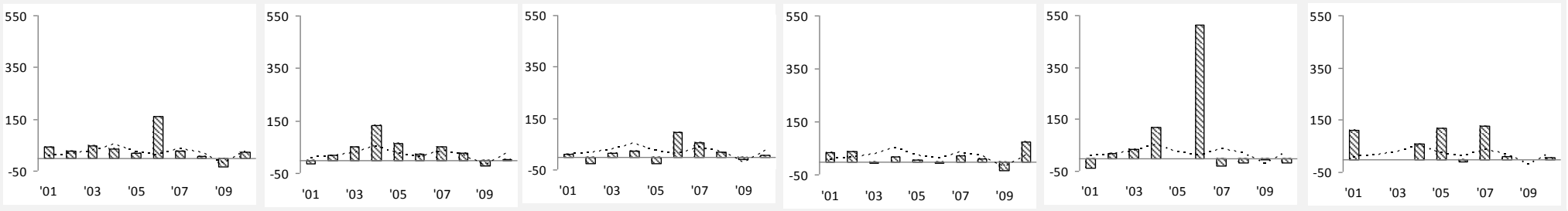




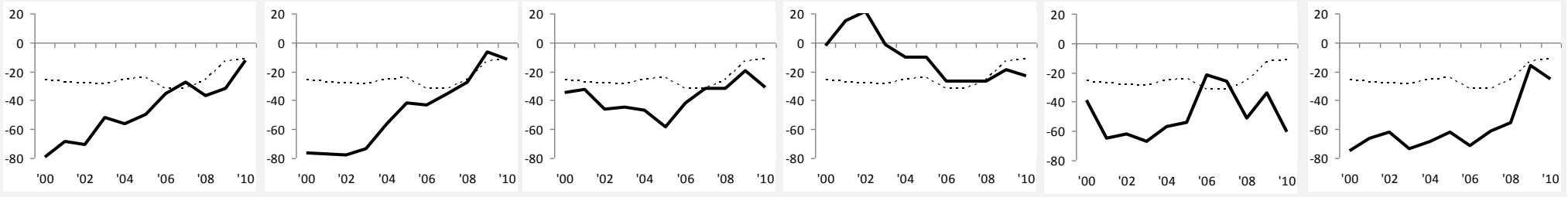




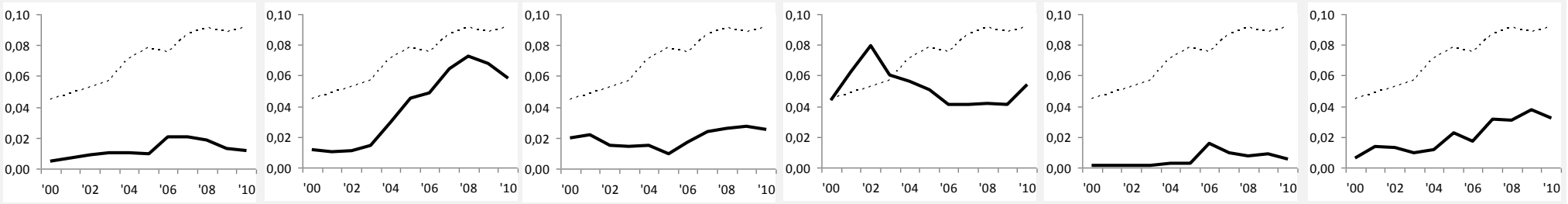
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



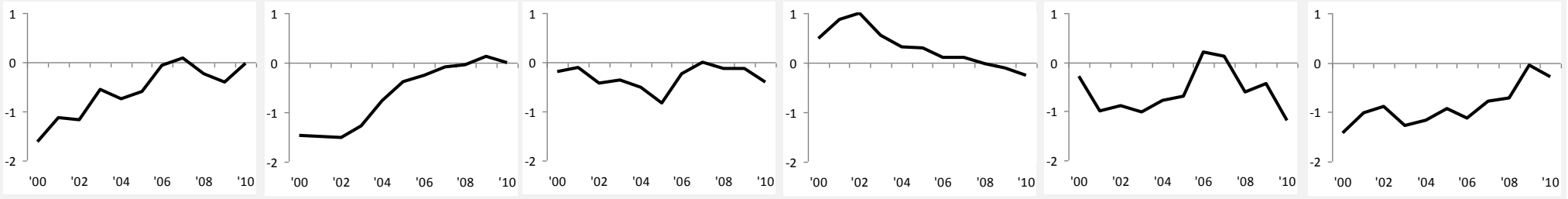
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



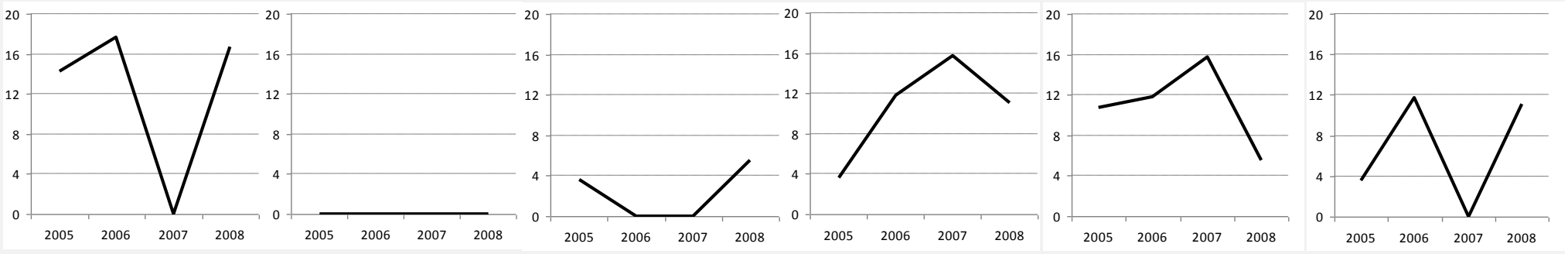
Source: UN: COMTRADE / ZEW and NIW calculation.

8.16 Lithuania

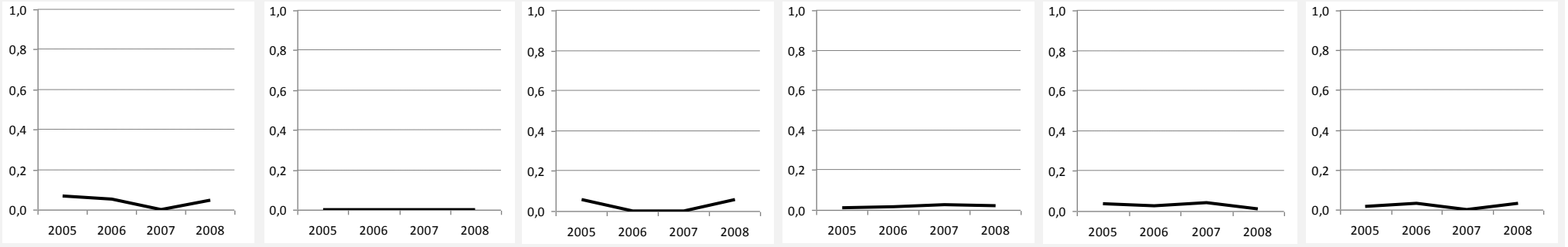
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

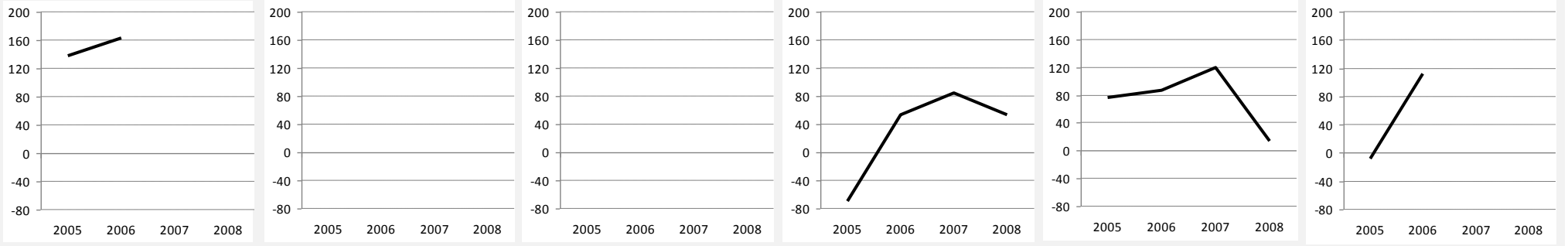
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
1	2	2	0	0	0	0	0	0	0	1	2	0	2	2	0	1	1

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

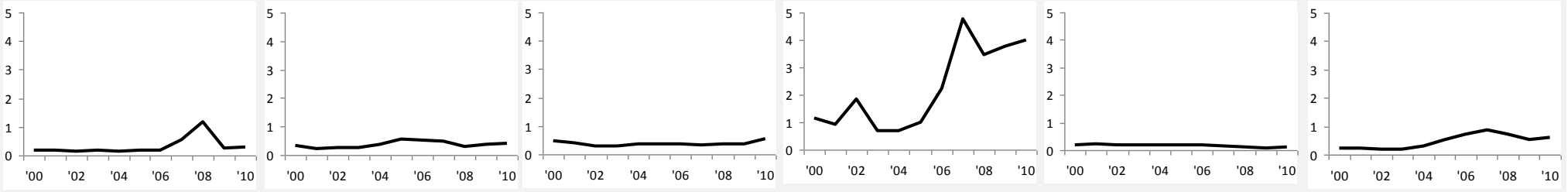
UAB EKSPLA	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

Source: EPO: PATSTAT / ZEW calculation.

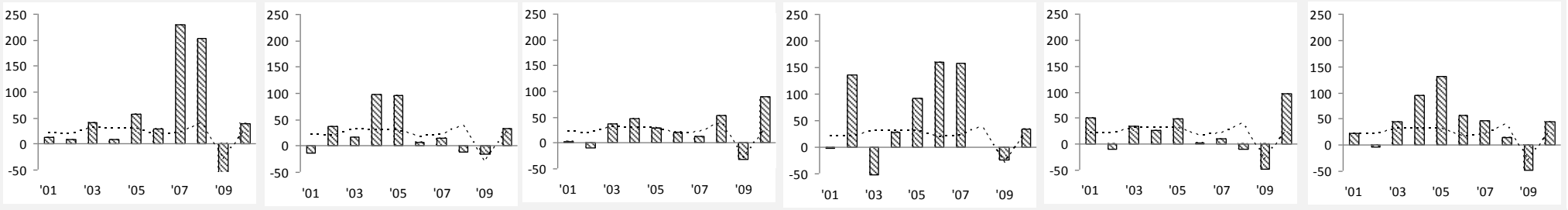
3) TRADE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

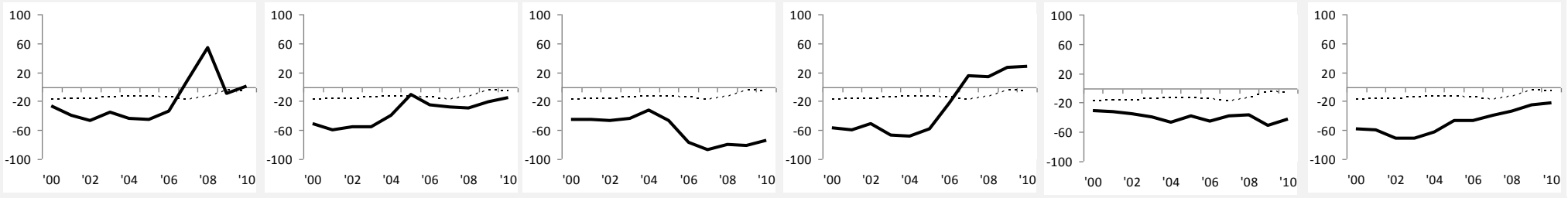
a) Significance: Share in the country's total exports (%)



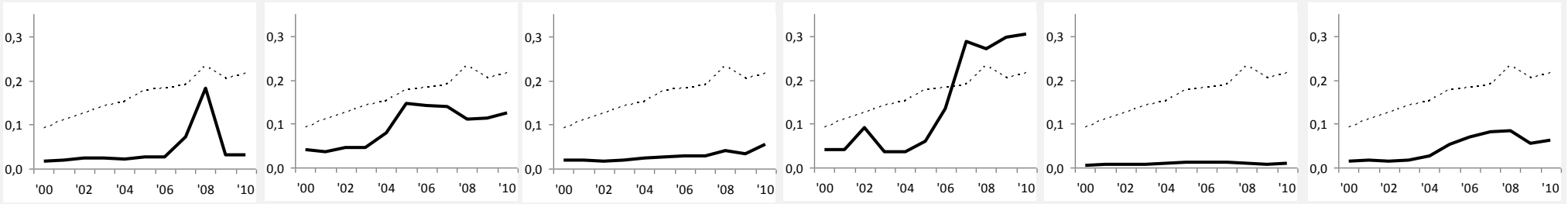
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



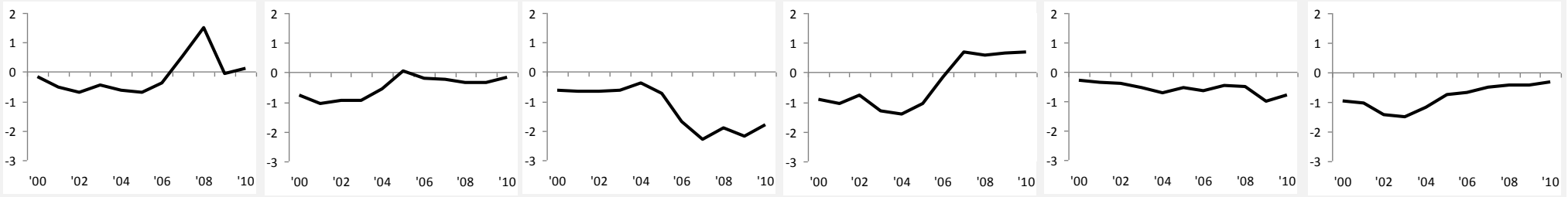
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



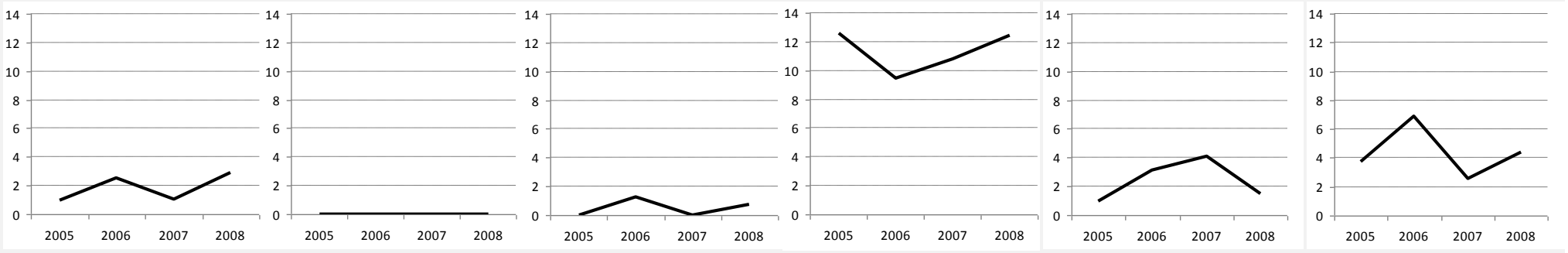
Source: UN: COMTRADE / ZEW and NIW calculation.

8.17 Luxembourg

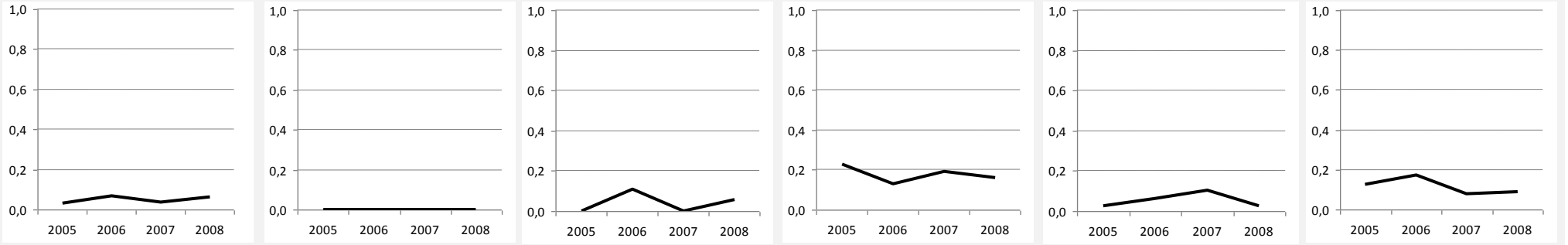
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

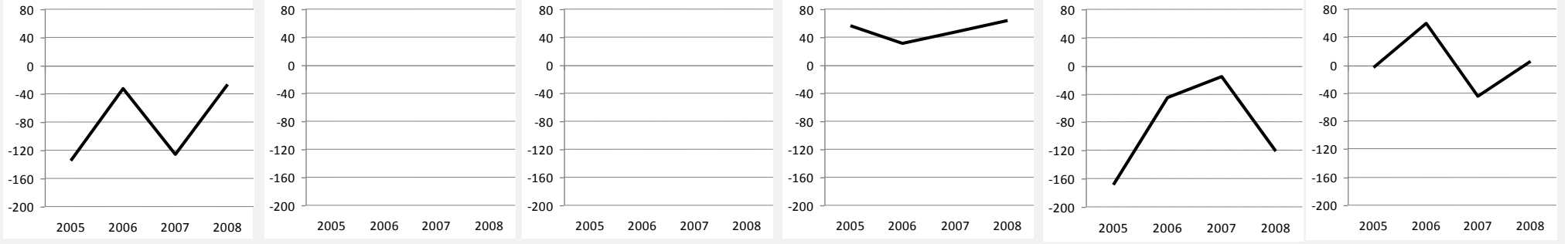
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
0	2	3	0	0	0	0	1	1	17	19	17	0	2	5	6	8	7

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

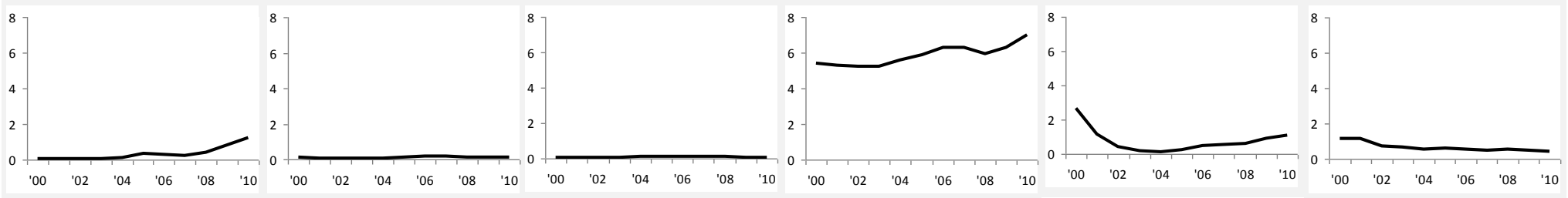
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
SEEREAL TECHNOLOGIES S.A.	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	Centre Luxembourgeois de Recherches	Delphi Technologies Holding S.Ã .r.l.	IEE International Electronics & Engineer
Noctron Soparfi S.A.			INVISTA TECHNOLOGIES S.A.R.L.	NOCTRON HOLDING S. A.	Delphi Technologies Holding S.Ã .r.l.
CENTRE LUXEMBOURGEOIS DE RECHERC			Husky Injection Molding Systems S.A.	IEE INTERNATIONAL ELECTRONICS & EN	LUXEMBOURG PATENT COMPANY S.A.
SMR Patents S.a.r.l.			Advanced Plastics Technologies Luxemb	Centre Luxembourgeois de Recherches	Husky Injection Molding Systems S.A.
NOCTRON SOPARFI S.A.			MOLTECH INVENT SA		PAUL WURTH S.A.
VISIOCORP PATENTS S.A.R.L.			Delphi Technologies Holding S.Ã .r.l.		
			ET LA CERAMIQUE S.A.		
			ArcelorMittal Commercial RPS S.Ã r.l.		

Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

a) Significance: Share in the country's total exports (%)


8
6
4
2
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'00
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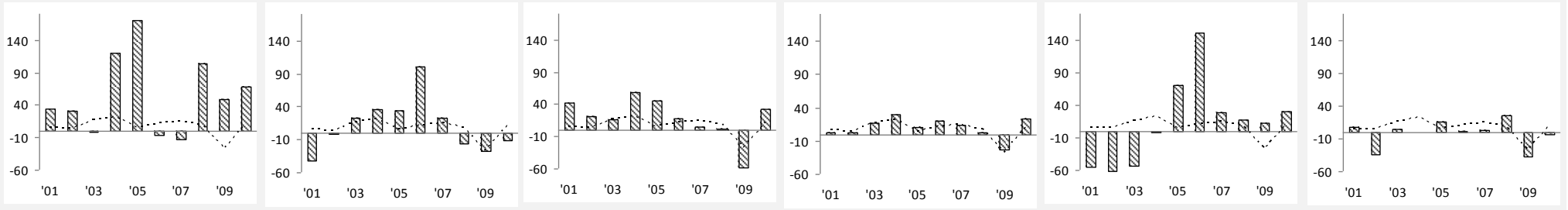
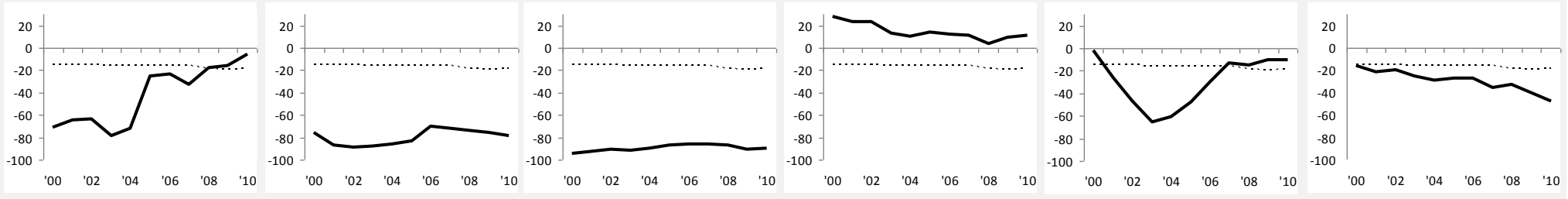
'06
'08
'10

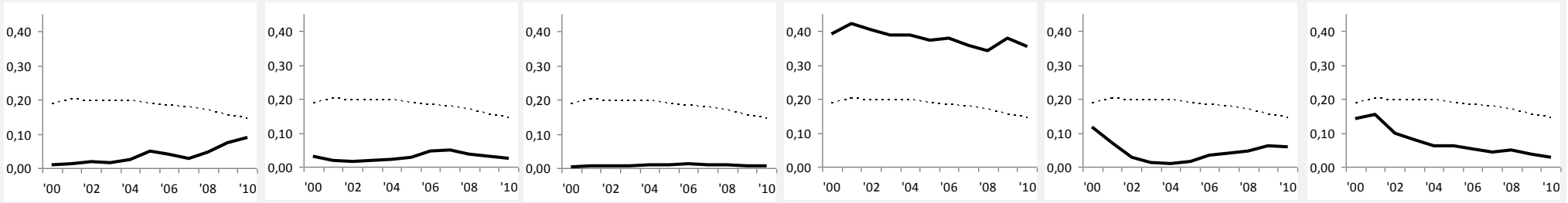
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



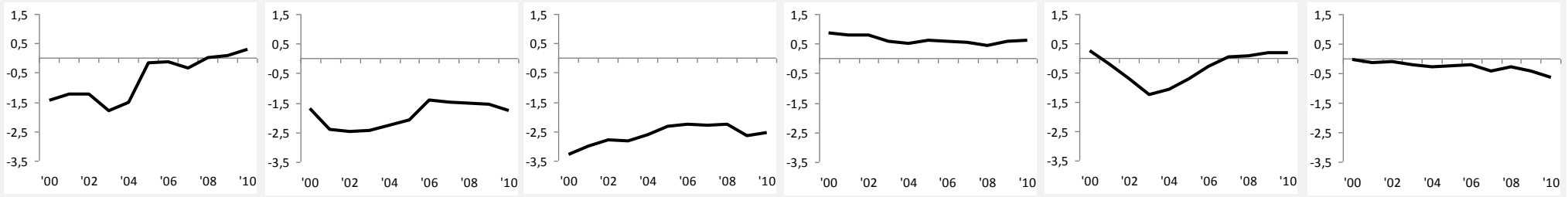
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



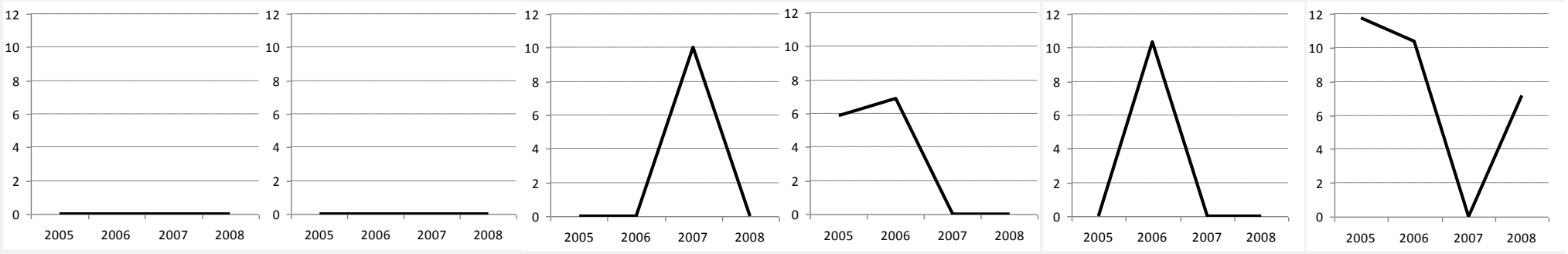
Source: UN: COMTRADE / ZEW and NIW calculation.

8.18 Malta

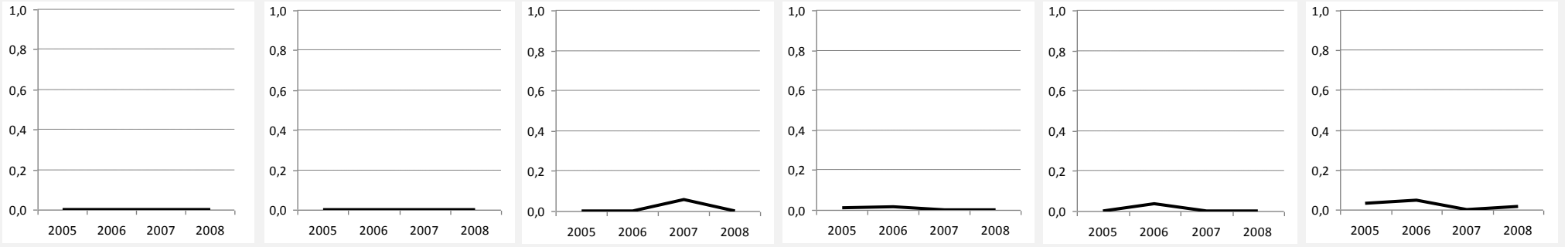
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

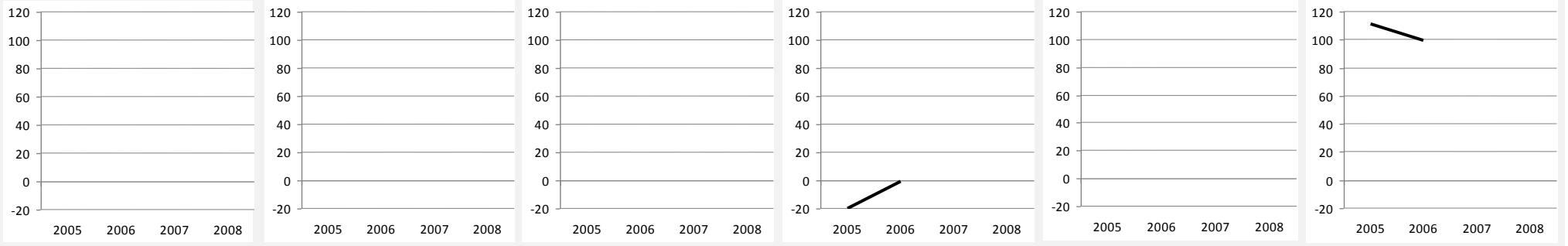
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

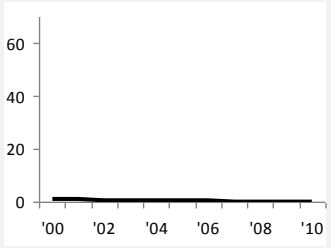
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

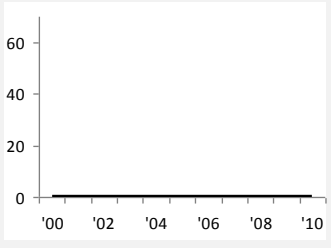
Source: EPO: PATSTAT / ZEW calculation.

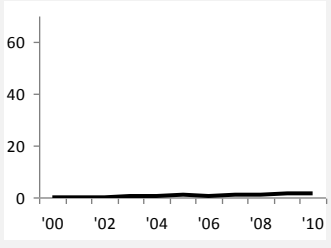
3) TRADE

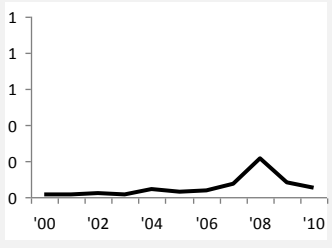
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

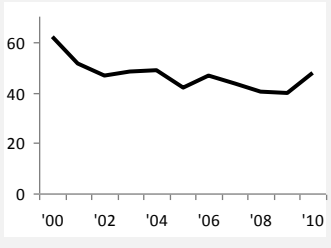
a) Significance: Share in the country's total exports (%)

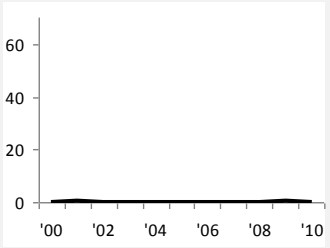




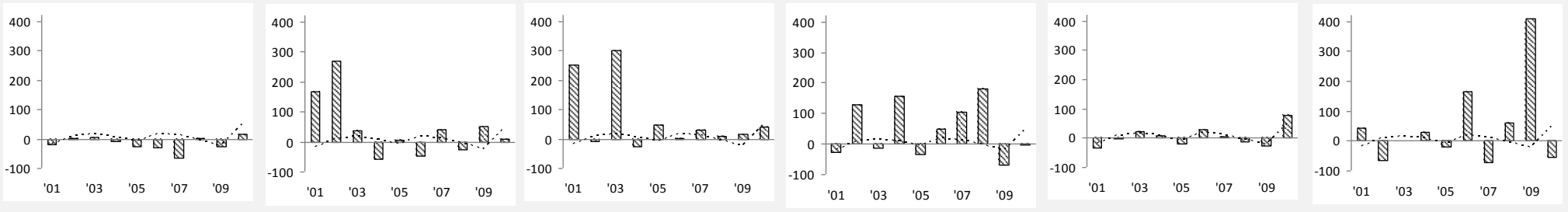




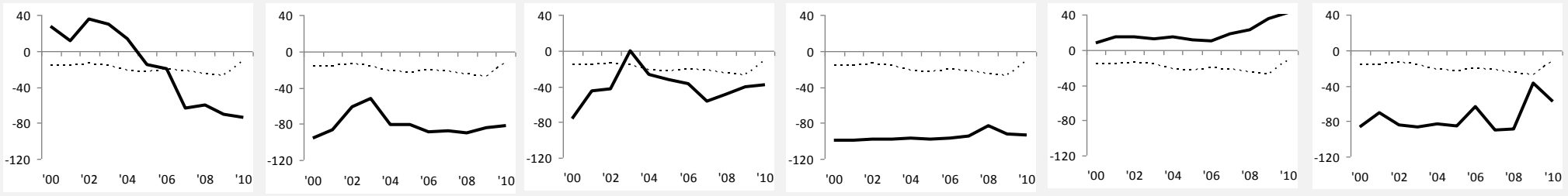




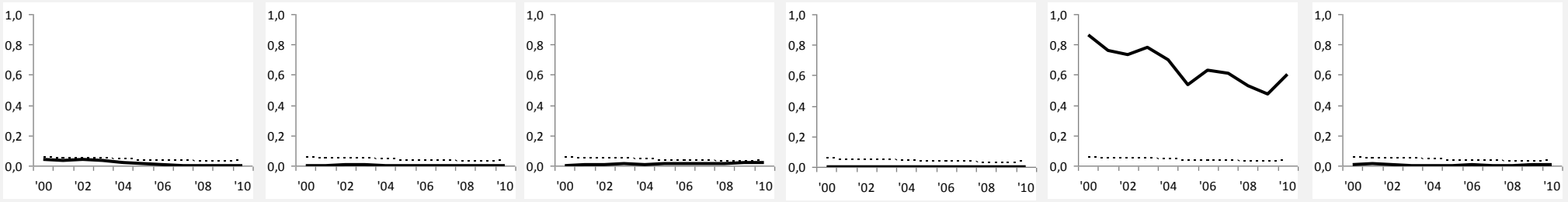
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



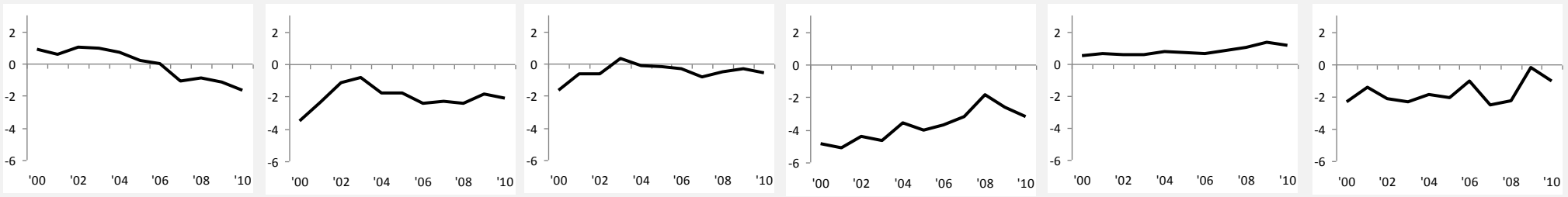
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



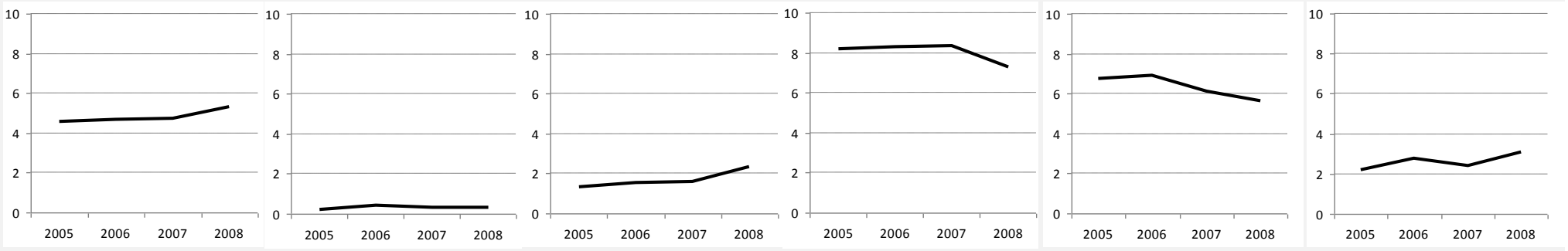
Source: UN: COMTRADE / ZEW and NIW calculation.

8.19 Netherlands

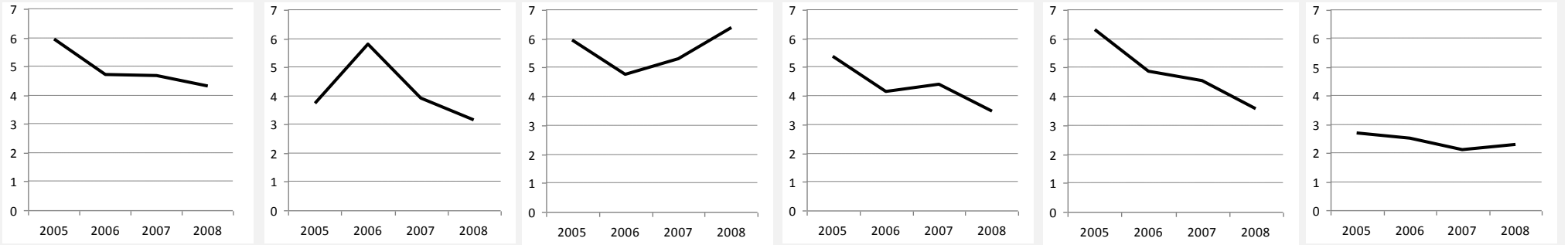
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

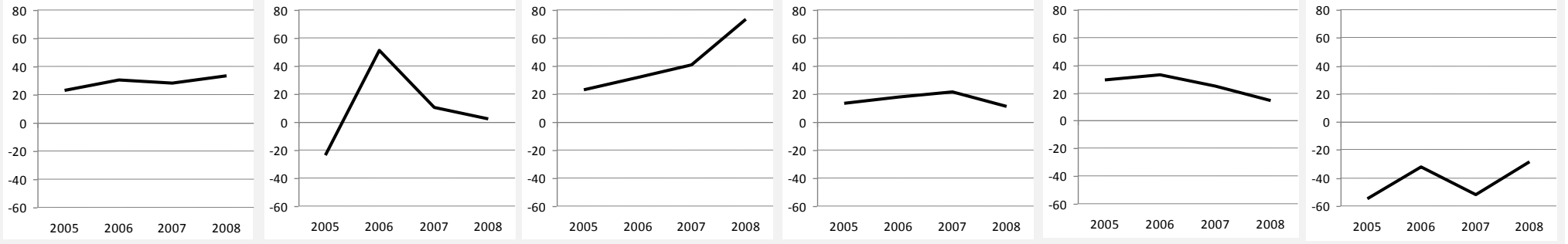
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
174	271	265	4	12	20	58	78	94	407	480	432	267	386	338	106	127	149

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

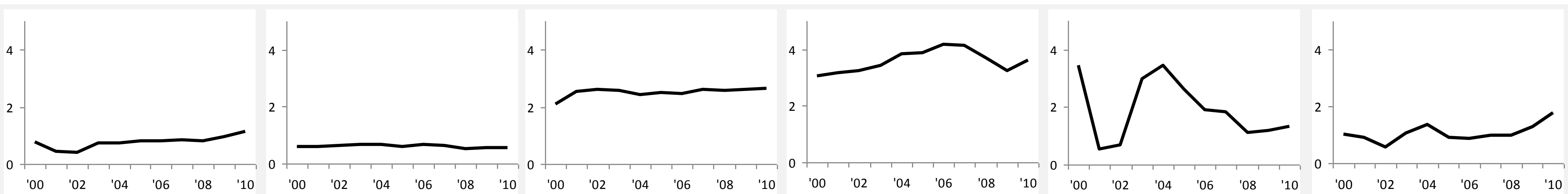
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Koninklijke Philips Electronics N.V.	KONINKLIJKE PHILIPS ELECTRONICS, N.V	DSM IP ASSETS B.V.	NXP B.V.	NXP B.V.	Koninklijke Philips Electronics N.V.
Draka Comteq B.V.	NXP B.V.	SHELL INTERNATIONALE RESEARCH MAA	ASML Netherlands B.V.	ASML Netherlands B.V.	NXP BV
ASML Netherlands BV	Nederlandse Organisatie voor Toegepa	KONINKLIJKE PHILIPS ELECTRONICS N.V.	DSM IP ASSETS B.V	ASML HOLDING N.V.	Nederlandse Organisatie voor toegepa
DSM IP ASSETS B.V.	ASML Netherlands B.V.	ederlandse Organisatie voor Toegepast	Sabic Innovative Plastics IP B.V.	NEDERLANDSE ORGANISATIE VOOR TOE	SCHLUMBERGER TECHNOLOGY BV
NEDERLANDSE ORGANISATIE VOOR TOE	HITACHI GLOBAL STORAGE TECH	UNILEVER N.V.	Akzo Nobel N.V.	ASML MASKTOOLS B.V.	SHELL INTERNATIONAL RESEARCH MAAT
NXP, B.V.	UNIVERSITEIT TWENTE	SUN CHEMICAL B.V.	SABIC Innovative Plastics IP B.V.	Hitachi Global Storage Technologies Ne	Berkin B.V.
SHLJUMBERGER TEKNOLODZHI B.V.		AKZO NOBEL N.V.	NEDERLANDSE ORGANISATIE VOOR TOE	PHILIPS INTELLECTUAL PROPERTY	TECHNISCHE UNIVERSITEIT DELFT
OTB GROUP BV		OCE-TECHNOLOGIES B.V.	Shell Internationale Research Maatscha	FICO BV	adidas International Marketing B.V.
ASML Holding N.V		PURAC BIOCHEM BV	ASML Holding N.V.	OTB Group B.V.	UNIVERSITEIT TWENTE
Helianthos B.V.		SYNAPSE B.V.	KRATON Polymers Research B.V.	Helianthos B.V.	PRAD RESEARCH AND DEVELOPMENT N.

Source: EPO: PATSTAT / ZEW calculation.

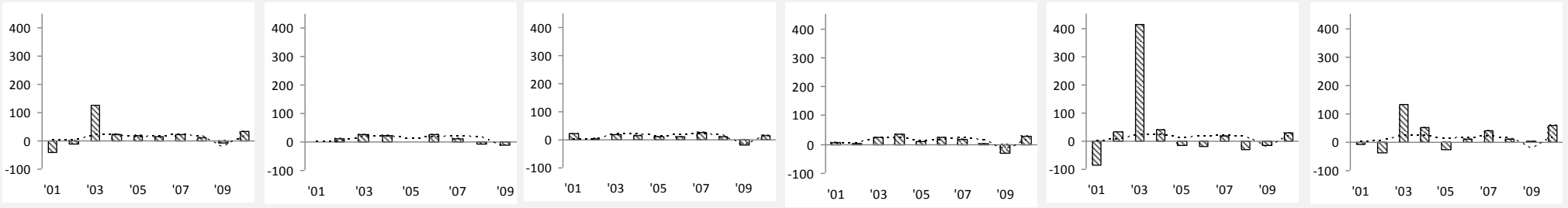
3) Trade

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

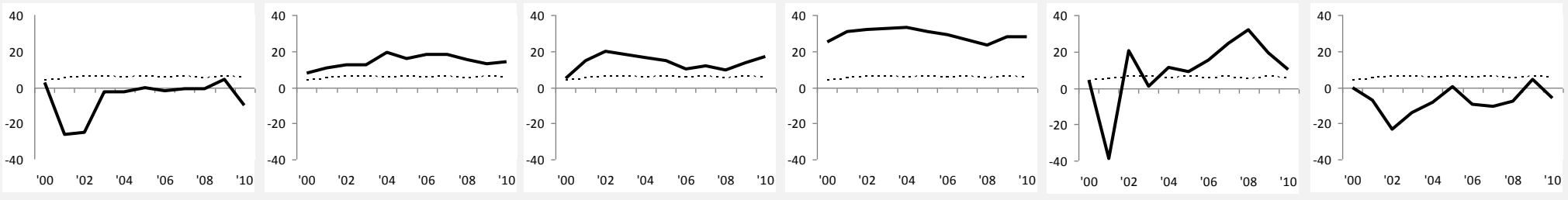
a) Significance: Share in the country's total exports (%)



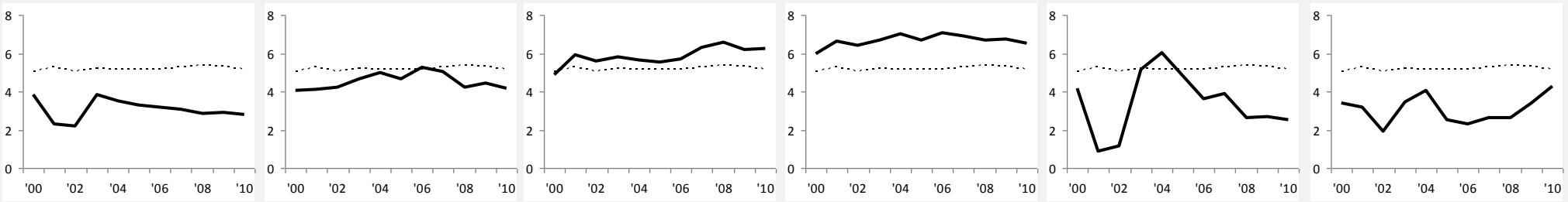
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



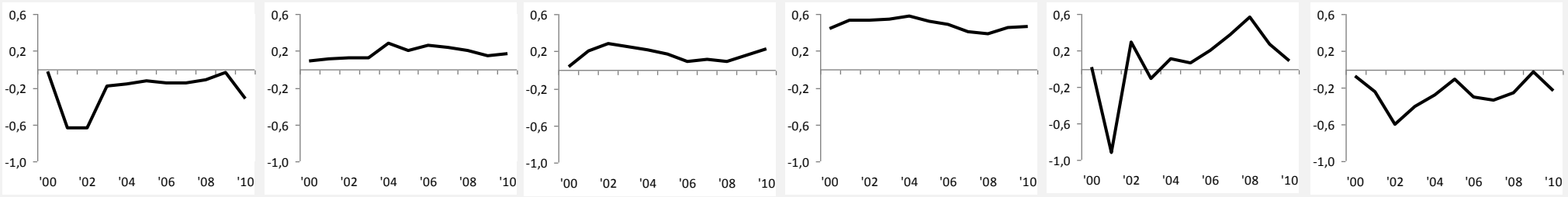
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



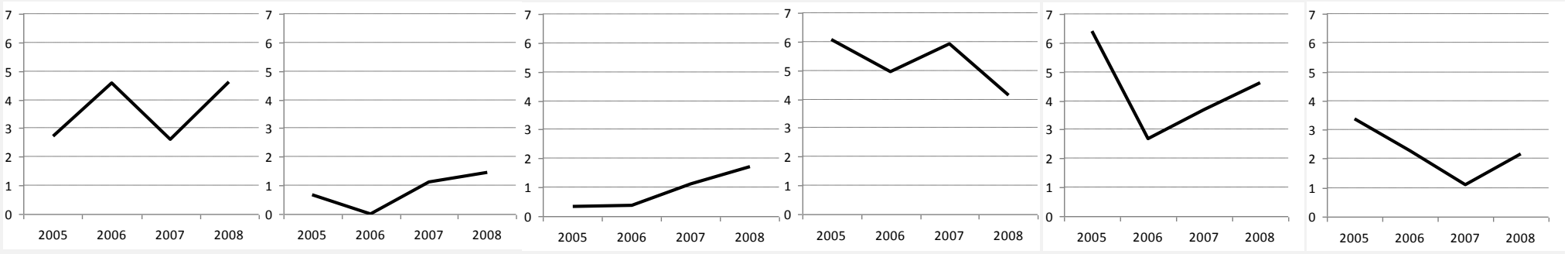
Source: UN: COMTRADE / ZEW and NIW calculation.

8.20 Poland

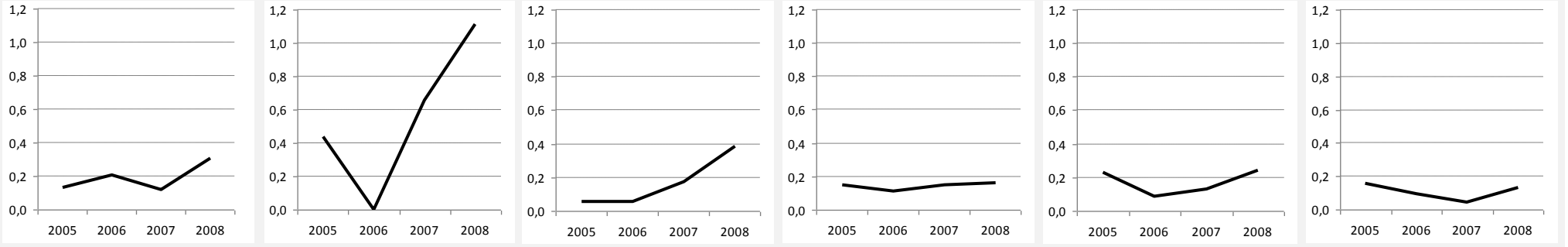
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

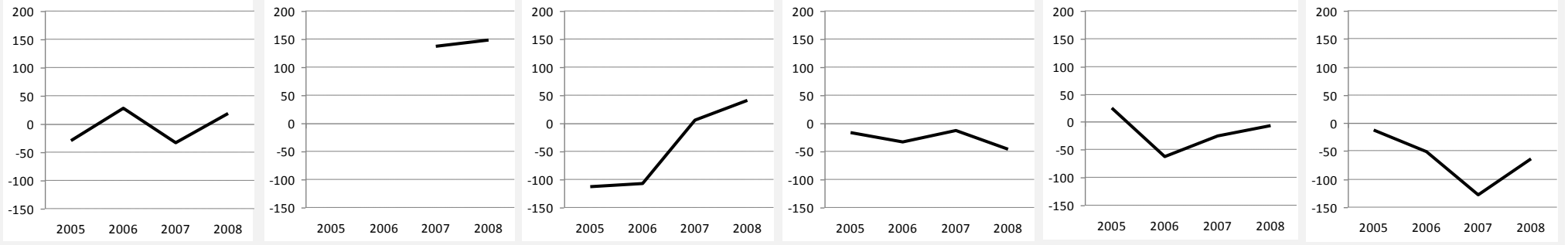
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
3	6	11	0	1	3	1	1	4	14	15	15	8	11	11	5	6	6

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

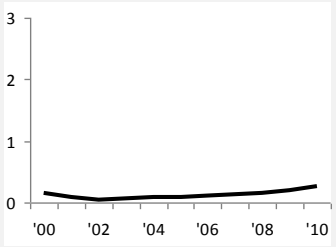
POLITECHNIKA WROC&LSTROK;AWSKA
INSTYTUT TECHNOLOGII ELEKTRONOWE
POLITECHNIKA WARSZAWSKA
CZOGALLA JACEK MCJ
AMMONO SP.ZO.O.

Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

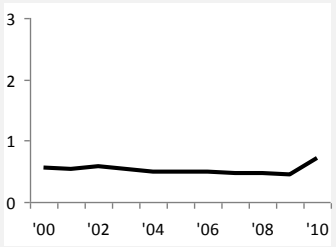
Photonics

a) Significance: Share in the country's total exports (%)



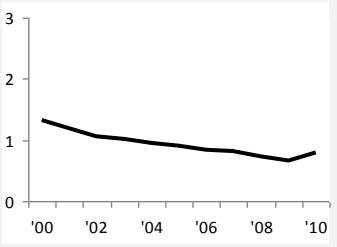
Nanotechnology

ZACHODNIOPOMORSKI UNIWERSYTET T



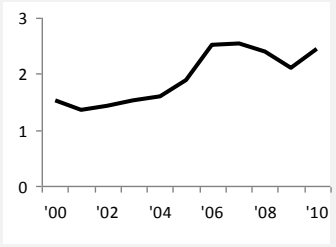
Industrial Biotechnology

POLITECHNIKA LUBELSKA
UNIWERSYTET PRZYRODNICZY WE WROC
POLITECHNIKA &LSTROK;ODZKA
INSTYTUT HODOWLI I AKLIMATYZACJI RO
AKADEMIA ROLNICZA



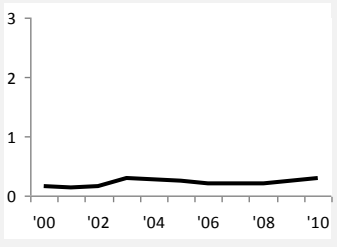
Advanced Materials

AMMONO Sp.z o.o.
INSTYTUT WYSOKICH CISNIEN POLSKIEJ
Termo Organika Sp. z o.o.
INSTYTUT CHEMII PRZEMYS&LSTROK;OW
INSTYTUT TECHNOLOGII ELEKTRONOWE
POLITECHNIKA &LSTROK;ODZKA
INSTYTUT METALI NIE&ZDOT;ELAZNYCH
UNIWERSYTET MIKO&LSTROK;AJA KOPE
AKADEMIA GORNICZO-HUTNICZA IM. ST
POLITECHNIKA LUBELSKA



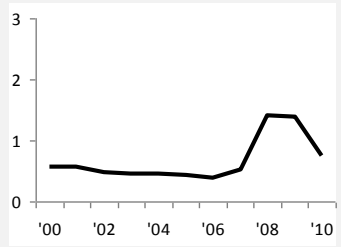
Micro-/Nanoelectronics

INSTYTUT TECHNOLOGII ELEKTRONOWE
Ammono. Sp. z o.o.
INSTYTUT TELE-I RADIOTECHNICZNY
INSTYTUT FIZYKI POLSKIEJ AKADEMII NA
ZACHODNIOPOMORSKI UNIWERSYTET T
POLITECHNIKA WROC&LSTROK;AWSKA

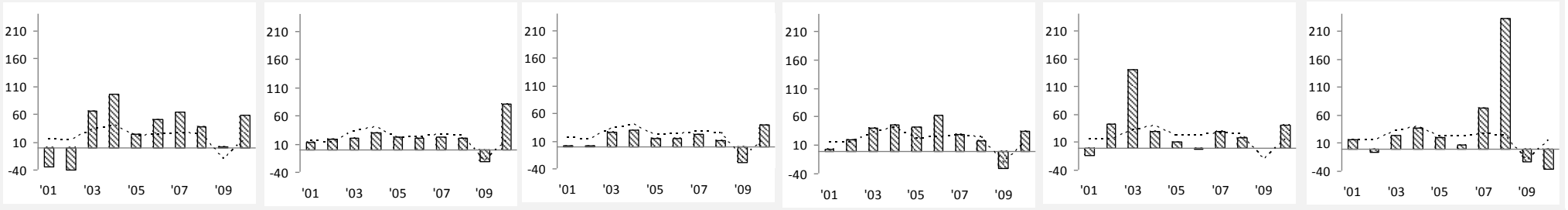


Advanced Manufacturing

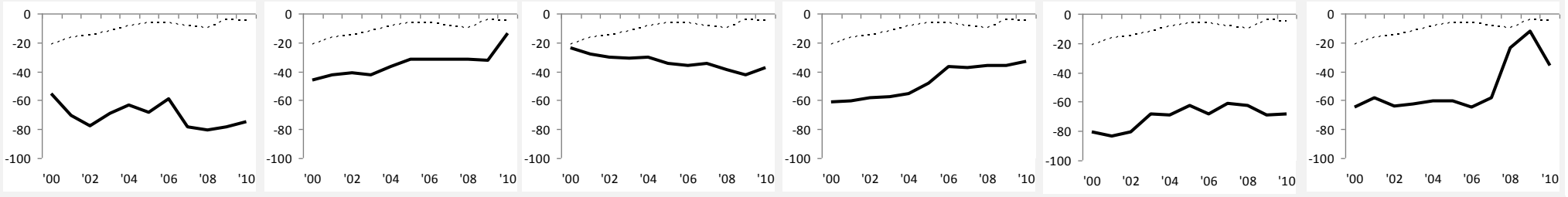
PRZEMYS&LSTROK;OWY INSTYTUT AUTC
POLITECHNIKA WROC&LSTROK;AWSKA
AKADEMIA GORNICZO-HUTNICZA IM. ST
INSTYTUT METALI NIE&ZDOT;ELAZNYCH
POLITECHNIKA WARSZAWSKA
POLSKA AKADEMIA NAUK INSTYTUT ME
ENERGOINSTAL SPO&LSTROK;KA AKCYJI
FILA ANTONI POLSKA FABRYKA WODOM
CENTRUM NAUKOWO-TECHNICZNE KOL
INSTYTUT TECHNICZNY WOJSK LOTNICZ



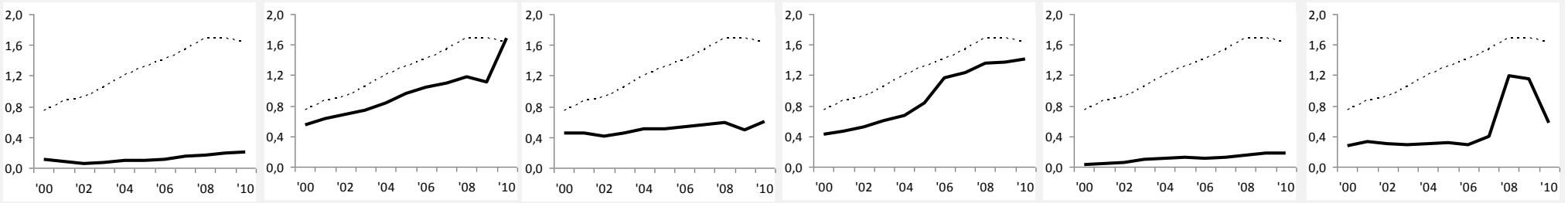
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



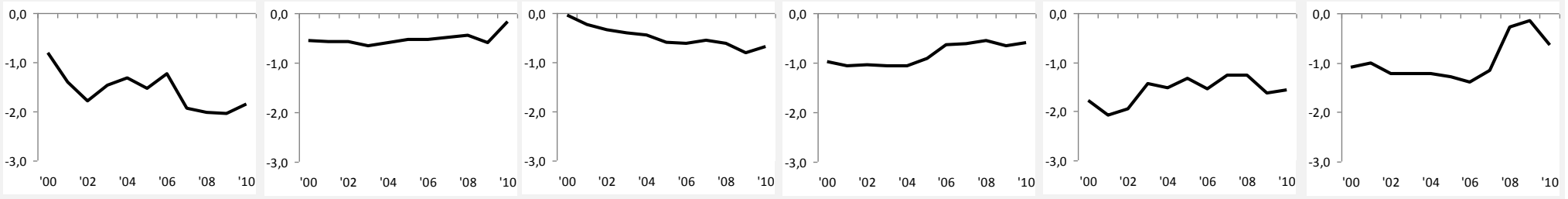
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



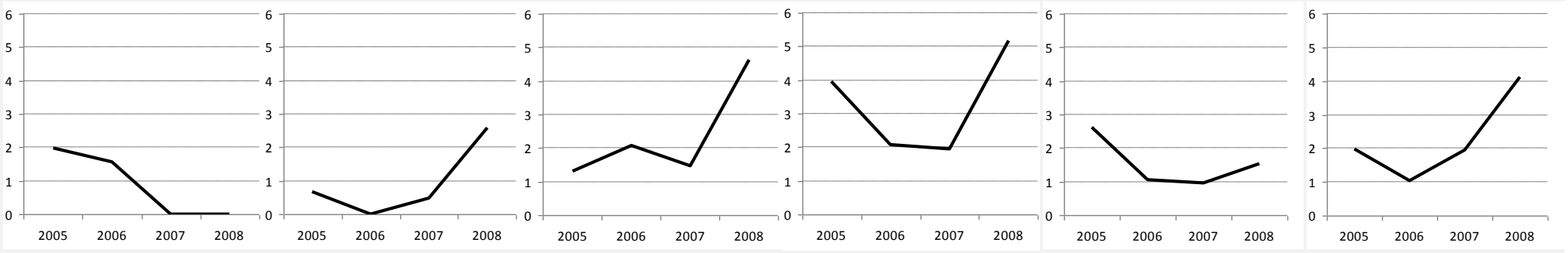
Source: UN: COMTRADE / ZEW and NIW calculation.

8.21 Portugal

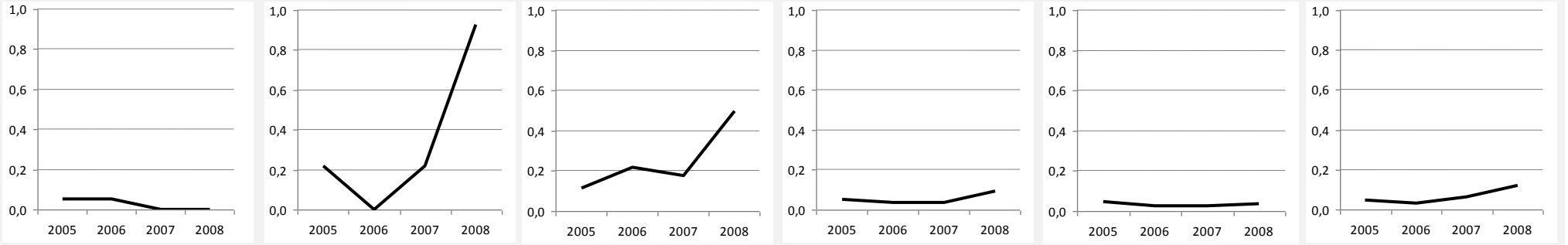
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

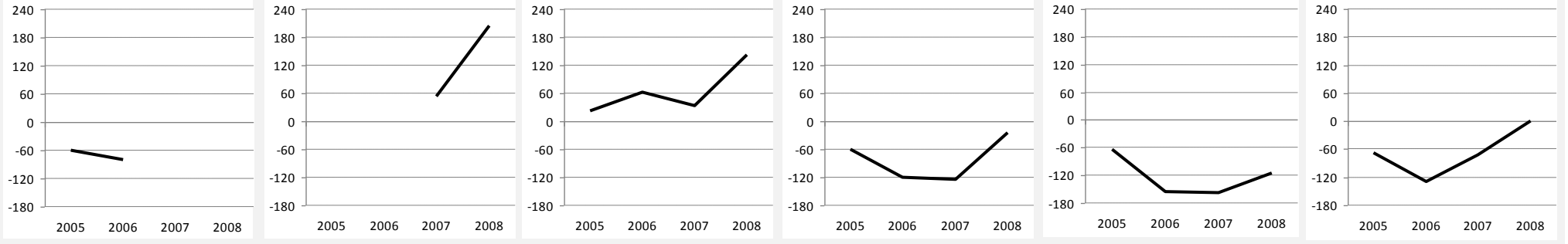
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
4	3	1	0	0	2	2	2	5	6	4	6	6	4	2	0	4	5

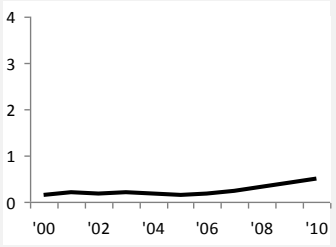
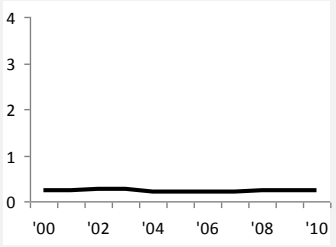
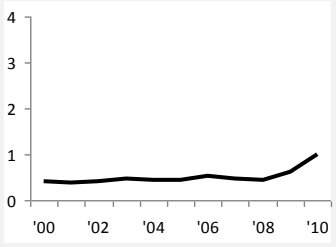
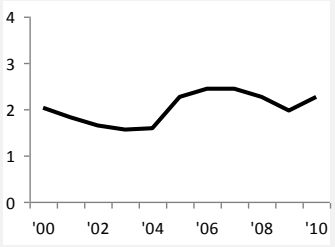
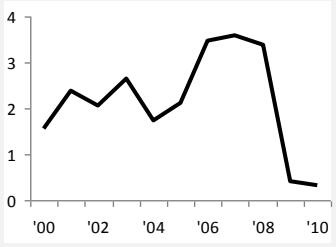
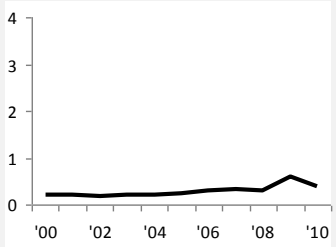
Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

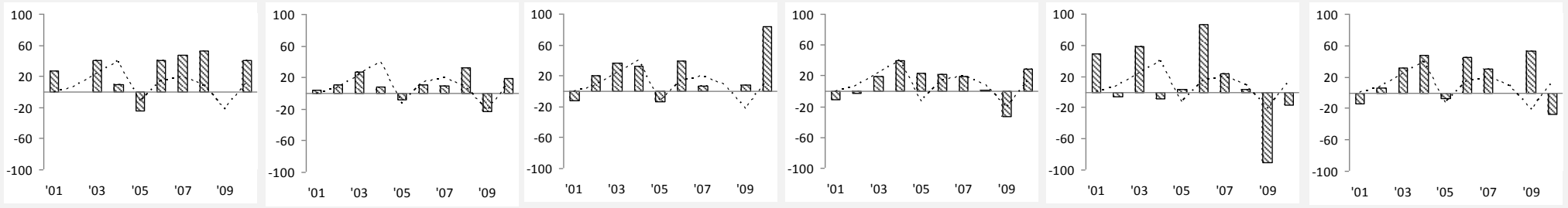
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)					
INSTITUTO SUPERIOR TECNICO	No organisations with >4 EPO/ PCT or national patents in 2005	Bial-Portela & CA, S.A FACULDADE DE CIENCIAS E TECNOLOGIA	INSTITUTO SUPERIOR TECNICO	No organisations with >4 EPO/ PCT or national patents in 2005	INSTITUTO SUPERIOR TECNICO

Source: EPO: PATSTAT / ZEW calculation.

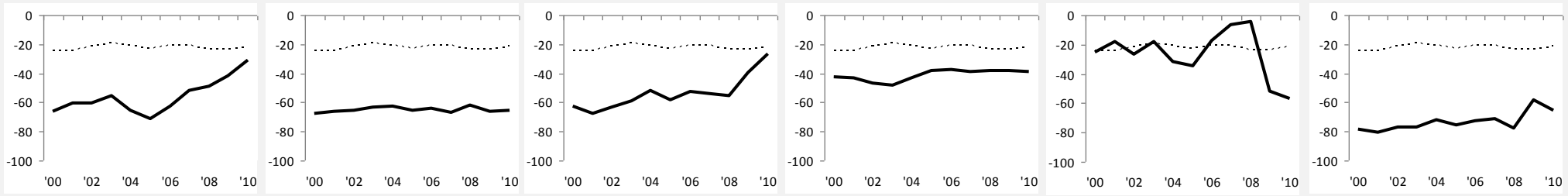
3) TRADE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
a) Significance: Share in the country's total exports (%)					
					

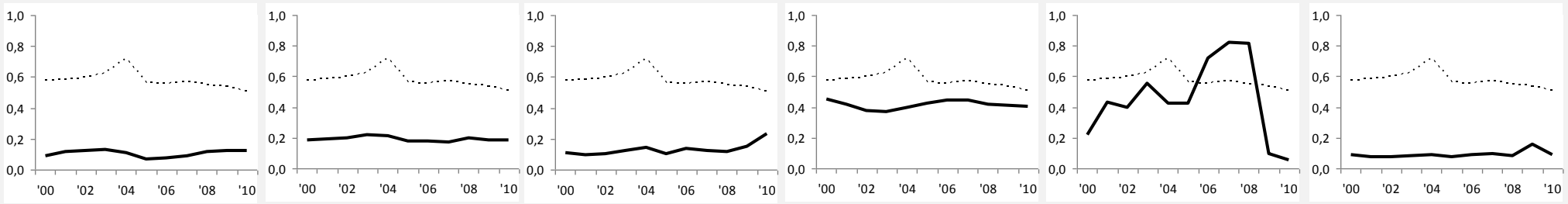
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



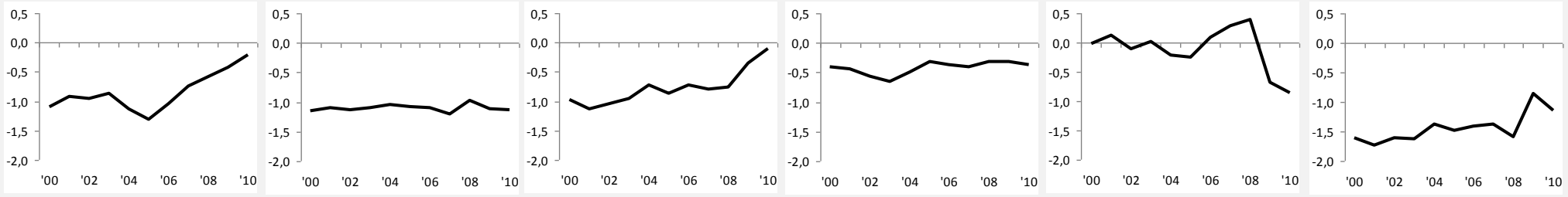
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



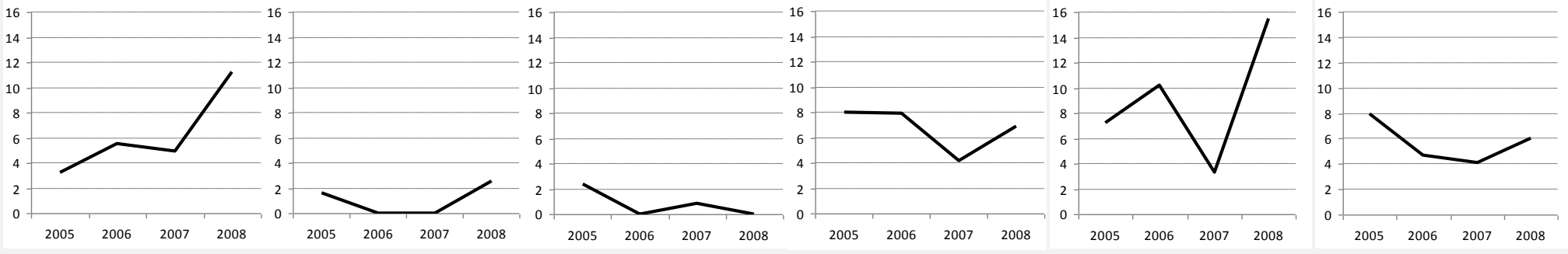
Source: UN: COMTRADE / ZEW and NIW calculation.

8.22 Romania

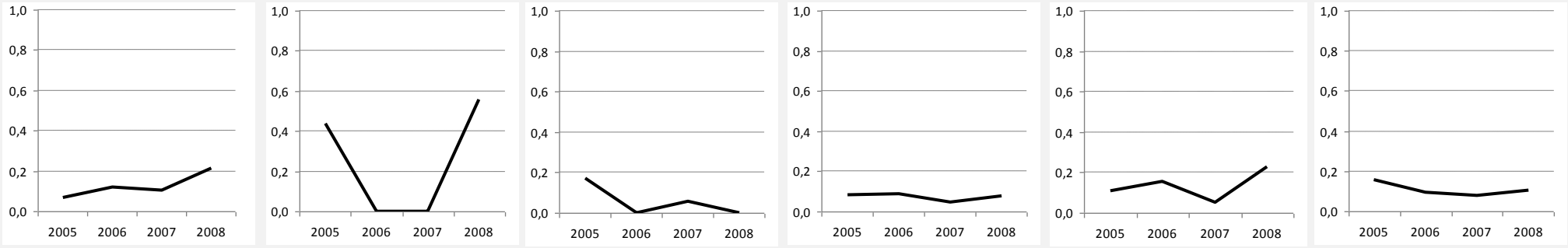
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

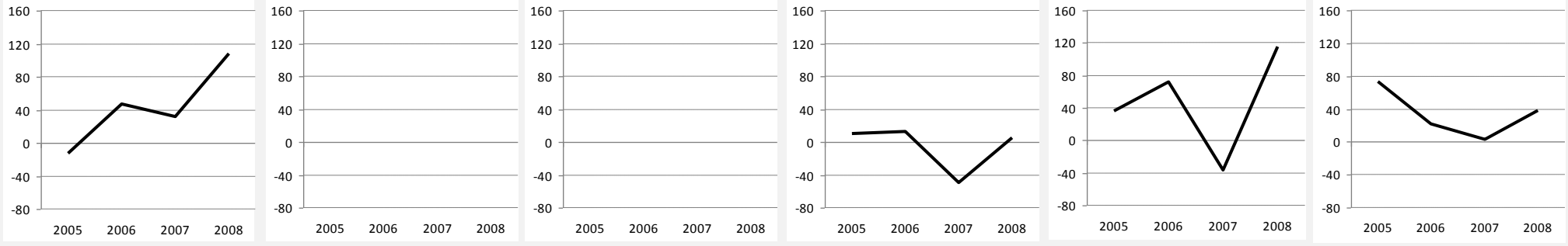
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
	2	4	8	0	1	1	0	1	0	2	6	8	3	5	11	1	6	6

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

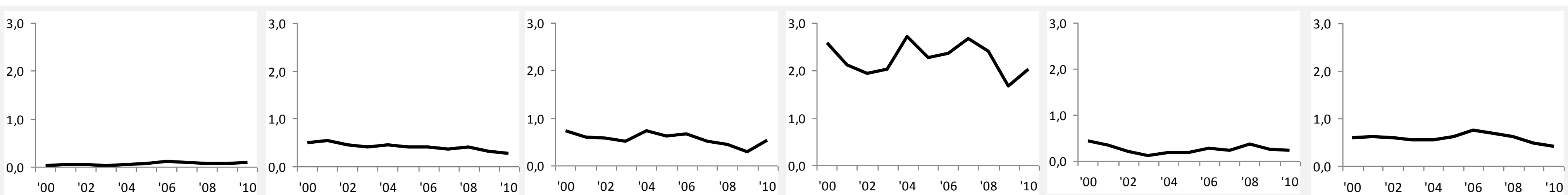
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	INSTITUTUL NA IONAL DE CERCETARE-DI	INSTITUTUL NA IONAL DE CERCETARE DE	UNIVERSITATEA TEFAN CEL MARE DIN S INSTITUTUL NA IONAL DE CERCETARE - D UNIVERSITATEA <![CDATA[&SCEDIL;]]>T INOE 2000 - INSTITUTUL DE CERCET ERI P

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

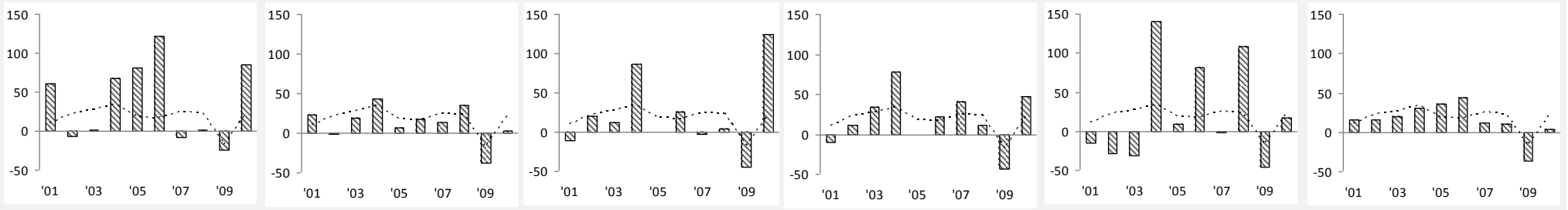
3) Trade

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

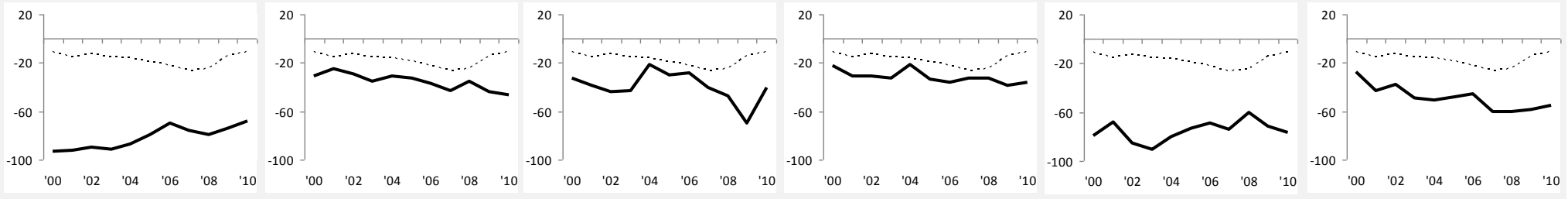
a) Significance: Share in the country's total exports (%)



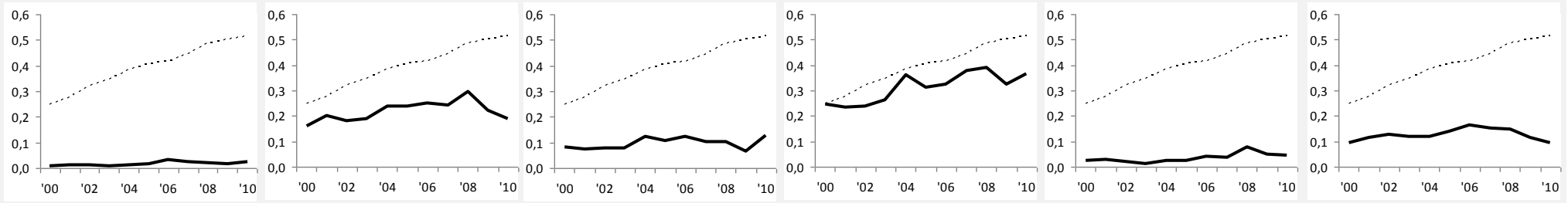
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



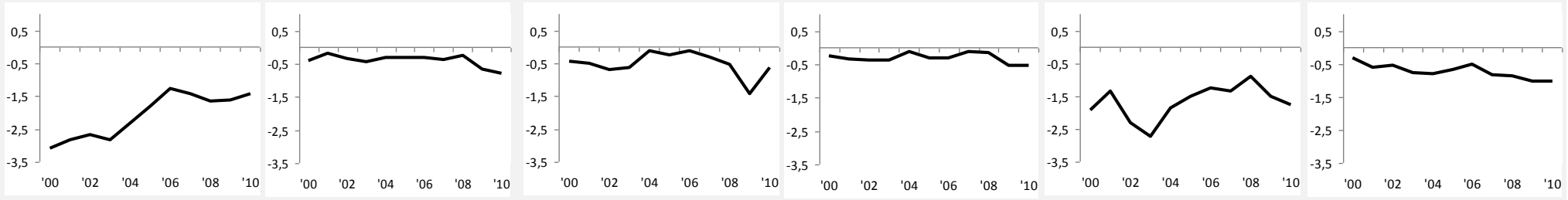
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



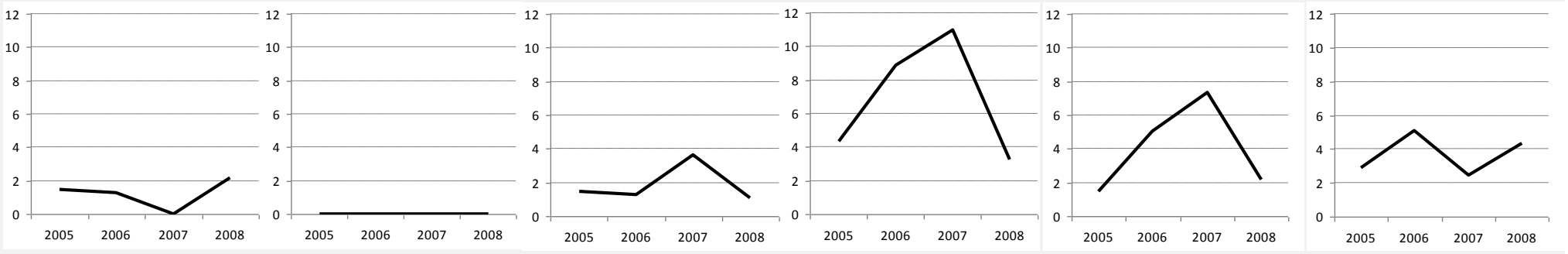
Source: UN: COMTRADE / ZEW and NIW calculation.

8.23 Slovakia

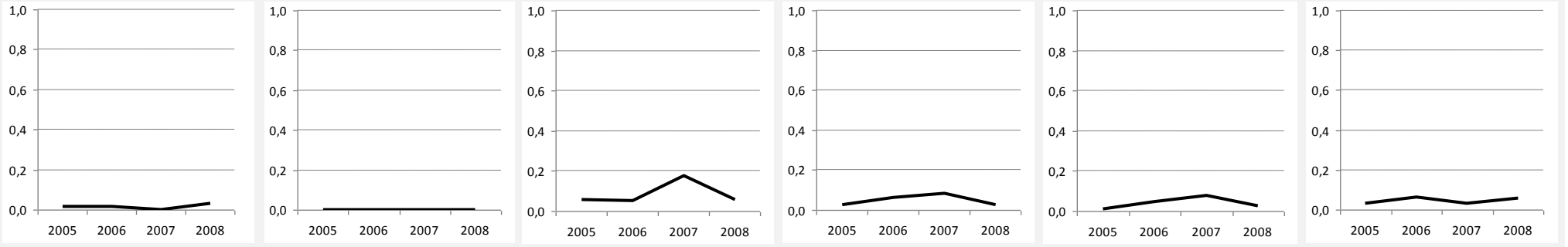
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

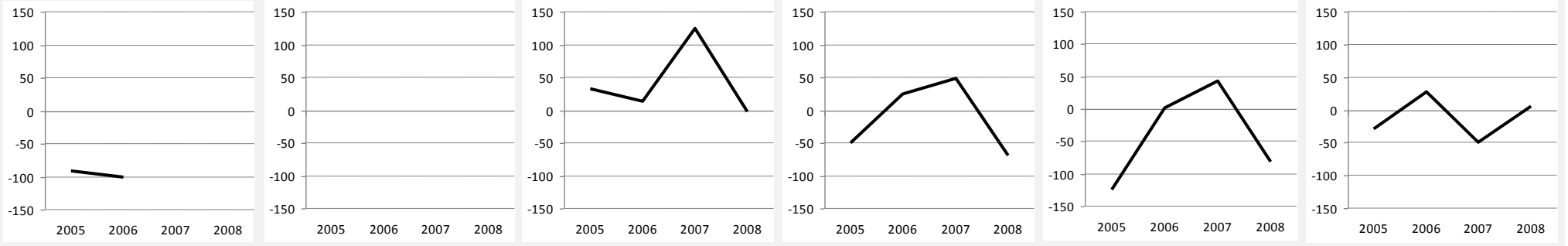
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08
1	1	1

00/02	03/05	06/08
0	0	0

00/02	03/05	06/08
2	0	1

00/02	03/05	06/08
3	2	6

00/02	03/05	06/08
2	1	4

00/02	03/05	06/08
1	1	4

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

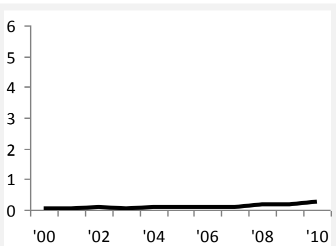
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

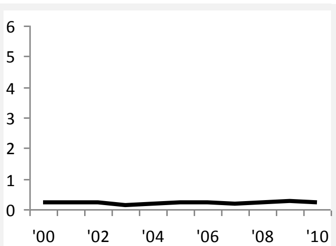
Source: EPO: PATSTAT / ZEW calculation.

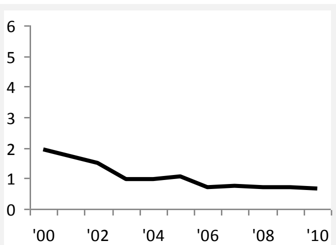
3) Trade

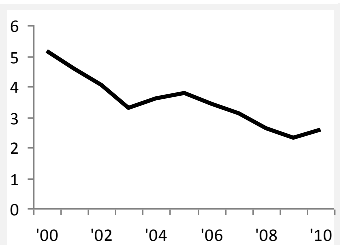
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

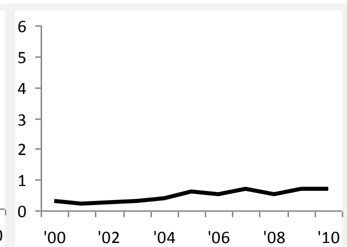
a) Significance: Share in the country's total exports (%)

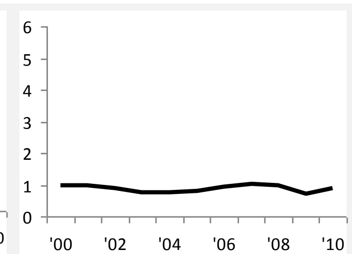




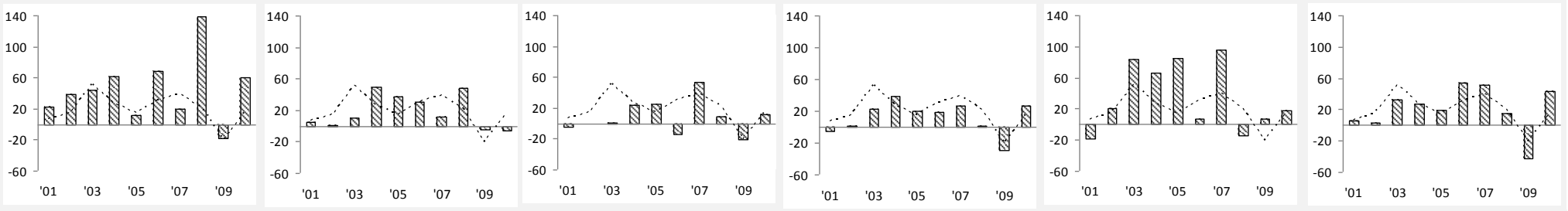




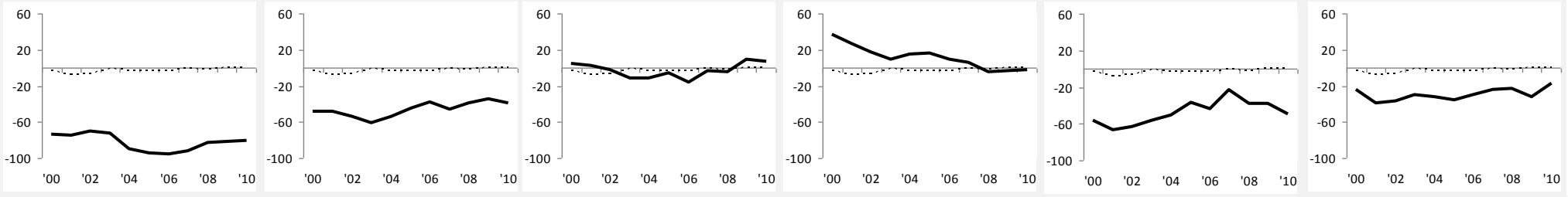




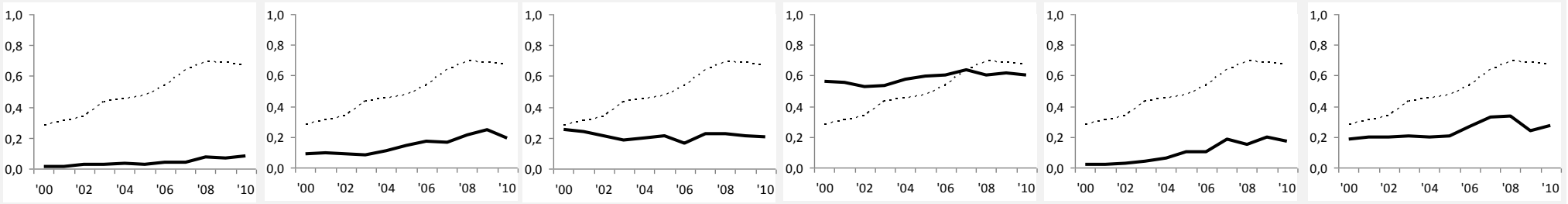
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



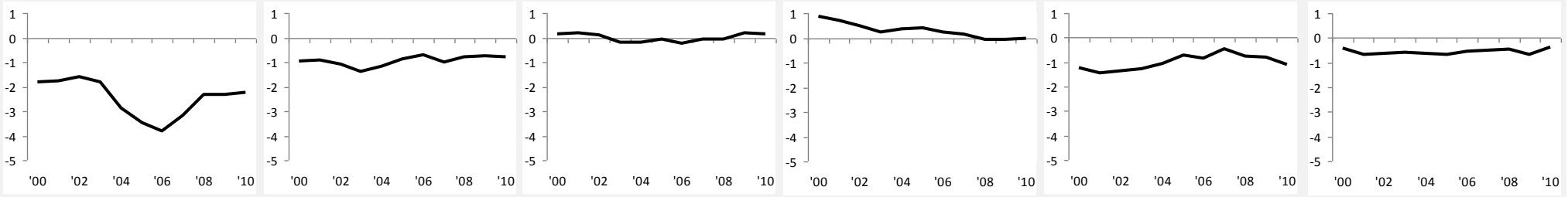
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



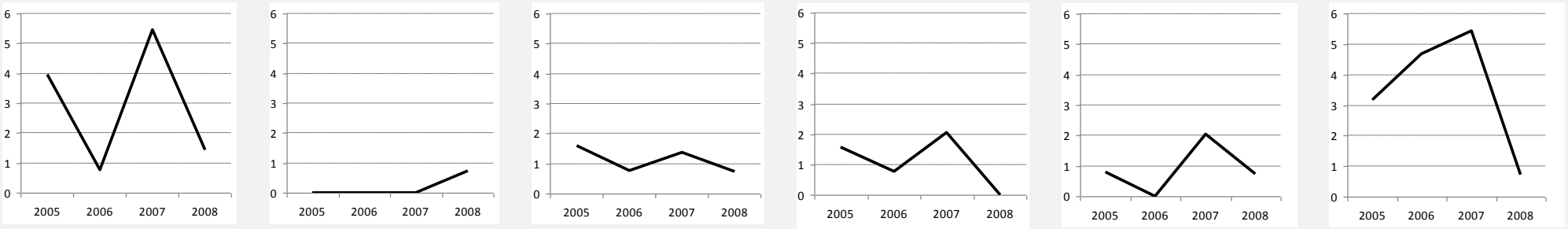
Source: UN: COMTRADE / ZEW and NIW calculation.

8.24 Slovenia

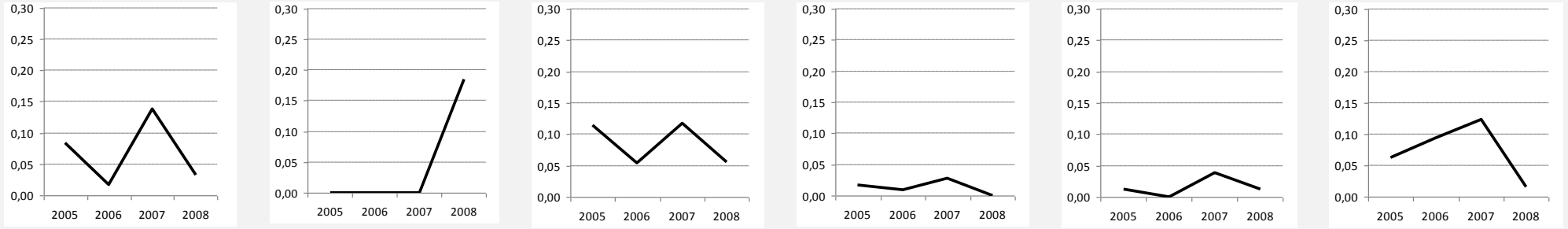
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

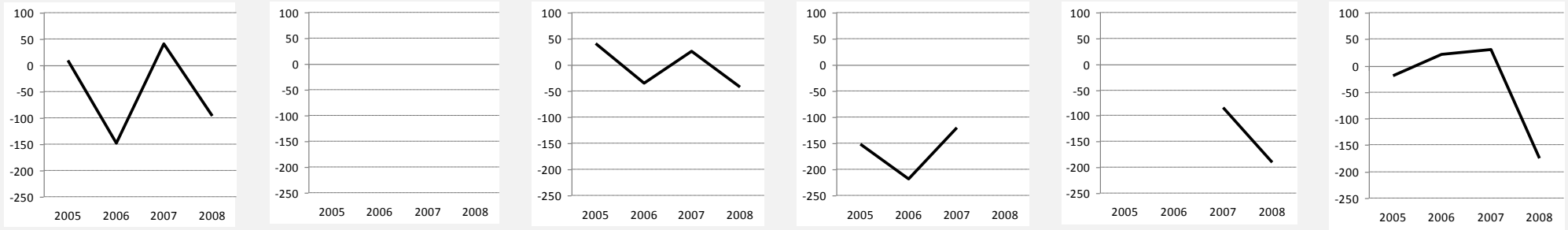
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08
1	4	4

00/02	03/05	06/08
0	0	0

00/02	03/05	06/08
2	1	1

00/02	03/05	06/08
7	4	1

00/02	03/05	06/08
2	1	1

00/02	03/05	06/08
1	1	6

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

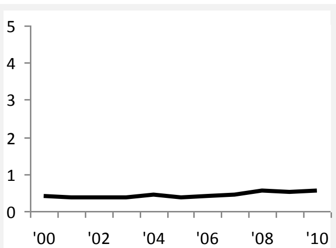
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
No organisations with >4 EPO/PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005-2008	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005	No organisations with >4 EPO/ PCT or national patents in 2005

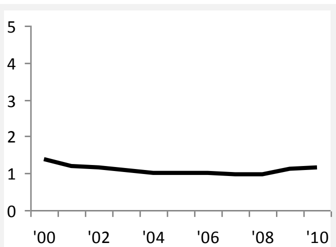
<u>Source:</u> EPO: PATSTAT / ZEW calculation.

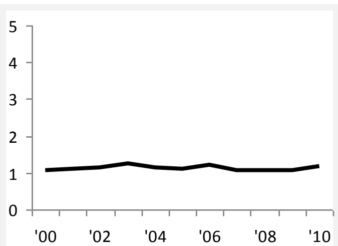
3) TRADE

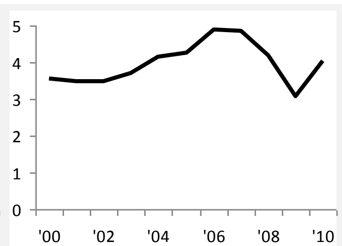
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

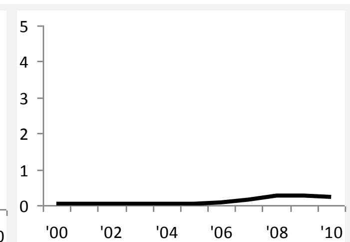
a) Significance: Share in the country's total exports (%)

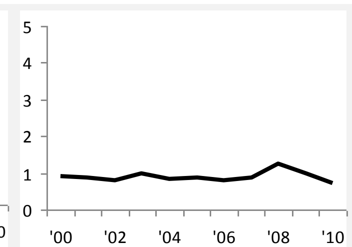




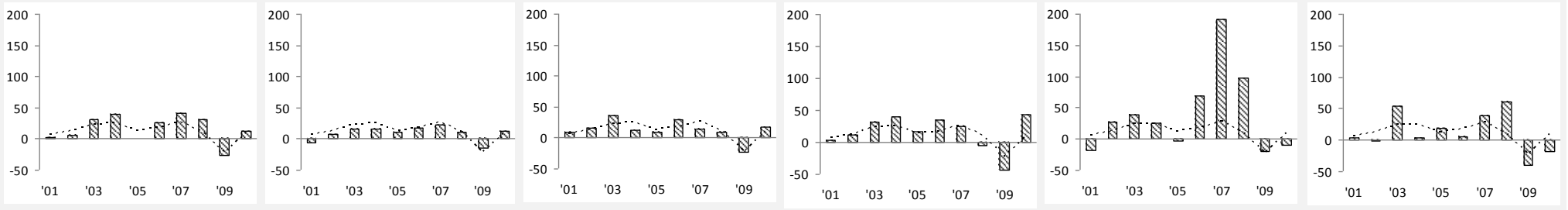




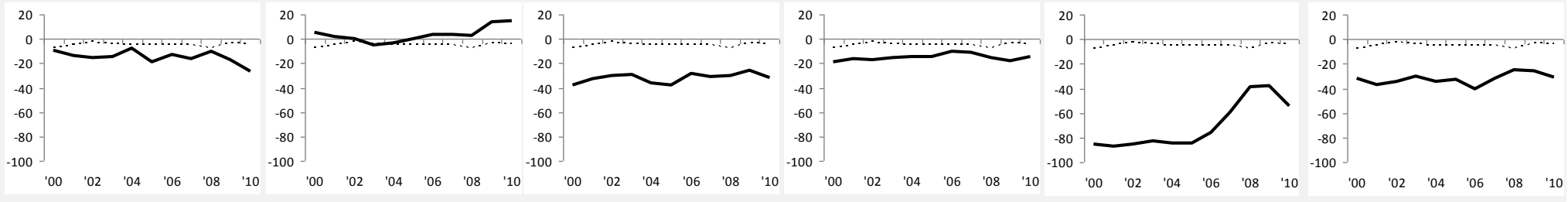




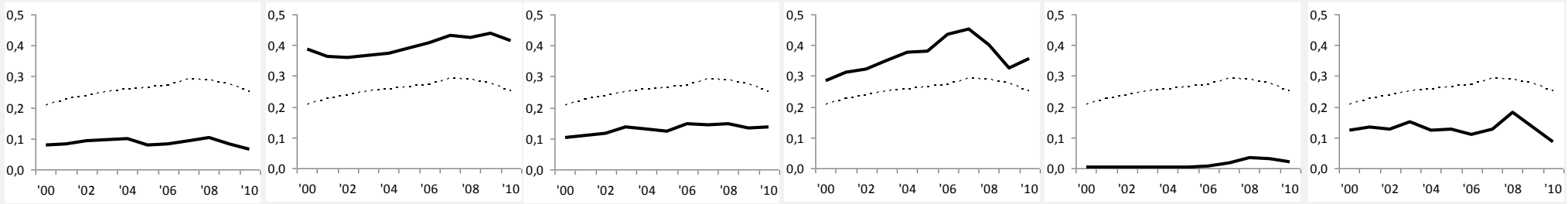
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



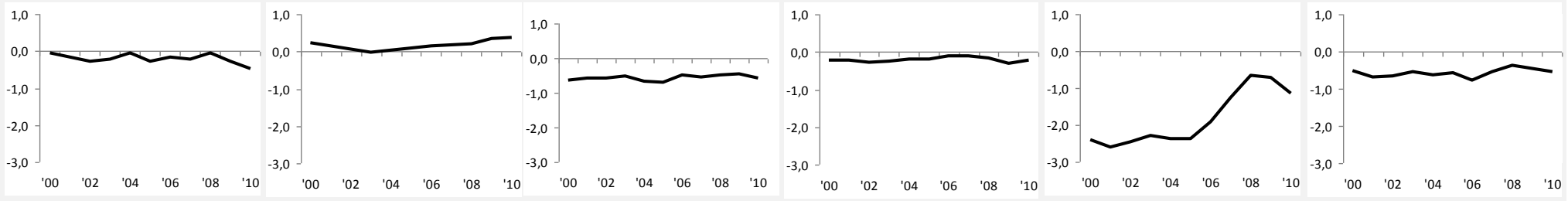
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



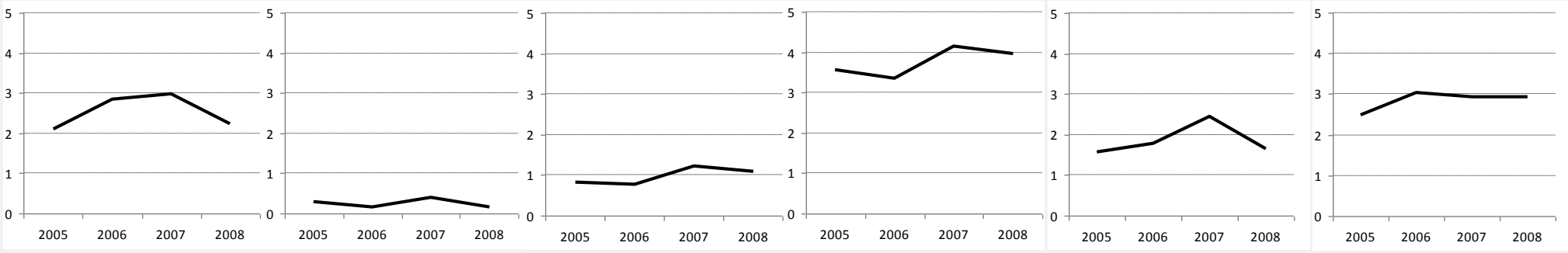
Source: UN: COMTRADE / ZEW and NIW calculation.

8.25 Spain

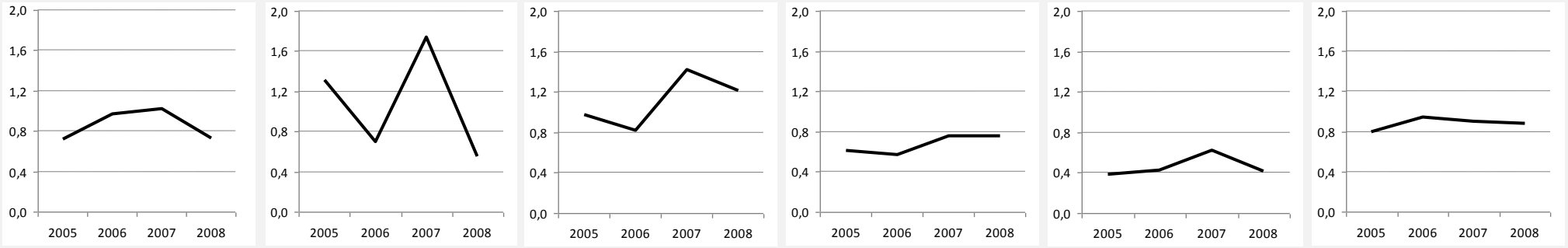
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

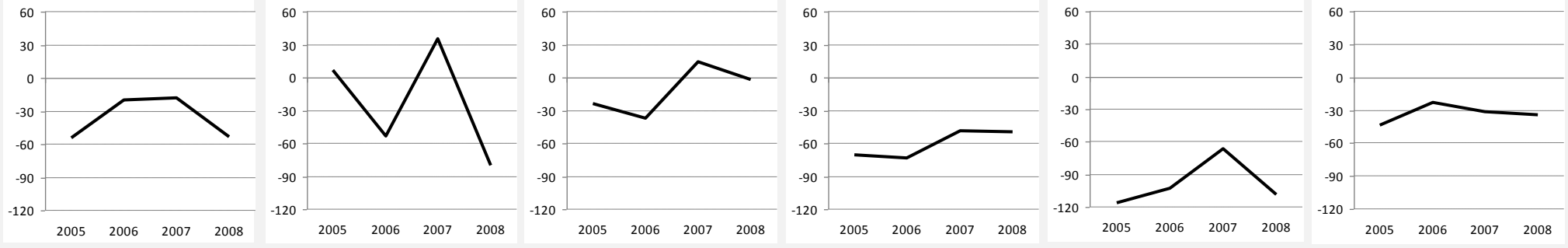
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
13	29	53	3	3	5	11	13	21	46	49	75	12	19	38	25	43	58

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

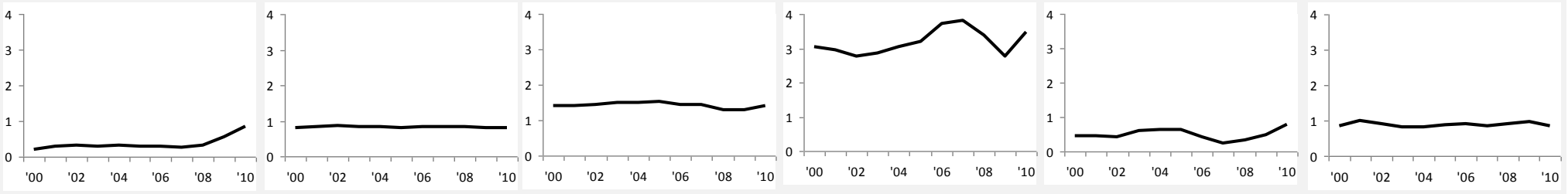
Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
CONSEJO SUPERIOR DE INVESTIGACION	IKERLAN, CENTRO DE INVESTIGACIONES	CONSEJO SUPERIOR DE INVESTIGACION	Consejo Superior de Investigaciones Cie	CONSEJO SUPERIOR DE INVESTIGACION	CONSEJO SUPERIOR INVESTIGACION
UNIVERSIDAD COMPLUTENSE DE MADRI	CONSEJO SUPERIOR DE INVESTIGACION	Bio Fuel Systems, S.l.	ULMA C Y E.S. COOP.	UNIVERSIDAD POLITECNICA DE MADRID	AIRBUS ESPANA, S.L.
UNIVERSIDAD POLITECNICA DE MADRID		STROIAZZO-MOUGIN, BERNARD, A.J.	ROVALMA, S.A	BP Solar Espana, S.A. Unipersonal	FAGOR, S.COOP
INSTITUT DE CIENCIES FOTONIQUES, FUI		UNIVERSIDAD DE SEVILLA	UNIVERSIDAD DEL PAIS VASCO - EUSKAL	UNIVERSIDAD DEL PAIS VASCO - EUSKAL	AMESA INNOVATION & TECH SL
INSTITUCIO CATALANA DE RECERCA I ES		UNIVERSIDAD COMPLUTENSE DE MADRI	Airbus Operations S.L.	UNIVERSITAT DE VALENCIA	FUNDACION FATRONIK
TEILO ALABARTE S.L.		UNIVERSIDAD DE GRANADA	Universidad PolitÃ©cnica de Madrid	UNIVERSITAT AUTONOMA DE BARCELON	EIKA S. COOP.
GRUPO ANTOLIN-INGENIERIA, S.A.		UNIVERSIDAD DE MURCIA	REPSOL YPF, S.A.		BSH ELECTRODOMESTICOS ESPANA, S.A
Antares IluminaciÃ³n, S.A.			Iqap Masterbatch Group, S.L.		GOIZPER, S. COOP.
FICO MIRRORS, S.A.			CHEMO IBERICA, S.A.		BAOLAB MICROSYSTEMS S.L.
BP SOLAR ESPANA, S.A. UNIPERSONAL			DRO BIOSYSTEMS, S. L.		Seat, S.A.

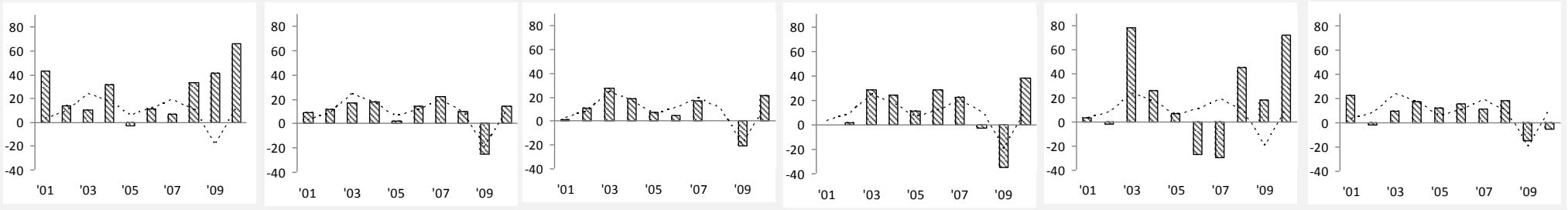
Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

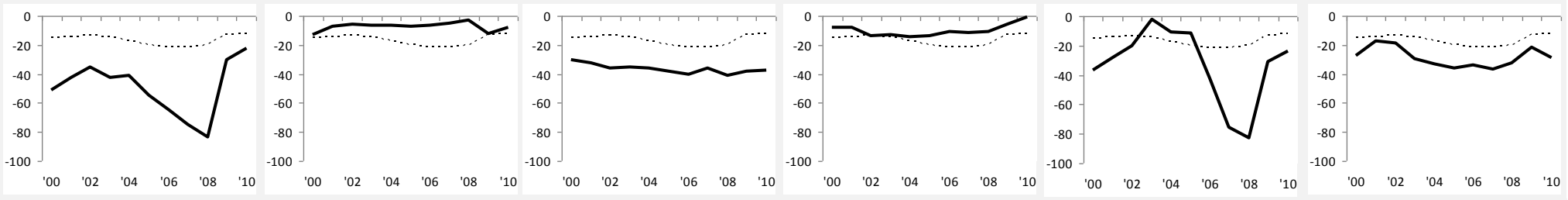
a) Significance: Share in the country's total exports (%)



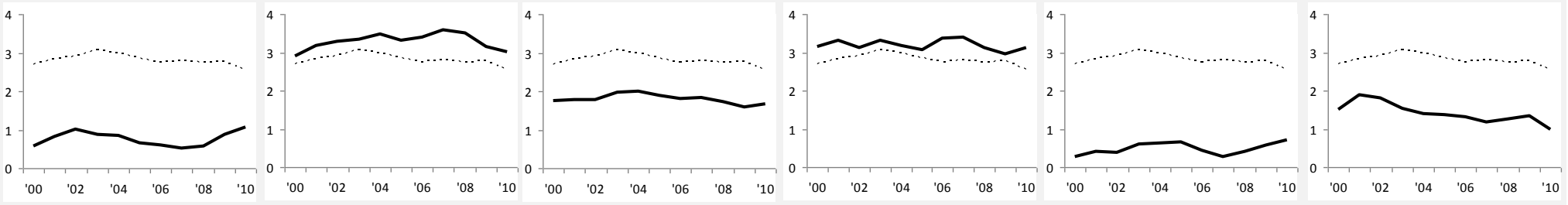
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



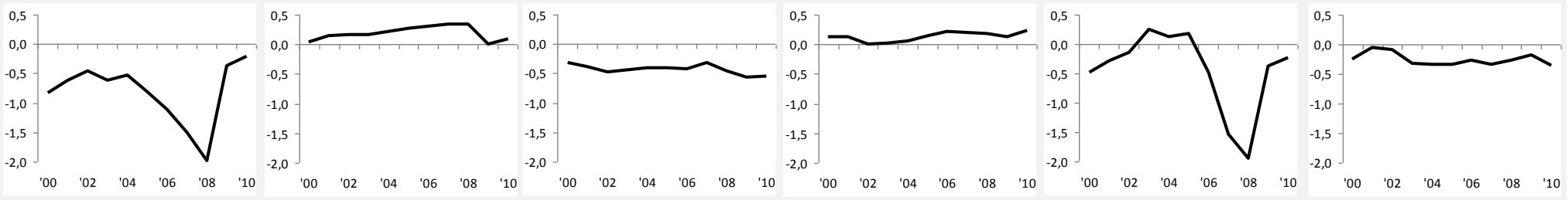
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



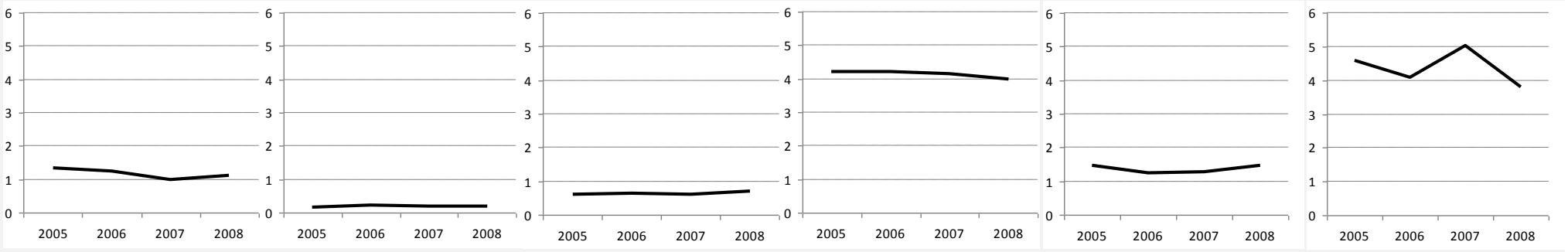
Source: UN: COMTRADE / ZEW and NIW calculation.

8.26 Sweden

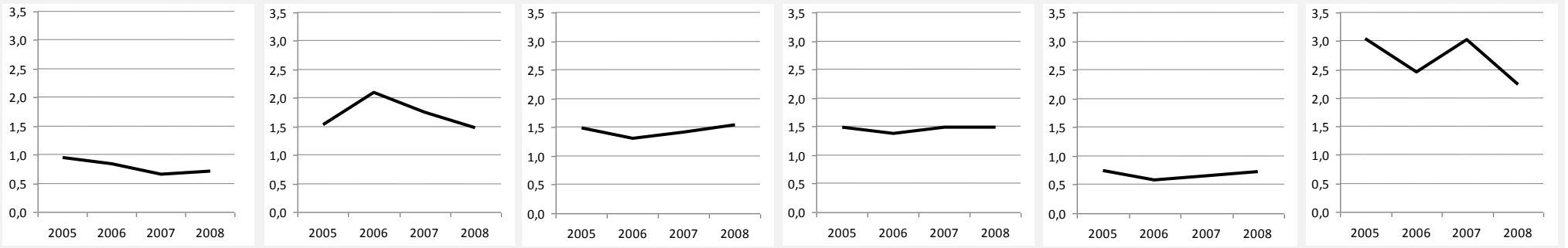
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

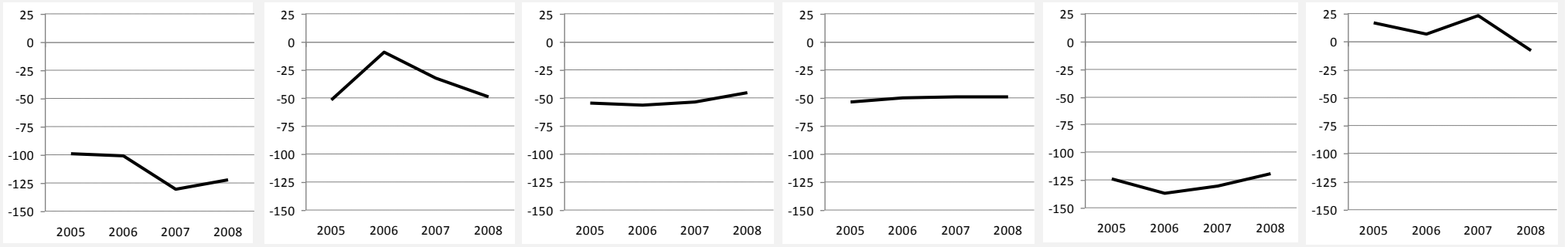
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
72	45	42	8	7	7	16	19	24	157	139	155	70	55	49	120	140	167

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

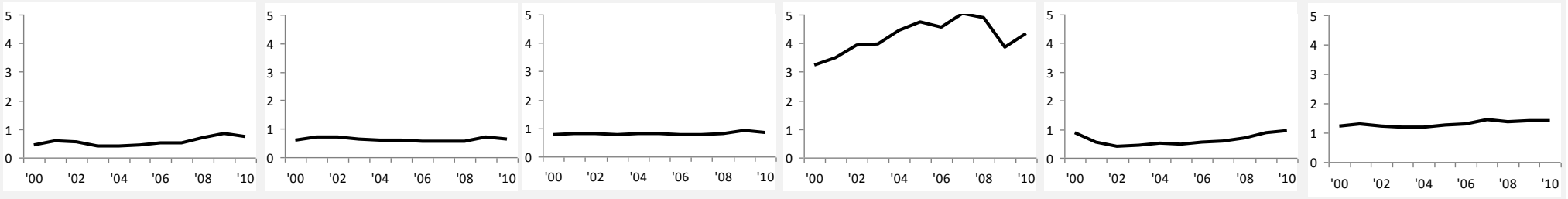
Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Sony Ericsson Mobile Communications A	QuNano AB	ASTRAZENECA AB	Sandvik Intellectual Property Ab	SONY ERICSSON MOBILE COMMUNICATI	ABB AB
Acreo AB	Obducat AB	FORSKARPATENT I SYD AB	HÃ¶ganÃ¤s AB	MICRONIC LASER SYSTEMS AB	AB SKF
PROXIMION FIBER SYSTEMS AB	Smoltek AB	Amic AB	Seco Tools AB	QUNANO AB	Sony Ericsson Mobile Communications A
Syntune AB	SILEX MICROSYSTEMS AB	GE HEALTHCARE BIO-SCIENCES AB	MICRONIC LASER SYSTEMS AB	Obducat AB	Volvo Lastvagnar AB
OPTOSKAND AB	MICRONIC LASER SYSTEMS AB	Gambro Lundia AB	Eka Chemicals AB	Spintronix AB	Rosemount Tank Radar AB
ERICSSON AB		PERSTORP SPECIALTY CHEMICALS AB	SCA HYGIENE PRODUCTS AB	SILEX MICROSYSTEMS AB	SAAB AB
FLIR SYSTEMS AB		CELLARTIS AB	Uddeholm Tooling Aktiebolag	Acreo AB	ALFA LAVAL CORP. AB
Micronic Laser Systems AB			OBDUCAT AB	PiezoMotor Uppsala Aktiebolag	DELAVAL HOLDING AB
SOLIBRO AB			ALFA-LAVAL CORPORATE AB	SMOLTEK AB	Scania CV AB (Publ)
Silex Microsystems AB			MIP Technologies AB	Flir Systems AB	Autoliv Development AB

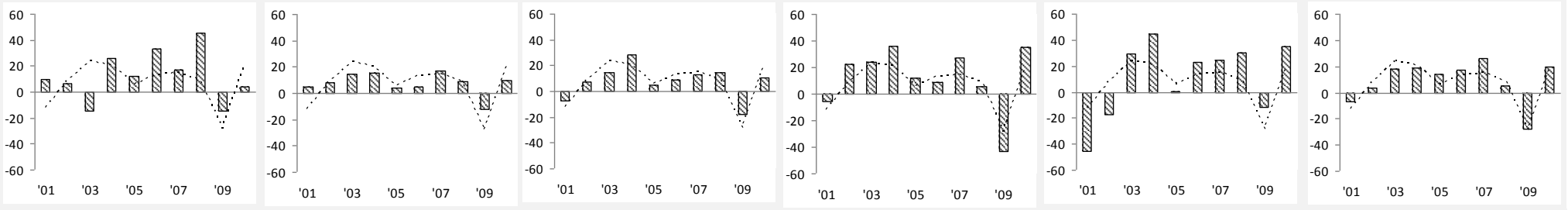
Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

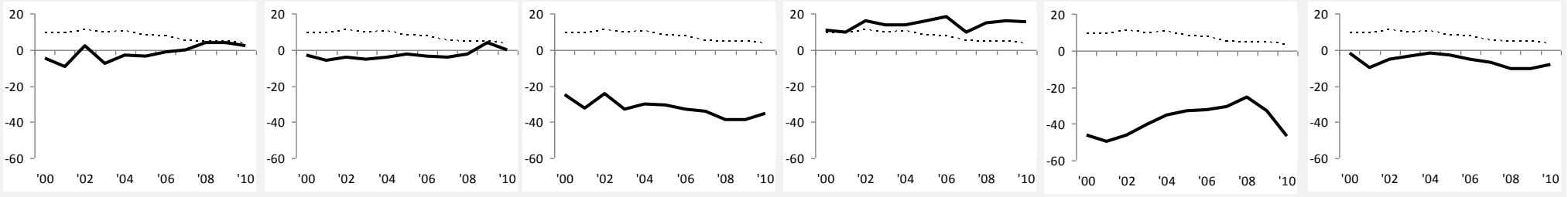
a) Significance: Share in the country's total exports (%)



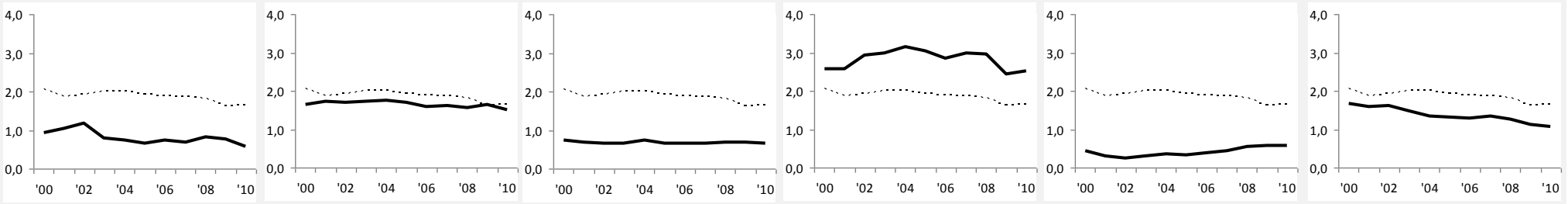
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



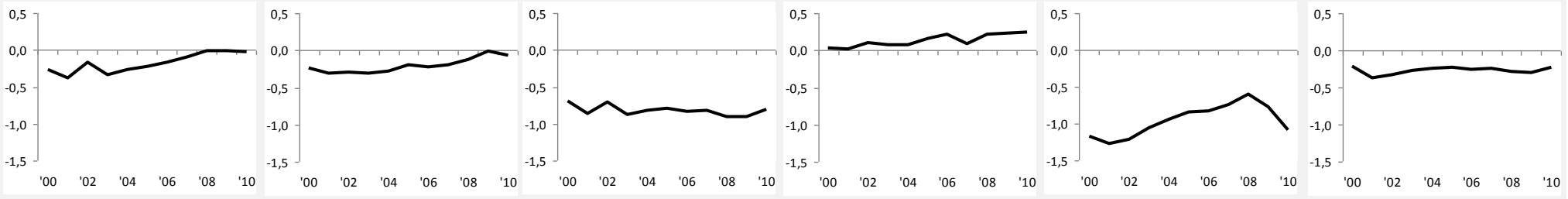
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



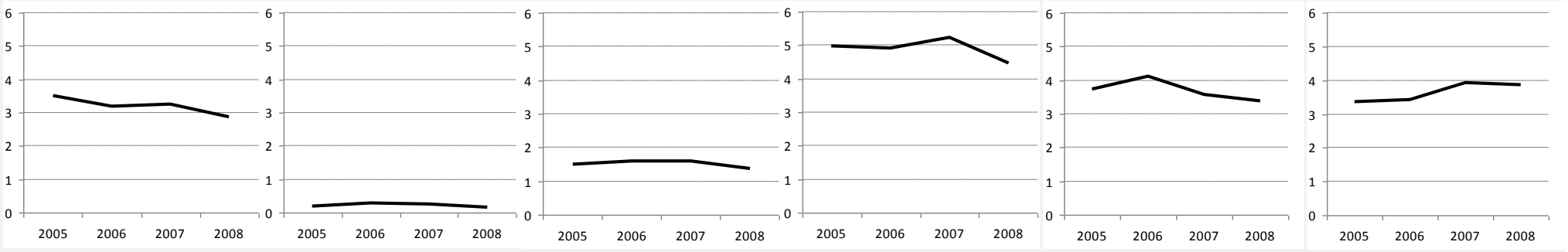
Source: UN: COMTRADE / ZEW and NIW calculation.

8.27 United Kingdom

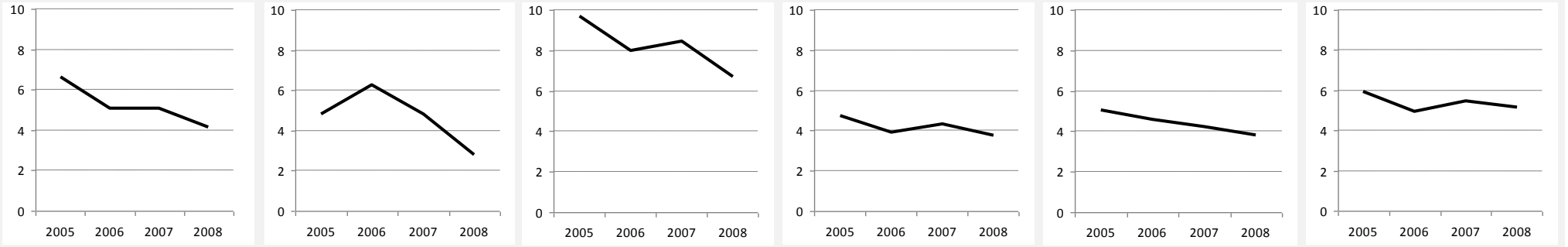
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

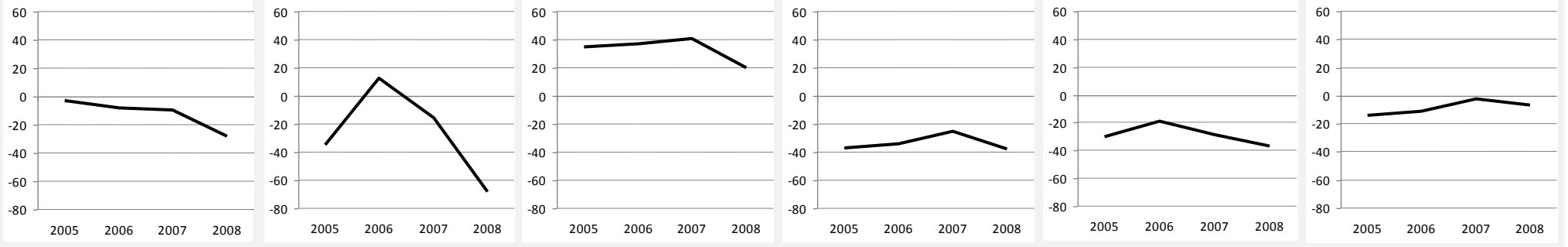
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
323	326	270	11	14	21	132	143	130	420	423	429	269	316	328	270	280	326

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

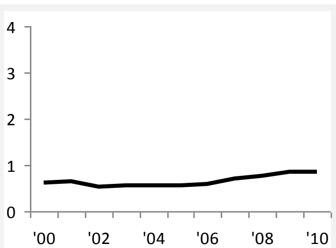
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
CAMBRIDGE DISPLAY TECHNOLOGY LIMI	Nanoco Technologies Limited	FUJIFILM IMAGING COLORANTS LIMITED	INEOS EUROPE LTD.	Cambridge Display Technology Limited	Rolls-Royce plc
CDT OXFORD LIMITED	Point 35 Microstructures Limited	JOHNSON MATTHEY PUBLIC LIMITED CO	IBM UNITED KINGDOM LIMITED	IBM UNITED KINGDOM LIMITED	RENISHAW PLC
QINETIQ LIMITED	UNIVERSITY OF NOTTINGHAM	BP Chemicals Limited	Pilkington Group Limited	CDT OXFORD LIMITED	QINETIQ LTD
PLASTIC LOGIC LIMITED	WOLFSON MICROELECTRONICS PLC	SERICOL LIMITED	Cambridge Display Technology Limited	Plastic Logic Limited	BRITISH TELECOMMUNICATIONS PUBLIC
BRITISH TELECOMM	CAVENDISH KINETICS LIMITED	DAVY PROCESS TECHNOLOGY LIMITED	Hexcel Composites, Ltd.	E2V Technologies (UK) Limited	BAE SYSTEMS PLC
BOOKHAM TECHNOLOGY PLC	BAE SYSTEMS plc	Lifescan Scotland Limited	UNILEVER PLC	QINETIQ LIMITED	AIRBUS UK LIMITED
BAE Systems PLC	UNIV BELFAST	OXFORD BIOSENSORS LIMITED	Plastic Logic Limited	EDWARDS LIMITED	Transense Technologies PLC
GSI GROUP LTD		LUBRIZOL LIMITED	Rolls-Royce plc	Nanoco Technologies Limited	AIRBUS OPERATIONS LIMITED
Cambridge Enterprise Limited		AVECIA LIMITED	JOHNSON MATTHEY PUBLIC LIMITED CO	STMicroelectronics (Research & Develo	GLAXO GROUP LIMITED
TYCO ELECTRONICS UK LTD		CIBA SPEC CHEM WATER TREAT LTD.	CIBA SPECIALTY CHEMICALS WATER TRE.	OLED-T LIMITED	THE BOC GROUP PLC

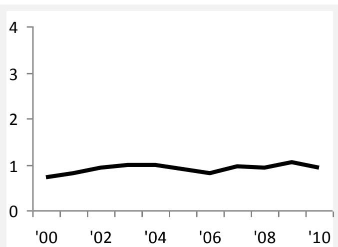
Source: EPO: PATSTAT / ZEW calculation.

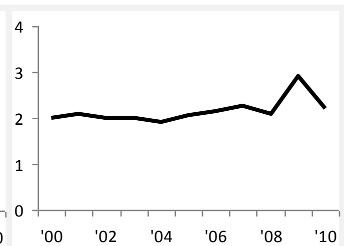
3) Trade

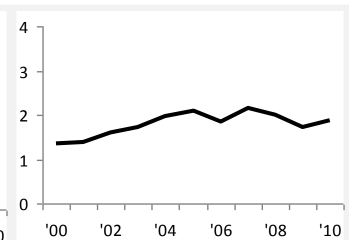
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

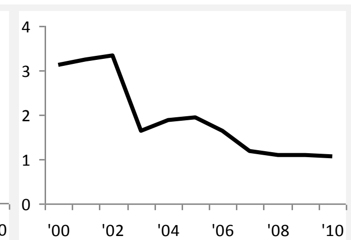
a) Significance: Share in the country's total exports (%)

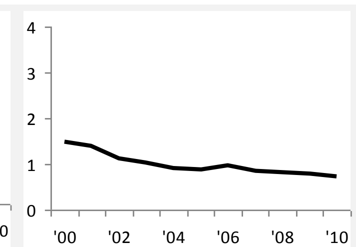




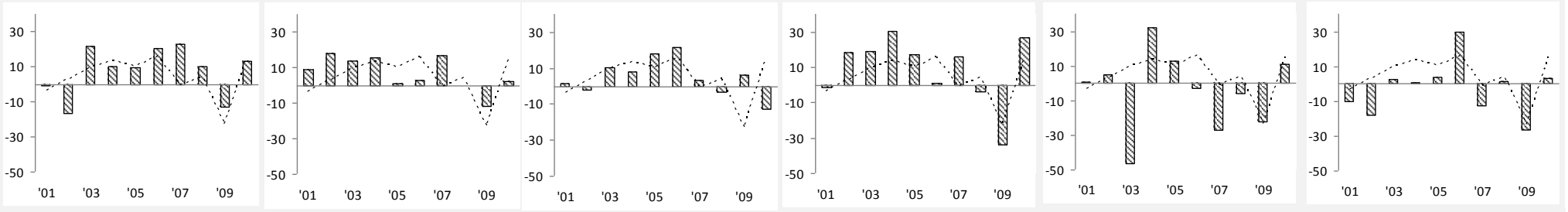




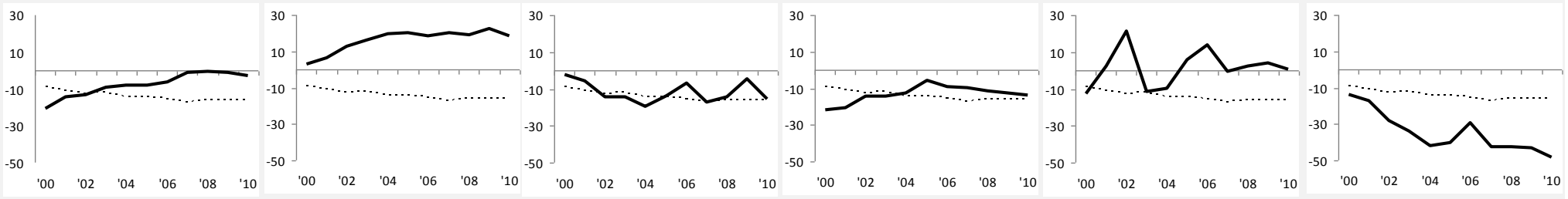




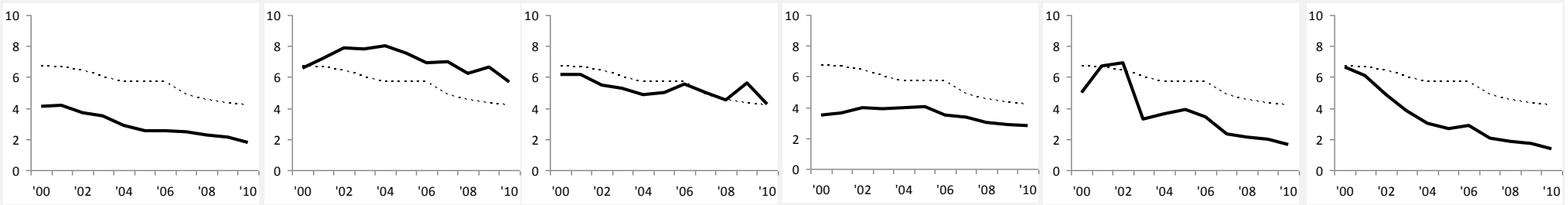
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



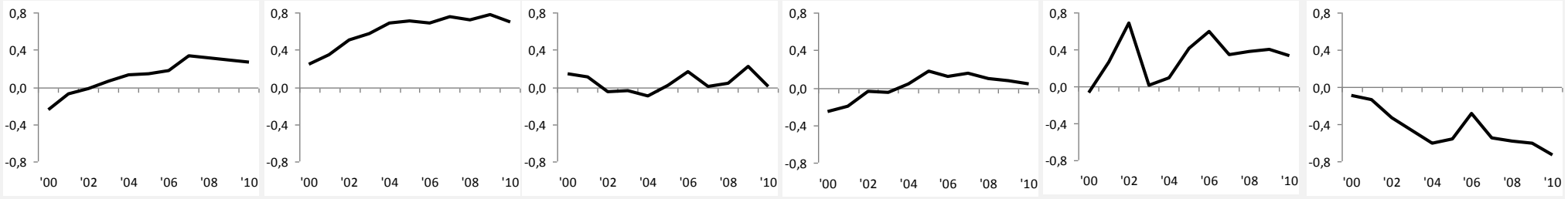
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



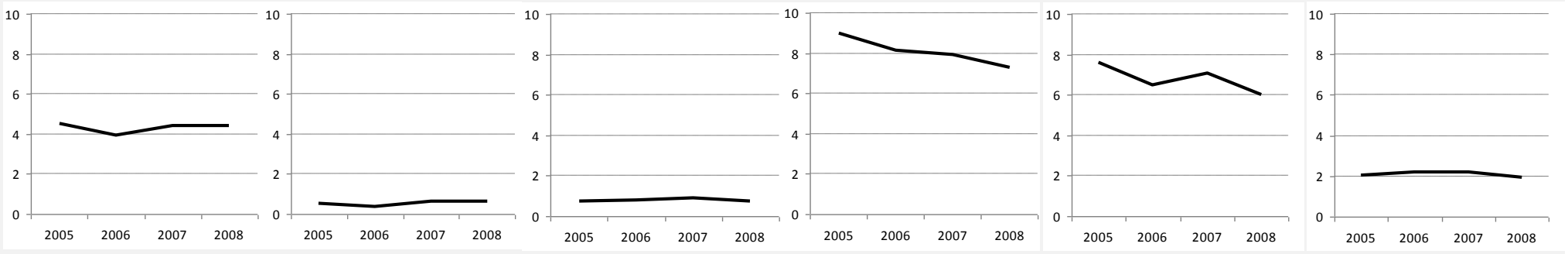
Source: UN: COMTRADE / ZEW and NIW calculation.

8.28 China

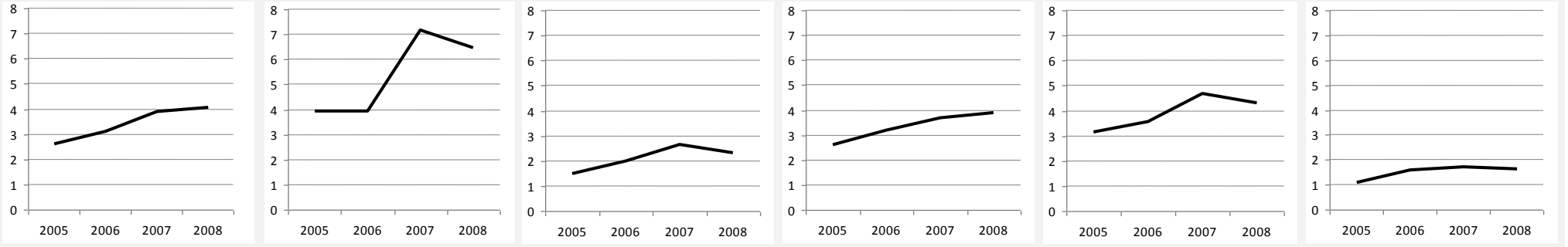
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

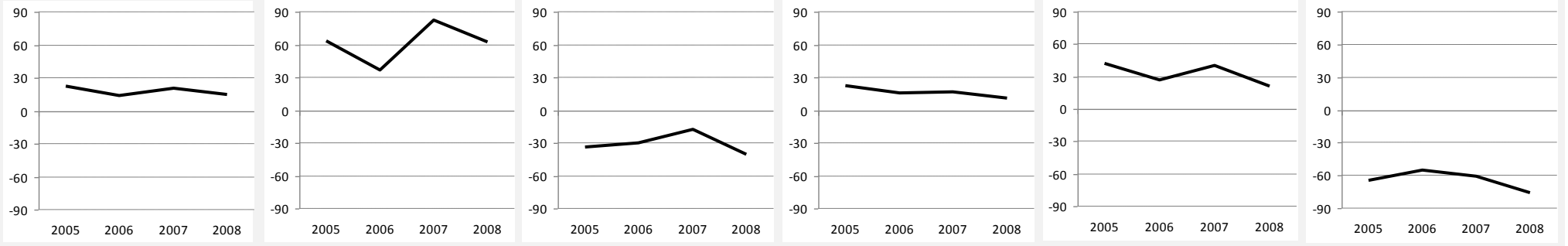
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
37	115	217	2	11	28	10	23	42	145	261	392	119	219	329	20	53	106

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

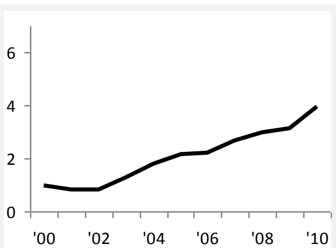
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
HUAWEI TECHNOLOGIES CO., LTD.	TSINGHUA UNIVERSITY	SUZHOU ANJ BIOTECH CO. LTD.	China Petroleum & Chemical Corporatic	LATTICE POWER (JIANGXI) CORPORATIC	HUAWEI TECHNOLOGIES CO., LTD.
NINGBO ANDY OPTOELECTRONIC CO., I	SHANGHAI JIAO TONG UNIVERSITY	ZHEJIANG UNIV.	LATTICE POWER(JIANGXI) CORPORATIO	TSINGHUA UNIVERSITY	SHENZHEN BAK BATTERY CO., LTD
TSINGHUA UNIVERSITY	PEKING UNIVERSITY	JIANGNAN UNIVERSITY	BEIJING RESEARCH INSTITUTE OF CHEMI	SHANGHAI MICRO ELECTRONICS EQUIPI	IDT TECHNOLOGY LTD.
He Shan Lide Electronic Enterprise Con	ZHEJIANG UNIV.	NANJING NORMAL UNIV.	BYD COMPANY LIMITED	Princo Corp.	BYD CO., LTD.
WUXI SUNTECH-POWER CO., LTD.	NANJING UNIV.	TSINGHUA UNIV.	Shanghai Micro Electronics Equipment (	NINGBO ANDY OPTOELECTRONIC CO., L	COMPUTIME LTD.
FOXSEMI SEMICONDUCTOR PRECISION	SHANGHAI INSTITUTE OF MICROSYSTEM	EAST CHINA UNIVERSITY OF SCIENCE & T	Tsinghua University	Hong Kong Applied Science and Techno	Netac Technology Co., Ltd.
SHENZHEN TCL NEW TECHNOLOGY LTD	SOUTHEAST UNIVERSITY	SHANGHAI JIAO TONG UNIVERSITY	INSTITUTE OF PHYSICS, CHINESE ACADEI	WUXI SUNTECH POWER CO., LTD	The Hong Kong Polytechnic University
HONG KONG APPLIED SCIENCE AND TE	INSTITUTE OF MICROELECTRONICS OF C	INSTITUTE OF PROCESS ENGINEERING, C	Petrochina Company Limited	INSTITUTE OF PHYSICS, CHINESE ACADEI	Tsinghua University
TPO Hong Kong Holding Limited	EAST CHINA NORMAL UNIVERSITY	TIANJIN UNIVERSITY	ASM Assembly Automation Ltd	ASM Assembly Automation Ltd.	POSITEC POWER TOOLS(SUZHOU) CO., L
Wuhan Telecommunication Devices Cc	TONGJI UNIVERSITY	Dalian Institute Of Chemical Physics, Cl	ANJI MICROELECTRONICS (SHANGHAI) (	ANJI MICROELECTRONICS (SHANGHAI) (	Nuctech Company Limited

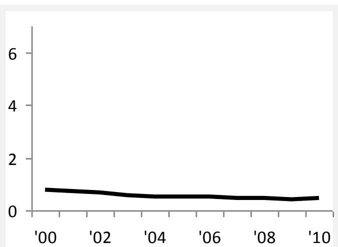
Source: EPO: PATSTAT / ZEW calculation.

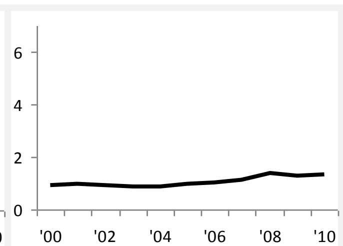
3) Trade

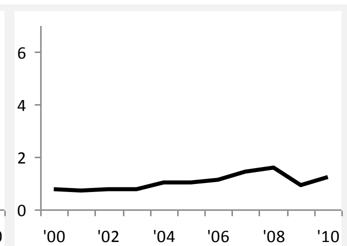
Photonics | **Nanotechnology** | **Industrial Biotechnology** | **Advanced Materials** | **Micro-/Nanoelectronics** | **Advanced Manufacturing**

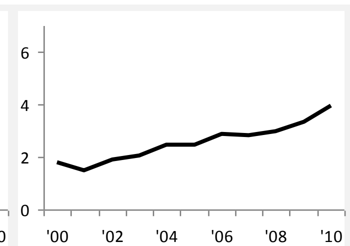
a) Significance: Share in the country's total exports (%)

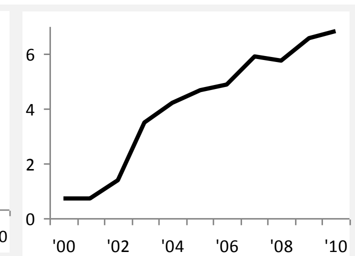




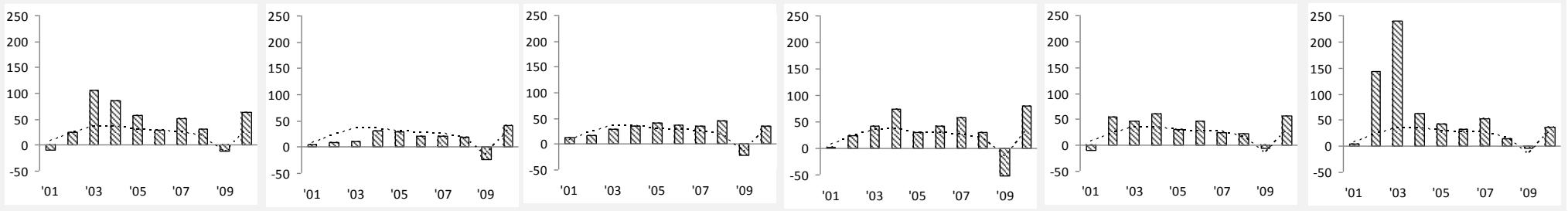




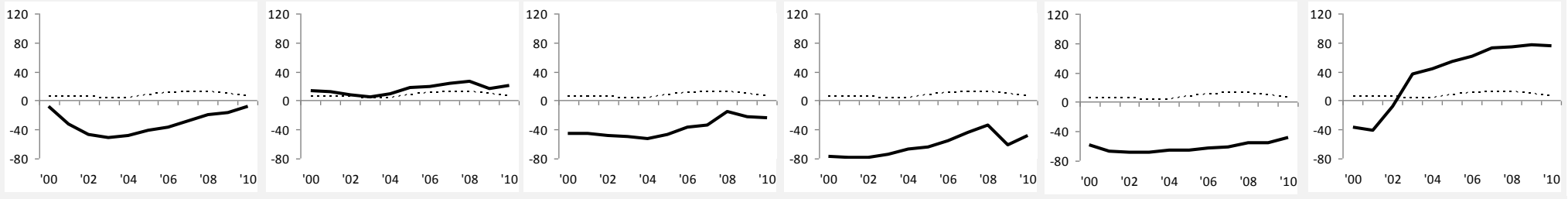




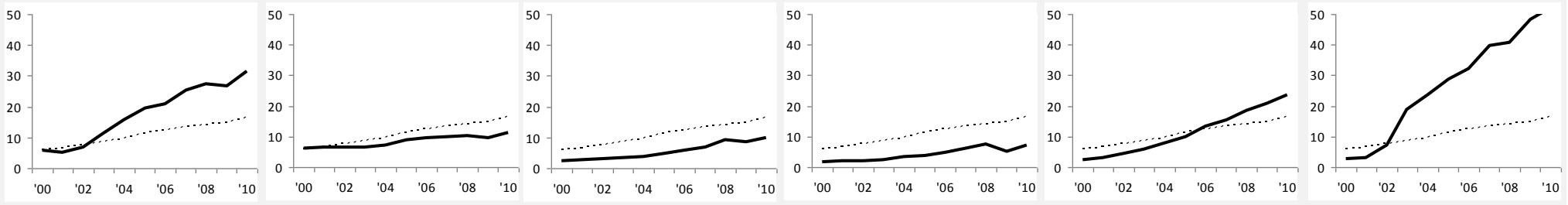
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



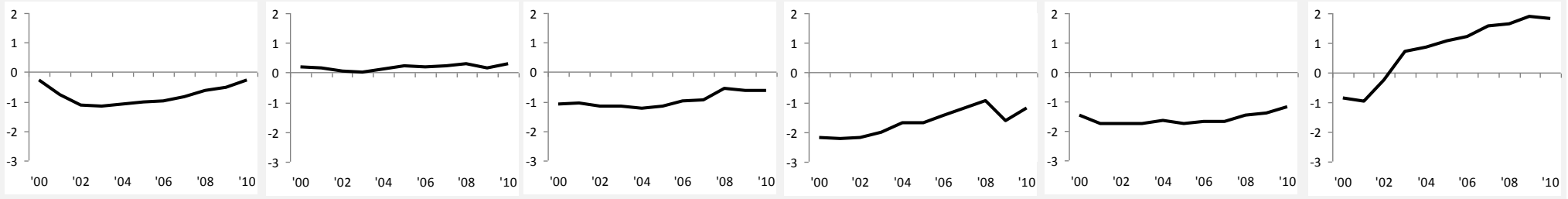
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



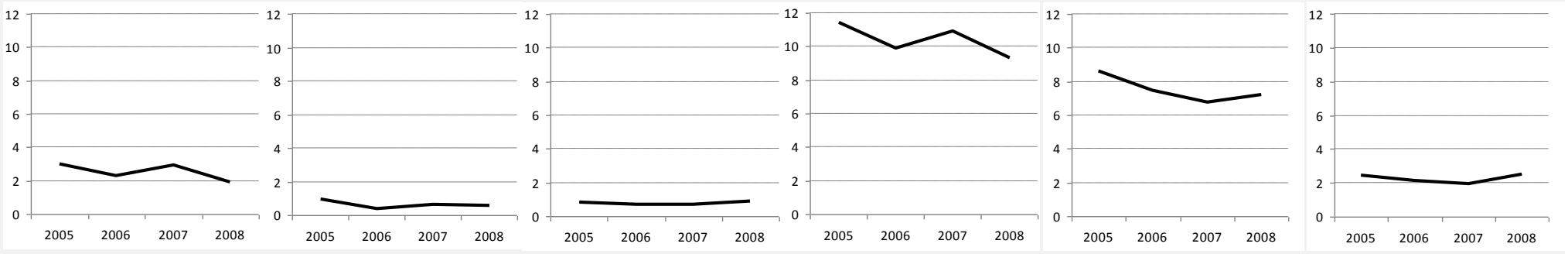
Source: UN: COMTRADE / ZEW and NIW calculation.

8.29 India

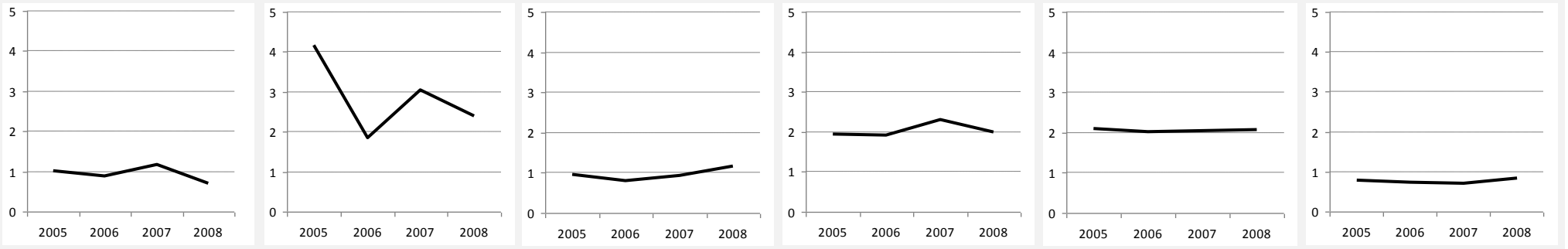
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

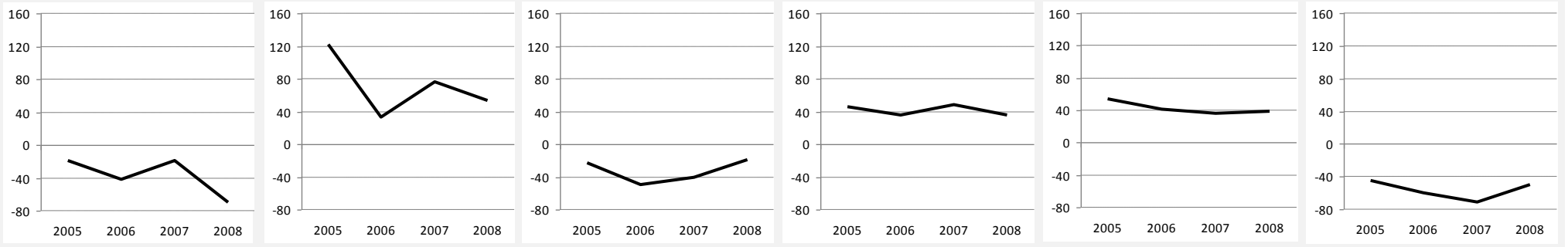
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
18	46	54	1	11	12	15	19	18	113	173	226	101	133	162	18	31	50

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

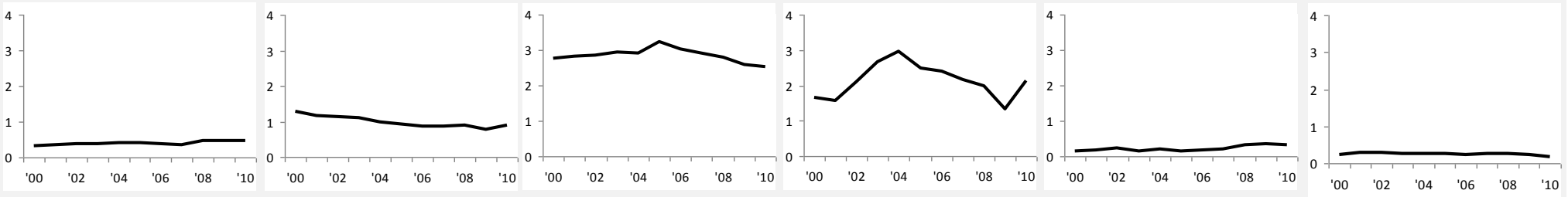
Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
SHRIRAM INSTITUTE FOR INDUSTRIAL RE	No organisations with >4 EPO/ PCT or national patents in 2005	RELIANCE LIFE SCIENCES PVT LTD.	COUNCIL OF SCIENTIFIC & INDUSTRIAL R	COUNCIL OF SCIENTIFIC & INDUSTRIAL R	PRICOL LTD.
STERLITE OPTICAL TECHNOLOGIES LTD.		Council of Scientific and Industrial Rese	Futura Polyesters Limited		COUNCIL OF SCIENTIFIC & INDUSTRIAL R
		Biocon Limited	SHRIRAM INST FOR IND RES		INDIAN INSTITUTE OF SCIENCE
		NAGARJUNA ENERGY PRIVATE LIMITED	ARROW COATED PRODUCTS LTD.		
		PHARMED MEDICARE PRIVATE LIMITED	Reliance Industries Ltd.		
		HINDUSTAN UNILEVER LIMITED	HINDUSTAN LEVER LIMITED		
		V.B. MEDICARE PVT. LTD.	RELIANCE LIFE SCIENCES PVT., LTD.		
			BNT FORCE BIODEGRADABLE POLYMERS		

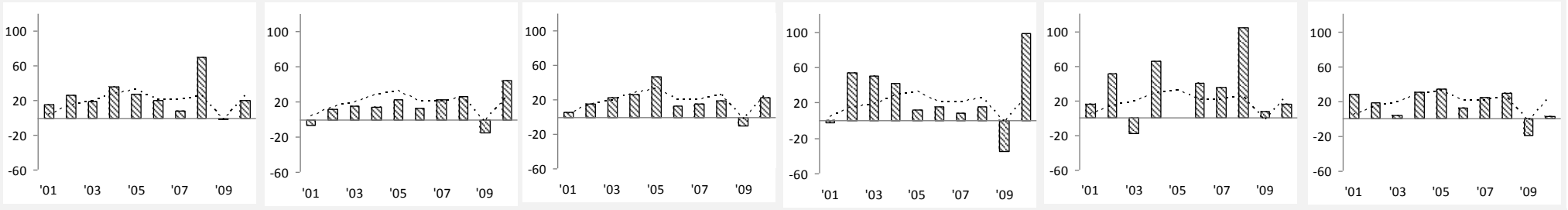
Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

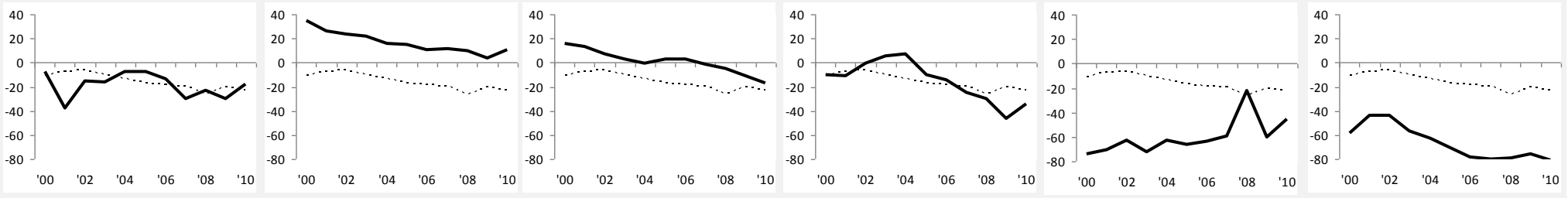
a) Significance: Share in the country's total exports (%)



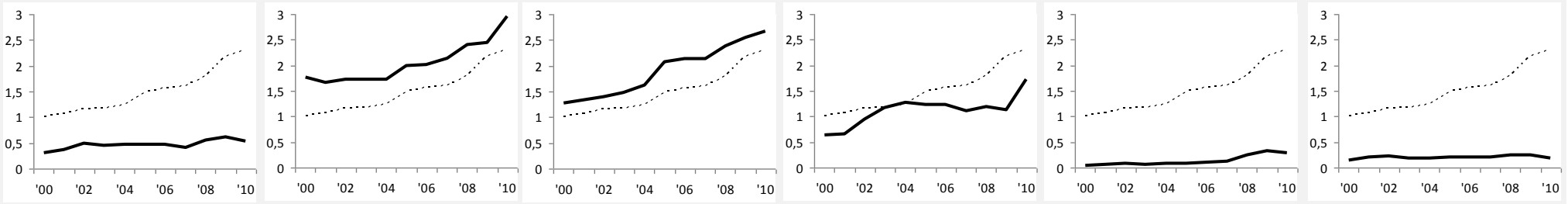
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



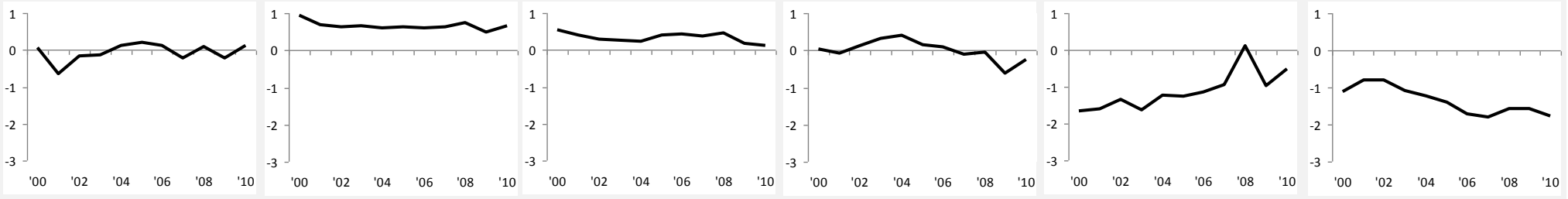
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



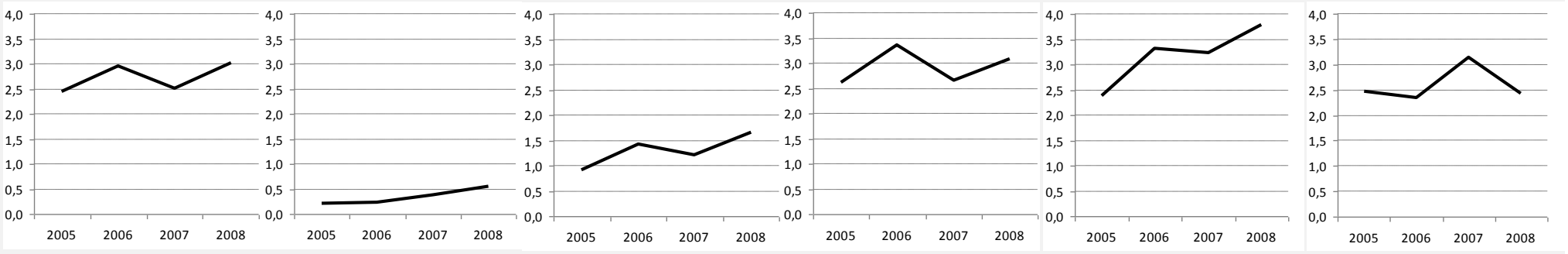
Source: UN: COMTRADE / ZEW and NIW calculation.

8.30 Israel

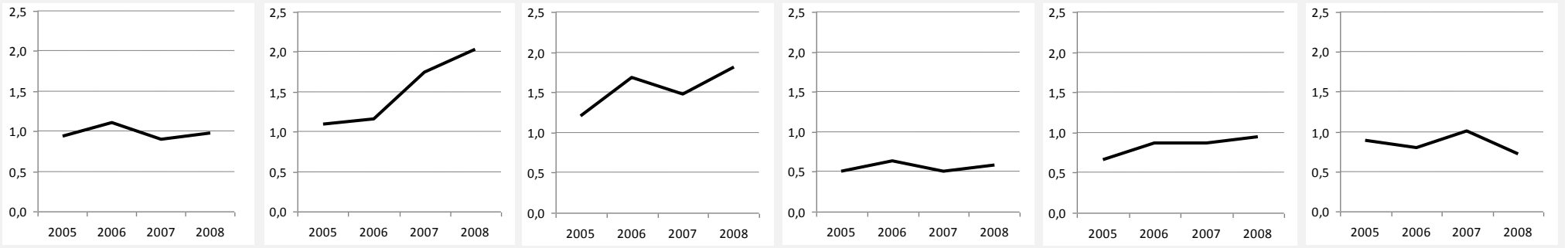
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

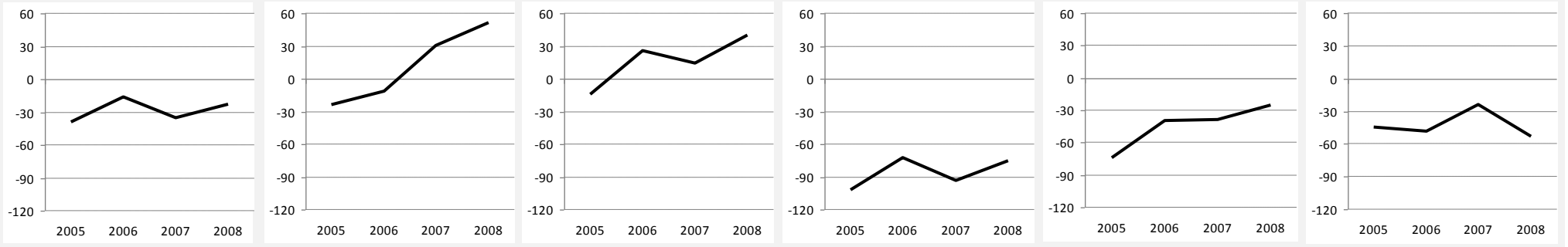
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
44	59	56	5	4	8	15	19	28	61	56	61	56	54	70	49	49	55

<u>Source:</u> EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

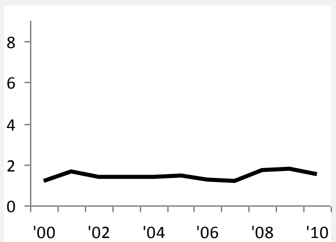
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
LUMUS LTD.	YISSUM RESEARCH DEVELOPMENT COM	YISSUM RESEARCH DEVELOPMENT COM	BROMINE COMPOUNDS LTD.	TECHNION RESEARCH AND DEVELOPME	TECHNION RESEARCH & DEVELOPMENT
Technion Research & Development Fou	RAMOT AT TEL AVIV UNIVERSITY LTD.	Teva Pharmaceutical Industries Ltd	TECHNION RESEARCH & DEVELOPMENT	Saifun Semiconductors Ltd.	Arad Measuring Technologies Ltd.
Mirage Innovations Ltd	Yeda Research & Development Compar	YEDA RESEARCH AND DEVELOPMENT CC	CAMTEK LTD.	Yeda Research and Development Ltd.	KAIZEN INTERNATIONAL TECHNOLOGIES
YISSUM RESEARCH DEVELOPMENT COM	DO-COOP TECHNOLOGIES LTD.	TransBiodiesel Ltd.	ISKAR LTD.	YISSUM RESEARCH DEVELOPMENT COM	Yeda Research & Development Co., Ltd.
RAFAEL - ARMAMENT DEVELOPMENT AU	CIMA NANO TECH ISRAEL LTD	Protalix Ltd.	COREFLOW SCIENTIFIC SOLUTIONS LTD	Ramot At Tel-Aviv University Ltd.	BEN-GURION UNIVERSITY OF THE NEGE
ELBIT SYSTEMS ELECTRO-OPTICS ELOP LT		CIMA NANO TECH ISRAEL LTD.	YISSUM RESEARCH DEVELOPMENT COM	CAMTEK LIMITED	Pulsar Welding Ltd.
KILOLAMBDA TECHNOLOGIES LTD.		BEN-GURION UNIVERSITY OF THE NEGEV	Saifun Semiconductors Ltd.	Nanomotion Ltd.	ELBIT SYSTEMS ELECTRO-OPTICS ELOP LT
YEDA RESEARCH AND DEVELOPMENT CC		Cell Kinetics, Ltd.	NOVA MEASURING INSTRUMENTS LTD.	COREFLOW SCIENTIFIC SOLUTIONS LTD	CAMTEK LTD.
OREE, ADVANCED ILLUMINATION SOLUT			PRS MEDITERRANEAN LTD.	SanDisk IL Ltd.	BIO-MAGNETICS LTD
Xceed Imaging Ltd.			Bar-Ilan University	Nova Measuring Instruments Ltd.	BRODY ENGINEERING LTD.

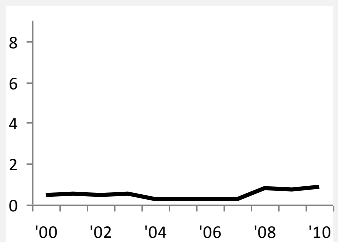
<u>Source:</u> EPO: PATSTAT / ZEW calculation.

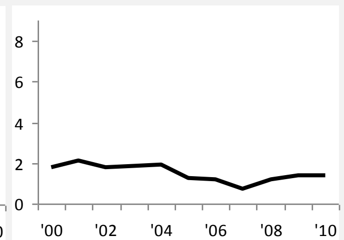
3) Trade

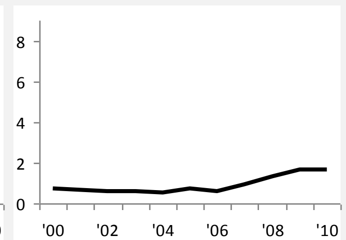
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

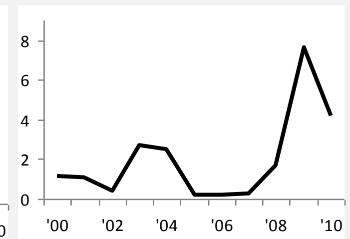
a) Significance: Share in the country's total exports (%)

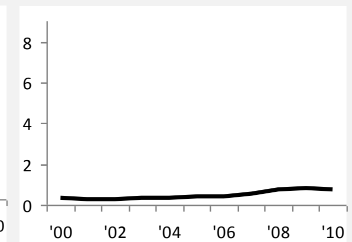




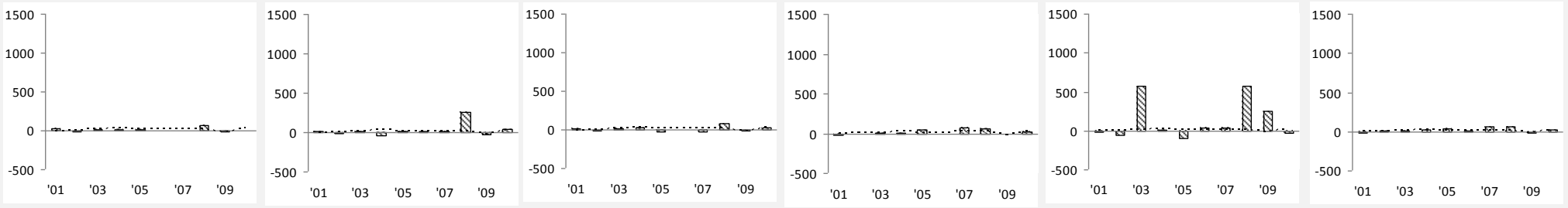




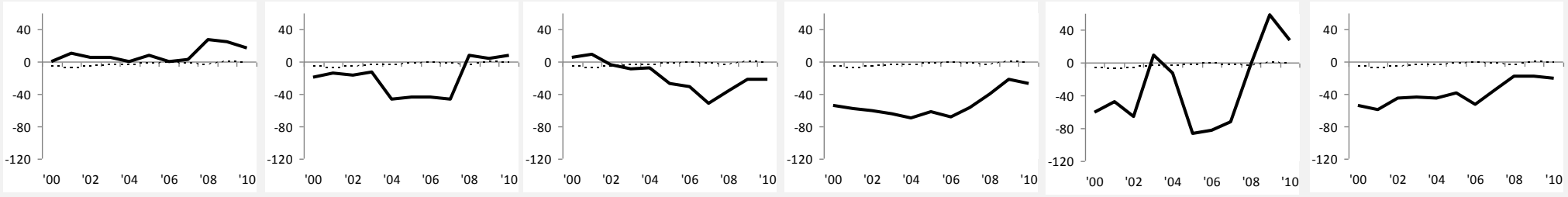




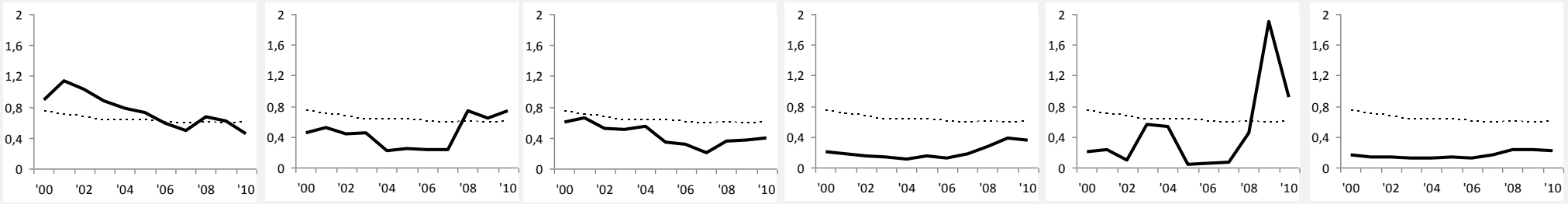
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



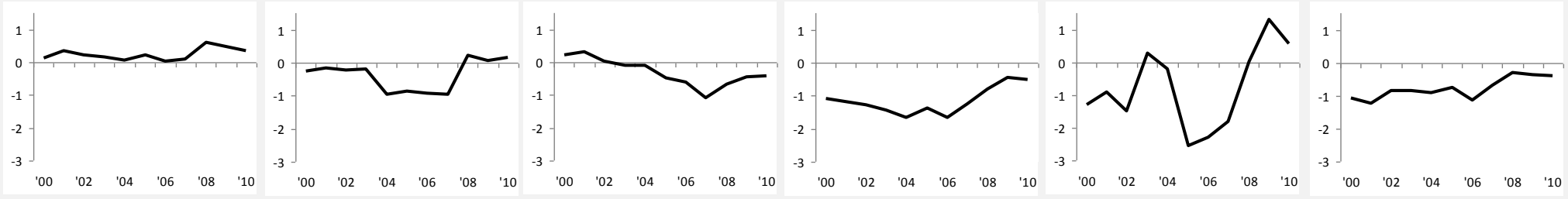
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



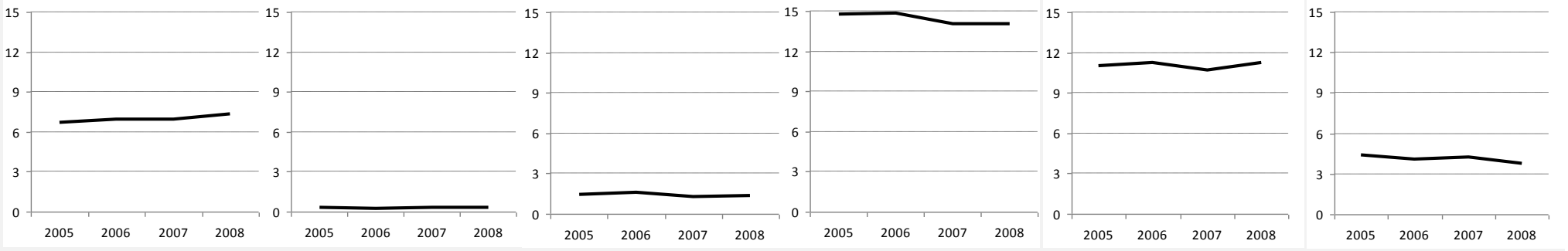
Source: UN: COMTRADE / ZEW and NIW calculation.

8.31 Japan

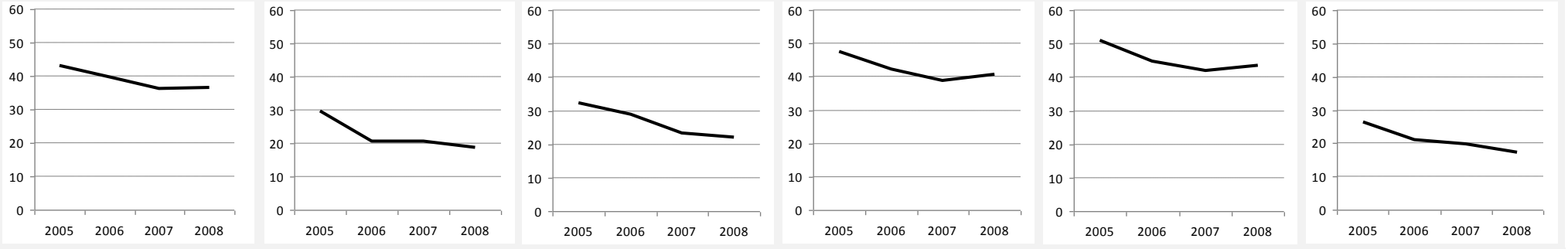
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

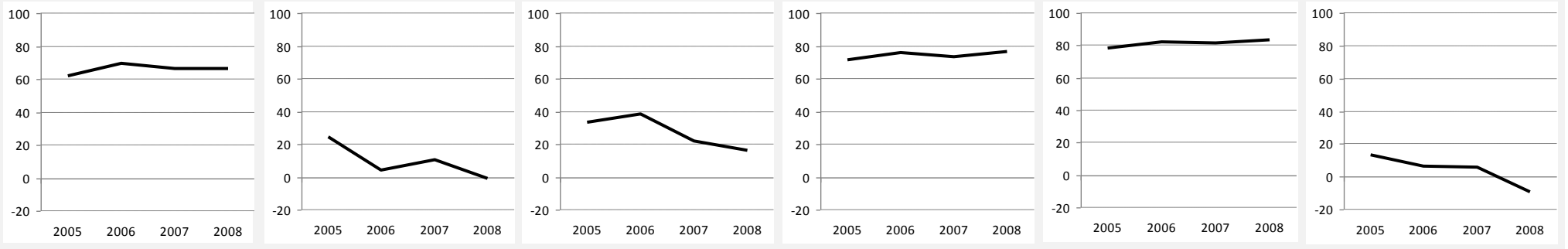
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
1306	1947	2146	25	89	93	312	407	427	2943	4165	4308	1891	3161	3350	835	1266	1232

Source: EPO: PATSTAT / ZEW calculation.

2) IMPORTANT ACTORS

Photonics | **Nanotechnology** | **Industrial Biotechnology** | **Advanced Materials** | **Micro-/Nanoelectronics** | **Advanced Manufacturing**

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

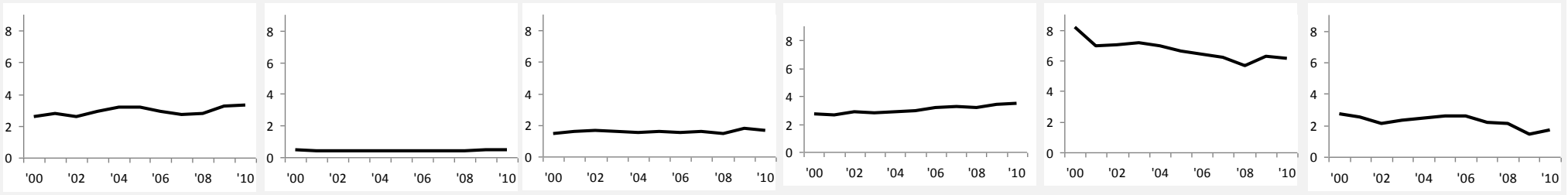
Sharp Kabushiki Kaisha	JAPAN SCIENCE AND TECHNOLOGY AGE	FUJIFILM CORPORATION	TOKYO ELECTRON LIMITED	TOKYO ELECTRON LTD.	FANUC LTD.
SONY CORP.	CANON KABUSHIKI KAISHA	CANON KK	NIPPON KOGAKU K. K.	MATSUSHITA ELECTRIC INDUSTRIAL CO.,	Panasonic Corporation
FUJIFILM Corporation	National Institute of Advanced Industri	Seiko Epson Corporation	NITTO DENKO CORPORATION	NIKON CORPORATION	HONDA MOTOR CO., Ltd.
NITTO DENKO CORP.	Seiko Epson Corporation	Sumitomo Chemical Company, Limited	FUJIFILM CORPORATION	CANON KABUSHIKI KAISHA	TOYOTA JIDOSHA KABUSHIKI KAISHA
IDEMITSU KOSAN CO. LTD.	FUJIFILM Corporation	Ricoh Company, Ltd.	Asahi Glass Company, Limited	SEMICONDUCTOR ENERGY LABORATORY	FUJITSU LTD.
Canon Kabushiki Kaisha	Panasonic Corporation	KAO. CORP.	MATSUSHITA ELECTRIC IND CO.,LTD.	SHARP KABUSHIKI KAISHA	Hitachi, Ltd.
Panasonic Corporation	Sony Corporation	AJINOMOTO CO., INC	Shin-Etsu Chemical Co., Ltd.	Sony Corporation	Magnescale Co., Ltd.
Sumitomo Chemical Company, Limited	SUMITOMO ELECTRIC INDUSTRIES LTD.	Nippon Kayaku Kabushiki Kaisha	SUMITOMO CHEMICAL COMPANY, LIMIT	Seiko Epson Corporation	MITSUBISHI DENKI KABUSHIKI KAISHA
Semiconductor Energy Laboratory Co., L	Fujitsu Limited	KONICA MINOLTA MEDICAL & GRAPHIC,	CANON KK	FUJITSU LIMITED	Seiko Epson Corporation
SEIKO EPSON CORP.	Konica Minolta Medical & Graphic, Inc.	Arkray, Inc	SUMITOMO ELECTRIC INDUSTRIES	Idemitsu Kosan Co., Ltd.	Panasonic Corporation

Source: EPO: PATSTAT / ZEW calculation.

3) TRADE

Photonics | **Nanotechnology** | **Industrial Biotechnology** | **Advanced Materials** | **Micro-/Nanoelectronics** | **Advanced Manufacturing**

a) Significance: Share in the country's total exports (%)


8
6
4
2
0
'00
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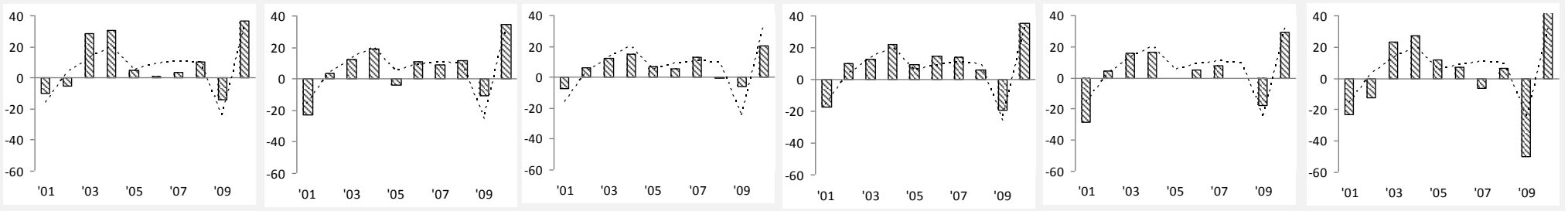
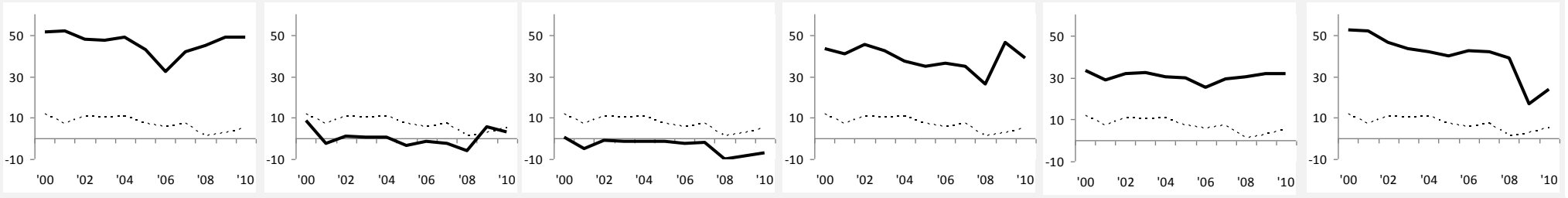
'10

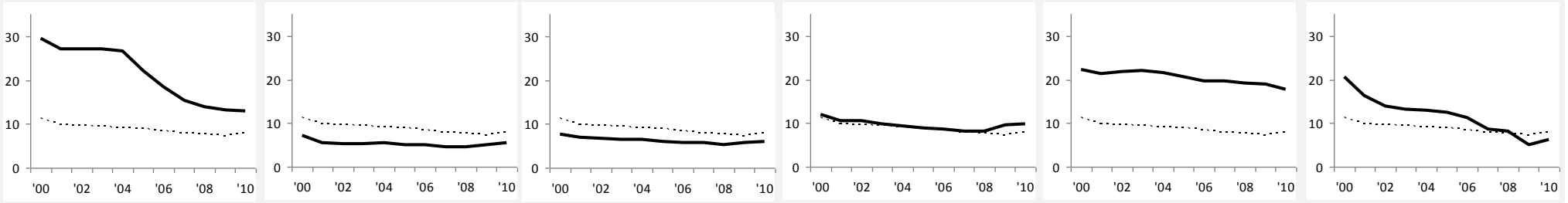
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



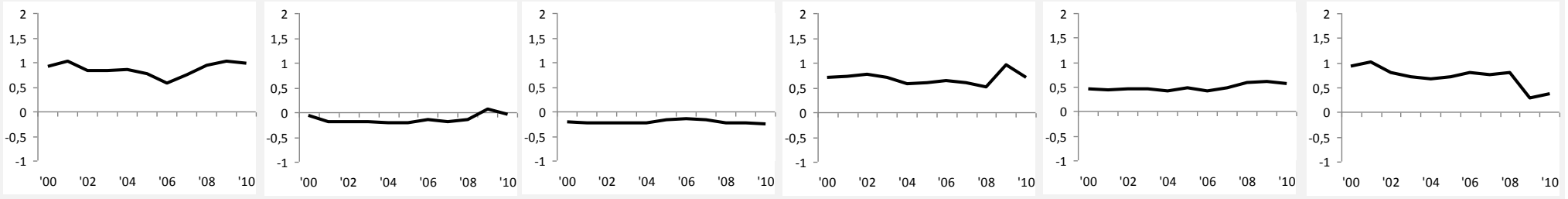
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



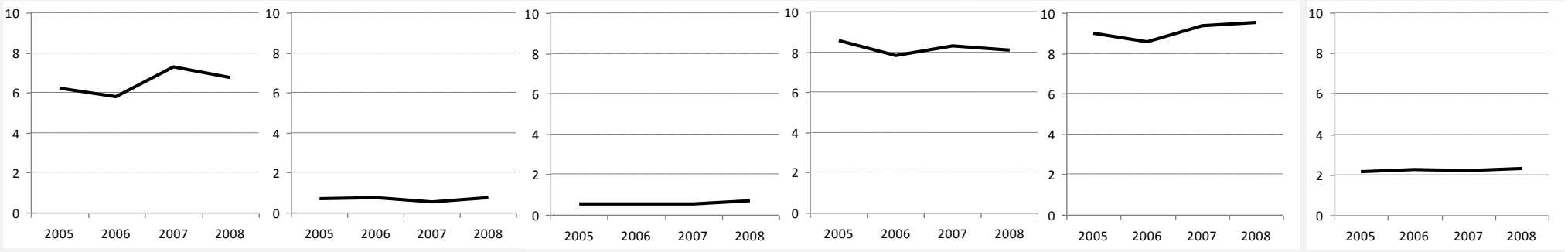
Source: UN: COMTRADE / ZEW and NIW calculation.

8.32 Korea

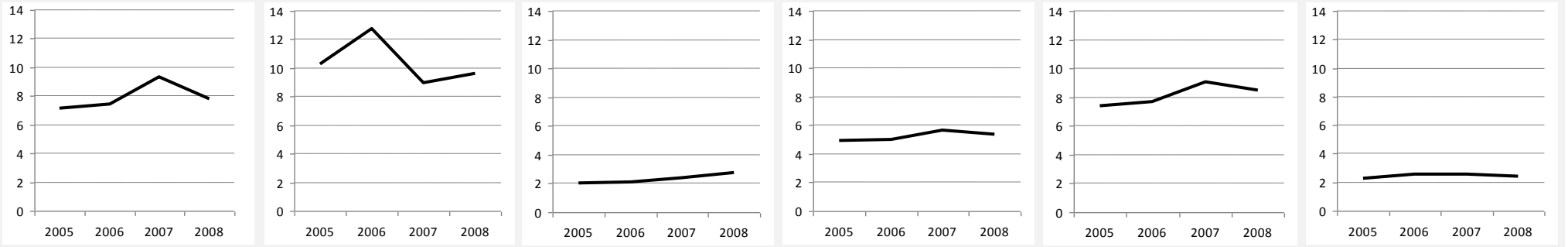
1) Patent Performance

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

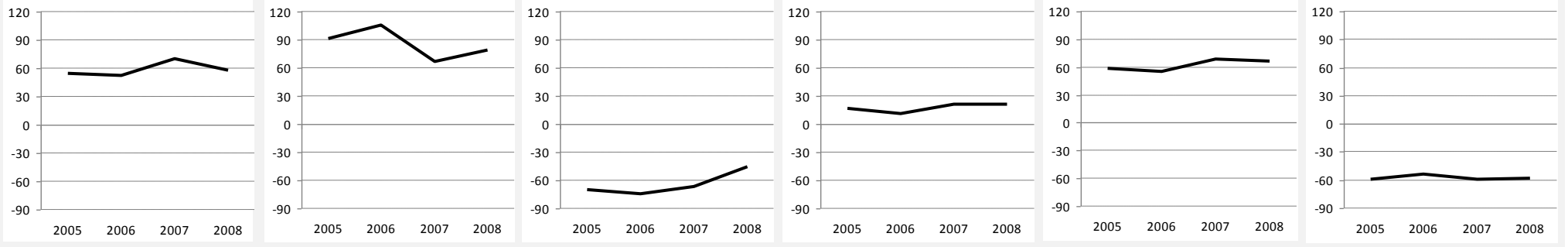
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

	Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
	97	318	478	11	36	50	19	28	43	194	414	582	144	434	663	53	111	164

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

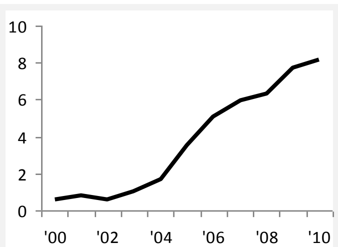
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
SAMSUNG CO., LTD.	Samsung	SAMSUNG	LG	SAMSUNG	SAMSUNG
LG	LG	LG	Samsung	LG	LG
ELECTRONICS AND TELECOMMUNICATIO	KOREA ELECTRONICS TELECOMM	CJ CORP	CHEIL INDUSTRIES INC	ELECTRONICS AND TELECOMMUNICATIO	ELECTRONICS AND TELECOMMUNICATIO
GRACEL DISPLAY INC.	SEOUL NATIONAL UNIVERSITY INDUSTRY	Corestem Co., Ltd.	POSCO	SEOUL OPTO DEVICE CO. LTD.	Seoul National University Industry Four
Seoul Semiconductor Co., Ltd.	KOREA RES INST OF BIOSCIENCE	Inktec Co., Ltd	Electronics and Telecommunications Re	SEOUL SEMICONDUCTOR CO., LTD.	KOREA INSTITUTE OF MACHINERY & MA
CHEIL INDUSTRIES INC.	KOREA INSTITUTE OF SCIENCE AND TECH	ENZYTECH, LTD.	KOLON INDUSTRIES, INC	GRACEL DISPLAY INC.	Korea Advanced Institute of Science and
KOREA ADVANCED INSTITUTE OF SCIEN	KOREA INSTITUTE OF ENERGY RESEARCH	INDUSTRY-ACADEMIC COOPERATION FO	Seoul Opto Device Co., Ltd.	SILICONFILE TECHNOLOGIES INC.	EO Technics Co., Ltd.
LS CABLE LTD.	KOREA ADVANCED INSTITUTE OF SCIEN	SEWON CELLONTECH CO., LTD.	Korea Advanced Institute of Science and	Korea Advanced Institute of Science and	POSCO
KOLON INDUSTRIES, INC.	Cheil Industries, Inc.	i-Sens, Inc.	SK Energy Co., Ltd	Cheil Industries, Inc.	
	NEXEN NANO TECH CO., LTD	UNHWA	SILTRON INC.		

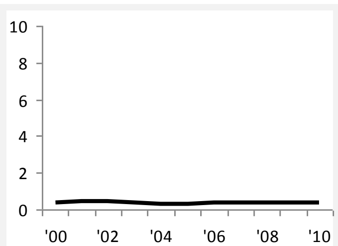
Source: EPO: PATSTAT / ZEW calculation.

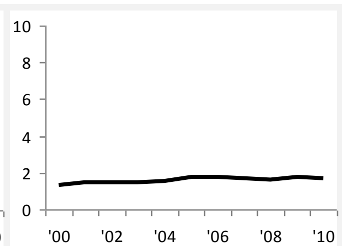
3) Trade

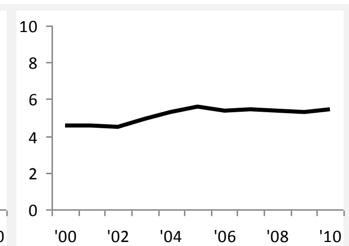
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

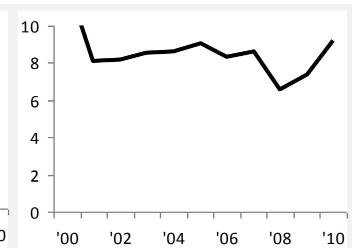
a) Significance: Share in the country's total exports (%)

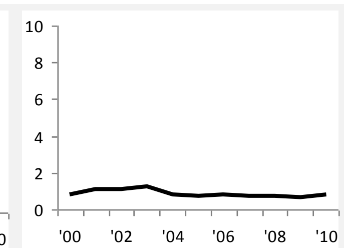




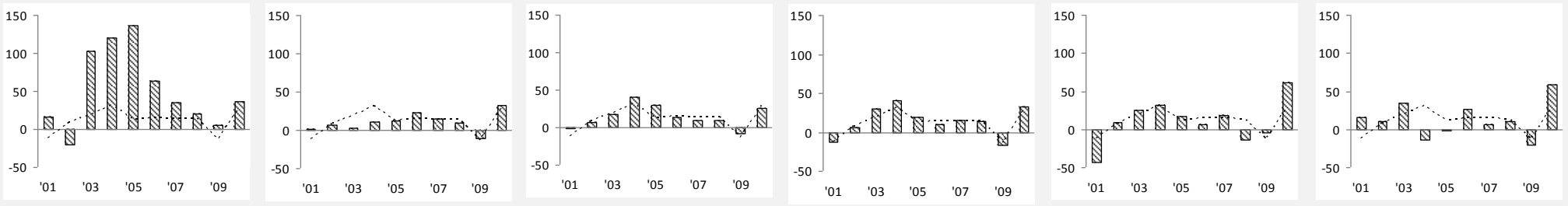




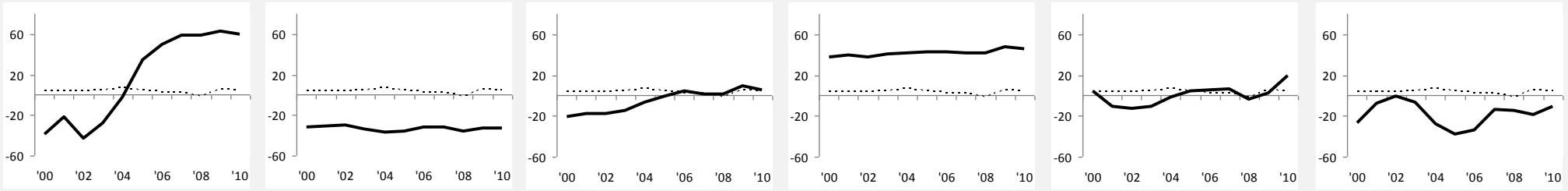




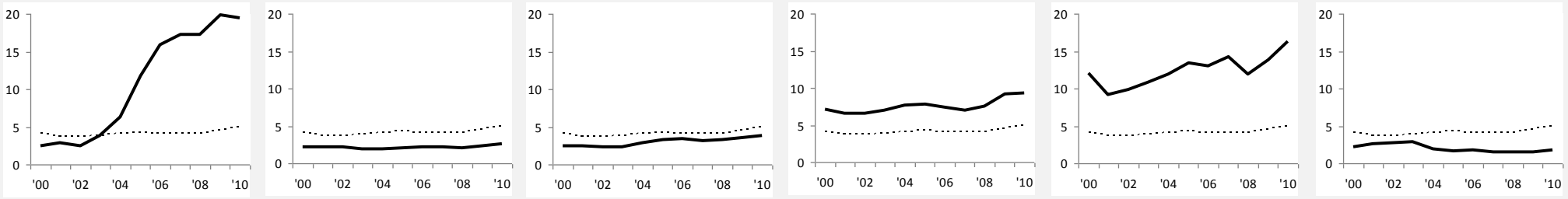
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



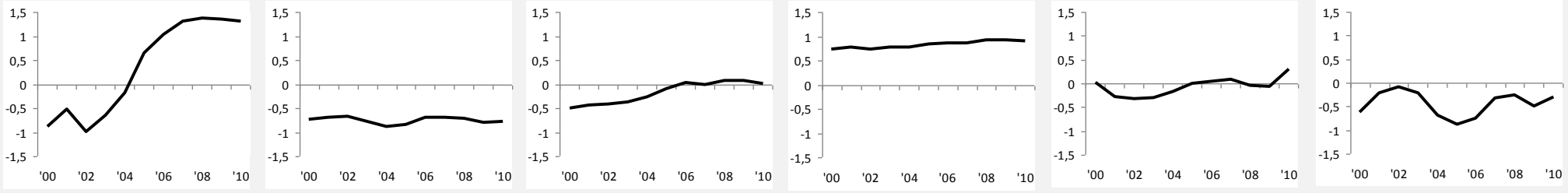
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



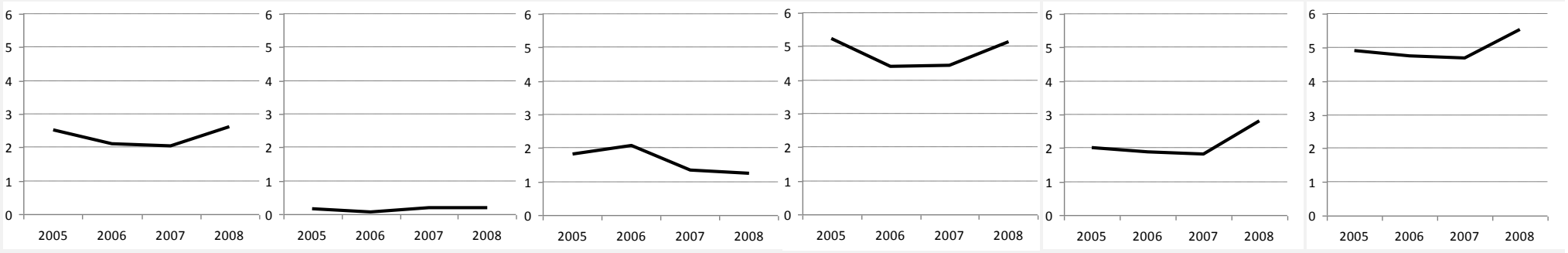
Source: UN: COMTRADE / ZEW and NIW calculation.

8.33 Switzerland

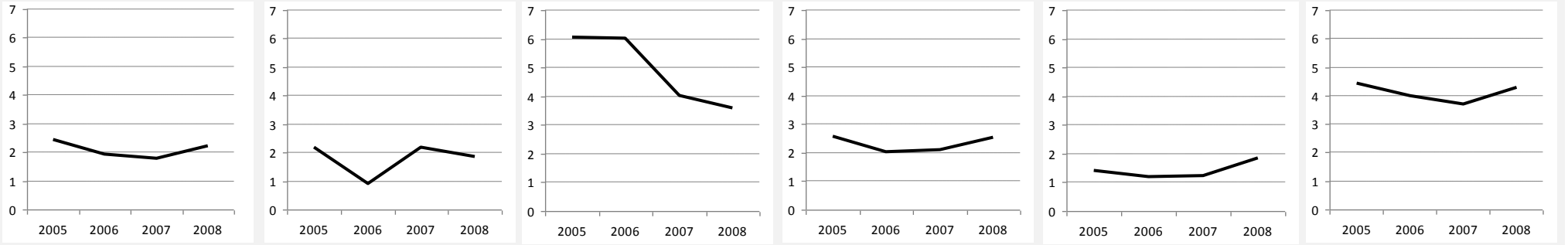
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

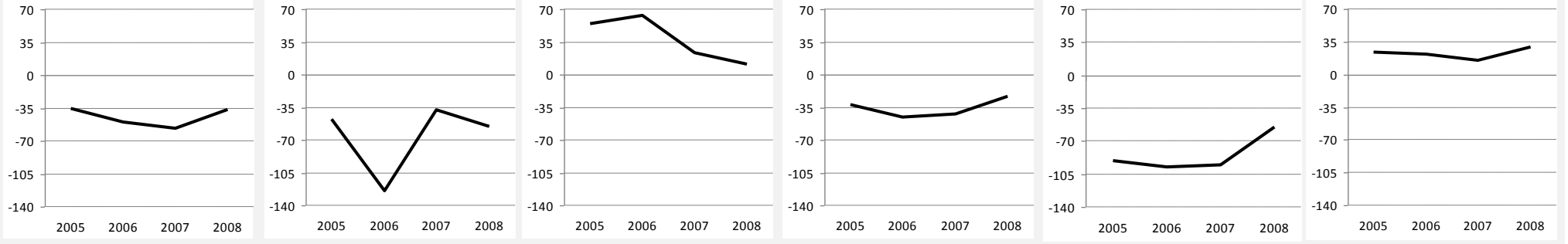
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

Photonics			Nanotechnology			Industrial Biotechnology			Advanced Materials			Micro-/Nanoelectronics			Advanced Manufacturing		
00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
109	111	112	6	8	8	66	69	78	232	235	239	96	86	110	165	207	255

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

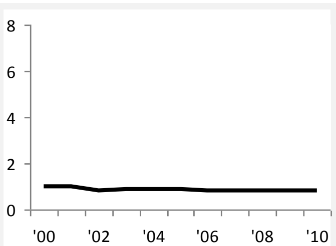
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
Alcon, Inc.	F. HOFFMANN LA-ROCHE AG	HOFFMANN LA ROCHE	SIKA TECHNOLOGY AG	ABB Research Ltd	Endress+Hauser Flowtec AG
NOVARTIS AG	Nivarox-FAR S.A.	CIBA SPECIALTY CHEMICALS HOLDING IN	Michelin Recherche et Technique S.A.	CSEM CENTRE SUISSE D'ELECTRONIQUE	ABB RESEARCH LTD.
CIBA HOLDING INC.	THE SWATCH GROUP RESEARCH AND D	CLARIANT INTERNATIONAL LIMITED	Ciba Holding Inc	ECOLE POLYTECHNIQUE FEDERALE DE LA	ALSTOM TECHNOLOGY LTD
CSEM CENTRE SUISSE D'ELECTRONIQUE	DEBIOTECH S.A.	Lonza AG	CLARIANT INTERNATIONAL LTD	Ciba Holding Inc.	Michelin Recherche et Technique S.A.
EMS-CHEMIE AG		HUNTSMAN ADV MAT SWITZERLAND	ABB Research Ltd.	MICHELIN RECHERCHE ET TECHNIQUE S.A	F. Hoffmann-La Roche AG
ABB Research Ltd.		NOVARTIS AG	Alcan Technology & Management Ltd.	OERLIKON ASSEMBLY EQUIPMENT AG, S	ALCON, INC.
ECOLE POLYTECHNIQUE FEDERALE DE LA		SICPA HOLDING SA	Tetra Laval Holdings & Finance SA	MESA IMAGING AG	ENDRESS+HAUSER PROCESS SOLUTIONS
ALCAN TECHNOLOGY & MANAGEMENT I		Nestec S.A.	EMS CHEMIE AG	F.HOFFMANN-LA ROCHE AG	KROHNE AG.
OVD KINEGRAM AG		FIRMENICH SA	HUNTSMAN ADVANCED MATERIALS(SW	EM MICROELECTRONIC MARIN SA	Kistler Holding AG
Leica Geosystems AG		Baxter Healthcare S.A.	Invista Technologies S.Ã .r.l.	BRUKER BIOSPIN AG	Mettler-Toledo AG

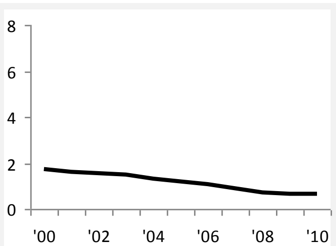
Source: EPO: PATSTAT / ZEW calculation.

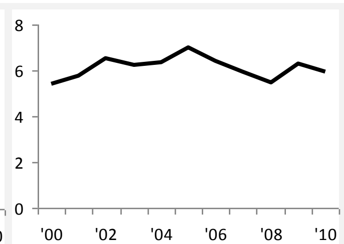
3) Trade

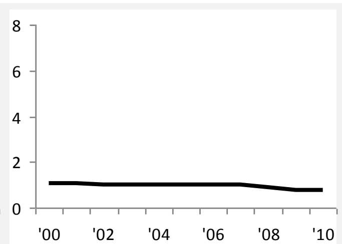
a) Significance: Share in the country's total exports (%)

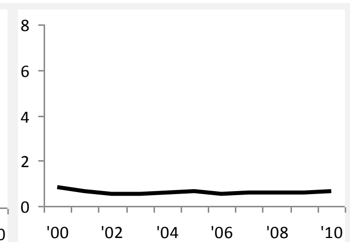
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

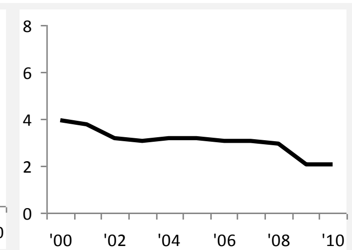




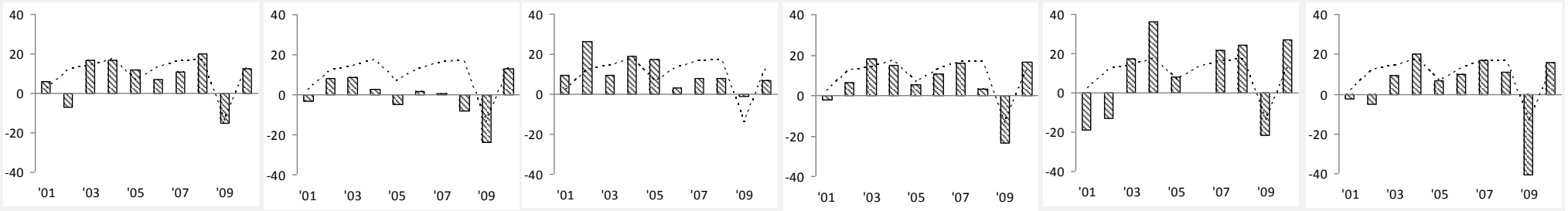




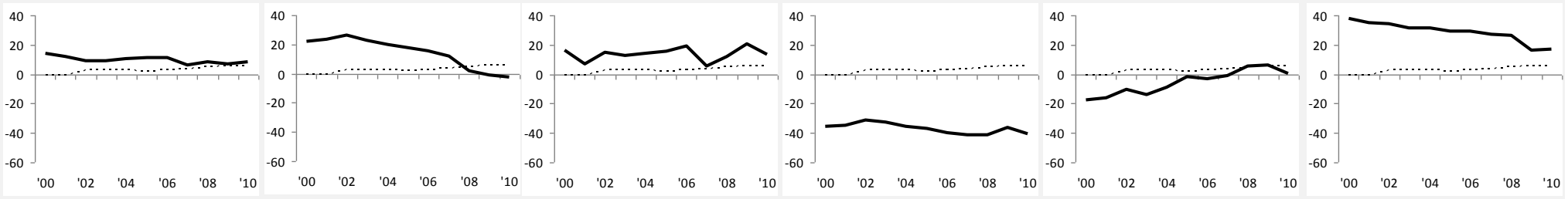




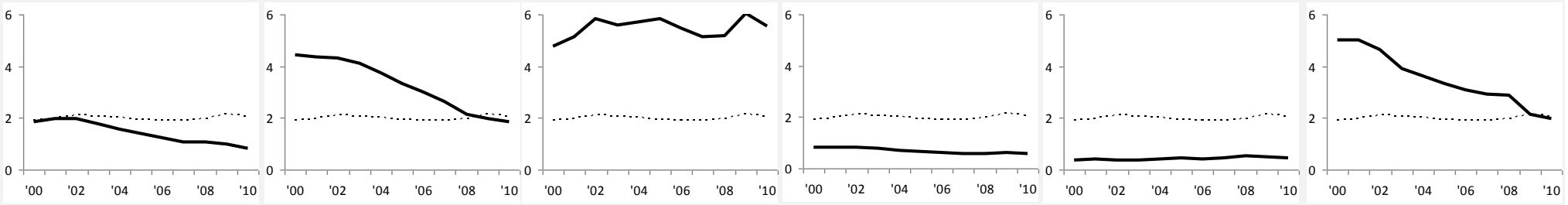
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



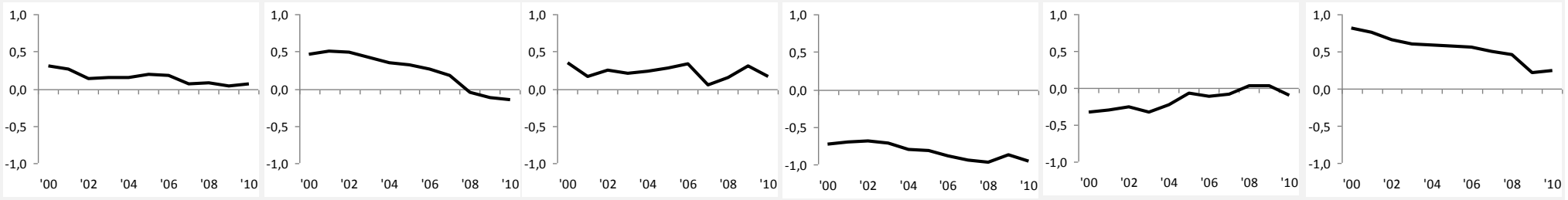
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



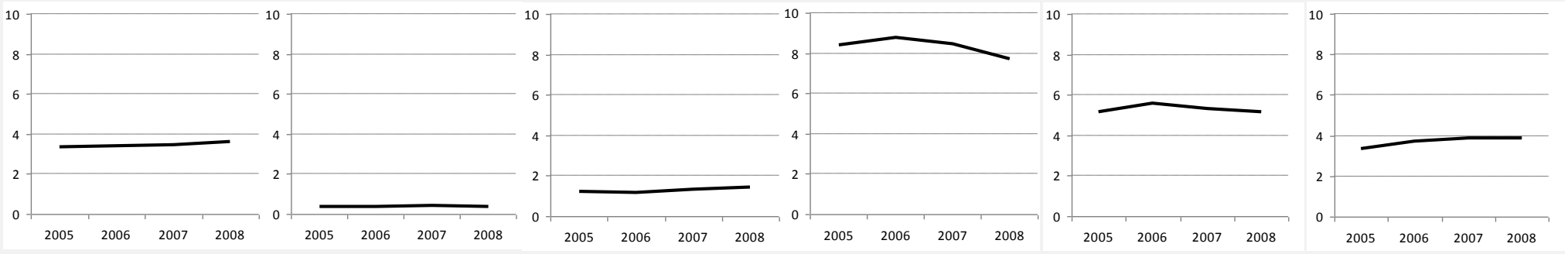
Source: UN: COMTRADE / ZEW and NIW calculation.

8.34 United States

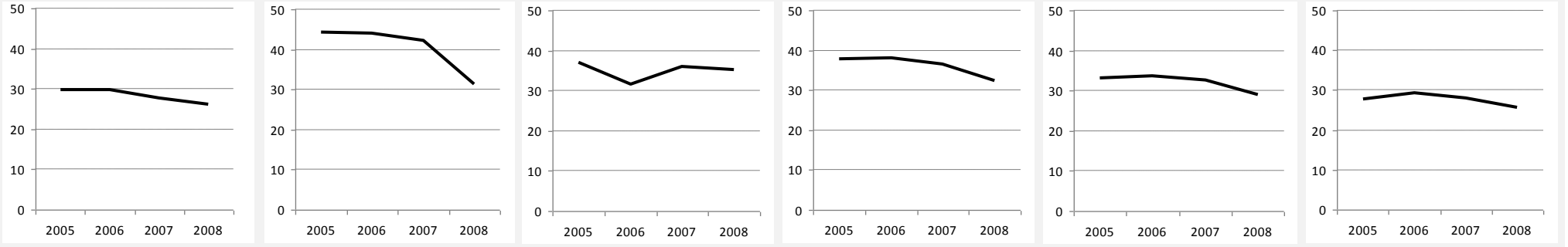
1) PATENT PERFORMANCE

Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

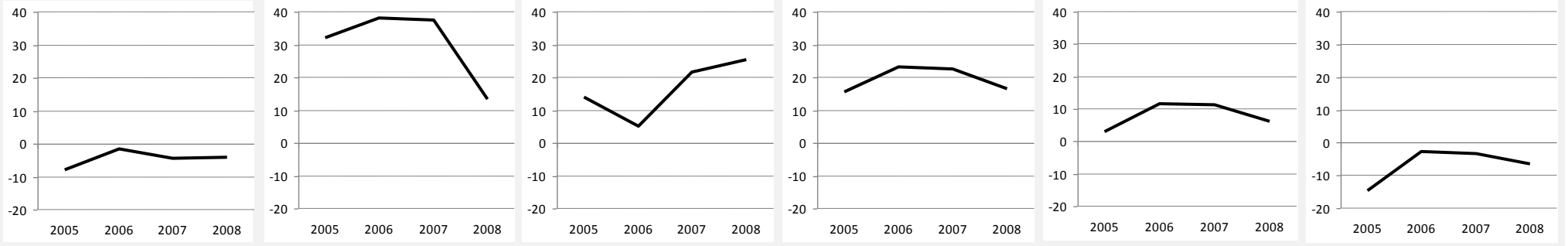
a) Significance: Share in the country´s total EPO/PCT patents (%)



b) Market Share: Share in total EPO/PCT patents by applicants from EU-27 + 7 large non-EU countries (%)



c) Specialisation: Share in the country´s total EPO/PCT patents related to the respective share for all EU-27 + 7 large non EU-countries (ln*100)



d) Dynamics: Number of EPO/PCT patent applications in 2000/02, 2003/05 and 2006/08 (annual averages)

00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08	00/02	03/05	06/08
1666	1653	1620	125	167	182	564	591	602	3919	4190	3835	2332	2622	2497	1300	1587	1777

Source: EPO: PATSTAT / ZEW calculation.

2) Important Actors

Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

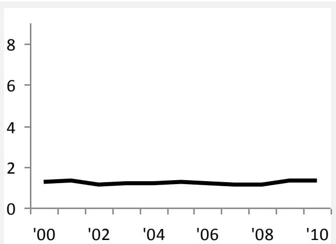
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing
3M INNOVATIVE PROPERTIES COMPANY	IDC, LLC	HEWLETT-PACKARD DEVELOPMENT CON	DU PONT	International Business Machines Corpo	HONEYWELL INTERNATIONAL INC.
E.I. DU PONT DE NEMOURS AND COMPA	3M Innovative Properties Company	E.I. DUPONT DE NEMOURS AND COMPA	MICRON TECHNOLOGY, INC.	Micron Technology, Inc.	GENERAL ELECTRIC COMPANY
EASTMAN KODAK COMPANY	HEWLETT-PACKARD DEVELOPMENT CON	XEROX CORP.	3M Innovative Properties Company	TEXAS INSTRUMENTS INCORPORATED	Rosemount, Inc.
Corning Incorporated	Honeywell International Inc.	Sun Chemical Corporation	GENERAL ELECTRIC COMPANY	INTEL CORPORATION	UNITED TECHNOLOGIES CORP. (N.D.GES
General Electric Company	QUALCOMM MEMS Technologies, Inc.	BAYER HEALTHCARE LLC	APPLIED MATERIALS INC.	APPLIED MATERIALS INC.	DELPHI TECHNOLOGIES, INC.
HEWLETT-PACKARD DEVELOPMENT CON	THE REGENTS OF THE UNIVERSITY OF CA	Novozymes North America, Inc.	Dow Global Technologies Inc.	IBM	Rockwell Automation Technologies, Inc
ADC TELECOMMUNICATIONS, INC.	Nanosys, Inc.	The Regents of the University of Califor	IBM	Freescale Semiconductor, Inc.	THE BOEING COMPANY
Corning Cable Systems LLC	International Business Machines Corpo	Becton, Dickinson and Company	Lam Research Corporation	MICRON TECHNOLOGY, INC.	ILLINOIS TOOL WORKS INC.
Intel Corporation	GENERAL ELECTRIC COMPANY	3M Innovative Properties Company	Freescale Semiconductor, Inc.	Lam Research Corporation	CARRIER CORPORATION
International Business Machines Corpo	DU PONT	Eastman Kodak Company	Micron Technology, Inc.	E. I. DU PONT DE NEMOURS AND COMPA	LINCOLN GLOBAL INC.
			EXXONMOBIL CHEMICAL PATENTS, INC.		

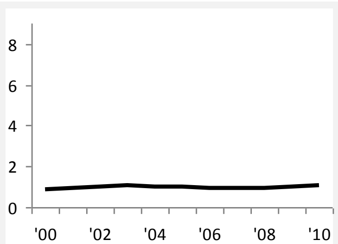
Source: EPO: PATSTAT / ZEW calculation.

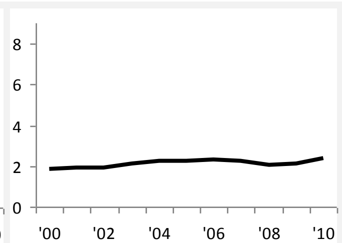
3) Trade

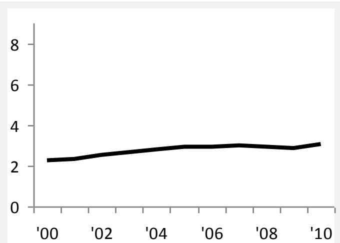
Photonics	Nanotechnology	Industrial Biotechnology	Advanced Materials	Micro-/Nanoelectronics	Advanced Manufacturing

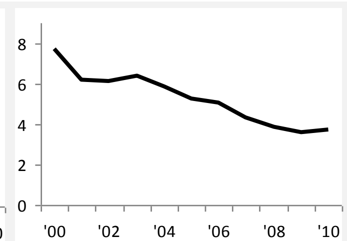
a) Significance: Share in the country's total exports (%)

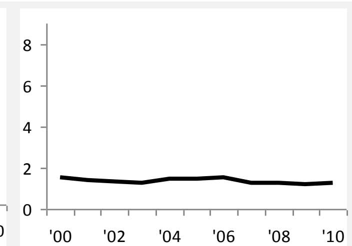




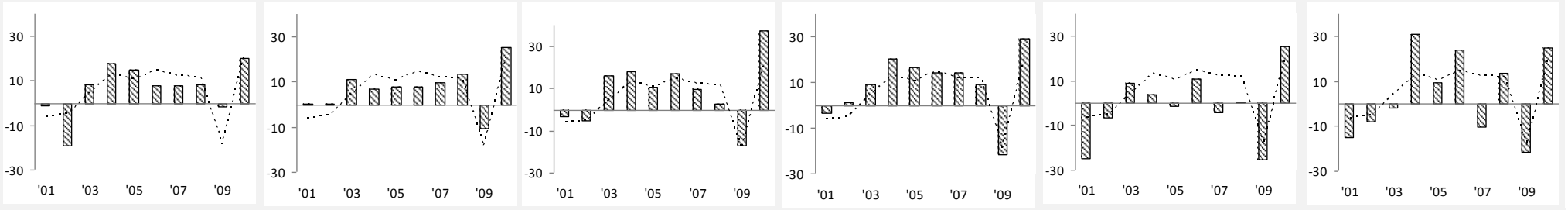




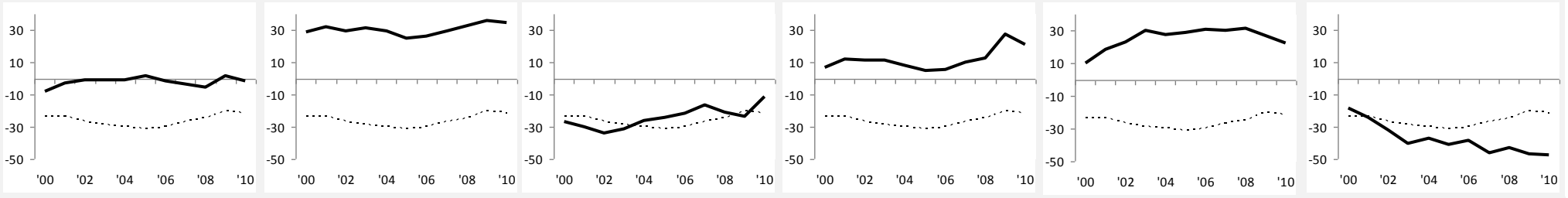




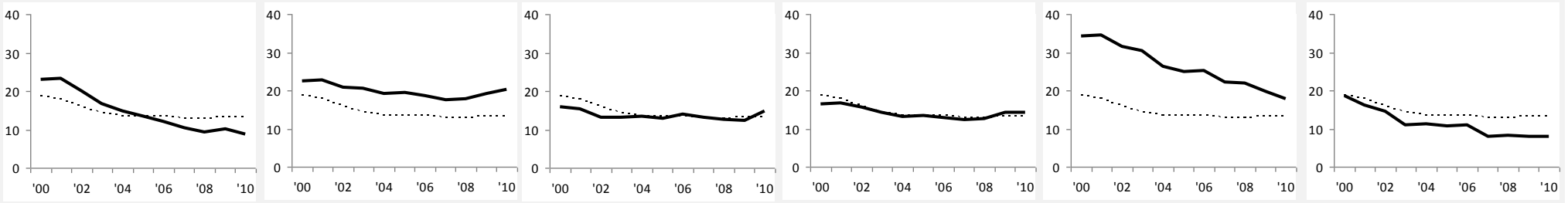
b) Export Growth: Change in volume of exports (in US-$) to previous year (%)



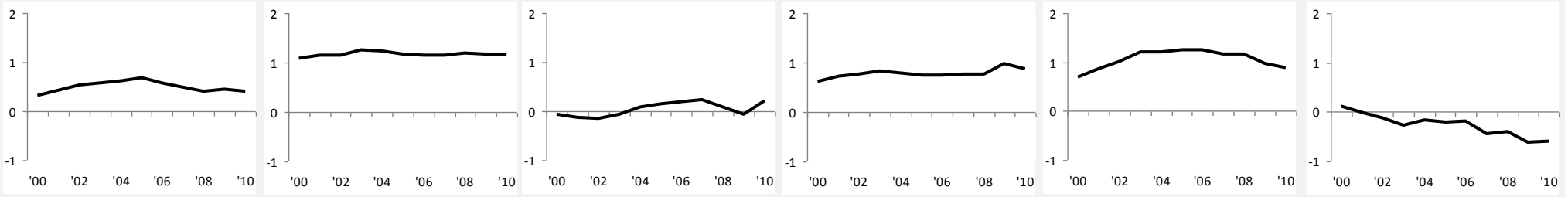
c) Trade Balance: Exports minus imports over the sum of exports and imports (%) – dotted line: total trade



d) Market Share: Country's share in total exports by KET (%) – dotted line: total trade



e) Specialisation: RWA: export to import ratio by KET over export to import ratio for total trade (ln*100)



Source: UN: COMTRADE / ZEW and NIW calculation.