



High-Technology Trade Indicators 2008

An international comparison of the big economic areas and countries

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Executive summary

The present report gives an overview on the level and development of the high-technology exports and imports of the four big economic areas and countries of the world: the USA, the EU-25, Japan, and China. In addition to these economic areas and countries also the countries participating in the Group of Eight process (G8) – the USA, Japan, Germany, the United Kingdom, France, Italy, Canada, and Russia – are analysed where it was found informative by the author.

For the analyses of the total high-tech trade three different definitions of market shares are used: high-tech trade in world high-tech trade, high-tech trade in world total trade, and high-tech trade in one country's total trade. For the definition of the high-tech sectors and goods the current classifications of high-tech sectors and product groups of the OECD were applied.

Furthermore, the composition of the high-tech exports and imports of each of the four big economic areas and countries was studied and also the per-capita high-tech exports and imports as well as the share of high-tech exports in the gross domestic product (GDP) were examined.

One main finding is that the EU-25 shows a stable development in its market shares of the total high-tech trade. It is especially strong in aerospace products, pharmaceutical products, chemical products, scientific instruments, and non-electrical machinery.

The USA and Japan are losing ground in high-tech trade and China is increasing quite strongly its position in the total world high-tech trade. China is or is becoming the top-player. Especially in computer products, electronics and telecommunications products China is already in the lead. The Chinese government is pressing its domestic companies to move up the value chain. A China analyst of an investment bank has summarised it this way: “Now, China's saying, ‘We don't want to be the world's sweatshop for junk any more.’”¹

¹ Andy Rothman, a longtime China analyst at CLSA, the investment bank, quoted in: Barboza, David: “In China, low-end industries give way to high-tech” in: International Herald Tribune, August 1, 2008.

1. Concepts and definitions

Technology is one of the essential actors in the enhancement of economic growth and productivity. Sales of high-tech products are already a vital part of many countries' export performance and high-tech industries are considered as synonymous of high added value and well-paid jobs.

Even if it is actually difficult to estimate countries' performance in developing and commercialising technology, high-tech trade is definitely one important indicator in this direction, as high-tech products are the leading edge of science-based trade and are often the result of considerable R&D investments.

The importance of trading in high-tech products is due to several reasons; for example, it returns the capacity of a country to carry out R&D, to develop new knowledge, and to transform it into advanced goods to be sold in the global market. All such actions are symptoms of an increasing efficiency, supporting a virtuous cycle of learning, productivity and competitiveness.

Basically, high-tech trade takes into account exports and imports of products requiring a high amount of R&D. Trade sectors are defined on the basis of SITC product codes (Standard International Trade Classification – Rev. 3). According to the OECD² there are nine main product groups of high-technology:

1. Aerospace
2. Computers and office machines
3. Electronics and telecommunications
4. Pharmacy
5. Scientific instruments
6. Electrical machinery
7. Chemistry
8. Non-electrical machinery
9. Armaments

Definition of high-technology

The report covers both approaches for the calculation of high-tech trade indicators: the product approach and the sectoral approach. An important distinction has to be stressed between trade of high-tech products and trade of goods by high-tech industries. In fact, not all goods produced by high-tech industries are really high-tech products. For this reason, two different approaches are chosen for the calculation of high-tech trade indicators.

Data basis

The data was compiled exclusively from the Comtrade Database of the United Nations.³

Methodology and Concepts

For the EU Member States, the statistical information is provided by the traders' customs declarations (extra-EU trade) and direct enterprise declarations (intra-EU trade). Data are collected by the competent national authorities of the Member States and compiled according to a harmonised methodology established by EU regulations before transmitted to Eurostat and being published in the Comext

² Hatzichronoglou, Thomas (1997), "Revision of the High-Technology Sector and Product Classification" in: OECD Science, Technology and Industry Working Papers, 1997/2, p. 9.

³ Weblink: <http://comtrade.un.org/>

database⁴ (community concept). However, in order to enhance international comparability also for the EU member states the data from the UN Comtrade database was used.

In order to get an approximation to the Extrastat concept, the exports to other EU Member States and the imports from other EU Member States were deducted from the exports and the imports respectively. This methodology coincides with the methodology proposed by the OECD for the measurement of intra-regional and extra-regional trade.⁵ An alternative calculation using Comext data for the EU Member States did not show major differences in the percentages compared to this method. For the non EU countries, data are based on national concepts.

Country coverage

The countries covered in this study are the Member States of the EU-25 (considered as an aggregate), Japan, the USA, and China. Therefore, in this report intra-EU-25 trade figures are omitted and only extra-EU exports are considered when calculating the indicator for the EU-25 as a whole. The EU-25 was chosen instead of the EU-27 because the data available for the analyses only covers up to 2006, the last year before the accession of Bulgaria and Romania.

In addition, some indicators for the states participating in the international forum *Group of Eight* (G8) were calculated. In these cases the countries that are EU Member States and G8 members at the same time show their total trade (intra-community and extra-community trade).

Time coverage

The indicators are calculated from 2000 to 2006, the latest year where data are available for all countries.

Definition of the indicators used

The analyses carried out in this study focus on **market shares**. The market share is a ratio in which the nominator is the total export of high-tech products from the country under study. Three different denominators can be considered, producing in turn three different indicators:

(DEF. 1): ratio of a country's high tech exports to the world high tech exports

This denominator is calculated as the sum of high tech exports from all the countries in the world. This indicator provides a picture of leading high-tech traders all over the world; leading countries have high percentage of exports in the high-tech sector with respect to other countries, but no information is provided for non high-tech trading sectors.

Formula:

$$= \frac{\text{high tech trade of country } X}{\text{world high tech trade}}$$

⁴ Weblink: <http://epp.eurostat.ec.europa.eu/newxtweb/>

⁵ For details, see OECD Handbook on Economic Globalisation Indicators, 2005, pp. 196-200.

(DEF. 2): ratio of a country's high-tech exports to the world exports (high-tech and non high-tech)

This denominator is calculated as the sum of exports over all manufacturing sectors from all the countries in the world (excluding intra EU-25 exports). This indicator offers information on the country's specialization in the high-tech sector; leading countries are those having a large percentage of high-tech exports compared to trade in all sectors (both high and non high-tech).

Formula:

$$= \frac{\text{high tech trade of country } X}{\text{total world trade}}$$

(DEF. 3): ratio of a country's high-tech exports to its total exports

This denominator is the total exports of the country of interest. This indicator shows the trading performance of a given country, i.e. how much of all trading activity of a country is devoted to the high-tech sector. The indicator highlights the most specialized countries in the high-tech sector. This measure cannot be considered as a measure of market share: countries with a high score in DEF 3 could have low scores in DEF 1 and 2.

Formula:

$$= \frac{\text{high tech trade of country } X}{\text{total trade of country } X}$$

The same definitions hold for imports.

Relative trade balance is another indicator of interest. This is obtained by the difference between exports and imports (trade balance) divided by the trade volume (exports plus imports). A positive relative trade balance indicates that exports in the sector under study are higher than imports in the same sector. The normalisation by dividing the trade balance by the trade volume makes an international comparison possible.

It must be considered, when interpreting results, that a negative trade balance is not necessarily a negative sign. If a country is experiencing a loss in the domestic production of some goods, a high level of import of those goods can be helpful for the economy, as the knowledge the countries convey can motivate the production of goods in other sectors.

Data availability and comparability

When one of the indicators refers to the world total trade (exports or imports) or the total world trade in high-tech industries (sectoral approach) or with high-tech goods (product approach), it has to be kept in mind that data comparability between years is slightly limited because the number of countries that reported their trade data to the UN varies over the years and, some of them, on an irregular basis. So the composition and structure of the world total can differ from one year to another. However, the influence of these variations is very limited and therefore does not have a significant impact on the assessment of the results.

2. Sectoral Approach

In the sectoral approach, we have used trade data from high-tech sectors as classified in Annex 1 of this report. (The list of high-tech sectors has been updated by the OECD in 2001.⁶) It has to be noted that exports from high-tech industries are usually not 100% high-tech, but can also include medium-high-tech, medium-tech or low-tech.

2.1. *World Market Share (Def. 1) – ratio of a country's exports of its high tech sectors to the world exports of high tech sectors*

In the following, the world market share for both imports and exports according to definition 1 will be analysed for the four large economic areas (EU-25, USA, Japan, and China) and for the G8 + China.

The world market share (Def. 1) is defined as the ratio between the exports of the high-tech industries from the country / area under study and the world exports of high tech industries, which is calculated as the sum of exports by high-tech industries of all countries (excluding intra EU-25 exports).⁷

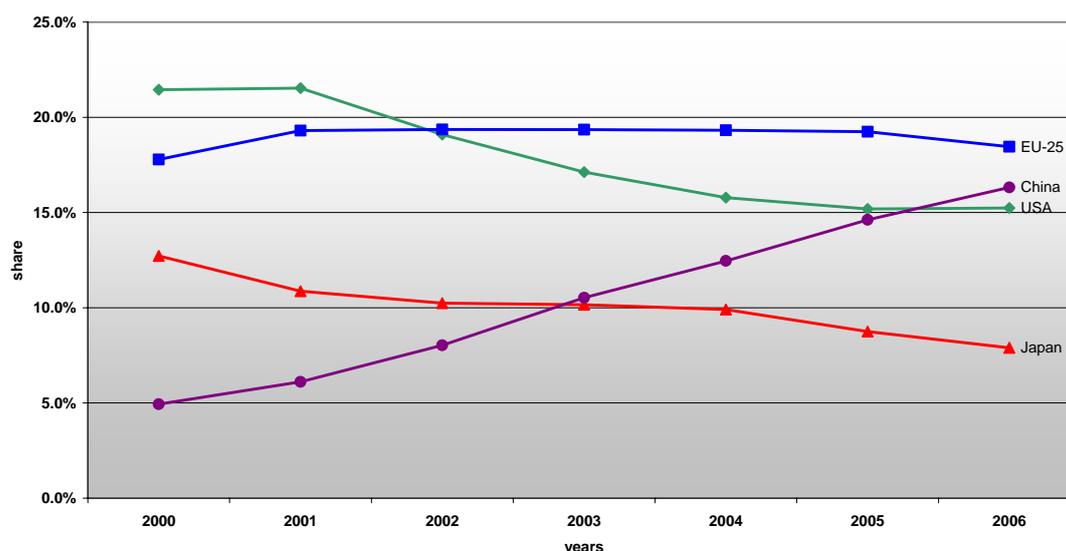
EXPORTS

Table 1: Share of the goods exported by high-tech sectors of the listed countries in relation to the total (world) exports of high-tech sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	17.8%	19.3%	19.4%	19.3%	19.3%	19.2%	18.5%
USA	21.4%	21.5%	19.1%	17.1%	15.8%	15.2%	15.2%
Japan	12.7%	10.9%	10.2%	10.1%	9.9%	8.7%	7.9%
China	4.9%	6.1%	8.0%	10.5%	12.5%	14.6%	16.3%
Sum big 4 areas	56.9%	57.8%	56.7%	57.1%	57.5%	57.8%	57.9%

Figure 1

World market share of high-tech exports of country X compared to total high-tech exports



⁶ OECD Handbook on Economic Globalisation Indicators, 2005, p. 172.

⁷ Due to variations in the number and composition of countries reporting their trade data, the world total can differ (ceteris paribus) very slightly from one year to another.

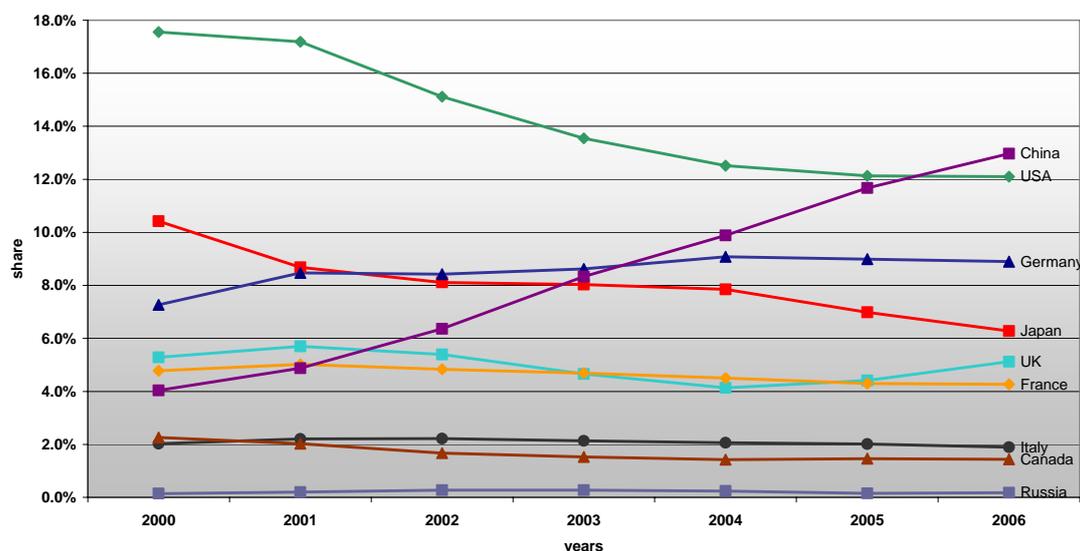
From the Table 1 and Figure 1 it can be seen that the export world market share of high-tech industries in the EU-25 is relatively stable around 19% over the observed period from 2000 to 2006 whereas for the other highly industrialised countries Japan and the United States the export world market share of the high-tech industries is declining during the same period. China was able to more than triple its market share in the export of goods originating from high-tech industries from just about 5% in the year 2000 to over 16% in 2006. Looking at the market shares of the three economies this suggests that China was able to increase its market share mainly at the expense of the USA and Japan and did not have a mayor influence on the EU-25.

Table 2: Share of the goods exported by high-tech sectors of the listed countries in relation to the total (world) exports of high-tech sectors (G8 countries + China)⁸

	2000	2001	2002	2003	2004	2005	2006
USA	17.6%	17.2%	15.1%	13.5%	12.5%	12.1%	12.1%
Japan	10.4%	8.7%	8.1%	8.0%	7.9%	7.0%	6.3%
Germany	7.3%	8.5%	8.4%	8.6%	9.1%	9.0%	8.9%
United Kingdom	5.3%	5.7%	5.4%	4.7%	4.1%	4.4%	5.1%
France	4.8%	5.0%	4.8%	4.7%	4.5%	4.3%	4.3%
Italy	2.0%	2.2%	2.2%	2.1%	2.1%	2.0%	1.9%
Canada	2.3%	2.0%	1.7%	1.5%	1.4%	1.5%	1.4%
Russia	0.1%	0.2%	0.3%	0.3%	0.2%	0.2%	0.2%
Sum G8	49.7%	49.5%	46.0%	43.5%	41.8%	40.4%	40.2%
China	4.0%	4.9%	6.4%	8.3%	9.9%	11.7%	13.0%

Figure 2

World market share of high-tech exports of country X compared to total high-tech exports



Looking at the G8 + China figures (Table 2), it can be seen that the increase in the market share of China in the exports of high-tech industries did not affect to a great extent the EU G8 countries (France, Germany, Italy, and the UK). Germany was even able to increase its market share (+1.6 per-

⁸ The percentages for the countries shown in this table that are also included in Table 1 (USA, Japan, and China) are lower here, because the world total is defined differently and includes now also the intra-community trade of the EU-25.

centage points or by 22%). The USA, Japan and to much smaller extent Canada are showing considerable market share losses. In total the G8's market share decreased from almost 50% to roughly 40% (-9.6 percentage points or by -19%) and at the same time China increased its market share by 8.9 percentage points (221% increase).

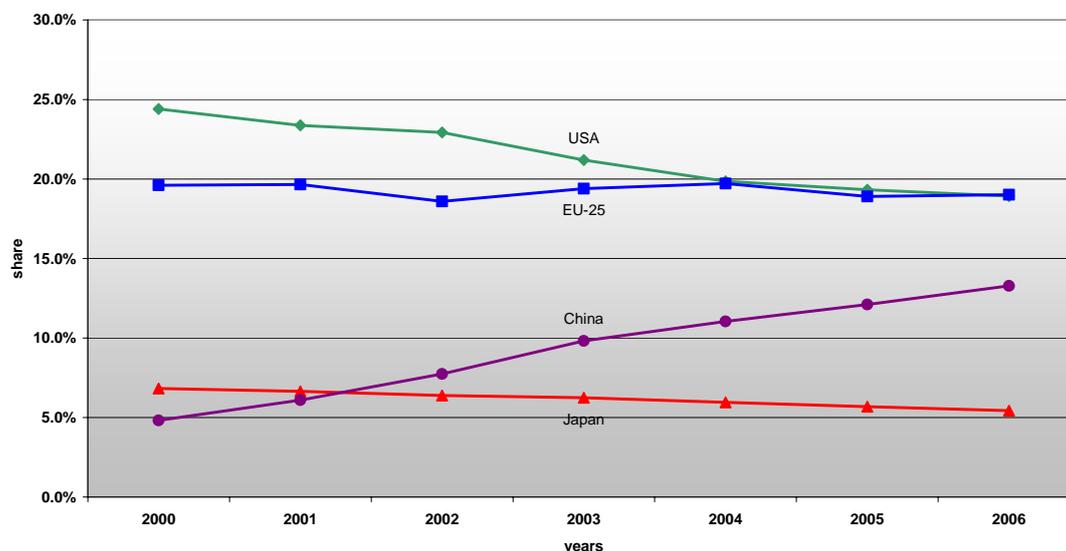
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Table 3: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of high-tech sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	19.6%	19.7%	18.6%	19.4%	19.7%	18.9%	19.0%
USA	24.4%	23.4%	22.9%	21.2%	19.9%	19.3%	18.9%
Japan	6.8%	6.7%	6.4%	6.2%	6.0%	5.7%	5.4%
China	4.8%	6.1%	7.7%	9.8%	11.0%	12.1%	13.3%
Sum big 4 areas	55.7%	55.8%	55.6%	56.6%	56.6%	56.0%	56.7%

Figure 3

World Market Share of high-tech imports of country X compared to total high-tech imports



Also on the import side, it can be observed that the world market share of imports by high-tech industries in the EU-25 was relatively stable over the period from 2000 to 2006. On the other hand, Japan, and more importantly the USA were experiencing decreasing world market shares. China however, was expanding its market share from about 5% in the year 2000 to more than 13% in 2006 and therefore almost tripled its market share.

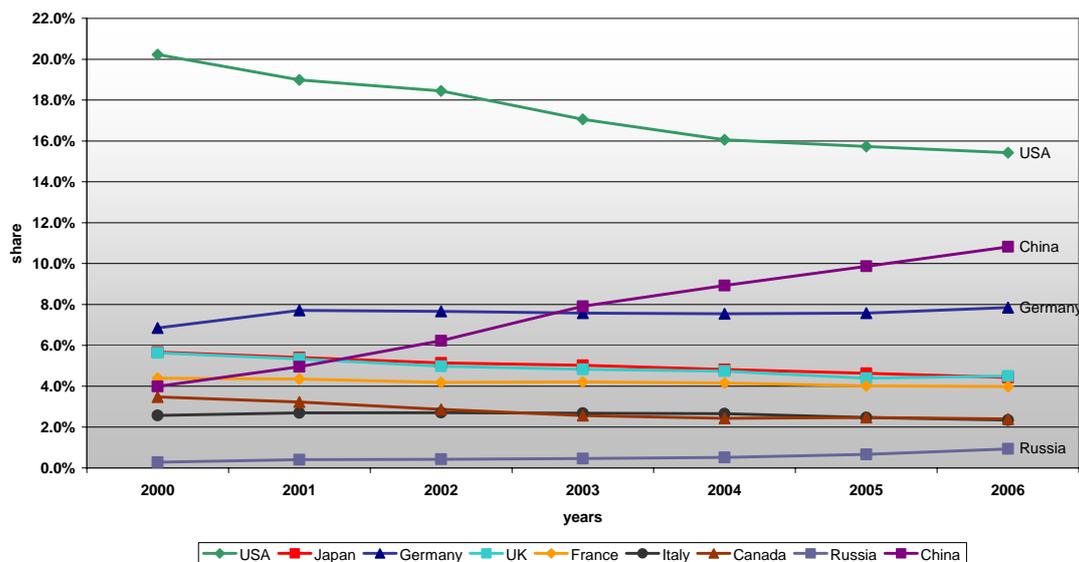
Table 4: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of high-tech sectors (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	20.2%	19.0%	18.5%	17.1%	16.1%	15.7%	15.4%
Japan	5.7%	5.4%	5.1%	5.0%	4.8%	4.6%	4.4%
Germany	6.9%	7.7%	7.7%	7.6%	7.5%	7.6%	7.8%
United Kingdom	5.6%	5.3%	5.0%	4.8%	4.7%	4.4%	4.5%
France	4.4%	4.4%	4.2%	4.2%	4.2%	4.0%	4.0%

	2000	2001	2002	2003	2004	2005	2006
Italy	2.6%	2.7%	2.7%	2.7%	2.7%	2.5%	2.3%
Canada	3.5%	3.2%	2.9%	2.6%	2.4%	2.5%	2.4%
Russia	0.3%	0.4%	0.4%	0.5%	0.5%	0.7%	0.9%
Sum G8	49.1%	48.1%	46.4%	44.4%	42.9%	41.9%	41.8%
China	4.0%	5.0%	6.2%	7.9%	8.9%	9.9%	10.8%

Figure 4

World market share of high-tech imports of country X compared to total high-tech imports



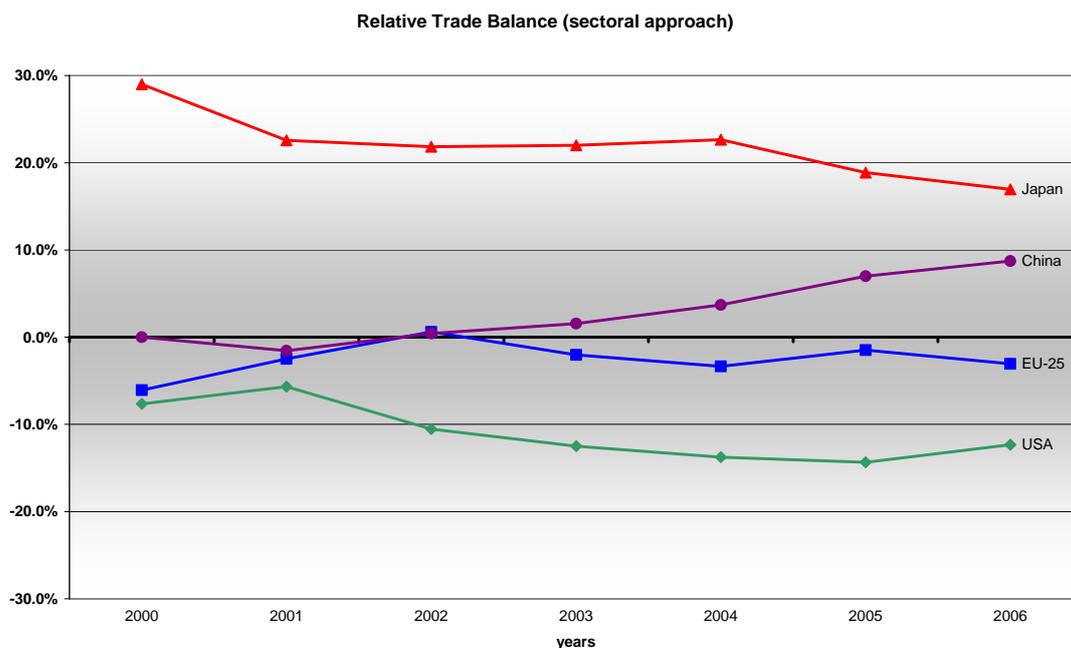
Analysing the G8 + China figures (Table 4), it can be pointed out that Germany was able to increase its market share by roughly one percentage point (or by 15%) and that the United Kingdom lost ground in the high-tech sectors' export (-1.1 percentage points or -20%). For the G8 members that are not EU Member States the downshift was more pronounced and varies from roughly minus one percentage point for Japan (22% decrease) and Canada (31% decrease) to minus five percentage points for the USA (24% decrease). Russia tripled its market share but started from a very low market share of only 0.3% in 2000. In total, the market share of the imports of G8's high-tech sectors declined from 49% in 2000 to 42% in 2006 (16% decrease). China's market share increased during the same period from 4% to almost 11% which means that China almost tripled its market share.

RELATIVE TRADE BALANCE

Table 5: relative trade balance of the four large economic areas

	2000	2001	2002	2003	2004	2005	2006
EU-25	-6.1%	-2.5%	0.6%	-2.0%	-3.3%	-1.5%	-3.1%
USA	-7.6%	-5.7%	-10.5%	-12.5%	-13.7%	-14.3%	-12.3%
Japan	29.0%	22.6%	21.8%	22.0%	22.7%	18.9%	17.0%
China	0.0%	-1.5%	0.4%	1.6%	3.7%	7.0%	8.7%

Figure 5



The relative trade balance is an indicator which makes it possible to compare the trade balances of different countries / areas. It is being calculated by dividing the trade balance (exports - imports) with the trade volume (exports + imports). The relative trade balances of the four countries / areas under study show quite different patterns. The USA has a high negative relative trade balance which has been increasing from -5.7% in 2001 to -14.3% in 2005 and only in 2006 was decreasing slightly to -12.3%. This is a sign that the USA becomes increasingly dependent on imports from foreign high-tech industries. Also Japan shows a decline in its relative high-tech trade balance although from a starting point with a very positive relative trade balance of almost 29%, which is now down to about only 17%. The relative trade balance of the EU-25 is quite stable around minus 2%. China's relative trade balance became positive in 2002 and is constantly increasing since then. In 2006 China had a positive relative trade balance of almost 9%, which means that China is probably increasing its local value added in the production of high-tech industries, as it becomes an increasingly integrated part of international production chains in the high-tech industries.⁹

Having looked at the exports, imports and relative trade balances we can say that China increased its market share of goods traded by high-tech industries considerably during the observed period mainly to the expense of the USA and Japan. China is becoming more and more an integrated part of the *world supply chain*. This could also mean that China's high market share in the trade of high-tech industries is due to a lot of assembly work in high-tech industries which in fact is a relative low- or mid-tech work. The increase in the relative trade balance however, might be seen as an indication of an increasing share of local value added.

⁹ It is worthwhile noting that the G8 member state Russia is increasingly becoming dependent on foreign imports in the high-tech industries with a relative trade balance that decreased from an already very negative -33% to -68%.

2.2. World Market Share (Def. 2) – ratio of a country's exports of its high-tech sectors to the world exports

World market share according to definition 2 is defined as the ratio between the exports of high-tech industries from the country / area under study and total world exports of **all economic sectors** of all countries (excluding intra EU-25 exports).¹⁰ (For imports the definition is analogous.) In other words, we now consider the market shares of countries obtained when the denominator is not the total export (or import) of all countries' high tech sectors, but the total export (or import) in all sectors.

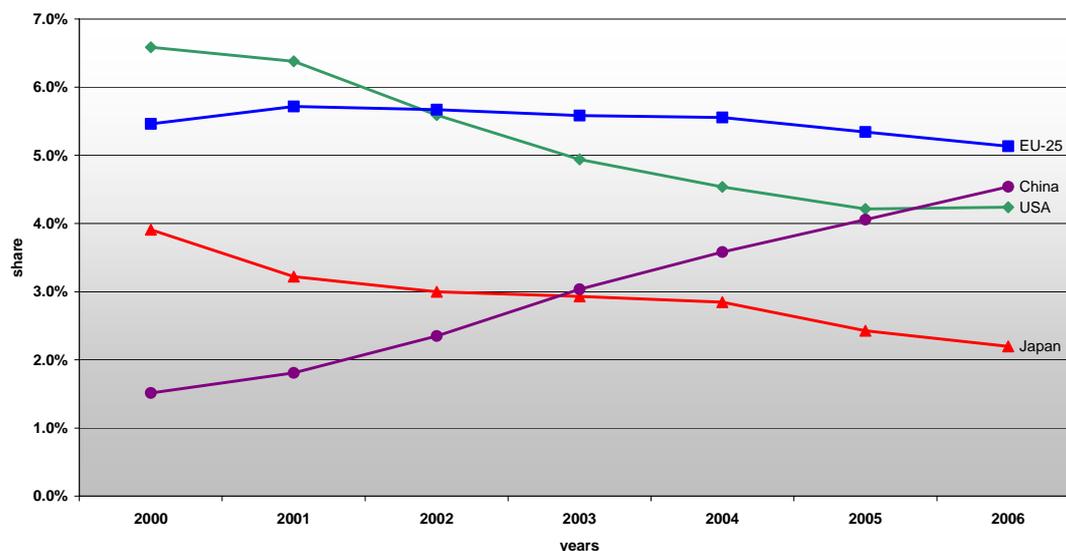
EXPORTS

Table 6: Share of the goods exported by high-tech sectors of the listed countries in relation to the total (world) export of all economic sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	5.5%	5.7%	5.7%	5.6%	5.6%	5.3%	5.1%
USA	6.6%	6.4%	5.6%	4.9%	4.5%	4.2%	4.2%
Japan	3.9%	3.2%	3.0%	2.9%	2.8%	2.4%	2.2%
China	1.5%	1.8%	2.4%	3.0%	3.6%	4.1%	4.5%
Sum big 4 areas	17.5%	17.1%	16.6%	16.5%	16.5%	16.0%	16.1%
World sum	30.7%	29.6%	29.3%	28.9%	28.8%	27.8%	27.8%

Figure 6

World market share of high-tech exports of country X compared to total (world) exports of all sectors



Looking at the different countries' market shares of the high-tech industries exports compared to the total world exports it can be seen that the EU-25 is relatively stable between 5% and 6% market share but also declines moderately since 2004. However, it is still too early to identify this as a clearly decreasing trend.¹¹ For the other three economic areas the case is clearer. The USA was constantly

¹⁰ Due to variations in the number and composition of countries reporting their trade data, the world total can differ (ceteris paribus) slightly from one year to another.

¹¹ This can also be confirmed by looking at the growth rates of the exports: From 2000 to 2006 the world exports of high-tech industries grew by 65%, the EU exports of high-tech industries (without the intra-community trade) grew by 71% during the same period. However, at the same time the share of world high-tech exports as of the total world exports shrank from 31% to 28%. So also the EU expan-

losing market share from 2000 to 2005 with no further decrease from 2005 to 2006. Japan was also constantly losing market share since 2005 and there is no indication of a trend change. Only China showed a significant increase of its market share which tripled from only 1.5% in the year 2000 to 4.5% in 2006.

Table 7: Share of the goods exported by high-tech sectors of the listed countries in relation to the total (world) export of all sectors (G8 countries + China)¹²

	2000	2001	2002	2003	2004	2005	2006
USA	5.0%	4.7%	4.1%	3.6%	3.3%	3.1%	3.2%
Japan	2.9%	2.4%	2.2%	2.1%	2.1%	1.8%	1.6%
Germany	2.1%	2.3%	2.3%	2.3%	2.4%	2.3%	2.3%
United Kingdom	1.5%	1.6%	1.5%	1.2%	1.1%	1.1%	1.3%
France	1.3%	1.4%	1.3%	1.2%	1.2%	1.1%	1.1%
Italy	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%
Canada	0.6%	0.6%	0.5%	0.4%	0.4%	0.4%	0.4%
Russia	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%
Sum G8	14.0%	13.6%	12.5%	11.5%	11.0%	10.5%	10.5%
China	1.1%	1.3%	1.7%	2.2%	2.6%	3.0%	3.4%

Analysing the G8 countries + China it can be seen that the market share of the G8 members that are EU Member States (France, Germany, Italy, and the UK) is very stable over the observed period. The market share of all G8 members however, was declining from 14.0% in the year 2000 to 10.5% in 2006 (-3.6 percentage points or by 25%). At the same time the market share of China tripled.¹³

IMPORTS

Table 8: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of all economic sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	5.8%	5.6%	5.3%	5.5%	5.6%	5.2%	5.1%
USA	7.3%	6.7%	6.5%	6.0%	5.6%	5.3%	5.1%
Japan	2.0%	1.9%	1.8%	1.8%	1.7%	1.6%	1.5%
China	1.4%	1.7%	2.2%	2.8%	3.1%	3.3%	3.6%
Sum big 4 areas	16.6%	16.0%	15.8%	16.1%	16.0%	15.4%	15.3%

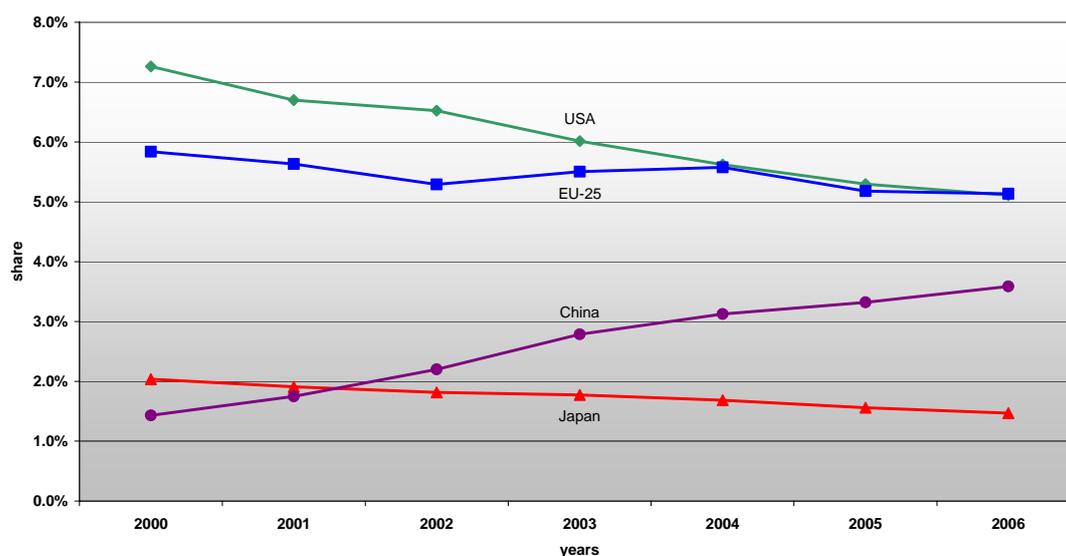
ded its market share in the exports of high-tech industries according to definition 1 from 17.8% in the year 2000 to 18.5% in 2006, the market share according to definition 2 decreased slightly due to the increase of exports of non-high-tech industries in the world.

¹² The percentages for the countries shown in this table that are also included in Table 6 (USA, Japan, and China) are lower here, because the world total is defined differently and includes now also the intra-community trade of the EU-25.

¹³ The differences to the figures in the table are due to rounding errors.

Figure 7

World market share of high-tech imports of country X compared to total (world) imports of all sectors



On the import side the market shares were clearly decreasing in Japan (28% decrease from 2.0% share to 1.5% share) and in the USA (30% decrease); with some fluctuations this decreasing trend can also be observed for the EU-25 to some lesser extent (12% decrease). As in the case of the exports of the high-tech industries compared to the total world exports, also here, on the import side, China was constantly increasing its market share from 1.4% in the year 2000 to 3.6% in 2006 (150% increase).

Table 9: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of all sectors (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	5.6%	5.1%	5.0%	4.5%	4.2%	4.1%	3.9%
Japan	1.6%	1.5%	1.4%	1.3%	1.3%	1.2%	1.1%
Germany	1.9%	2.1%	2.1%	2.0%	2.0%	2.0%	2.0%
United Kingdom	1.6%	1.4%	1.3%	1.3%	1.2%	1.1%	1.1%
France	1.2%	1.2%	1.1%	1.1%	1.1%	1.0%	1.0%
Italy	0.7%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%
Canada	1.0%	0.9%	0.8%	0.7%	0.6%	0.6%	0.6%
Russia	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
Sum G8	13.6%	13.0%	12.5%	11.7%	11.3%	10.8%	10.7%
China	1.1%	1.3%	1.7%	2.1%	2.4%	2.5%	2.8%

Looking at the G8 + China (Table 9) it can be observed that from the four EU Member States that are also G8 members only the United Kingdom showed significant decreases in its market share (27% decrease). The other non-European highly industrialised countries, the USA, Canada and Japan were losing considerably. The countries with the highest market share gains during the period 2000 to 2006 were Russia which tripled its market share (from 0.08% to 0.24%) and China with an increase of 1.6 percentage points (which equals an increase of 149%).

2.3. National Market Share (Def. 3) – ratio of a country’s exports of its high-tech sectors to its total exports

National market share according to definition 3 is defined as the ratio between the exports of high-tech products from the country / area under study and the total exports of **all economic sectors of that country / area under study** (excluding intra EU-25 exports). In other words, we now consider the market shares of countries obtained when the denominator is not the total world export of all countries, but the total export of the particular country. This ratio can be seen as an indicator for the high-tech specialisation of an economy’s foreign trade. (For imports the definition is analogous.)

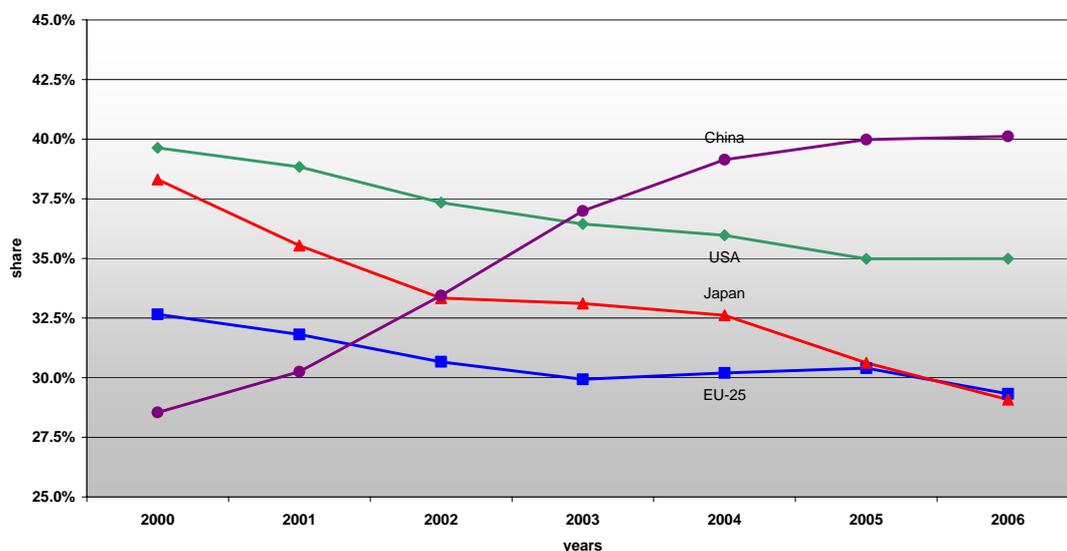
EXPORTS

Table 10: Share of the goods exported by high-tech sectors of the listed countries in relation to the country’s export of all economic sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	32.7%	31.8%	30.7%	29.9%	30.2%	30.4%	29.3%
USA	39.6%	38.8%	37.3%	36.4%	36.0%	35.0%	35.0%
Japan	38.3%	35.5%	33.3%	33.1%	32.6%	30.6%	29.1%
China	28.5%	30.3%	33.4%	37.0%	39.1%	40.0%	40.1%
Mean of the big 4 areas	35.8%	34.6%	33.6%	33.5%	33.8%	33.6%	33.2%

Figure 8

Market share of high-tech exports of country X compared to the total exports of the same country



In the year 2000, China had the lowest share of high-tech exports in its total exports of all four economic areas analysed. Since then the picture has dramatically changed. In the year 2006 40% of all Chinese exports came from high-tech industries. This is a ratio comparable to the ratios of the USA and Japan at the beginning of the 21st century. The USA has since then declined and seems to have reached a new stable concentration of 35% exports from high-tech industries (12% decrease between 2000 and 2006). Japan is still on the decline (24% decrease between 2000 and 2006) and in 2006 displaced the EU-25 from the last place. Also EU-25’s share of exports from high-tech industries declined from 32.7% in the year 2000 to 29.3% in 2006 (10% decrease).

Table 11: Share of the goods exported by high-tech sectors of the listed countries in relation to the total exports of the same country (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	39.6%	38.8%	37.3%	36.4%	36.0%	35.0%	35.0%
Japan	38.3%	35.5%	33.3%	33.1%	32.6%	30.6%	29.1%
Germany	23.3%	24.5%	23.4%	22.4%	23.4%	24.0%	23.8%
United Kingdom	32.9%	34.5%	32.9%	29.5%	27.9%	29.9%	34.6%
France	28.5%	28.6%	27.1%	25.5%	25.5%	25.8%	26.7%
Italy	14.9%	14.9%	14.9%	13.9%	13.7%	14.1%	13.6%
Canada	14.4%	12.8%	11.3%	10.9%	10.5%	10.6%	11.1%
Russia	2.5%	3.3%	4.4%	4.0%	3.1%	1.7%	1.8%
Mean G8	29.1%	28.4%	26.9%	25.5%	25.1%	24.7%	24.9%
China	28.5%	30.3%	33.4%	37.0%	39.1%	40.0%	40.1%

For the EU Member States that are G8 members the picture is heterogeneous. The United Kingdom and to lesser extend also Germany were able to increase their shares of exports originating from high-tech industries during the period from 2000 to 2006. The other two EU Member States France and Italy however, were experiencing decreases. The very low share of exports from high-tech industries in Russia is due to the fact that more than $\frac{3}{4}$ of all Russian exports are low-tech or medium low-tech (mainly oil, gas and its derivatives).

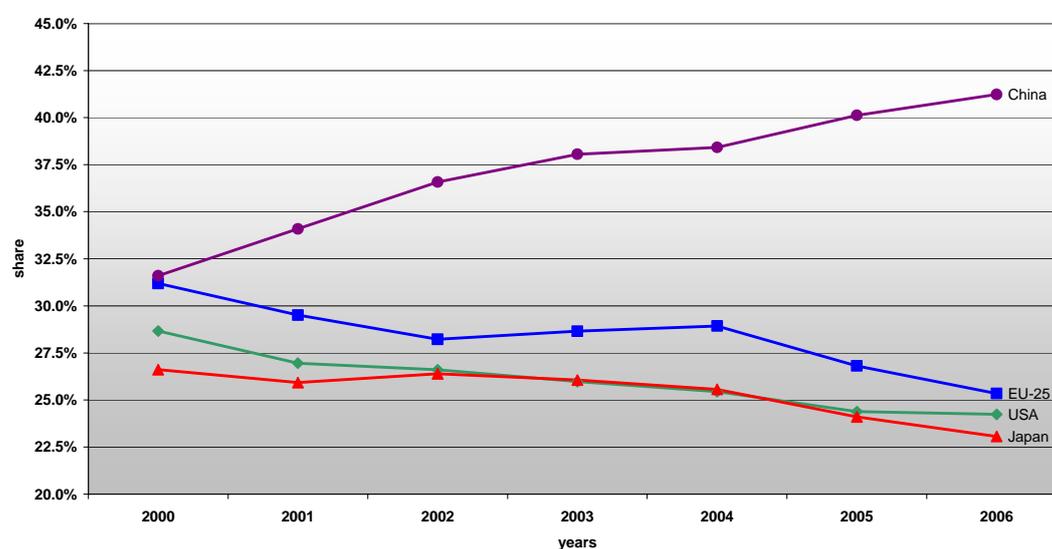
IMPORTS

Table 12: Share of the goods imported by high-tech sectors of the listed countries in relation to the total imports of the same country (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	31.2%	29.5%	28.2%	28.7%	28.9%	26.8%	25.3%
USA	28.7%	27.0%	26.6%	26.0%	25.4%	24.4%	24.2%
Japan	26.6%	25.9%	26.4%	26.1%	25.6%	24.1%	23.1%
China	31.6%	34.1%	36.6%	38.1%	38.4%	40.1%	41.2%
Mean big 4 areas	29.5%	28.3%	28.2%	28.5%	28.5%	27.5%	27.1%

Figure 9

Market share of high-tech imports of country X compared to the total imports of the same country



Again on the import side China shows a considerable increase. The share of goods imported by the Chinese high-tech industries in the total Chinese imports increased from 32% to 41% during the period from 2000 to 2006 (30% increase). In the other three large economic areas the share of imports of high-tech industries declined.

Table 13: Share of the goods imported by high-tech sectors of the listed countries in relation to the total imports of the same country (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	28.7%	27.0%	26.6%	26.0%	25.4%	24.4%	24.2%
Japan	26.6%	25.9%	26.4%	26.1%	25.6%	24.1%	23.1%
Germany	24.4%	26.6%	27.1%	25.0%	25.4%	26.1%	25.7%
United Kingdom	29.6%	26.4%	24.0%	24.4%	24.5%	22.8%	22.4%
France	25.7%	24.8%	23.9%	23.1%	23.1%	22.6%	22.6%
Italy	19.2%	19.2%	19.0%	17.9%	18.0%	17.2%	16.0%
Canada	25.8%	24.4%	22.3%	21.2%	21.5%	21.0%	20.6%
Russia	15.1%	16.4%	16.0%	16.1%	16.4%	18.2%	20.4%
Mean G8	26.6%	25.6%	25.1%	24.2%	24.1%	23.4%	23.0%
China	31.6%	34.1%	36.6%	38.1%	38.4%	40.1%	41.2%

Of the G8 members only Germany and Russia increased their shares of imports of high-tech industries in the period from 2000 to 2006. In the case of Russia this might be due to the strong increase in the prices of crude oil and natural gas¹⁴ which increased considerably Russia's income from its exports allowing for more purchases of high value / tech goods from other countries.

The share of imports of high-tech industries compared to the total imports decreased strongly in the United Kingdom. In the other three EU G8 members the declines were not as pronounced.

¹⁴ The price of one barrel of Brent oil increased from 28.50 Euros in the year 2000 to 65.14 Euros in 2006 or by 129%.

3. Product Approach

The product approach supplements the sector approach and opens the way to more detailed analysis of trade and competitiveness. The product approach excludes all the products that are not high-tech, even if they are manufactured by high-tech industries. This approach is therefore more restrictive than the sectoral approach. The list of products classified as high-tech was taken from the OECD and is listed in Annex 2.¹⁵

3.1. *World Market Share (Def. 1) – ratio of a country's exports of high tech products to the world exports of high tech products*

In the following the world market share for both imports and exports according to definition 1 will be analysed for the four large economic areas (EU-25, USA, Japan, and China) and also for the G8 + China. EU-25 instead of EU-27 was chosen, as the data available for the analyses only cover up to 2006, the last year before the accession of Bulgaria and Romania.

The world market share is defined in this case as the ratio between the exports of high-tech products from the country / area under study and the world exports of high tech products, which is calculated as the sum of high tech exports of all countries.

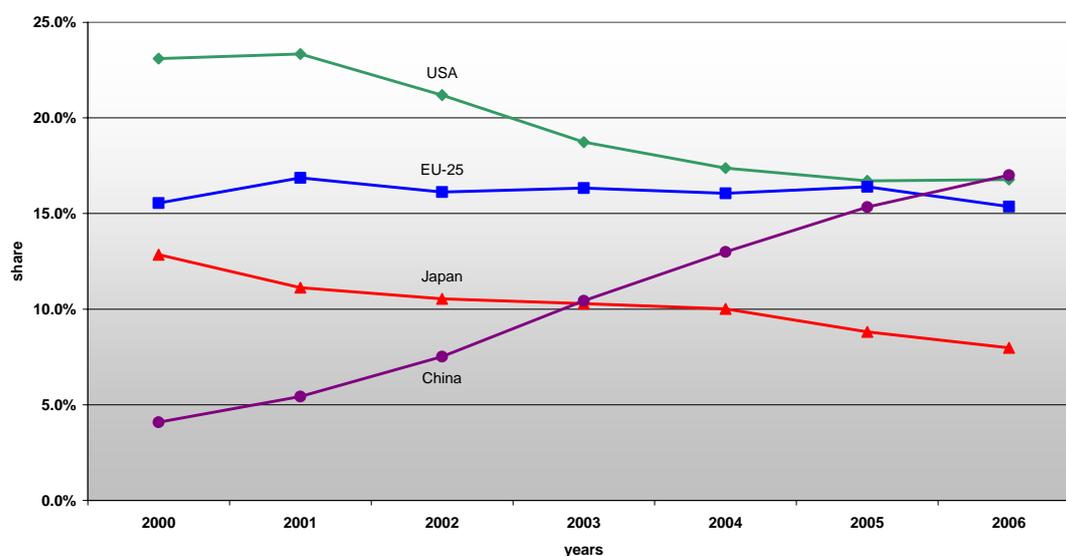
EXPORTS

Table 14: Share of high-tech goods exported by the listed countries in relation to the total (world) export of high-tech goods (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	15.5%	16.9%	16.1%	16.3%	16.1%	16.4%	15.4%
USA	23.1%	23.3%	21.2%	18.7%	17.4%	16.7%	16.8%
Japan	12.9%	11.1%	10.5%	10.3%	10.0%	8.8%	8.0%
China	4.1%	5.4%	7.5%	10.4%	13.0%	15.3%	17.0%
Sum big 4 areas	55.6%	56.8%	55.4%	55.8%	56.4%	57.3%	57.1%

Figure 10

World market share of high-tech exports of country X compared to total high-tech exports (product approach)



¹⁵ OECD Handbook on Economic Globalisation Indicators, 2005, p. 173.

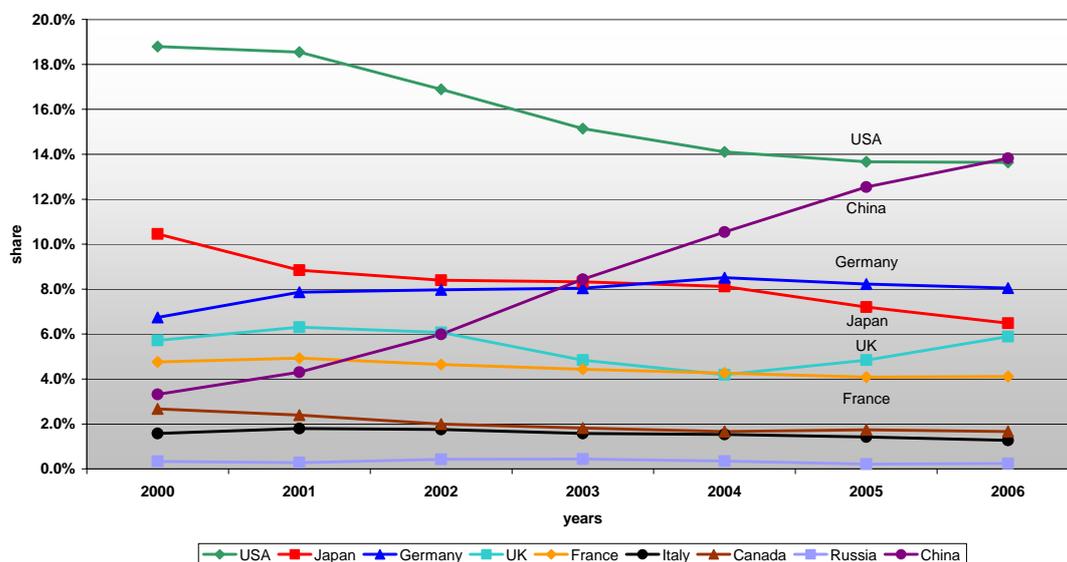
Looking at Table 14 and Figure 10 it can be observed that the market share of EU-25 high-tech exports was stable around 16% during the period 2000 to 2006. The market shares of the USA and Japan were declining at the same time. Especially the USA showed a pronounced downshift from 23% to 17% market share which is equivalent to market share loss of -27%. Japan's market share loss was even higher with -38% (from 13% market share down to 8%). China on the other hand more than quadrupled its market share from 4% in the year 2000 to 17% in 2006. China now has the highest market share in the exports of high-tech goods.

Table 15: Share of exported high-tech goods of the listed countries in relation to the total (world) export of high-tech goods (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	18.8%	18.5%	16.9%	15.1%	14.1%	13.7%	13.6%
Japan	10.5%	8.8%	8.4%	8.3%	8.1%	7.2%	6.5%
Germany	6.7%	7.9%	8.0%	8.0%	8.5%	8.2%	8.0%
United Kingdom	5.7%	6.3%	6.1%	4.8%	4.2%	4.8%	5.9%
France	4.8%	4.9%	4.6%	4.4%	4.3%	4.1%	4.1%
Italy	1.6%	1.8%	1.8%	1.6%	1.5%	1.4%	1.3%
Canada	2.7%	2.4%	2.0%	1.8%	1.7%	1.7%	1.7%
Russia	0.3%	0.3%	0.4%	0.4%	0.4%	0.2%	0.2%
Sum G8	51.1%	51.0%	48.2%	44.6%	42.8%	41.4%	41.3%
China	3.3%	4.3%	6.0%	8.4%	10.5%	12.5%	13.8%

Figure 11

World market share of high-tech exports of country X compared to the total high-tech exports (product approach)



Analysing the G8 + China figures, it can be seen that Germany's market share after an increase from 2000 to 2001 remained stable around 8% during the observed period. France and Italy were losing slightly market share, whereas the United Kingdom was showing ups and downs. The USA was losing considerably market share (minus 5 percentage points which is equal to a decrease of 27%) whereas China quadrupled its market share and is now the biggest exporter of high-tech goods. In total the G8 members lost 10 percentage points in the high-tech export market and China was gaining 10.5 percentage points.

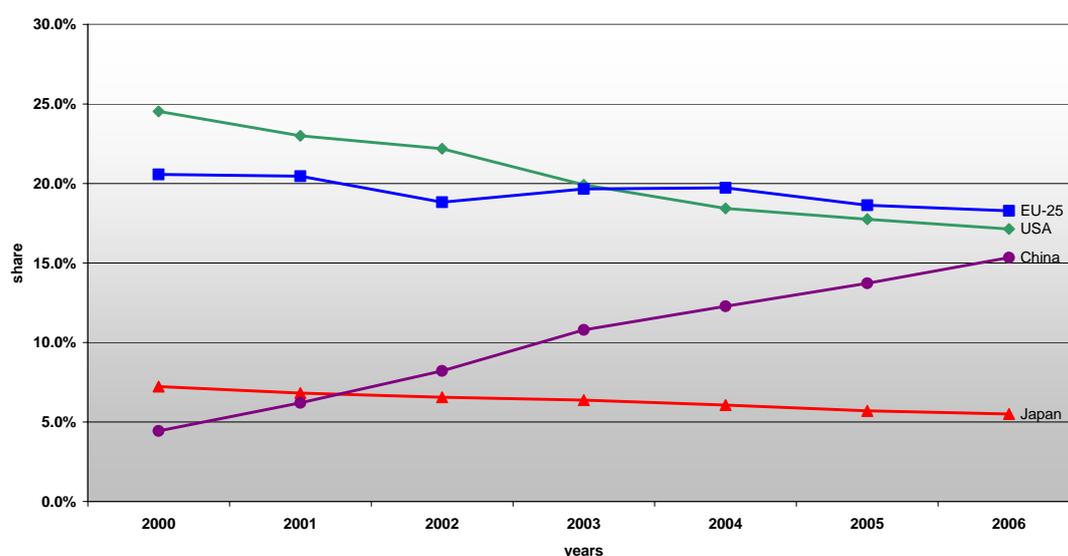
IMPORTS

Table 16: Share of high-tech goods imported by the listed countries in relation to the total (world) import of high-tech goods (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	20.6%	20.5%	18.8%	19.7%	19.7%	18.6%	18.3%
USA	24.5%	23.0%	22.2%	19.9%	18.4%	17.8%	17.1%
Japan	7.2%	6.8%	6.6%	6.4%	6.1%	5.7%	5.5%
China	4.4%	6.2%	8.2%	10.8%	12.3%	13.7%	15.3%
Sum big 4 areas	56.8%	56.5%	55.8%	56.7%	56.5%	55.8%	56.3%

Figure 12

World market share of high-tech imports of country X compared to total high-tech imports (product approach)



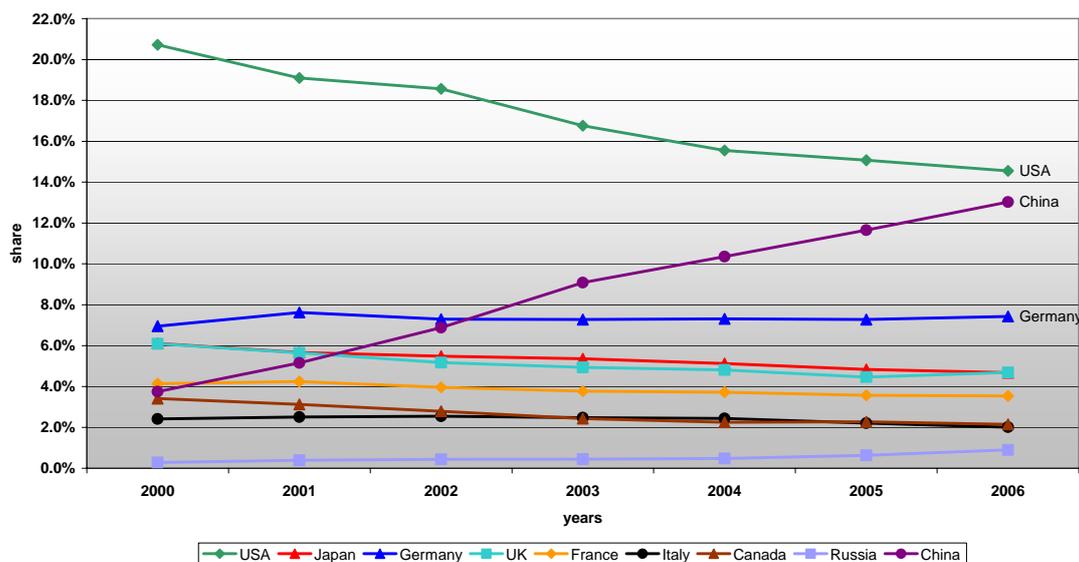
On the import side it can be observed that except from China all economic areas were losing market share in the import of high-tech goods. The EU-25, with a decrease of 11% (-2.3 percentage points), lost relatively less compared to the USA with a decrease of 30% and Japan with -24%. Therefore, since 2004 the EU-25 is the largest importer of high-tech goods. China expanded considerably its market share with a plus of 11 percentage points which is equivalent to an increase of almost 250%.

Table 17: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of high-tech sectors (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	20.7%	19.1%	18.6%	16.8%	15.5%	15.1%	14.6%
Japan	6.1%	5.7%	5.5%	5.4%	5.1%	4.8%	4.7%
Germany	7.0%	7.6%	7.3%	7.3%	7.3%	7.3%	7.4%
United Kingdom	6.1%	5.6%	5.2%	4.9%	4.8%	4.5%	4.7%
France	4.1%	4.2%	4.0%	3.8%	3.7%	3.6%	3.5%
Italy	2.4%	2.5%	2.5%	2.5%	2.4%	2.2%	2.0%
Canada	3.4%	3.1%	2.8%	2.4%	2.2%	2.3%	2.1%
Russia	0.3%	0.4%	0.4%	0.4%	0.5%	0.6%	0.9%
Sum G8	50.1%	48.3%	46.3%	43.5%	41.7%	40.3%	39.9%
China	3.8%	5.2%	6.9%	9.1%	10.4%	11.7%	13.0%

Figure 13

World market share of high-tech imports of country X compared to total high-tech imports (product approach)



Between the years 2000 and 2006 the EU G8 member France, Italy and the United Kingdom were all losing market share in range between from -15% to -23%. Only Germany was increasing its market share slightly by 7%. The USA showed a pronounced decrease in the high-tech imports with a loss of about 6 percentage points, while China increased its market share 9 percentage points. It is also interesting that Russia more than tripled its share, but from a quite low 0.3% to 0.9% probably due to the increased revenues from its oil and gas exports.

RELATIVE TRADE BALANCE

Table 18: relative trade balance of the four large economic areas

	2000	2001	2002	2003	2004	2005	2006
EU-25	-16.1%	-12.3%	-10.2%	-12.0%	-13.7%	-9.7%	-11.2%
USA	-5.3%	-2.0%	-4.7%	-5.9%	-6.4%	-6.4%	-3.6%
Japan	25.8%	21.4%	20.9%	20.9%	21.2%	18.2%	15.9%
China	-6.5%	-9.5%	-6.9%	-4.5%	-0.7%	2.2%	2.7%

In the year 2000 all economic areas except Japan (+26%) showed negative relative trade balances. Especially the EU-25 showed a large negative balance (-16%), followed by China (-7%) and the USA (-5%). This picture has changed dramatically. Japan's positive balance was declining steadily to now +16%. China shows positive relative trade balances since 2005 and therefore became a net exporter of high-tech goods. The other economies, the EU-25 and the USA, have reduced their negative balances.

3.2. *World Market Share (Def. 2) – ratio of a country’s exports of high-tech products to the world exports*

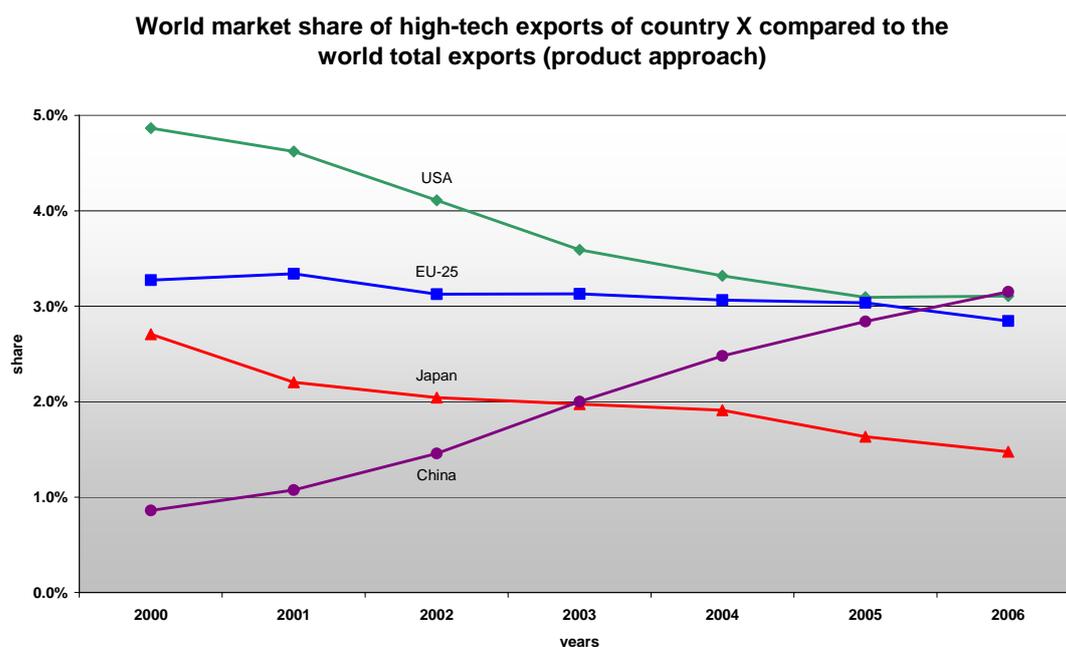
World market share according to definition 2 is defined as the ratio between the exports of high-tech products from the country / area under study and the total world exports of **all products** of all countries (excluding intra EU-25 exports). (For imports the definition is analogous.) In other words, we now consider the market shares of countries obtained when the denominator is not the world total export (or import) of high-tech goods, but the world total export (or import) of all goods.

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Table 19: Share of the high-tech goods exported of the listed countries in relation to the total (world) export of goods (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	3.3%	3.3%	3.1%	3.1%	3.1%	3.0%	2.8%
USA	4.9%	4.6%	4.1%	3.6%	3.3%	3.1%	3.1%
Japan	2.7%	2.2%	2.0%	2.0%	1.9%	1.6%	1.5%
China	0.9%	1.1%	1.5%	2.0%	2.5%	2.8%	3.2%
Sum big 4 areas	12.0%	11.5%	11.0%	10.9%	11.0%	10.8%	10.8%

Figure 14



Except for China, all economic areas lost market shares in the period 2000 to 2006. The USA’s market share dropped 36% (from 5% share to 3% share) and Japan’s market share decreased 45% (from 2.7% to 1.5%). The EU-25’s market share loss was smaller with -13% (from 3.3% to 2.8%). Only China increased and in fact more than tripled its market share of high-tech exports compared to the world exports from less than 1% to now more than 3% and became the exporter of high-tech goods with the largest market share in 2006.¹⁶

¹⁶ The total market share of high-tech exports of all countries compared to the total trade of all countries dropped from 21.1% in the year 2000 to 18.5% in 2006. This is equivalent to a decline of 12%. As the four big economic areas also declined similarly by 10%, it can be assumed that China was able to extend its market share on the expense of the other three economic areas.

Table 20: Share of the high-tech goods exported by the listed countries in relation to the total (world) export of goods (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	3.7%	3.4%	3.0%	2.6%	2.4%	2.3%	2.3%
Japan	2.0%	1.6%	1.5%	1.4%	1.4%	1.2%	1.1%
Germany	1.3%	1.5%	1.4%	1.4%	1.5%	1.4%	1.4%
United Kingdom	1.1%	1.2%	1.1%	0.8%	0.7%	0.8%	1.0%
France	0.9%	0.9%	0.8%	0.8%	0.7%	0.7%	0.7%
Italy	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%
Canada	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%
Russia	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%
Sum G8	9.9%	9.4%	8.6%	7.7%	7.3%	7.0%	7.0%
China	0.6%	0.8%	1.1%	1.5%	1.8%	2.1%	2.3%

Out of the G8 members only Germany was able to maintain its market share in the export of high-tech goods. All other G8 members showed considerable market share losses in the range of -10%| to -46%.

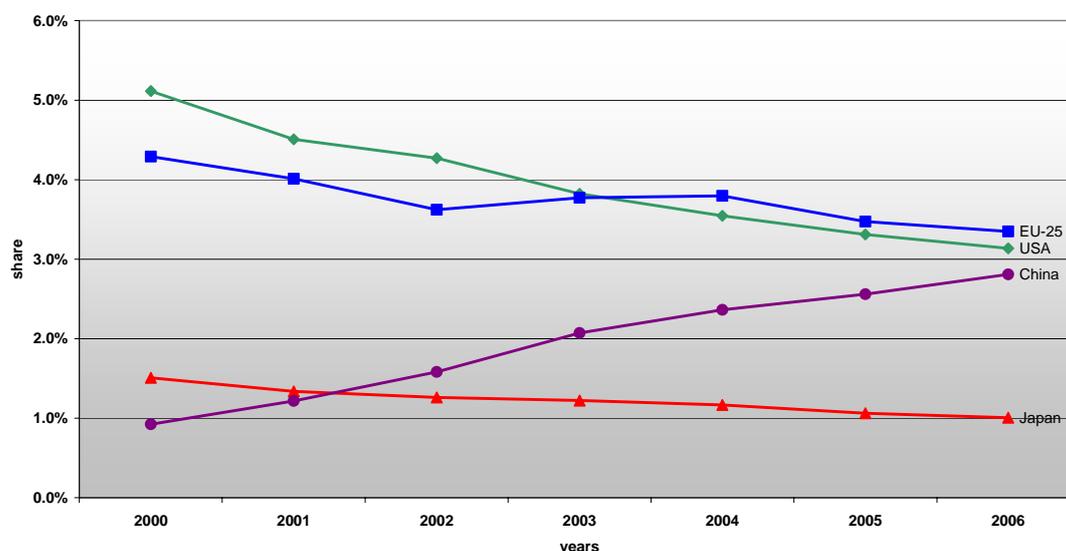
IMPORTS

Table 21: Share of the goods imported by high-tech sectors of the listed countries in relation to the total (world) import of all economic sectors (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	4.3%	4.0%	3.6%	3.8%	3.8%	3.5%	3.3%
USA	5.1%	4.5%	4.3%	3.8%	3.5%	3.3%	3.1%
Japan	1.5%	1.3%	1.3%	1.2%	1.2%	1.1%	1.0%
China	0.9%	1.2%	1.6%	2.1%	2.4%	2.6%	2.8%
Sum big 4 areas	11.8%	11.1%	10.7%	10.9%	10.9%	10.4%	10.3%

Figure 15

World market share of high-tech imports of country X compared to world total imports (product approach)



From the data above (Table 21) it can be observed that since 2004 the EU-25 has the largest import share of high-tech goods in relations to the world imports. However, the import shares of the EU-25 and of the USA are declining. China has almost reached these two economic areas and showed constant increases over the observed period. Between the years 2000 and 2006, China actually tripled its market share from 0.9% to 2.8%.

Table 22: Share of high-tech goods imported by the listed countries in relation to the total (world) import of all goods (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	4.0%	3.5%	3.2%	2.9%	2.7%	2.5%	2.4%
Japan	1.2%	1.0%	1.0%	0.9%	0.9%	0.8%	0.8%
Germany	1.3%	1.4%	1.3%	1.2%	1.3%	1.2%	1.2%
United Kingdom	1.2%	1.0%	0.9%	0.8%	0.8%	0.8%	0.8%
France	0.8%	0.8%	0.7%	0.6%	0.6%	0.6%	0.6%
Italy	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%	0.3%
Canada	0.7%	0.6%	0.5%	0.4%	0.4%	0.4%	0.4%
Russia	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Sum G8	9.6%	8.7%	8.1%	7.4%	7.2%	6.8%	6.6%
China	0.7%	0.9%	1.2%	1.6%	1.8%	2.0%	2.2%

The total G8 share of high-tech goods in the total world imports declined from 9.6 in the year 2000 to 6.6% in 2006, which is equivalent to a decrease of 31%.

So looking at Table 22, it can be pointed out, that from the G8 members which are also EU members, only Germany showed a decrease in its market share of high-tech imports of 7% which was below the G8 average of -31%. All other EU G8 members had decreases in their market share of around 30% for the period 2000 to 2006. The USA and Canada had losses of almost 40% or more. Only Russia showed an increase and almost tripled its market share from 0.054% to 0.149%, but still remains insignificant.

3.3. *National Market Share (Def. 3) – ratio of a country’s exports of high-tech products to its total exports*

Market share according to definition 3 is defined as the ratio between the exports of high-tech goods from the country / area under study and the total exports of all goods of the same country / area (excluding intra EU-25 exports). In other words, we now consider the market shares of countries obtained when the denominator is not the total world export of all countries, but the total export of the particular country. (For imports the definition is analogous.)

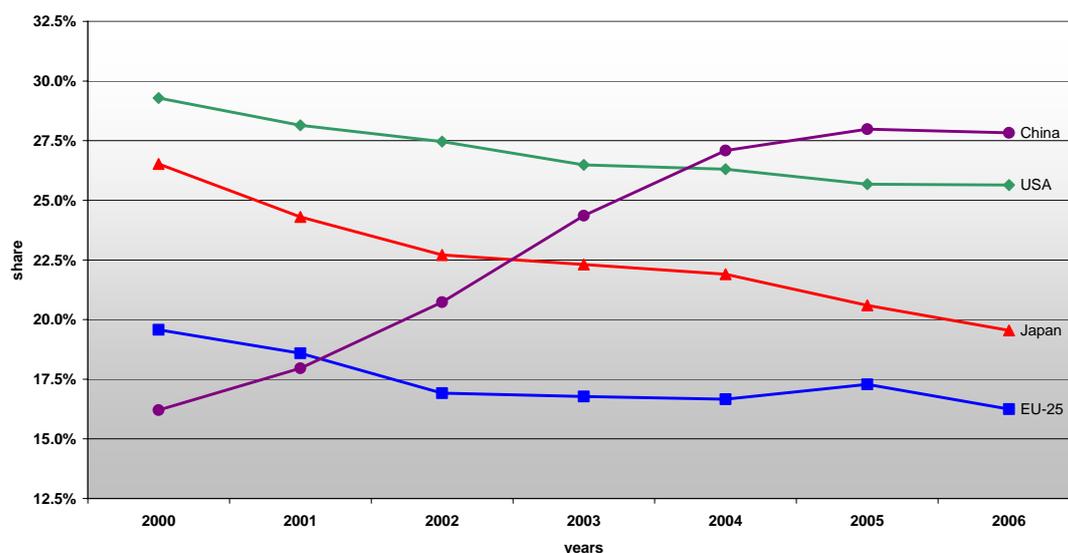
EXPORTS

Table 23: Share of high-tech goods exported by the listed countries in relation to the country’s total export (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	19.6%	18.6%	16.9%	16.8%	16.7%	17.3%	16.3%
USA	29.3%	28.1%	27.5%	26.5%	26.3%	25.7%	25.6%
Japan	26.5%	24.3%	22.7%	22.3%	21.9%	20.6%	19.6%
China	16.2%	18.0%	20.7%	24.4%	27.1%	28.0%	27.8%
Mean of the big 4 areas	22.2%	20.6%	18.8%	17.7%	17.0%	16.3%	15.3%

Figure 16

Market share of high-tech exports of country X compared to the total exports of the same country (product approach)



The economic areas USA, Japan and the EU-25 are all showing a negative trend in the share of high-tech exports in their total exports. The countries with the highest relative losses were Japan with a decrease of 26% (from 26.5% share to 19.6% share) followed by the EU-25 with -17% (from 19.6% to 16.3%) and the USA with -12% (from 29.3% to 25.6%). Of the four big economic areas only China showed a steady increase (+72% from a 16.2% share in 2000 to a 27.8% share in 2006) and overtook the USA in 2004 becoming a highly specialised economy in the trade of high-tech goods. However, this high percentage of high-tech exports (and high-tech imports, see Table 25) could also be due to the fact that China became a more integrated part in the international production chains, where many unfinished high-tech products are imported to be assembled by the low-cost workforce in China and then being re-exported.

Table 24: Share of high-tech goods exported by the listed countries in relation to the country's total export (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	29.3%	28.1%	27.5%	26.5%	26.3%	25.7%	25.6%
Japan	26.5%	24.3%	22.7%	22.3%	21.9%	20.6%	19.6%
Germany	14.9%	15.3%	14.6%	13.6%	14.2%	14.3%	14.0%
United Kingdom	24.6%	25.7%	24.4%	19.9%	18.3%	21.4%	25.9%
France	19.6%	18.9%	17.2%	15.7%	15.7%	16.0%	16.8%
Italy	8.0%	8.2%	7.8%	6.7%	6.6%	6.5%	5.9%
Canada	11.7%	10.2%	8.9%	8.5%	8.0%	8.2%	8.4%
Russia	4.1%	3.1%	4.5%	4.2%	2.9%	1.5%	1.6%
Mean G8	20.6%	19.7%	18.6%	17.0%	16.7%	16.5%	16.7%
China	16.2%	18.0%	20.7%	24.4%	27.1%	28.0%	27.8%

The mean G8 share of high-tech exports in the G8 total exports dropped from 20.6% in the year 2000 to 16.7% in 2006 or by 19%.¹⁷ However, this trend was not uniform within the G8 members. Some showed relatively low or no losses, like Germany (-6%) or the United Kingdom (+5%). Others had losses considerably higher than the mean loss, like Japan (-26%), Italy (-26%) or Canada (-29%). The relative strong drop for Russia (-61%) can be explained by the increasing share of fossil fuel exports due to the increased crude oil and natural gas prices.

IMPORTS

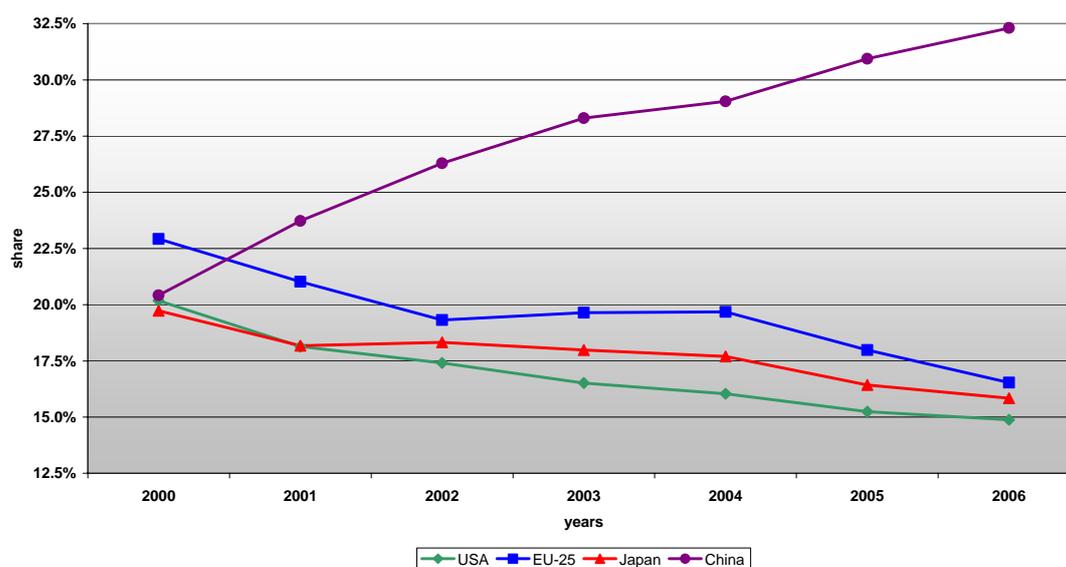
Table 25: Share of high-tech goods imported by the listed countries in relation to the country's total import (large economic areas)

	2000	2001	2002	2003	2004	2005	2006
EU-25	22.9%	21.0%	19.3%	19.6%	19.7%	18.0%	16.5%
USA	20.2%	18.1%	17.4%	16.5%	16.0%	15.2%	14.9%
Japan	19.7%	18.2%	18.3%	18.0%	17.7%	16.4%	15.8%
China	20.4%	23.7%	26.3%	28.3%	29.0%	30.9%	32.3%
Mean big 4 areas	21.0%	19.6%	19.1%	19.3%	19.4%	18.7%	18.3%

¹⁷ At the same time China increased its share of high-tech exports in their total exports by 72% (from 16.2% to 27.8%).

Figure 17

Market share of high-tech imports of country X compared to the total imports of the same country (product approach)



The economic areas EU-25, Japan, and the USA show decreasing shares of high-tech imports in their total imports during the period from 2000 to 2006. The highest decline was registered for the EU-25 with a loss close to -30% (from 22.9% share to 16.5%). China, on the other hand, increased the share of high-tech imports from 20.4% in the year 2000 to 32.3% in 2006 or by 58%. In 2006 China's high-tech share was almost 16 percentage points higher than the share of its runner-up, the EU-25.

Table 26: Share of high-tech goods imported by the listed countries in relation to the country's total import (G8 countries + China)

	2000	2001	2002	2003	2004	2005	2006
USA	20.2%	18.1%	17.4%	16.5%	16.0%	15.2%	14.9%
Japan	19.7%	18.2%	18.3%	18.0%	17.7%	16.4%	15.8%
Germany	17.0%	17.6%	16.8%	15.5%	16.0%	16.4%	15.8%
United Kingdom	22.0%	18.7%	16.2%	16.1%	16.2%	15.2%	15.1%
France	16.7%	16.2%	14.7%	13.4%	13.5%	13.2%	13.1%
Italy	12.4%	11.9%	11.6%	10.7%	10.8%	10.1%	8.9%
Canada	17.4%	15.8%	14.1%	13.0%	12.9%	12.7%	12.0%
Russia	10.1%	10.5%	10.7%	10.0%	9.9%	11.2%	12.8%
Mean G8	18.6%	17.2%	16.3%	15.3%	15.2%	14.7%	14.3%
China	20.4%	23.7%	26.3%	28.3%	29.0%	30.9%	32.3%

Analysing the G8 member states, it can be seen, that Germany had by far the lowest decline with only -7% compared to the mean loss of the G8 countries of -23%. Of the other G8 members only Japan had a decrease significantly below the mean (-20% from a 19.7% share to a 15.8% share) and Russia was the only member increasing the share of high-tech imports in its total imports by 26% (from a 10.1% share in 2000 to a 12.8% share in 2006).

4. Sectoral approach versus product approach

The results of the market shares according to definition 1 for the sectoral and the product approach are compared in this section, in order to see if they agree, and if changes across time in one approach are reflected also in the other approach. From the two plots (one for exports and one for imports) below, we can see the product approach being confronted with the sectoral approach. Each country is plotted in a different colour. For the seven years under consideration the trend is very similar in the two approaches, so that we can say that there are no substantial differences between them. From these plots it is easy to see how strong the expansion of China was. The EU-25 and also the USA were at the highest levels, but the EU-25 was more stable than the USA.

For the definitions 2 and 3 similar scatter plots were drawn but they do not show any substantial differences to the plots of definition 1. Also for definitions 2 and 3 the results correlated quite well, although the points were usually below the diagonal, meaning that the market shares were higher with the sectoral approach than with the product approach.

These plots are helpful in order to have a complete picture of the two approaches for all countries and all years at the same time. But to know if the trend of a given country is increasing or decreasing, we have to refer to the previous graphs as the points in the scatter plots are NOT necessarily in chronological order.

Figure 18

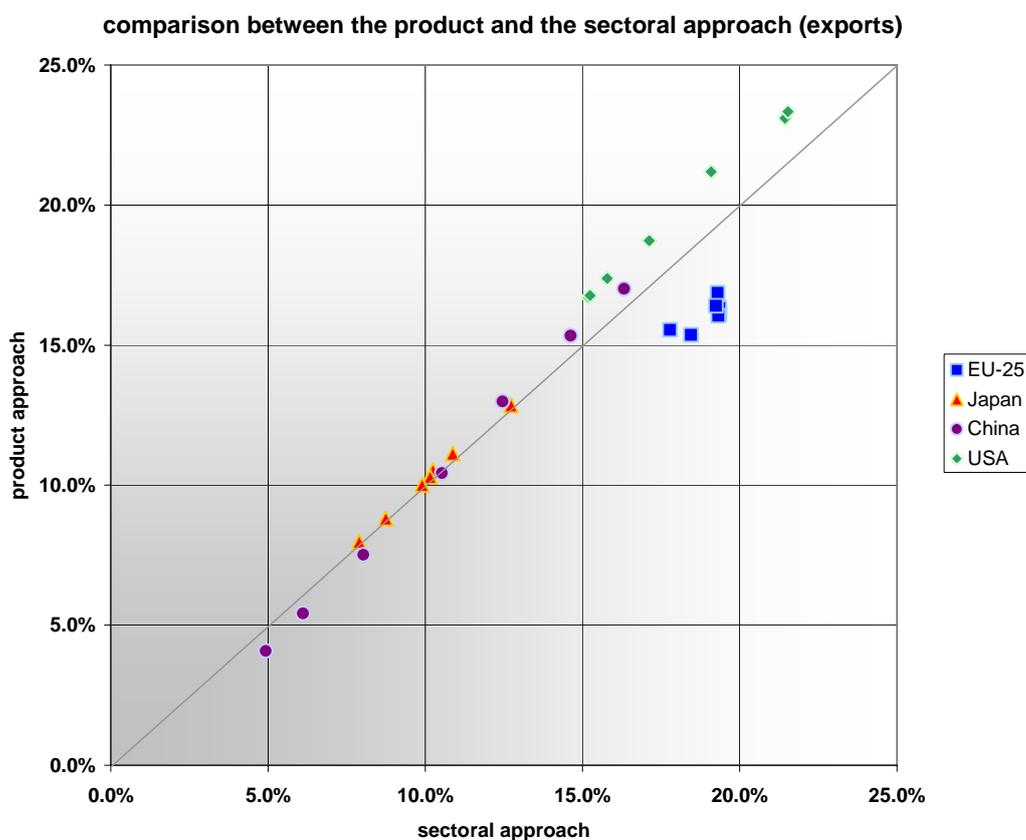
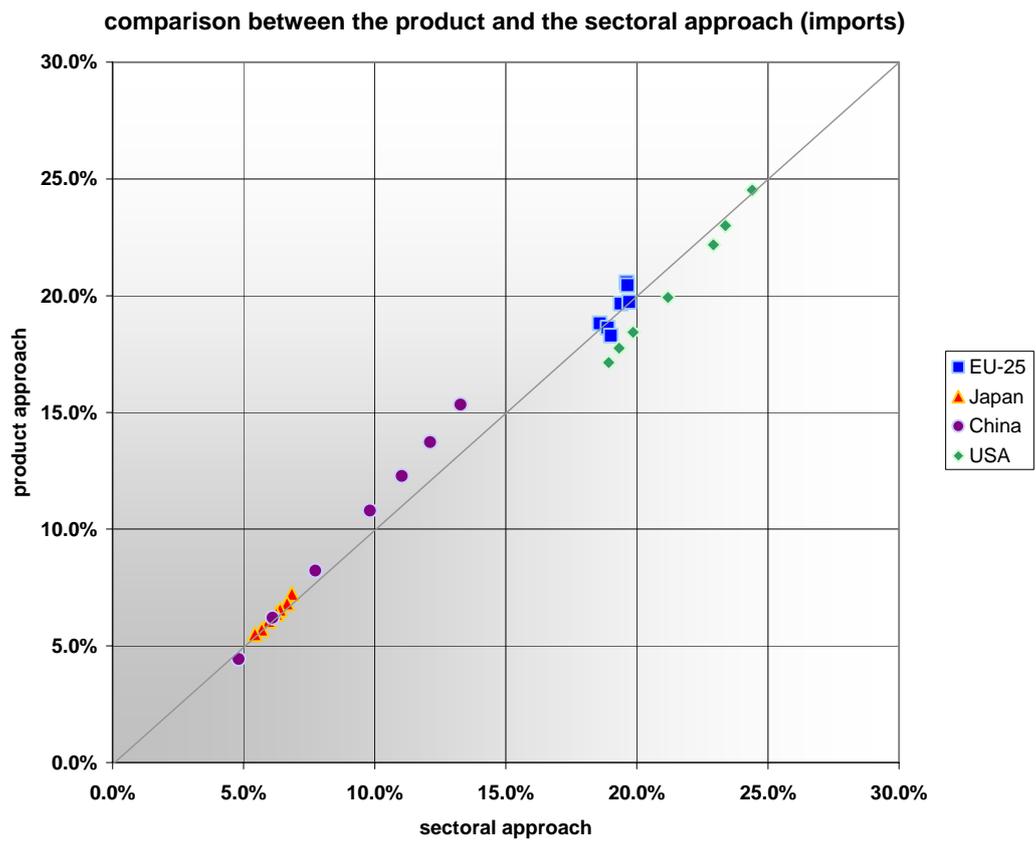


Figure 19



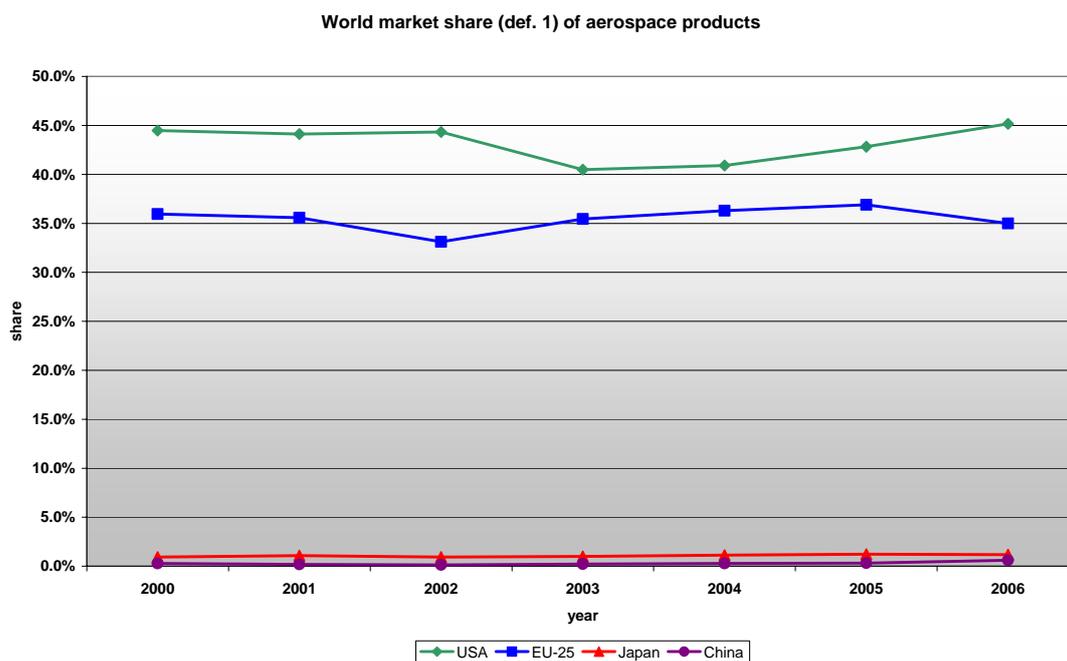
5. Detailed analyses of the high-tech product groupings (product approach)

5.1. Analyses of the export market shares (def. 1) of the different product groups.

World market shares of the exports of aerospace products

The USA has the highest share in the world exports of aerospace products with 40% to 45% during the years 2000 to 2006. The EU-25 (excluding intra-community trade) has also very high shares with 33% to 37% during the same period. China and Japan do not have relevant shares of exports in this sector.

Figure 20



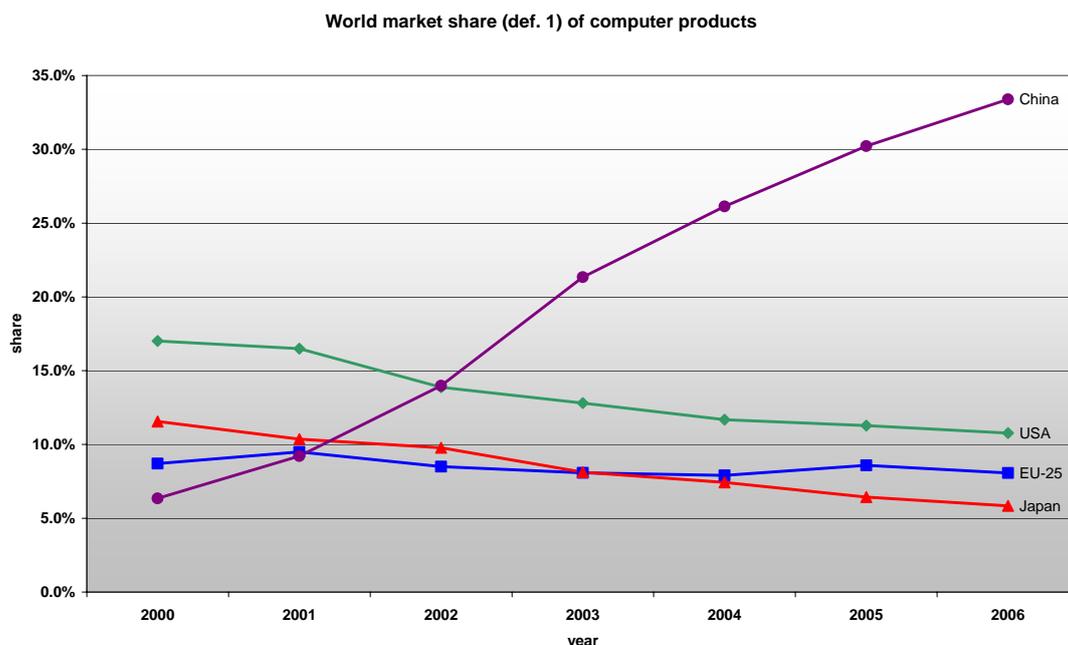
Including intra-community trade, France with around 17% is in second place after the USA with 35%¹⁸ market share. Germany – the second largest European manufacturer of aerospace products – is third with a share of around 15%.

World market shares of the exports of computer products

The USA and Japan are dramatically losing ground in the market share of computer products (at similar decreasing rates between 6 and 8% yearly). China on the other hand is growing very fast and quintupled its market share from the year 2000 to 2006 and now accounts for more than 33% of the total computer products exports. The EU-25 stays more or less stable at around 8%.

¹⁸ The USA account for around 35% in this comparison as the world market in aerospace exports now also includes intra-community trade.

Figure 21

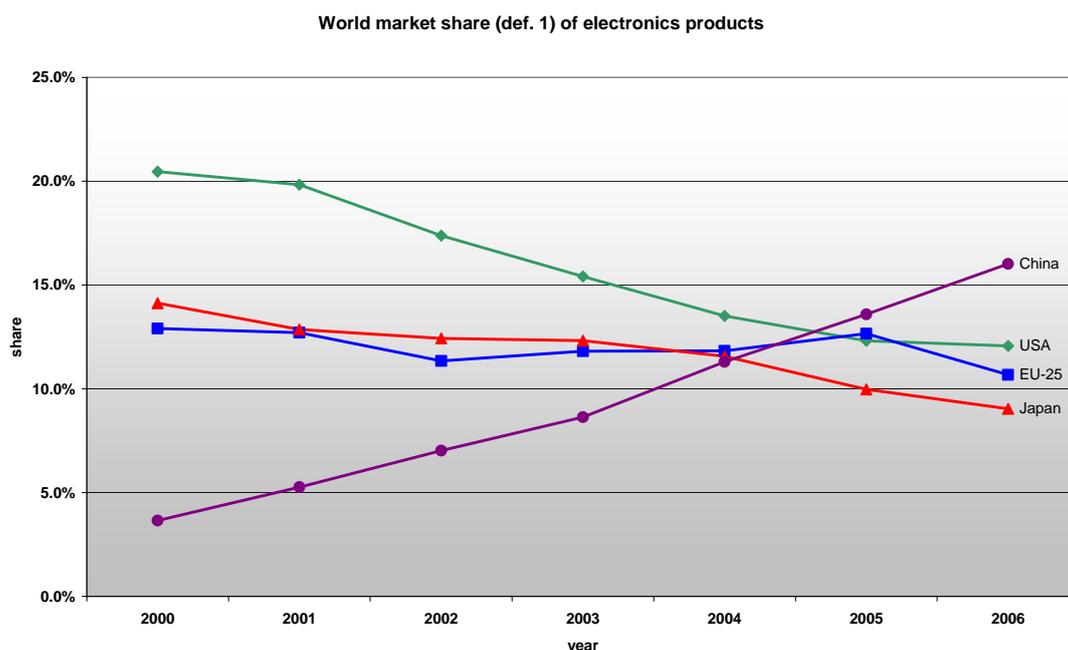


Analysing the G8 figures (including intra-community trade), in 2006 all G8 countries together accounted for 25% of the world computer exports. This is less than China's share of almost 27%.

World market shares of exports of **electronics and telecommunications** products

In the exports of electronics and telecommunications products the USA and Japan have lost around 40% of their market shares between 2000 and 2006. The EU-25 market share remained more or less stable around 12% until 2005, but has declined to 11% in 2006. (Whether this is the start of a downward trend has to be confirmed in the years to come.) In contrast to the other big economic areas, China has steadily increased its market share from 3.6% in 2000 to 16% in 2006. Since 2005 it is the country with the highest market share in the exports of electronics and telecommunication products.

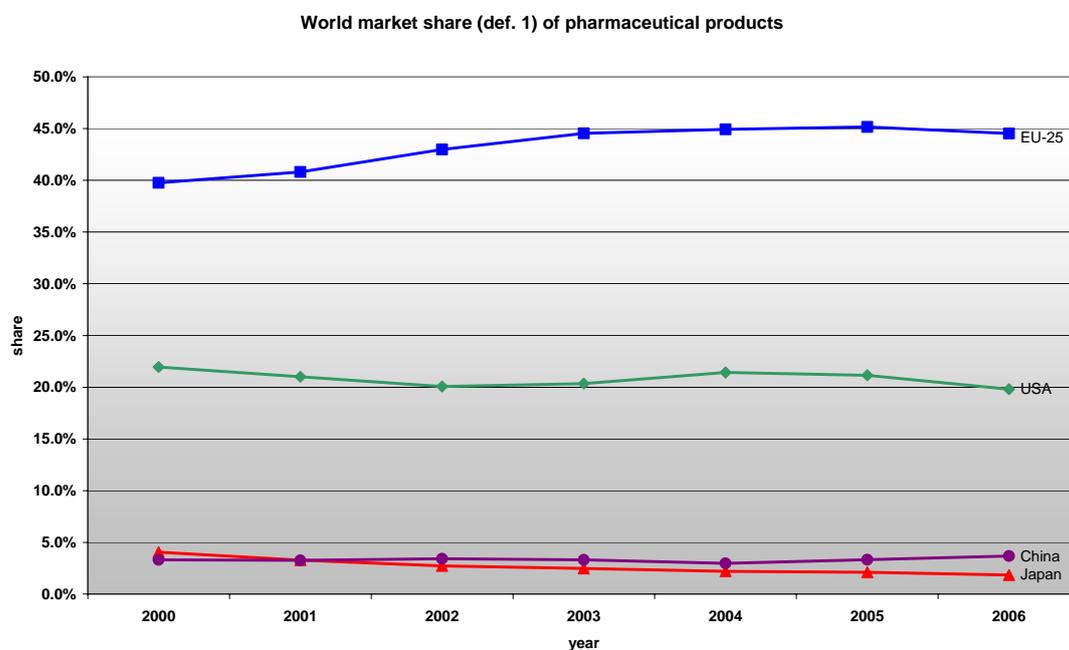
Figure 22



World market share of exports of pharmaceuticals products

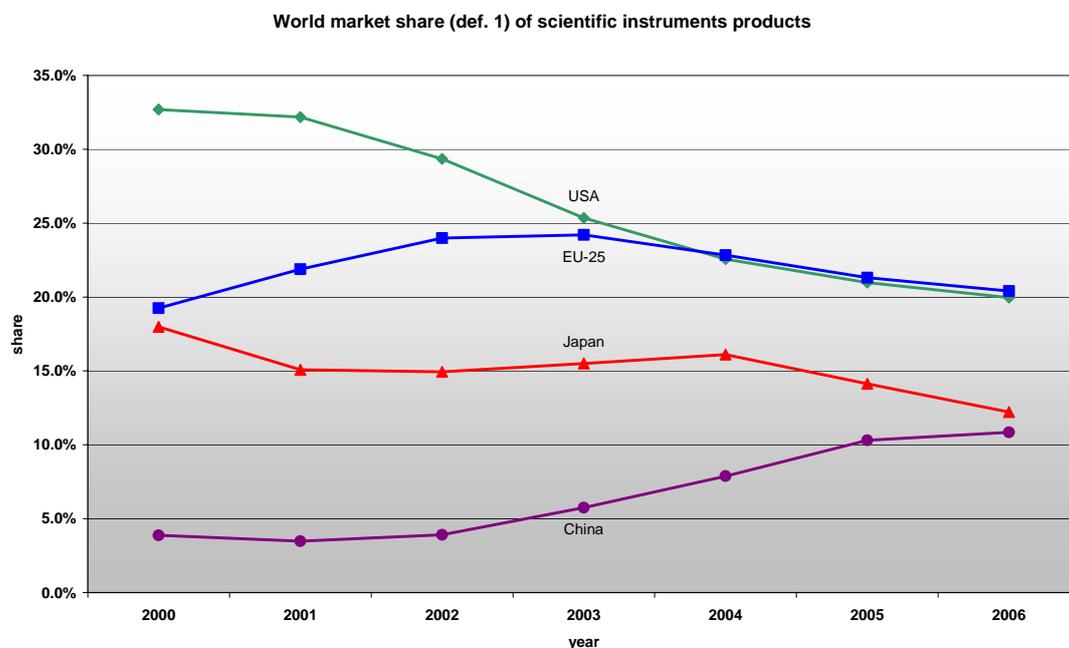
The EU-25 is the world's largest exporter of pharmaceutical products and even increased its market share from 40% in the year 2000 to 45% in 2006. The EU-25 is followed by the USA with a market share in 2006 of around 21%, roughly half of the EU-25's market share. Japan and China lack behind with market shares of less than 2% and less than 4% respectively.

Figure 23



World market share of exports of scientific instruments products

Figure 24



In the year 2000 the USA was clearly leading the exports of scientific instruments with a market share of 33% but since then has lost ground and now accounts for only 20%. The EU-25 has improved its market share during the years 2000 to 2003 from 19% to 24% but since then has lost market share again and is now at 20%. Nonetheless, since 2004 the EU-25 has the largest market share slightly

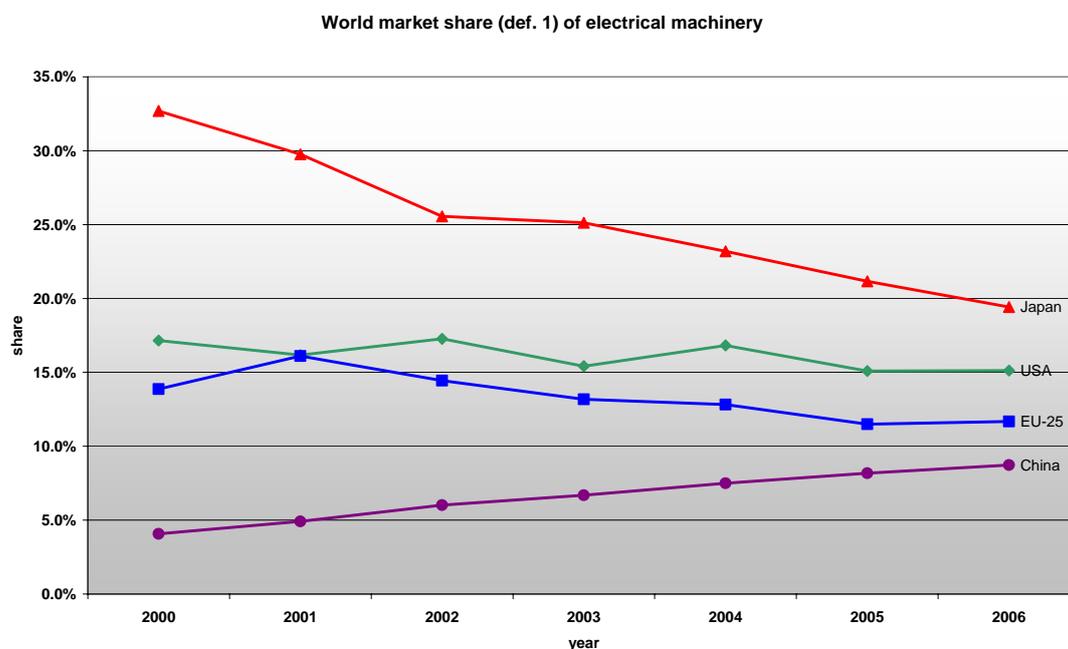
above the USA. Japan has lost a third of its share since the year 2000 and now accounts for 12% of the exports of scientific instruments. China almost tripled its market share from 4% in the year 2000 to 11% in 2006. However, it seems that the increase in its market share reaches a new level of stability.

Looking at the G8 members, it can be pointed out that the USA still leads with a market share of 17% in 2006 but that it lost more than 10 percentage points or 39% of its share. Germany is second with a market share of 12% in 2006, followed by Japan with 10% and China with 9%. (These figures were calculated including the intra-community trade.)

World market share of exports of electrical machinery products

Japan, although having lost 13 percentage points of market share in the exports of electrical machinery products between 2000 and 2006, is still the leader in the world export market of these goods. Japan is followed by the USA which was more or less stable around 16% and the EU-25 which was showing a slightly declining market share. China more than doubled its export market share of electrical machinery products but still has a rather modest share of almost 9% in the year 2006.

Figure 25

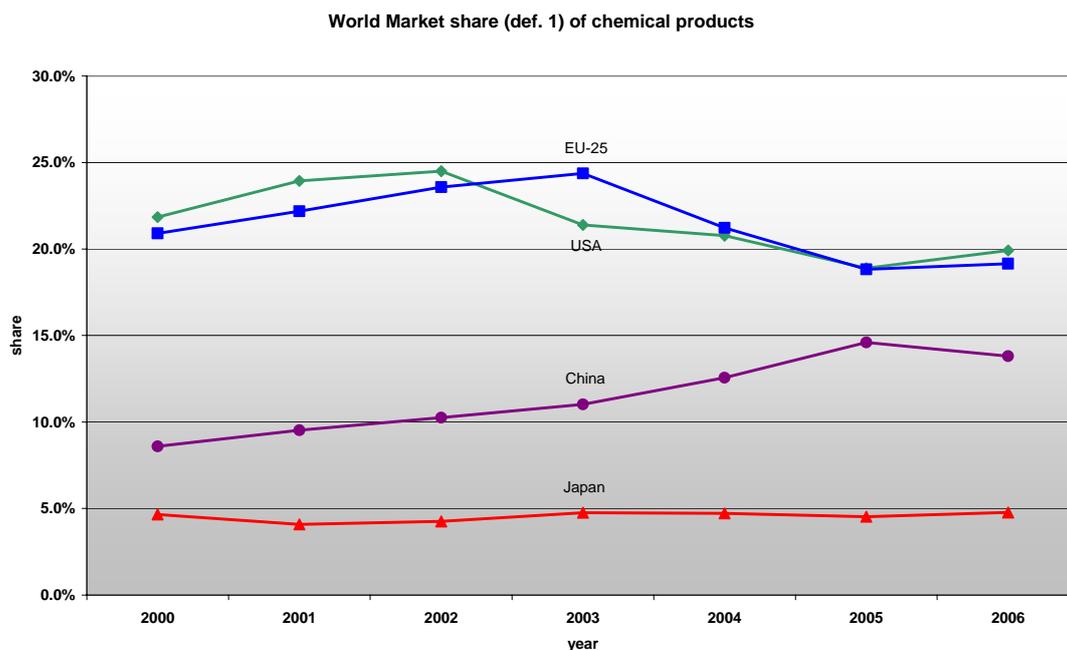


Looking at the EU G8 members, it can be pointed out that while the United Kingdom and France halved its market shares (to 4% and 1% respectively in 2006). Germany and Italy were able to increase their market shares in the export of electrical machinery since 2000 (from 7.5% to 8.1% for Germany and from 0.8% to 1.0% for Italy).

World market share of exports of chemistry products

The EU-25 and the USA are swapping places in the lead of the exports of chemicals. Both economic areas have lost about 10% of their market shares since 2000, but in 2006 were still strong with 20% (USA) and 19% (EU-25) market share. China increased strongly its market share in the exports of chemicals from 10% to 14% or by 40%, but seems to stabilise now. Japan was stable around 4.5% during the whole period.

Figure 26

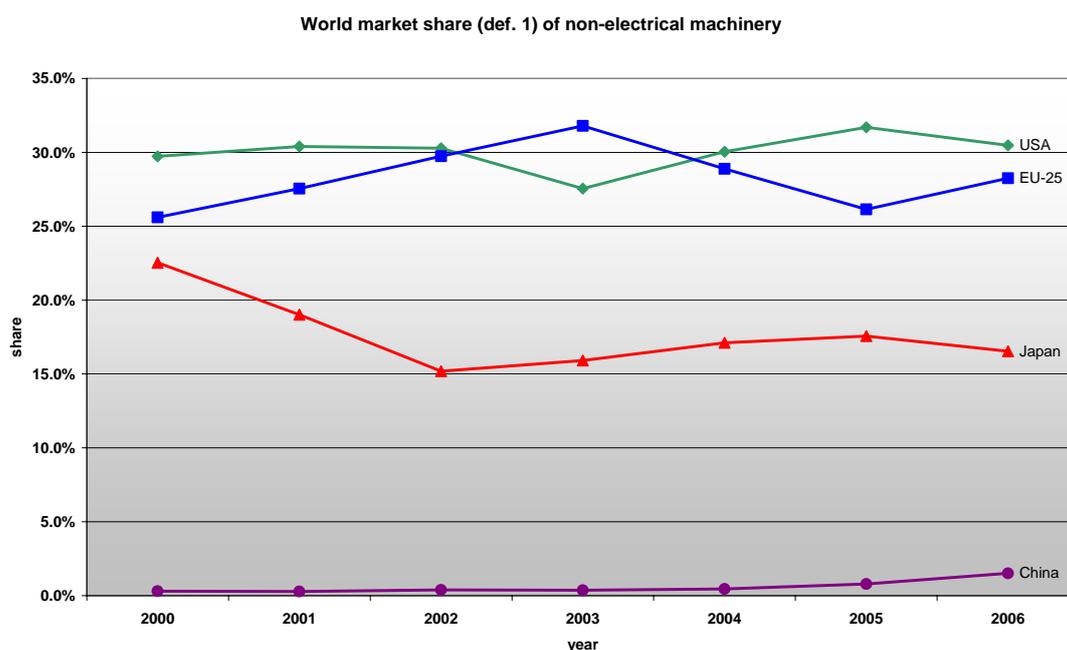


Looking at the G8 figures (including intra-community trade) China is now the second largest exporter of chemicals together with Germany (both 10.2% market share in 2006) followed closely by France (with 9.9%). The USA is in the lead with 14.7%.

World market share of exports of **non electrical machinery** products

The USA and the EU-25 are swapping places in the lead and show average market shares in the export of non-electrical machinery of around 30% and 28% respectively. Japan lost a third of its market share between 2000 and 2003 and since then is stable at 17%. China does not have a relevant exports market share in these goods but nonetheless quintupled its share between 2000 and 2006 reaching 1.5%.

Figure 27



Looking at the G8 figures it can be noted, that Germany was stable around 13% market share (including intra-community trade) and is now on par with Japan who lost more than a quarter of its market share since the year 2000. The USA stays in the lead with around 24% export share and China is having an even lower share than Russia (1.2% compared to 1.8%).

World market share of exports of armaments products

The exports of armaments were not analysed as the JRC assumes that a lot of exports of armaments are not declared as such in the national statistics due to nondisclosure and that therefore the figures to be presented here would probably be underestimated and meaningless.

Short summary

The analyses of the export shares (def. 1) of the different R&D intensive product groups shows

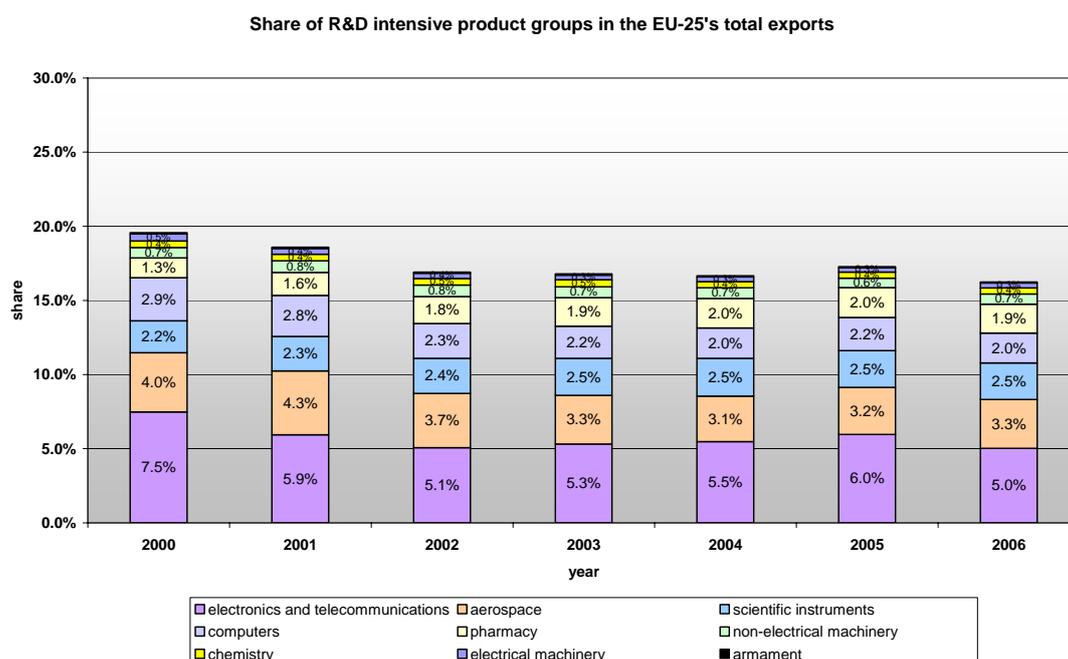
- that the EU-25's market share in most product groups remains relatively stable,
- that the USA have still an important position although they are losing ground,
- that China is clearly gaining market share in most sectors,
- and that Japan is definitively losing market shares in almost all sectors.

5.2. *Share of the exports of R&D intensive product groups in the total exports of the same country (def. 3)*

EU-25:

Among the four big economic areas, the EU-25 has the lowest ratio of R&D intensive products being exported in comparison to the total exports of the EU-25 (excluding intra-community trade). The share of the high-tech products was just above 16% in 2006. More than 90% of these high-tech products being exported come from five of the nine product groups under study. The main R&D intensive product groups in the EU-25's exports are: electronics and telecommunications, aerospace, scientific instruments, computers, and pharmacy.

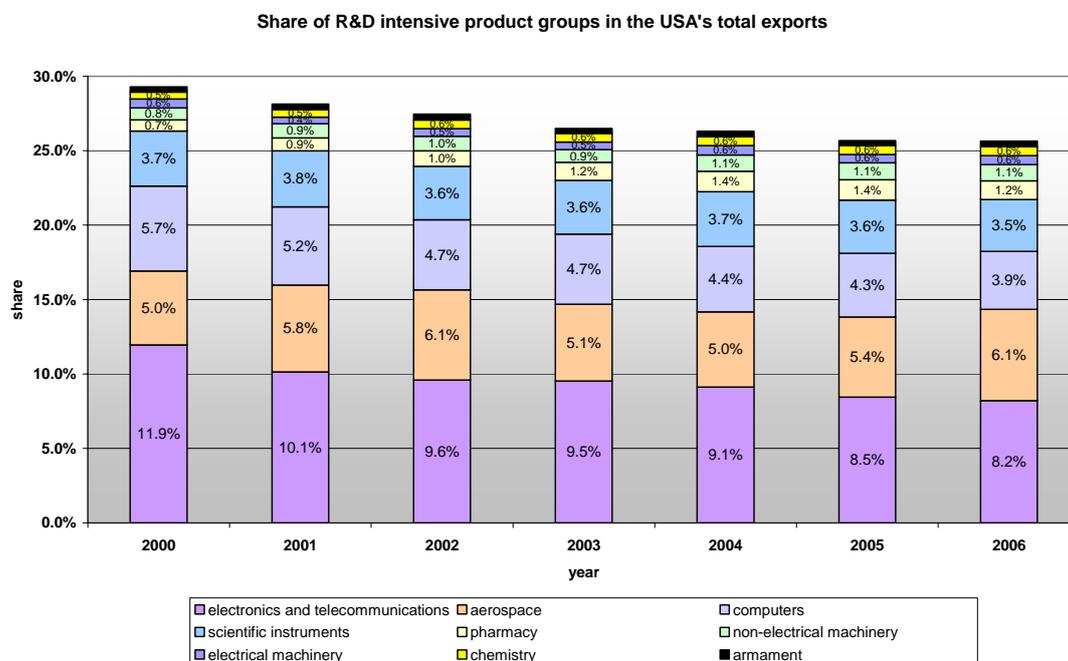
Figure 28



United States of America:

The USA is the economic area with the second highest share of high-tech exports in its total exports after China. The share of the high-tech products was between 25 and 26% in 2006. Also in the case of the USA five product groups account for roughly 90% of the total high-tech exports. The main R&D intensive product groups in the USA's exports are: electronics and telecommunications, aerospace, computers, scientific instruments, and pharmacy. These are the same product groups as in the EU-25.

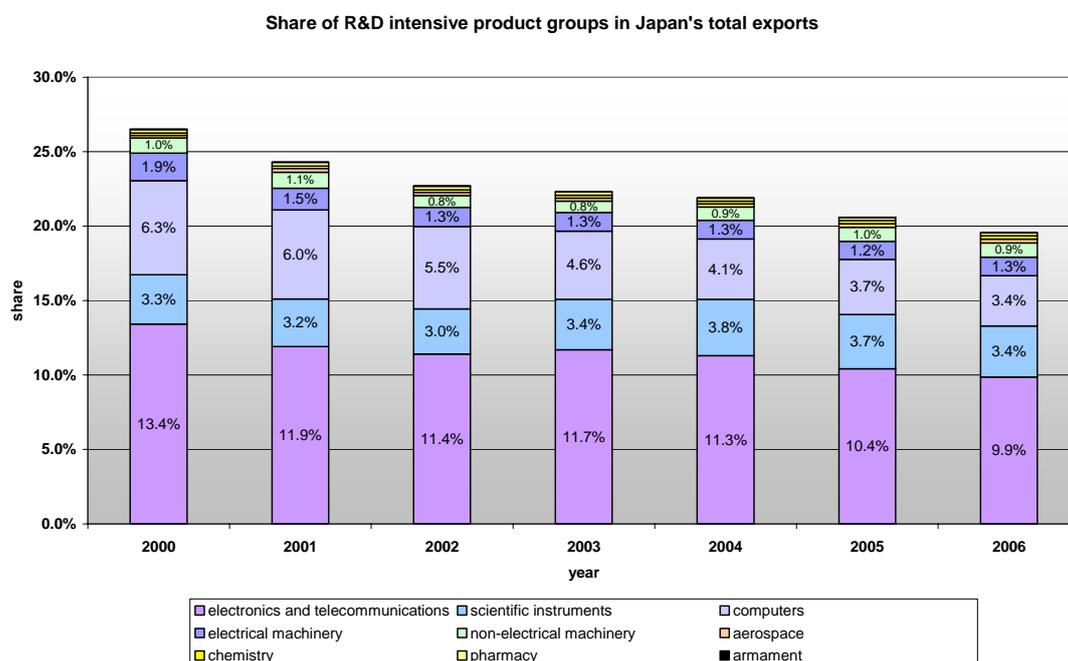
Figure 29



Japan

Japan is on third place of the four economic areas under study concerning the ratio of high-tech exports to its total exports. The share of the high-tech products was between 19% and 20% in 2006. The high-tech exports of Japan are concentrated in only four R&D intensive product groups which account for almost 92% of all high-tech exports. The main R&D intensive product groups in Japan's exports are: electronics and telecommunications, scientific instruments, computers, and electrical machinery.

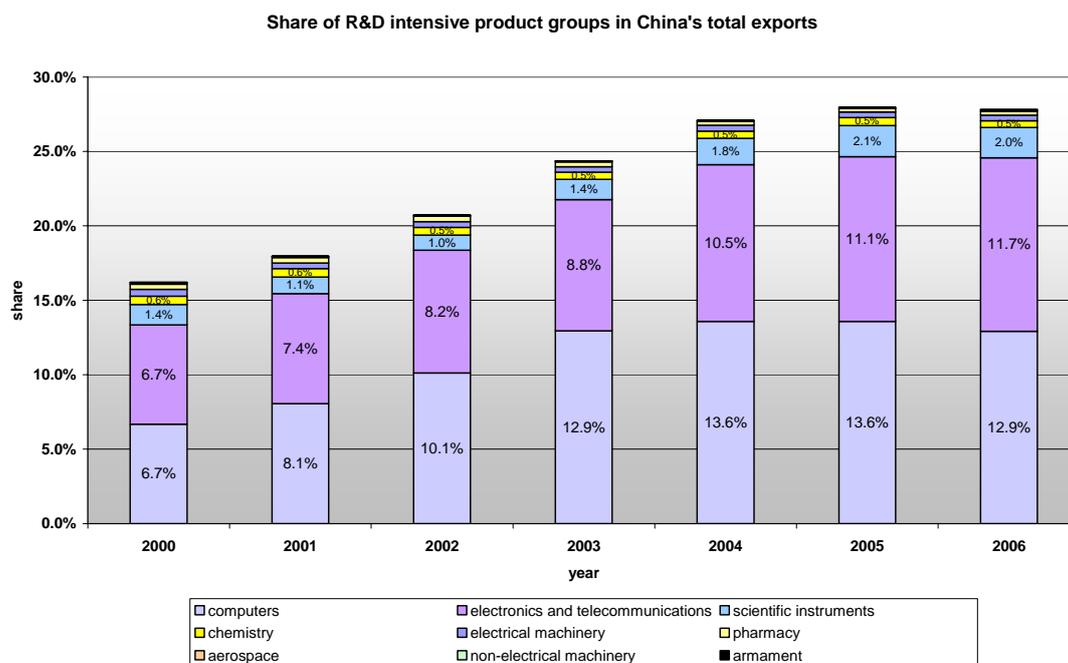
Figure 30



China:

China shows the highest ratio between high-tech exports and its total exports for the four economic areas under study. The share of the high-tech products was almost 28% in 2006. The high-tech exports of China are the most concentrated as only three R&D intensive product groups account for almost 96% of all high-tech exports. The main R&D intensive product groups in China's exports are: computers, electronics and telecommunications, and scientific instruments. But the scientific instruments account only for about 7% of all high-tech exports, whereas computers and electronics and telecommunications account for more than 40% each.

Figure 31



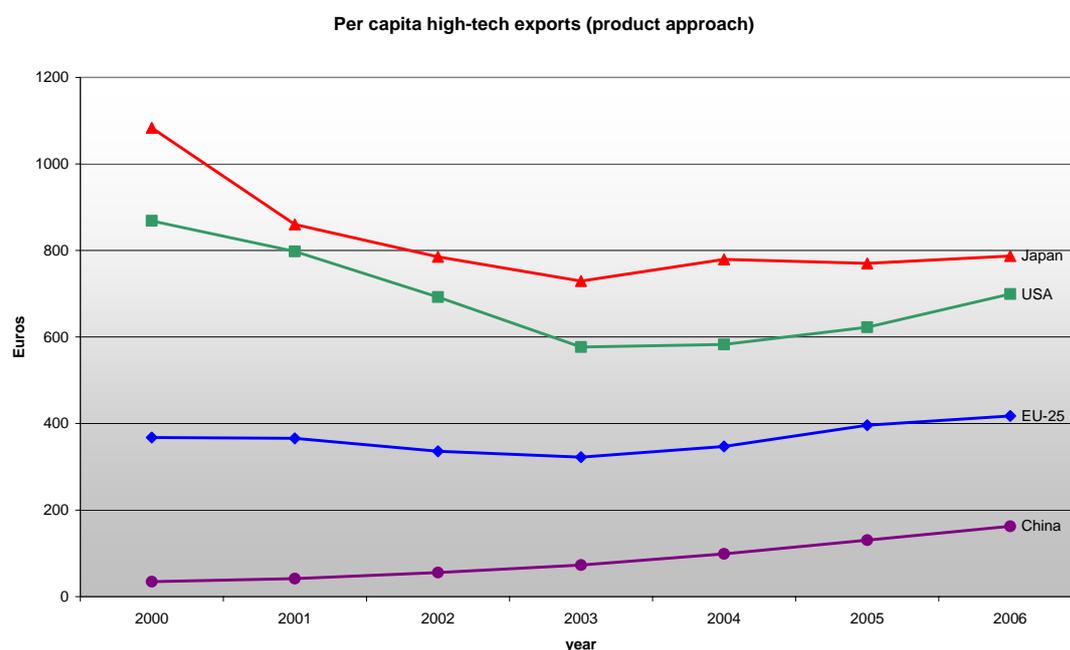
6. Per capita high-tech trade

A different indicator that can be calculated for each economic area or country is the amount of exports (imports) of high-tech products per capita¹⁹. This provides the magnitude of high-tech trade in relation to the population of the country considered.

Table 27: Per capita high-tech exports (product approach) in Euros

	2000	2001	2002	2003	2004	2005	2006
EU-25	368	366	336	322	347	396	417
USA	869	798	692	577	583	623	699
Japan	1083	860	785	729	779	770	787
China	34	42	55	73	99	131	163

Figure 32



Apart from China, which almost quintupled its per capita high-tech exports from the year 2000 to the year 2006, only the EU-25 was able to increase its per capita exports (+13%, calculated in Euros). The USA as well as Japan were showing decreasing per capita high-tech exports (-19% and -27% respectively), especially during the years 2000 to 2003 and were recuperating since then slightly. However, if calculated in US-Dollars, the per capita high-tech exports were actually increasing by 9% in the case of the USA and were almost unchanged in the case of Japan. (The EU-25 shows an increase of 54% calculated in US-Dollars and China more than sextupled its per capita high-tech exports in Dollar terms.) So the informational value of the per capita high-tech exports is somewhat limited or at least partially bound to the exchange rate development of the Euro towards the US-Dollar, which improved for the Euro by 36% between the years 2000 and 2006.

Besides of these limitations, it can be pointed out that Japan is the highest per capita exporter of high-tech goods, closely followed by the USA. In comparison with Japan, the EU-25 is only exporting

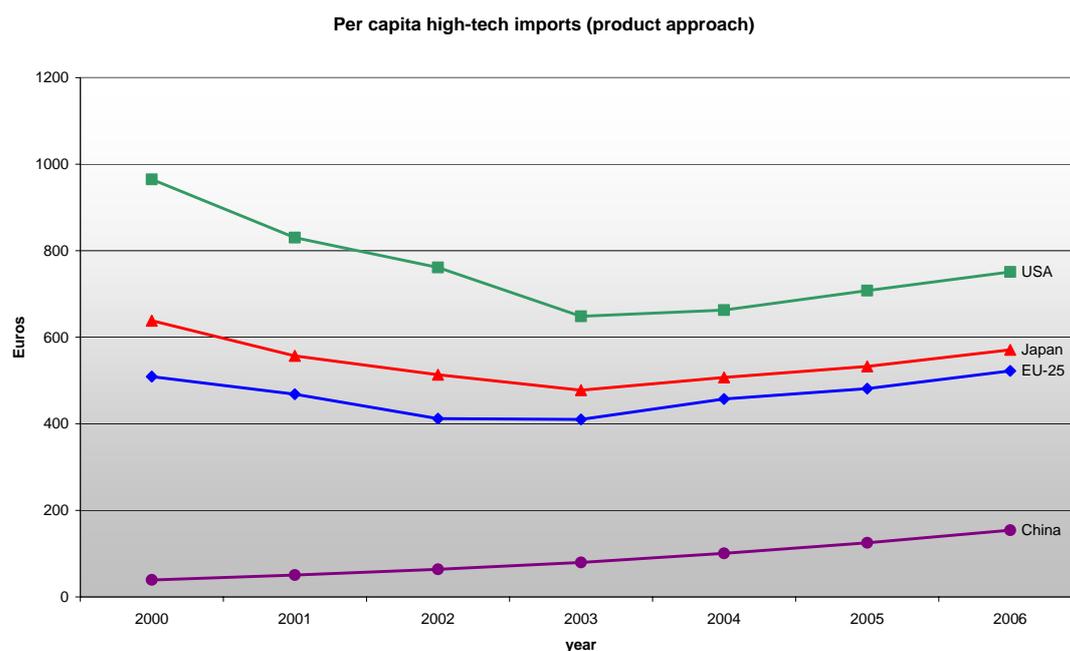
¹⁹ The population figures for the EU-25 are from Eurostat; the population figures for the other countries come from United Nations Annual interpolated mid-year population estimates 1997 - 2006; Source: UN Demographic Yearbook 2006.

roughly half of the high-tech goods per capita. China is behind with its per capita high-tech exports but this is even truer for its per capita total imports (see Table 28).

Table 28: Per capita high-tech imports (product approach) in Euros

	2000	2001	2002	2003	2004	2005	2006
EU-25	509	468	412	410	457	481	522
USA	965	830	761	649	663	708	751
Japan	638	557	513	477	507	533	571
China	39	50	64	80	100	125	154

Figure 33



On the import side the picture is different. Here the USA dominates the per capita imports of high-tech goods (measured in Euros) and is followed by Japan and the EU-25 who have a per capita high-tech import at the magnitude of 75 to 70% of the USA's per capita high-tech imports. China is relatively far behind but has quadrupled its per capita high-tech imports between 2000 and 2006.

Measured in Euros the USA, Japan, and the EU-25 showed all decreasing per capita imports of high-tech goods from 2000 to 2003 and show since then parallel increasing per capita imports.

Also in the case of the per-capita high-tech imports the exchange rate of the Euro towards the US-Dollar shows some effects. While calculated in Euros the USA's and Japan's per capita high-tech imports decreased during the period from 2000 to 2006, they were increasing when calculated in US-Dollars.

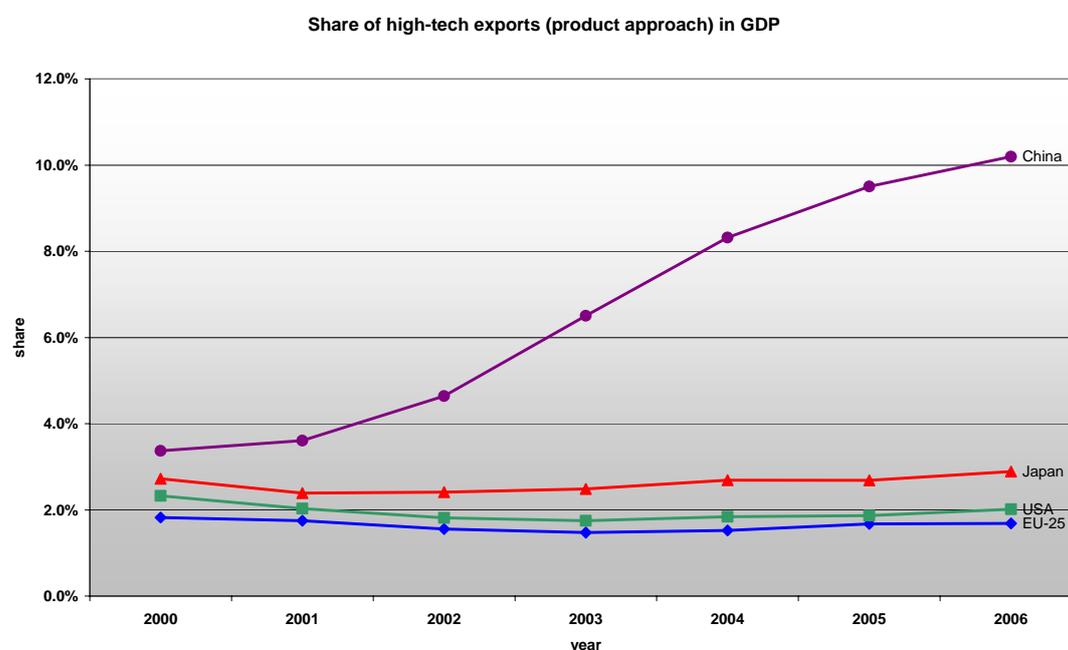
7. Share of high-tech exports in gross domestic product

The share of total trade in gross domestic product (GDP) is probably the most frequently used indicator of trade integration since it provides a measure of the degree of dependence of domestic producers on foreign markets. In this section an indicator is used which is derived from this indicator: the share of high-tech exports in GDP. An increasing share of high-tech exports in GDP means that the exports of high-tech products grow faster than the GDP. A decreasing share of high-tech exports in GDP means that the exports of high-tech products grow slower than the GDP.

Table 29: Share of high-tech exports in GDP²⁰

	2000	2001	2002	2003	2004	2005	2006
EU-25	1.8%	1.7%	1.6%	1.5%	1.5%	1.7%	1.7%
USA	2.3%	2.0%	1.8%	1.7%	1.8%	1.9%	2.0%
Japan	2.7%	2.4%	2.4%	2.5%	2.7%	2.7%	2.9%
China	3.4%	3.6%	4.6%	6.5%	8.3%	9.5%	10.2%

Figure 34



Looking at the graph (Figure 34) it can be observed that the share of high-tech exports in the gross domestic product (GDP) was relatively stable for the EU-25, the USA, and Japan.

Exceptional was only the development of this ratio for China: Between 2000 and 2006 the Chinese exports of high-tech products grew by two thirds faster than the GDP and at the same time the non-high-tech exports grew not even half as fast as the GDP. This resulted in an increase of the share of high-tech exports in the GDP from 3.4% in the year 2000 to 10.2% in 2006.

²⁰ GDP data was extracted from the IMF World Economic Outlook Database, April 2008 Edition.

8. References

Barboza, David: “In China, low-end industries give way to high-tech” in: International Herald Tribune, August 1, 2008. Weblink: <http://www.ihf.com/articles/2008/08/01/business/01factory.php>

Hatzichronoglou, Thomas (1997), “Revision of the High-Technology Sector and Product Classification” in: OECD Science, Technology and Industry Working Papers, 1997/2. Weblink: http://www.oecd.org/LongAbstract/0,3425,en_2649_34443_1885085_119684_1_1_1,00.html

IMF World Economic Outlook Database, April 2008 Edition. Weblink: <http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx>

Eurostat Comext Database, Weblink: <http://epp.eurostat.ec.europa.eu/newxtweb/>

OECD Handbook on Economic Globalisation Indicators, 2005. Weblink: http://www.oecd.org/document/44/0,3343,en_2649_34443_34957420_1_1_1_1,00.html

UN Comtrade Database. Weblink: <http://comtrade.un.org/>

UN Demographic Yearbook 2006. Weblink: <http://unstats.un.org/unsd/demographic/products/dyb/dyb2006/AnnexI.pdf>

Annex 1: Manufacturing industries classified according to their global technological intensity (ISIC Revision 3)

High-technology

1. Aerospace	353
2. Pharmaceuticals	2423
3. Computer, office equipment	30
4. Electronics-communication	32
5. Precision instruments	33

ISIC Revision 3

Medium-high-technology

6. Electrical Machinery	31
7. Motor vehicles	34
8. Chemicals (except pharmaceuticals)	24 (excl. 2423)
9. Other transport equipment	352 + 359
10. Machinery and equipment	29

Medium-low-technology

11. Petroleum refining	23
12. Rubber and plastic products	25
13. Non-metallic mineral products	26
14. Shipbuilding	351
15. Basic metals	27
16. Fabricated metal products (except machinery and equipment)	28

Low-technology

17. Other manufacturing industry	36 + 37
18. Wood and furniture	20
19. Paper printing	21 + 22
20. Textiles, clothing, leather	17 + 18 + 19

Source: OECD Handbook on Economic Globalisation Indicators, 2005, p. 172.

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Abstract

The present report gives an overview on the level and development of the high-technology exports and imports of the four big economic areas and countries of the world: the USA, the EU-25, Japan, and China. In addition to these economic areas and countries also the countries participating in the Group of Eight process (G8) – the USA, Japan, Germany, the United Kingdom, France, Italy, Canada, and Russia – are analysed where it was found informative by the author.

For the analyses of the total high-tech trade three different definitions of market shares are used: high-tech trade in world high-tech trade, high-tech trade in world total trade, and high-tech trade in one country's total trade. For the definition of the high-tech sectors and goods the current classifications of high-tech sectors and product groups of the OECD were applied.

Furthermore, the composition of the high-tech exports and imports of each of the four big economic areas and countries was studied and also the per-capita high-tech exports and imports as well as the share of high-tech exports in the gross domestic product (GDP) were examined.

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