



Study on the Future Opportunities and Challenges of EU-China Trade and Investment Relations

Study 2: Chemicals

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EXECUTIVE SUMMARY

The chemical industry is one of the largest and most diversified in the world. The total demand for chemicals (including pharmaceuticals) in 2004 was valued at €1.7 trillion. The EU-25 accounted for 29.1% of this, the United States for 23.7%, Japan for 9.9% and China for 9.2%. This can be contrasted sharply with ten years ago, when China's share of global chemicals turnover was only 3.5%. With a chemicals turnover of €137bn in 2004, China has become the world's fourth largest manufacturer of chemicals, just after Germany (€142bn), Japan (€185bn) and the USA (€415bn).

The structure of the global chemicals industry is changing, largely because China is becoming an increasingly important consumer and supplier of chemical products. The reasons for this are China's cost advantages over industrialised countries in the production of chemical products and strong demand conditions due to key customer industries building up production capacities in China. This has meant consumption of chemicals has increased by around 12% p.a. over the past ten years.

Competitive Strengths and Market Opportunities

Although China is now the world's fourth-largest manufacturer of chemicals products, domestic production is unable to cover demand in all segments. In 2004, China's chemicals imports (including pharmaceuticals) were valued at about €43.6bn, equivalent to an import ratio of 27%. This provides an opportunity for European commodity chemicals producers in upstream segments to invest in China, as well as specialty and fine Chemicals producers to export to China. The European chemical sector is the world leader in terms of energy efficiency, environmental management and the development of renewable materials. European chemical companies would therefore clearly gain a competitive edge if Chinese authorities would increase stringency of enforcement to comply with environmental standards in order to avoid pollution and wasting of resources as outlined in the 11th Five Year Programme (FYP) Moreover, a higher degree of environmental regulation in China would create business opportunities for the European chemical companies.

In addition, Chinese companies still lack the technological proficiency that many European companies have attained in the manufacturing of petrochemicals such as propionic acid or acrylic esters. This is one of the reasons China's oil and petrochemical companies are likely to continue to seek

foreign partners and European companies are best-placed to facilitate this.

The customer base of the specialty chemical industry has experienced consolidation and globalisation. This is a competitive advantage for the big-size European specialty giants, since chemical companies with a global reach are preferred global partners of their multinational customers. They are focusing less on their products and more on the services supporting them by concentrating more on niche markets and on building exclusive relations with customers, especially with the help of e-business. Since China has focused mostly on developing basic feedstock industries in the past, the growth potential for specialty chemicals is especially high. China is a particularly attractive destination for chemical specialties to invest, as their production tends to be relatively labour-intensive, while the increasing availability of a well educated academic workforce also makes establishing local and regional service centres an attractive proposition.

European specialty chemicals are in an advantageous position since their products are usually not made to specification. In other words they offer tailor-made solutions for customers. Products like specialty chemicals, which contain a strong service component, are not as prone to local competition, since local companies tend to lack necessary prerequisites. Given that domestic manufacturers in many cases do not fully satisfy the quality standards required for exports, European companies have good opportunities in this market.

Obstacles to Trade and Investment

Tariffs: Since China joined the WTO, obstacles for chemicals imports have been largely reduced. Import tariffs for more than 1,000 chemicals have been reduced from 15% to about 2 - 7%, since 2005.

Project approval: The Chinese government introduced legislation in late 2004 designed to simplify and speed up the approval process for investments by foreign and Chinese companies. Despite this, it remains unclear how effective this legislation will be and how it will be implemented.

Limitation in project size: The Chinese government has acknowledged the overheating economy and has introduced cooling measures. The Government has published a long list of industries and products that either prohibit or limit new investment.

Environmental and labour standards - not a level playing field: Environmental and labour

standards are very strictly applied to foreign invested enterprises whereas provincial and local governments tend to turn a blind eye when it comes down to local industries.

Chinese legislation on new and toxic chemical substances: A significant and growing Non-Tariff Barrier (NTB) facing the global chemical industry is the divergence of regulatory schemes used to ensure the protection of safety, health and the environment. China's present requirements regarding new and toxic chemical substances, are an example of this trend, and are likely to prevent companies from entering the Chinese market.

IPR enforcement: Although China has signed the Trade-Related Intellectual Property Rights Agreement (TRIPS), the enforcement of IP rights remains problematic.

Export Controls on Rare Earth Materials: The Chinese government operates a rare earth export quota system on critical raw materials, such as rare earth metals, phosphorous and fluorspar. These measures mean that European industry cannot obtain sufficient quantities of export licences and Europe-based Chemicals producers have difficulties in obtaining important inputs, giving Chinese competitors with easy access to these raw materials an unfair advantage.

A quantification of non-tariff barriers (NTBs) to trade reveals that these obstacles cost European Chemical producers up to \$379 million in lost business opportunities.

Policy Recommendations

When considering the competitive nature of markets and free trade it is important to recognise the critical nature and dependency of the inter-relationship that exists between upstream and downstream chemicals. To generate free and fair trade at all levels in the chain it is important that these relationships are considered both independently and across the chain and that a test is applied to ensure that distortion does not exist or remain isolated at any one level.

Tariffs: To pursue agreement on an ambitious Non-Agriculture Market Access (NAMA) Agreement in multi-lateral trade talks that includes a chemical sector deal regarding the elimination of tariffs in which all major chemical producing countries are participating, notably China. Preference should be given to multilateral deals to trade liberalisation, but the EU must react quickly should other trading partners engage in bilateral or regional trade agreements with China.

Environmental and labour standards: Must be implemented comprehensively and without prejudice. As is the case in other areas, this must be monitored and documented to be brought to the attention of Chinese policy-makers.

Anti-dumping measures taken by the EU: The EU must maintain the efficiency of EU trade defence instruments and to convince China to implement the WTO Anti-dumping Agreement in line with EU anti-dumping regulations.

Chinese legislation on the manufacture and import of new chemical substances and IPR infringement: To seek regulatory dialogues with relevant Chinese ministries to work on non-tariff obstacles to trade. A stronger stance in negotiations with China on technical barriers to trade and IP infringements must be taken and all available means to secure market access (including the possibility of recourse to the WTO) must be considered. China must not be granted Market Economy Status unless a number of key criteria have effectively been met and overall progress regarding compliance with WTO agreements has been made. These steps must be made only together with the US to avoid distortion of trade.

Project approval: Many hope that these new regulations mean that long delays to chemical investment projects by overseas companies in China, caused by government bureaucracy and inefficiency, will become a thing of the past. However, further improvement in administrative processes for project approval must be further monitored and encouraged.

Limitation in project size: Although the austerity measures put in place to limit the over-production of certain chemical products will ultimately benefit the Chinese chemical industry as well as foreign chemicals companies, these measures must be closely monitored.

In addition, regulation, energy and transport have a strong impact on the industry's competitiveness at home. In all three areas, Europe compares unfavourably to other parts of the world. Europe will need to tackle these issues through a more balanced regulatory framework which provides adequate incentives for innovation, a unified energy policy to reduce energy costs and investment in knowledge and physical infrastructure

Recommendations for Competitiveness

Maintain sustainable competitiveness: European companies are world leaders in terms of energy efficiency, environmental management, and the development of

renewable materials. With these strengths maintained, they will be best-placed to benefit from new environmental standards and efficiency targets under the 11th Five Year Programme.

Leverage China's cost advantages: Utilising China as a base for the production of specialty chemicals, which is particularly

labour-intensive, will allow European companies to improve profit margins. Furthermore, the advantages of China's low-cost base could also be applied to certain R&D investments, providing companies with additional resources to improve competitiveness.

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ABBREVIATIONS

API	Active Pharmaceutical Ingredient
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditures
Cefic	European Chemical Industry Council
ChemChina	China National Chemical Corporation
CNPC	China National Petroleum Corporation
CNOOC	China National Offshore Oil Corporation
CSPC	CNOOC & Shell Petrochemicals Corporation
CTHA	Chemical Tariff Harmonisations Agreement
Ethylene	An olefinic hydrocarbon recovered from refinery or petrochemical processes.
FYP	Five Year Programme
GMP	Good Manufacturing Practice
ICCA	International Council of Chemical Associations
JV	Joint Venture
MES	Market Economy Status
NAMA	Non-Agriculture Market Access
MOFCOM	Ministry of Commerce
Naphta	A generic term applied to a petroleum fraction with an approximate boiling range between 122 degrees Fahrenheit and 400 degrees Fahrenheit.
NDRC	National Development and Reform Commission
NTB	Non-Tariff Barrier
PCB	Printed Circuit Board
PVC	Polyvinyl Chloride, a commonly used plastic
RMB	Chinese currency Renminbi
ROK	Republic of Korea
Secco	Shanghai Secco Petrochemical Corporation
SEPA	China State Environmental Protection Administration
Sinopec	China National Petrochemical Corporation
SOE	State Owned Enterprise
SPC	Shanghai Petrochemical
TRIPS	Trade-Related Intellectual Property Rights
VCI	German Chemical Industry Association
WFOE	Wholly Foreign Owned Enterprises (also known as WOFE)
WTO	World Trade Organization

1. INTRODUCTION

Today, the chemical industry is one of the largest and most diversified in the world. The total value of chemicals demand (including pharmaceuticals) in 2004 was about €1.7 trillion, with the EU-25 accounting for 29.1% of this figure, the United States for 23.7%, Japan for 9.9% and China for 9.2%¹. Among OECD member states, chemicals and petroleum products make a larger contribution to GDP than any other manufacturing industry. The chemical industry represented 2.4% of the GDP of the EU-15 in 2004².

1.1 Market Segmentation and the Value Chain

The chemical industry is a broad, complex, industry that produces over 70,000 different products. These products range from the chemicals first derived from the initial processing of organic or inorganic raw materials - such as benzene, toluene, and chlorine that are vital to other production - to finished consumer products such as medicines, soap, and toothpaste that are seldom associated with the chemical industry. In volume terms, however, most of the industry's outputs are basic chemicals little known to consumers. For the most part, its products are used by other chemical producers to make other chemicals or by other industries to make or grow things that serve society - products ranging from apples and autos to zippers and zithers. Nevertheless, much of the public is unaware of the vital role of the chemical industry in everyday life and modern products.

These diverse product lines are manufactured by more than 1,000 large and medium-sized

companies, plus countless very small ones. The many different products and processes of the chemical industry make a concise but meaningful description difficult. In essence, however, at the base of the chemical industry are companies that combine organic and inorganic materials from the earth with heat, air, and water to make chemicals that, in turn, are essential to products used in everyday life in modern economies. **Figure 2** displays - as a representative example - the value chain of the German chemical industry.

One way the "Chemicals Industry" can be roughly segmented is into product-use categories such as basic chemicals, specialty chemicals, fine chemicals, consumer chemicals and agrochemicals. **Figure 1** displays the global chemical output in 2004 by sub-sector based on product-oriented categories:

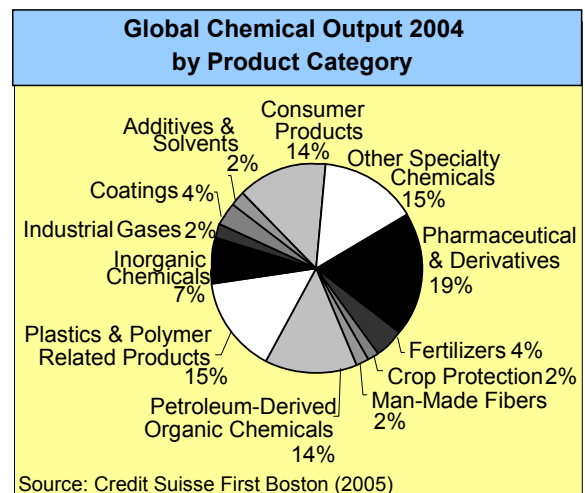


Figure 1: Global Chemical Output by Sub-Sector (Product-Oriented)

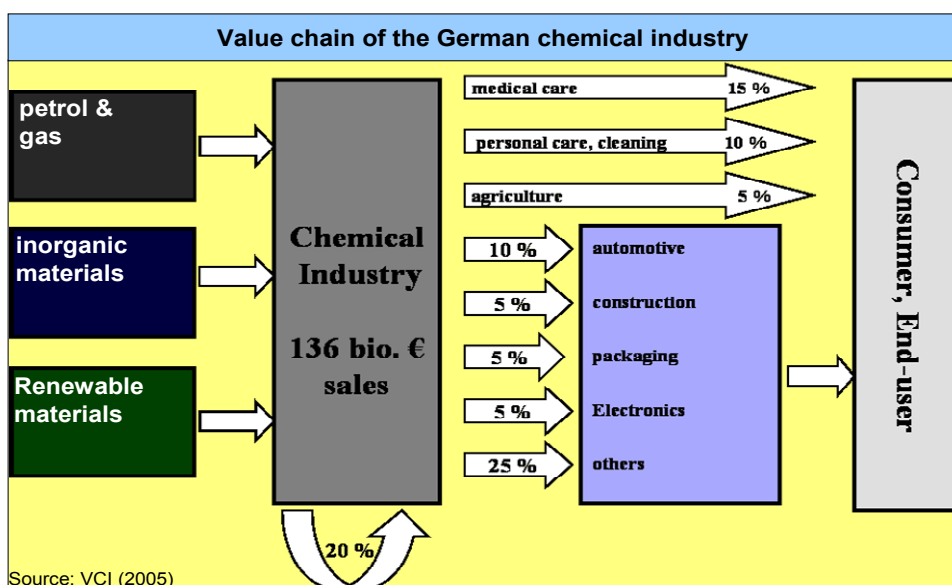


Figure 2: Value Chain of the German Chemical Industry

Alternatively, the chemical industry can be characterised as consisting of many "mini-industries" of varying sizes, and it counts virtually every other industry among its customers - from agriculture to construction and electronics. The huge range of products also means that the chemical industry's returns and financial condition are heavily reliant on the overall health of the economy. As a result, the sector is cyclical, and one of the key bellwethers of its fortunes is GDP trends. **Figure 3** displays global chemical output categorised by market-segments. The motor vehicle industry, for example, relies on several different chemicals in the production of tyres, beats, dashboards and coatings, to mention only a few major components.

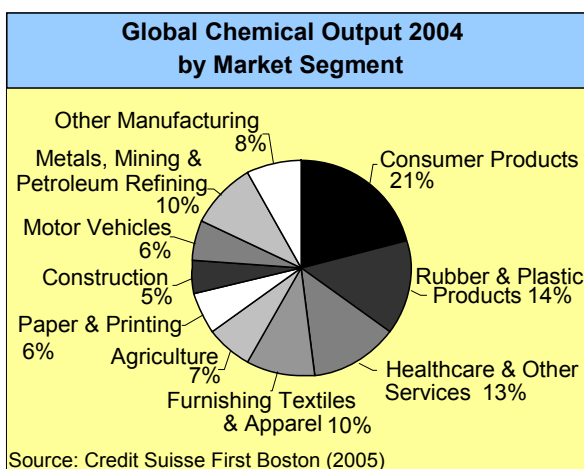


Figure 3: Global Chemical Output 2004 (Categorised by Market-Segments)

Chemical products can therefore also be roughly segmented into sectors according to their related markets. However, for the purposes of this study, chemicals are classified along product lines according to their position in the value chain due to their differences in strategic considerations (**Figure 4**)³:

- Commodity Chemicals:** Comprised of chemicals produced upstream intended for generic use, such as basic chemicals and petrochemicals as primary building blocks, and industrial chemicals such as polymers or man-made fibres;
- Specialty Chemicals:** Produced further downstream than commodity chemicals and are intended for a specific application and include many electronic and construction materials chemicals. From a strategic perspective, the category specialty chemicals includes "consumer chemicals" since the consumer chemicals business follows the same strategies and key success factors as the specialty chemicals business
- Fine Chemicals:** Represents the highest value end of the chemicals industry. This industry segment consists of products sold based on performance characteristics rather than price per weight unit and includes a large number of fine organics and life science products.

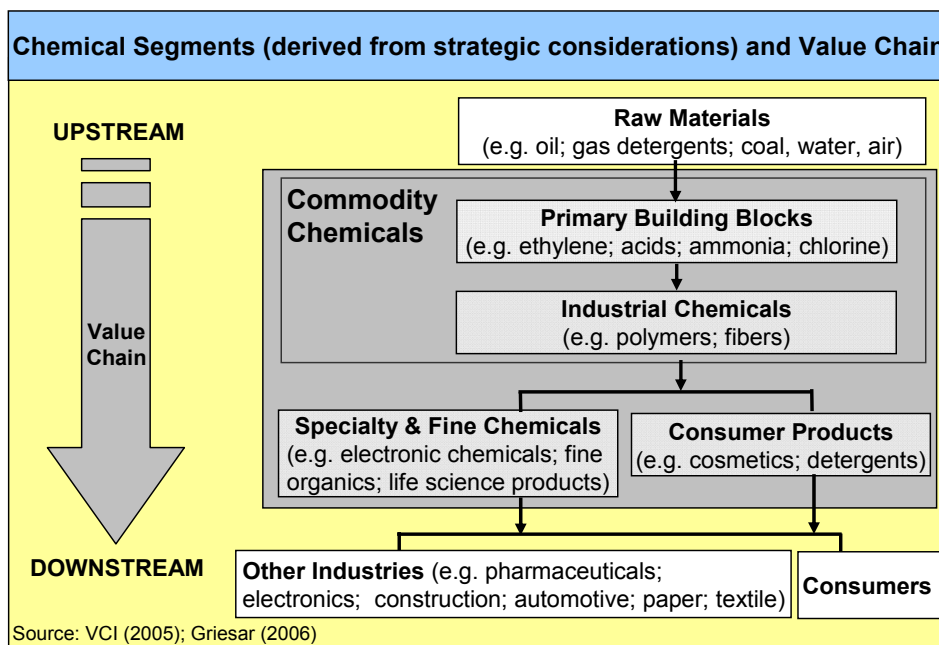


Figure 4: Chemical Segment (Derived from Strategic Considerations) and Value Chain

1.2 Fragmentation of Chemical Markets

An interesting aspect of the chemical sector is that the industry as a whole is highly fragmented. The top ten companies in chemicals (excluding pharmaceuticals) account for only 16% of the total market, well below other industries, such as automobiles, where the top ten companies account for 83% sales, or semiconductors, where the top companies account for more than half of all sales.⁴ However, at the product segment level, the top ten manufacturers of acrylic acid, for instance, account for 82% of their market. The top ten manufacturers of organic pigments account for 77% of their market, and the top ten in flavours and fragrances for 68%⁵.

The level of concentration in the industry also varies by region, with North America in general showing the highest concentration, and Asia the lowest. For acrylic acid, for example, the top four manufacturers in the United States account for the whole market. In Western Europe they account for 98% but in Asia (excluding Japan) they account for only 76% of the market. The comparable figures for the top four producers of PVC in the United States, Western Europe and Asia (excluding Japan) are 78%, 58% and 45% respectively.⁶ There are plenty of other examples (e.g. polypropylene and polystyrene) where the Herfindahl Index, a measure of industry concentration frequently used by antitrust authorities, is rather high in North America and Western Europe. This necessarily limits the opportunities for Western players to grow by means of mergers and acquisitions in their own domestic markets. Given this structure, it is not surprising that Western players are

becoming increasingly interested in acquiring Asian companies. In Asia, and China in particular, the large degree of industry fragmentation often results in sub-scale plants with fairly inefficient operations where the benefits of consolidation could be substantial.

2. THE EU AND CHINESE CHEMICALS MARKET IN COMPARATIVE PERSPECTIVE

2.1 Market Output and Demand

In 2004, the EU-25 was the largest global market with 30%, followed by the United States with a 24% share, Japan with 10% and China with 9%. World chemicals production (including pharmaceuticals) was estimated at €1,776bn in 2004, and the EU-25 accounts for 33% of the total. The EU is therefore also the largest chemicals producing area in the world and the only region where output outstrips demand (see **Figure 5**).

In China, chemicals consumption has increased by about 12% p.a. over the past ten years, while the EU-25 and the USA posted figures of only 4% apiece and Germany merely 2%⁷. **Table 1** on the next page shows the development of chemicals consumption (including pharmaceuticals) over the last decade. With chemicals turnover (including pharmaceuticals) of €137bn in 2004, China has become the world's fourth largest chemicals producer. Only in the USA (€415bn), Japan (€185bn) and Germany (€142bn) were more chemicals produced. Ten years ago, China's share of global chemicals turnover was only 3.5%⁸. In 2004, it had almost tripled, rising to over 9%.

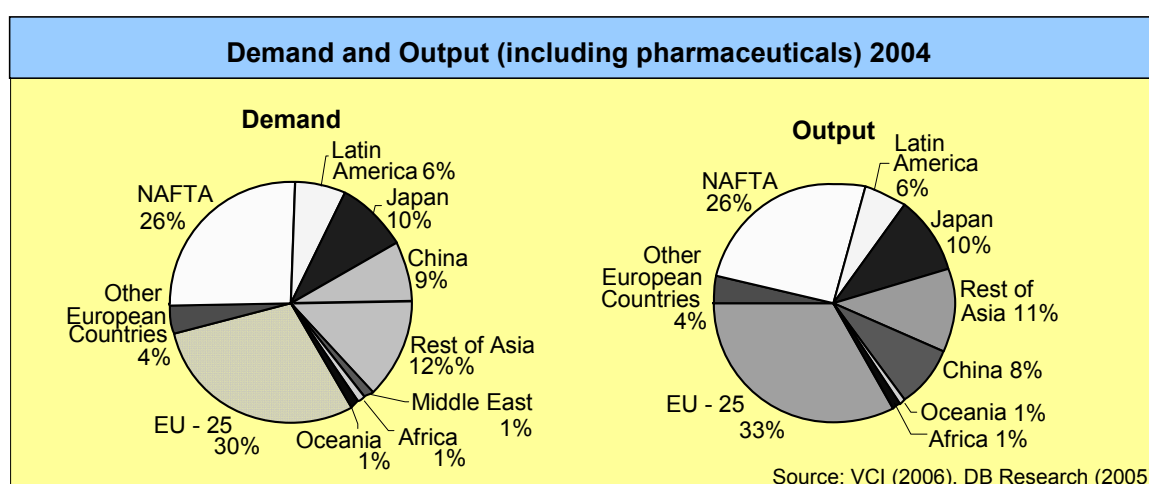


Figure 5: Chemicals Demand and Output (including Pharmaceuticals) 2004

Table 1: Chemicals Demand and Turnover (including pharmaceuticals) 1994 – 2004 in EU-25, China and Worldwide

Year	Chemicals demand [€ bn.]			Chemicals turnover [€ bn.]		
	EU-25	China	World	EU-25	China	World
1994	343	50	1,147	367	41	1,143
1995	363	58	1,190	389	46	1,185
1996	366	67	1,219	398	54	1,214
1997	389	81	1,382	429	66	1,380
1998	394	81	1,344	433	67	1,341
1999	409	93	1,453	454	76	1,446
2000	467	129	1,788	521	104	1,775
2001	479	139	1,802	536	114	1,784
2002	480	149	1,786	542	124	1,775
2003	486	157	1,697	553	132	1,696
2004	514	162	1,766	586	137	1,776

Source: VCI (2006); DB Research (2005b)

2.2 International Trade

In 2004, the global total of chemicals exports was estimated at €756bn. The EU-25 accounts for 60% of this trade, making it the biggest global player⁹ (Table 2). By comparison, China's low share of global exports (2.5%) reflects its minnow status in the global chemicals business and to some extent its inability to fulfil the quality

requirements of global customers. However, China's relatively low share of global exports is also explained by China's increasing industrial expansion which fuels domestic demand for chemical inputs. China's already significant share of global imports already stands at almost 6%¹⁰, with China's growth in imports rapidly outpacing its growth of exports in the last decade.

Table 2: Chemicals turnover (excluding pharmaceuticals) 2004

Countries and regions	Industry Turnover (2004)		Trade Balance (2004)	
	Total [€ bn]	Growth rates	Exports [€ bn]	Imports [€ bn]
EU – 25	586	5.7%	455 (60%)	384 (51.5%)
NAFTA	354	3.7%	107 (14.2%)	121 (16.2%)
Japan	134	5.3%	39 (5.2%)	28 (3.8%)
China	137	10%	19 (2.5%)	44 (5.9%)
World	1,304	6.7%	756	745

Source: VCI (2006); UN Comtrade (2006)

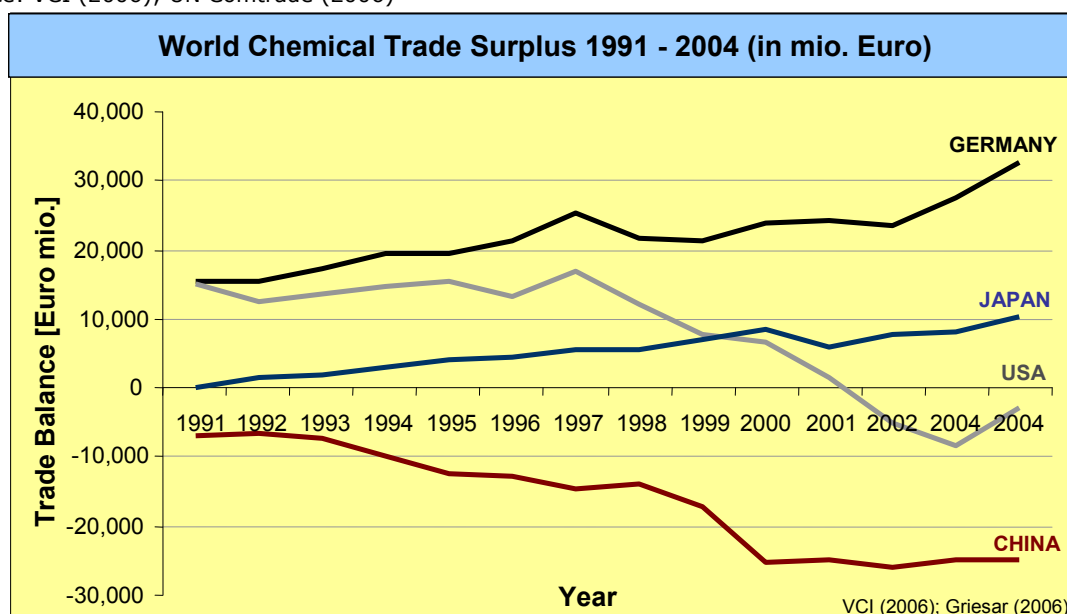


Figure 6: World Chemicals Trade Surplus for Selected Countries (1991-2004)

DB Research suggests two main reasons for China's continued inability to fulfil its domestic demand. Firstly, chemicals consumption is rising enormously as a result of rapidly expanding industrial capacity, fuelled by double-digit economic growth. Secondly, the market is demanding increasingly high-quality products that China will not be able to produce in sufficient quantities in the foreseeable future.¹¹

2.3 Intra-Regional Trade

Unfortunately, China's thirst for chemical inputs does not necessarily mean that China will become an attractive export destination for Europe. For commodity chemicals producers in particular, whose logistics costs such as freight and tariffs can often account for up to 30% of total costs¹², the global chemicals industry has a distinctly regional character. Even between the world's three main manufacturing regions (USA, Europe and Japan) only limited trade flows take place relative to overall output. In 2003, only 10.6% of total output was shipped between these three regions (see **Figure 7**). Accordingly, EU-25 chemical exports to China (including pharmaceuticals) only amounted to \$5.9bn or only 1.1% of total EU chemicals output, and only 7.6% of China's total chemicals imports. To fully tap into the potential of the Chinese market, European chemicals producers will therefore have to localise production within China. Not surprisingly, inter-regional trade is particularly limited for volume products, which are relatively expensive to transport. Nevertheless, even this limited amount of inter-regional trade is sufficient to couple prices and industry cycles in the different regions worldwide. The price of basic commodity plastics, for example, has been moving in remarkable close harmony in all three regions for the last two decades of the twentieth century.

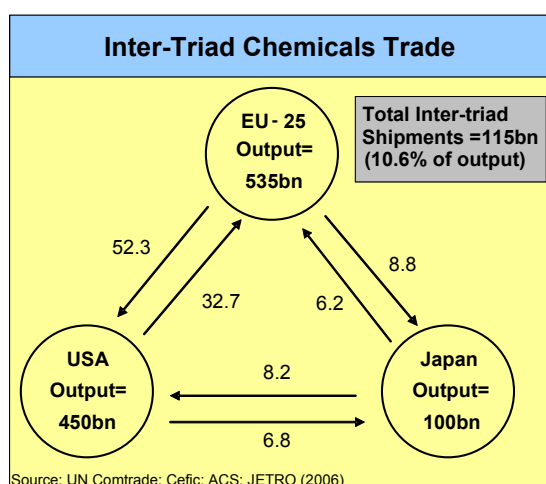


Figure 7: Inter-Triad Chemical Trade 2003

Chemical companies in the rest of Asia are becoming increasingly dependent on sales to the Chinese market. 50-80% of chemical exports from other Asian countries end up in China. As a result, China is the biggest driver of profitability for Asian chemical companies. China's influence on industry profitability in Asia will continue to grow, with the key drivers being China's self-sufficiency, trade flows, and buying patterns of Chinese plastics converters¹³. Roughly one-third of China's oil products are imported. Around 75% of imports come from neighbouring countries like Singapore and the Republic of Korea (ROK). For example, the ROK, Japan and Taiwan together account for 66% of general-purpose resin imports to China every year. Japan, ROK, Singapore, Malaysia and Taiwan also contribute 80% of China's polyester imports. About 90% of China's styrene butadiene rubber imports came from Japan, ROK, Russia and Taiwan.¹⁴

3. THE CHINESE CHEMICALS MARKET

Chinese Market Growth and Potential

Due to the importance of geographical proximity in the chemicals industry, multinational companies are increasingly shifting chemicals activities to China, following their main clients – the automobile, electronics, communications and textiles industries – that were attracted by Chinese sales prospects and cost advantages. This increase in demand from both foreign as well as local customer companies means that the market is estimated to grow 10% over the next decade, more than three times the growth rate of demand in markets such as the USA (3.5%) and Germany (3%).¹⁵ Despite increasing local production capacity from foreign as well as Chinese companies, European company BASF predicts that at least some of the increased demand will have to be made up from increased imports (see **Table 3**).

Table 3: China's Chemical Production Capacity Shortfall

	2004 [\$ bn]	2015 [\$ bn]	CARG [%]
Local Production	120	220	5.6
Imports	40	120	10.5
Export	30	100	11.6
Demand	130	240	5.7

Source: BASF Fact book. 2005

Chinese Market Segmentation

With basic chemicals accounting for 58% of the demand in the Chinese chemicals market, commodity chemicals are still by far the largest market segment in China with demand for fine chemicals (15%) and

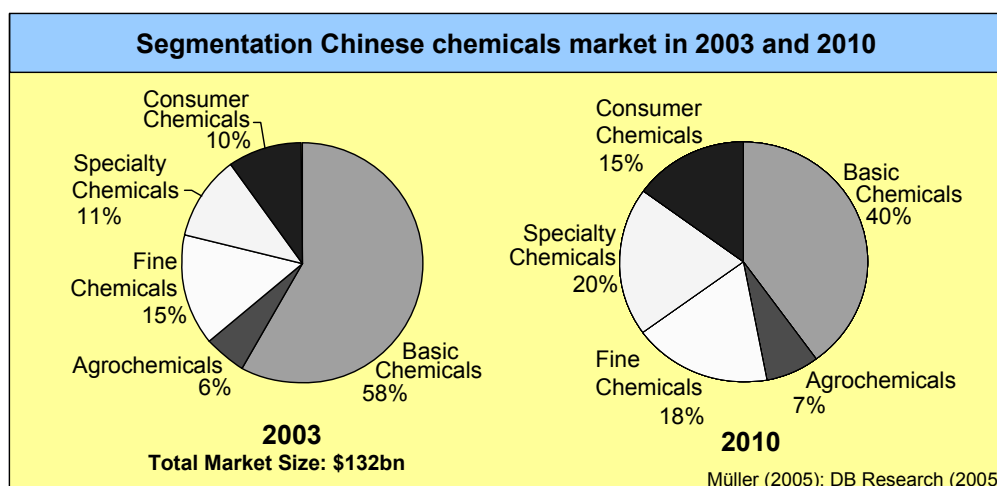


Figure 8: Segmentation Chinese chemicals market in 2003 and 2010

specialty chemicals (11%) trailing behind substantially in importance. However, DB Research predicts that over the next five years, the importance of basic chemicals relative to specialty and fine chemicals will decline substantially (a drop from 58% to 40% share of the market). Specialty chemicals in particular will grow in importance, almost doubling its current share (from 11% up to 20%). Consumer chemicals and fine chemicals will also become substantially more important (and increase 5 and 3 percentage points vis-à-vis other market segments). **Figure 8** shows an overview of the Chinese chemicals market segmentation in 2003 and a 2010 estimate.

3.1 Commodity Chemicals: Basic Chemicals, Petrochemicals & Plastics

Despite the aforementioned relative decline in the importance of commodity chemicals vis-à-vis other chemicals, commodity chemicals will continue to be by far the biggest market in China. China is changing from being a net exporter of primary materials into becoming a net importer (e.g. crude oil). Due to China's enormous economic growth, the same thing is happening in petrochemical products¹⁶ and starter chemicals - the raw materials for chemical products.

Basic commodity chemicals are produced in so-called cracker plants that require an investment of billions of euros. Since China is determined to establish a presence in this segment, it is assured of very high priority status. Projects of this kind have been mostly built and operated on a joint venture (JV) basis involving a foreign and a Chinese company. A production facility can take years to build, especially if one counts the planning phase and the time it takes to get the necessary licenses. The BASF, Shell and BP crackers (construction of these plants has been recently finalised) on average have a

ten-year planning phase behind them. Since no other similar production plants are in the pipeline in China apart from these three crackers, they are likely to be a very important source for supplying China's chemical industry with starter chemicals over the next ten years. With these three crackers now online, the Chinese chemical industry passed a landmark in 2005 with the start-up of three multi-billion dollar petrochemical joint ventures. BP and BASF commissioned separate JV's with Sinopec at Shanghai and Nanjing respectively, becoming the first foreign invested entities in China to produce olefins and derivatives. A third petrochemical JV, involving Shell Chemical and China National Offshore Oil Corp. (CNOOC), was also started in 2005. These three crackers added a combined 2.3 million m.t./year of ethylene capacity, increasing China's total by 37%, to 8.5 million m.t./year¹⁷.

Table 4: Chinese ethylene capacity vs demand

	2004 [m tonnes]	2010 [m tonnes]	CAGR [%]
Total Local Capacity	5,600	16,000	19.1%
Total Ethylene Demand	15,500	28,500	10.7%
Chinese Shortfall	9,900	12,500	4.0%

Source: Morgan Stanley (2005)

This is a compound growth rate of 19%, versus a growth rate in domestic ethylene, one of the basic chemicals used as feedstock in the petrochemical and chemical industries, consumption of almost 11% (see **Table 4**). Nevertheless, the required actual imports into China will continue to grow, albeit at a more modest level. By 2010, BASF forecasts China will import some 12.5m tonnes of ethylene and equivalents, up from 9.9m in 2004. At the same time, Chinese ethylene capacity is forecast by BASF to increase to 16m tonnes by 2010.

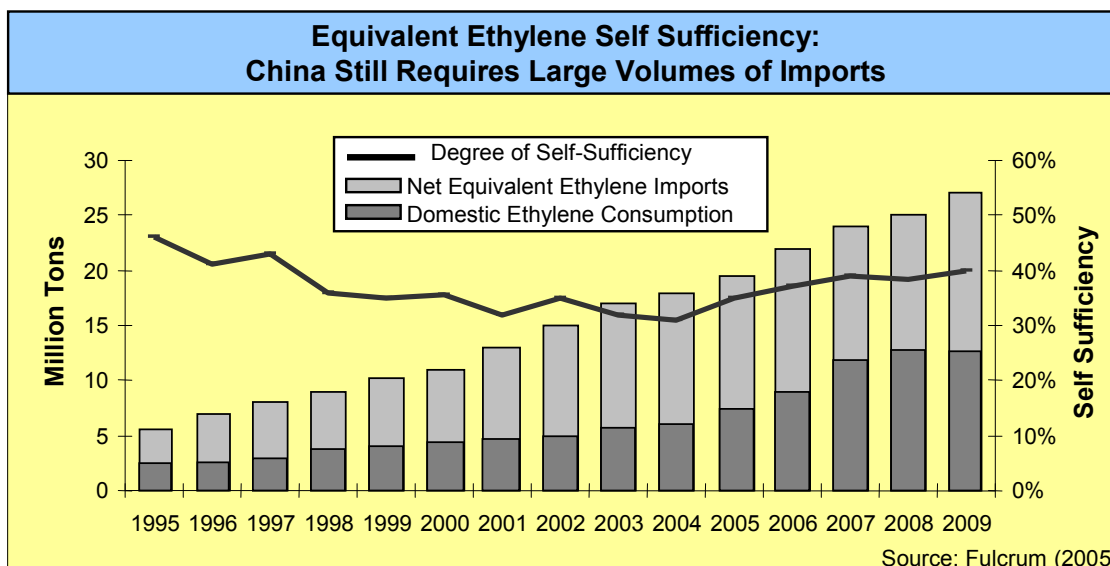


Figure 9: Ethylene Self Sufficiency in China, 1995–2009e

Similarly most products in the petrochemical chain are likely to remain in domestic deficit well past 2010 as illustrated in Table 5:

Table 5: Chinese chemical supply/ demand balance various basic chemicals

Chemical	2005	2010
Acrylic acid	Imports	Imports
SAP	Imports	Oversupply
BDO	Oversupply	Oversupply
TDI	Imports	Imports
MDI	Imports	Imports
Styrene	Imports	Imports
ABS	Imports	Imports
PS	Imports	Imports
EPS	Oversupply	Oversupply
Caprolactam	Imports	Imports
PE	Imports	Imports
PP	Imports	Imports
MEG	Imports	Imports

Source: Morgan Stanley (2005)

Plastics (Polymers)

While China is the world's workshop and the major exporter for products from toys to motorcycles, it will continue to be a net importer of plastics products. The net trade deficit of China's polymers increased from \$13.5bn in 1997 to \$33.4bn in 2002. Because Chinese companies can take advantage of tax-breaks for polymer imports,

essentially all polymers used to produce fabricated products or simple plastic products are imported. Currently, China is the world's largest polymer and chemical (monomer) importer. China accounts for approximately 45% of total Asian polymer demand, a number that is expected to exceed 50% by the end of the decade. As with most chemicals, imports for polymers are mainly related with intra-regional rather than inter-regional trade. In 2004, approximately 20% of China's polymer imports came from the ROK, the largest supplier of polymers to China. However, by the end of the decade the Middle East will become China's largest global supplier of polymers (Figure 10).

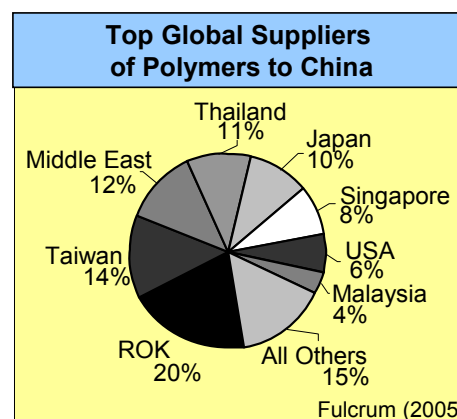


Figure 10: Top global suppliers of polymers to China, 2004 (market share in %)

Table 6: Major Polyethylene Capacity Additions in China

Company	Region	Polyethylene Type	Status
BASF	Yangzi Nanjing, Jiangsu	LDPE 400	Operating
Secco BP	Caojing, Shanghai	LLDPE 300, HDPE 300, PP250	Operating all units
ExxonMobil / Saudi, Aramco / Fujian Chem	Fuzhou, Fujian	LLDPE / HDPE 650, PP450	2008 start up
SABIC / Dalian Shide	Dalian, Liaoning	Not public	2010+
Formosa	Ningbo	Not decided	Dependent on Taiwan Government approval
Dow, Total, others	Not decided	Not decided	2012

Source: Fulcrum (2005)

Plastic supply in China is expanding, with four major joint ventures expected to be online in the next three years, and another three projects expected over the next seven years (see **Table 6**). In addition, domestic companies continue to expand and add capacity. In future, China should continue to drive polymer demand. Industry experts expect double-digit demand growth for polymers over the next few years but believe that production will not be sufficient to meet projected demand. Therefore, China should continue to be the world's largest importer of plastics.

China has become the dominant world player in the process export business (products produced for the export market that use imported resins), with more than a 50% share of the global polyethylene market and almost 38% share of the global polypropylene market, as shown in **Figure 11**. China has been able to gain such a strong hold on the process export market because of its favourable cost position relative to other players in the global market. The perceived unfairness of this cost differential contributed to the U.S., in 2003, to enact an anti-dumping action against China targeting carrier bag imports. As an example, in order to produce a tonne of

HDPE bags, a Chinese converter would need to invest \$103/tonne, whereas a U.S. producer would have to invest \$1,740/tonne, almost 17 times more. Such low capital expenditure requirements in China promote a fragmented conversion industry that has little indebtedness and a high production flexibility.

3.2 Specialty and Consumer Chemicals

The recent years of chemical market growth in China have been dominated by meeting the demand for basic chemicals. However, as customer needs change, change in the market structure is bound to follow in the long term. Many multi-national customers such as the automotive, construction, electrical and electronics industries are investing billions to build their own production plants in China. This means that chemical companies will increasingly have to offer these customers higher-value products from further down the value chain. As shown earlier, major specialty chemicals sub-segments are expected to double their volume vis-à-vis other chemicals segments by 2010. These include special chemicals needed for a large number of products like coatings, additives, adhesives, flavours, scents and pharmaceutical feedstock, all of which will continue to expand in China.

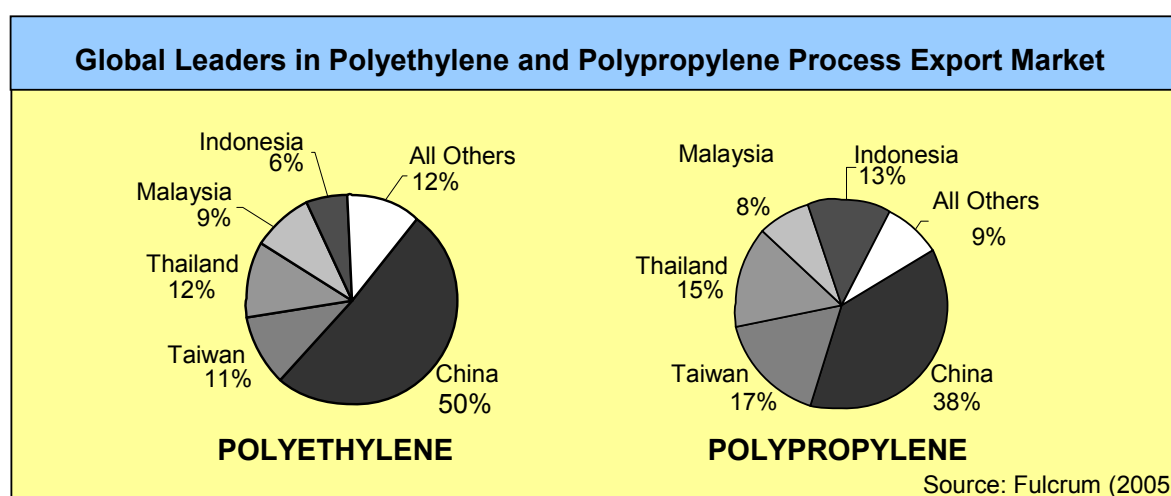


Figure 11: Global leaders in polyethylene and polypropylene process export market (market share in %)

Moreover, constant optimisation and upgrading in various fields of the national economy have promoted the development of a group of new industries such as environmental protection, new energy, and new materials. **Table 7** exhibits the future predicted Chinese demand for various specialty chemical segments. As shown in this table, all major Specialty chemicals sub-segments are expected to double their volume from 2003 to 2010.

Table 7: Demand of Major Fine and Specialty Chemicals for China in 2010 in 1000 tonnes)

Segment	Demand In 2003 ['000 t]	Demand in 2010 ['000 t]
Coatings	2,500	4,000
Food additives	2,200	2,800 – 3,000
Feed additives	1,800	2,600 – 2,800
Paper making chemicals	n/a.	1,000 – 1,200
Adhesives	3,350	4,800 – 5,000
Plastic assistants	n/a.	1,800 – 2,000
Water treatment agents	n/a.	200 - 250
Surfactants	n/a.	1,500 – 1,700

Source: CNCIC Chemdata (2005)

Box 1: Overview of Specialty and Consumer Chemicals

Coatings

Although China is expected to become the largest coating market in Asia (statistics show that China needs 2-3 million tonnes of coating material annually), tough market competition has forced down coating prices below normal standards. Despite strong demand, currently growing at an annual rate of 25%, the average price for coatings in China decreased in the first half of 2004, mainly due to fierce competition between multinationals and local small and mid-sized enterprises.

Feed additives

The output of feed additives in China had already reached 1.8 million tonnes in 2003. Although China has become a significantly large country in terms of feed production, the average annual feed possession per capita is only 50% of the average international level. According to the development plan of the feed industry, the output of mixed feed in China is expected to reach over 100 million tonnes in 2010, therefore there will be a rather significant increase in the demand for feed additives.¹⁸ Based on the present supply of feed additives, China will emphasize the development of products with limited supply, or those without production capacity, such as methionine and threonine. At the same time, China will develop new types of additives to replace those products that are no longer used in advanced countries.

Food additives

The total output of food additives in China was over 2.2 million tonnes in 2003, and production value exceeded RMB 20 billion.¹⁹ Compared to advanced countries, the food industry in China has great potential for development. Especially with the improvement of people's living standard and increasing population, the demand for processed food has been continuously increasing. According to the development plan of the food industry, it is projected that the production value of the food industry will reach around RMB 2,000 billion in 2010, needing 2.8-3.0 million tonnes of supporting food additives.²⁰ The emphasis on future development will be placed on the food additives used in convenient and special nutrient food.

Adhesives

China is a main producer and consumer of adhesives globally, and the output of adhesives reached 3.35 million tonnes in 2003. With the development of the domestic industries such as construction, wood processing, packing, and shoe making, synthetic adhesives will continue to grow at a high speed. It is projected that China's demand for synthetic adhesives will reach 4.8-5.0 million tonnes in 2010.²¹ The emphasis on development includes urea-formaldehyde adhesives with low formaldehyde release, widening the scope of application for polyurethane adhesives, high performance building sealants, adhesives used in electronic industry, adhesives used in automobile industry, environmentally friendly hot-melt adhesives and other non-solvent adhesives, and gradually washing out neoprene which is used in shoe making as well as 107 adhesives used in construction.

Electronic chemicals

Electronic information products have been listed as a key development pillar industry of the Chinese economy. It is projected that the industrial production value in China will be over RMB 1,500 billion in 2005. As supporting materials for the electronic industry, market scale of electronic chemicals in China will exceed RMB 26 billion by 2010²². However, because of the late start in the domestic production of electronic chemicals, and the low level of scientific research development, imported products can occupy around 50% of the total market value, and this is incompatible with common perception of China's relatively important position in the global electronic information industry. In order to satisfy the need for the development of China's electronic industry, the emphasis of development of electronic chemicals in recent years includes epoxy resins used in printed circuit board (PCB), dry film resists, and new type of electronic packaging materials.

Paper making chemicals

The additional amount of paper making chemicals accounts for around 2% of the total paper amount. These chemicals have an important role in determining the quality of the paper and the economical efficiency of paper production. China is the third largest country in pulp manufacturing, and the second in consumption, with paper and paperboard output of around 43 million tonnes in 2003. With the addition of imported products, consumption totalled 48.06 million tonnes. With the development of the economy and the improvement in the standard of living, it is projected that the demand for paper and paperboard will reach 70 million tonnes, basically reaching the present global level of consumption per capita.²³

Because China is relatively short of forestry resources, wood pulp paper only accounts for around 20% of the raw materials for paper making industries, and the proportion of the domestically produced wood pulp is less than 10%. The proportion of wood pulp paper in China is expected to reach 32% in 2010, therefore non-wood pulp is the major raw material for paper making industries. According to China's development plan and due to the problems of resources, environment, and energy, China's emphasis on future development of paper making chemicals are (a) supporting chemicals for straw pulp and bamboo pulp paper. They are mainly series products such as intensifier, whitener, and sizing agent. (b) Chemicals needed for waste paper recycling. They are mainly waste paper de-inking agent, intensifier, and sizing agent.

Plastic assistants

China's annual output of plastics has exceeded 20 million tonnes. Along with the increase in the amount of plastic processing and the enhancement of the requirements for the performance of plastic products, the requirements for the consumption and the product grade of plastic processing additives will be increasingly higher. It is projected that the consumption of plastic assistants in China will reach around 2 million tonnes in 2010, within which the consumption of PVC processing assistant is around 1.7 million tonnes.²⁴ China's emphasis on the future development of plastic assistants is to develop towards high efficiency, low toxicity or non-toxicity, and environmental friendliness.

Leather chemicals

While shifting the focus of the world's leather processing industry, China has not only developed into the largest leather processing country in the world, but has also developed into the country with the greatest consumption of leather. Leather processing has already become one of the largest industries in China's light industry sector with the greatest export value - USD 23.2 billion in 2003. Presently, the demand for various leather chemicals in China has exceeded 500,000 tonnes with a market value of around RMB 8 billion.²⁵ Compared with the leather processing industry, China's leather chemical production lags behind. Neither the quality nor the quantity of the products can satisfy the demand, causing many products to rely on imports. For example, the amount of various tanning agents imported exceeded 80,000 tons. According to the developmental trend of the leather processing industry, China's demand for leather chemicals will continuously increase. The increasing leather industry's requirements for environmentally friendly production and products, means the development and application of highly absorbent chroming tanning agent, chromeless tanning agent, new type of coatings agent, leather dyestuff, and intensifying zymin will be emphasised.

Textile Dyes and additives

Special chemicals providers which produce dyes and additives for textile production benefit from the booming Asian textile industry. Today, more than 50% of all chemical fibres are produced in Asia, with half of the total volume produced in China. Almost all textile fibres are produced synthetically, because natural fibres like cotton are by no means able to satisfy demand. Dye manufacturers also benefit from the flourishing textile industry. China is the biggest producer of synthetic dyes worldwide, at almost 600,000 tonnes annually. Moreover, this sector produces about 145,000 tonnes of organic pigments.

Others

In recent years, the output of water treatment agents in China has increased significantly, driven by the increasing amount of water that requires treatment. The output of water treatment agents has already reached more than 300,000 tonnes per year, within which inorganic flocculant accounts for over 50%.²⁶ Along with the further development of the economy, and the continuous decrease of water resources, there emerges a rather large market potential for water treatment agents in China, especially for new types of environmental protection products.

In addition, biochemical products, especially those with renewable resources as raw materials, have drawn the attention of advanced countries, and are increasingly used in medicines, pesticides, food additives, feed additives, and degradables. Presently, China's biochemical engineering has taken shape, and gained a certain international competitive edge. Developments in agriculture have created suitable material conditions for the development of biochemical engineering. At the same time, the development of biochemical engineering also facilitates the industrialised application of agricultural products, and in turn enhances the development of agriculture and increases rural income levels.

Source: PWC (2005) CNCIC Chemdata (2005)

3.3 Fine Chemicals

The Chinese fine chemicals industry has an estimated output worth around \$12 billion, already representing a significant part of the world's fine chemicals industry. Total market volume is about \$120m. In 2004, approximately 60% of this market was devoted to Active Pharmaceutical Ingredients (APIs).²⁷ In 2004 Chinese companies already accounted for 13.1% of global market share in the merchant market²⁸ for APIs, compared to a 44% share for European companies. Chinese companies are especially strong in the field of generic APIs. In this segment, Chinese producers account for 30% of merchant trade in generic APIs, while European companies at 36% account for only a slightly higher proportion of total world trade. China is also the world's largest producer of dyes, the second-largest producer of pesticides and the second-largest producer of composite feedstuffs.²⁹

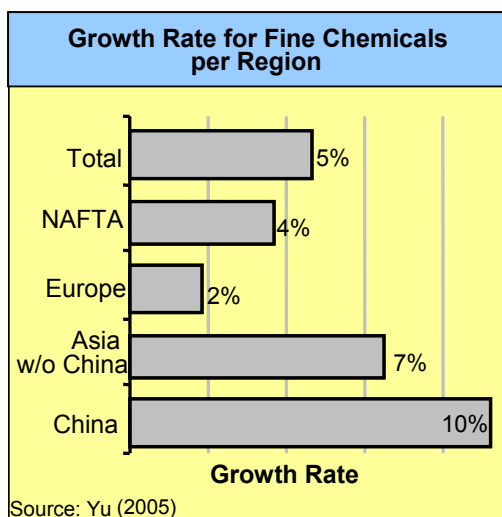


Figure 12: Growth Rate for Fine Chemicals per Region

A high growth rate is one obvious characteristic of the Chinese fine chemicals industry with the industry growing at an annual rate of more than 10% over the past ten years (see Figure 12). Due to China's generally strong economic growth, production relocation of multinational chemical companies, and the increasing trend among downstream manufacturers like the pharmaceuticals and agrochemicals industries to source from China (see Figure 13), it is likely that this growth rate will be maintained for the next five years.

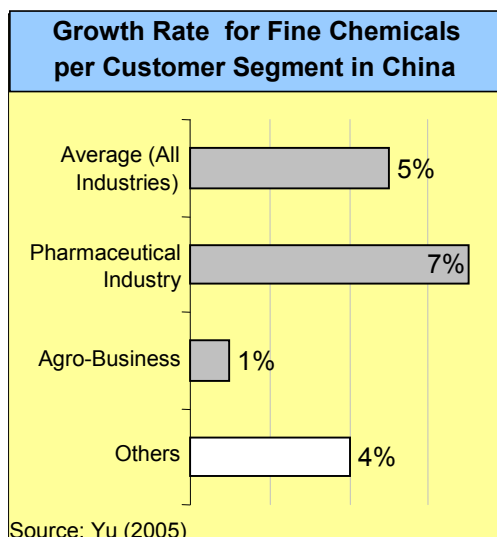


Figure 13: Growth for Fine Chemicals per Customers Segment in China

However, China lacks the capability to produce certain fine chemicals that are required only in small amounts but are nonetheless vital to the national economy. Examples are methionine, lysine, pantothenic acid, calcium, vitamins E, A and D, L-lactic acid, behenic acid, nucleic acid, artificial sweeteners, new types of enzyme, biodegradable polymers, long-chain fatty acids and new biotech-based pesticides³⁰. Most of China's fine chemicals are currently produced in small quantities, and in relative technical and geographical isolation. This sector can only be developed if China's scientific and technological base is upgraded, especially in chemical engineering.

4. COMPETITIVE TRENDS IN THE CHEMICAL INDUSTRY

4.1 Brief Evaluation of Global Competition

As mentioned above, the global chemical sector as a whole is traditionally very fragmented something which is beginning to change. In order to understand the broader strategic motivation of European chemical companies, this section describes the restructuring and consolidation process that has taken place during the last two decades.

In the 1990s, the chemical industry split into three parts in a bid to improve financial performance. The oil industry took over most of the petrochemicals and plastics industry elements, the pharmaceutical industry went its own way, leaving the centre ground to a core chemicals-business that are now often called specialty and fine chemicals.

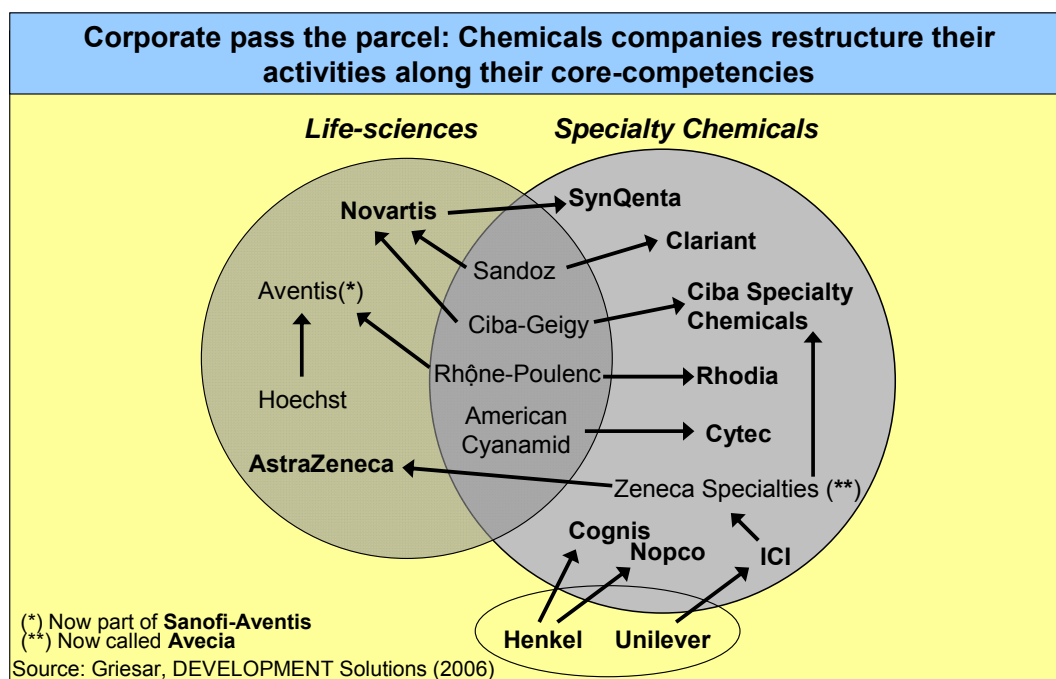


Figure 14: Chemical Conglomerates Re-Focus their Activities during the 1990s

In this global process of consolidation the chemical industry experienced many mergers, acquisitions and divestitures. Increasing shareholder pressure forced large broad-portfolio pharmaceutical and chemical conglomerates to re-focus their activities (see **Figure 14**)³¹. As a result of this break-up process, multi-billion dollar specialty chemical companies were formed - especially in Western Europe. These structural changes in the chemical industry signalled the abandonment of business models with vertical integration and a regional focus in favour of new models that are built around core competencies with a global orientation.

In this consolidation process, well-known names including Hoechst, Hüls, Rhône-Poulenc, Sandoz American Cyanamid and Union Carbide have disappeared and their assets and organisations have been merged into other entities. Mergers created new names like Novartis, AstraZeneca and Aventis (disappearing after being merged with Sanofi) while other parts were spun-off into new companies such as Clariant, SynQenta, Avecia and Cognis.

Life Sciences

The life sciences concept in the mid-1990s that created Novartis and Aventis tried to capture synergies among pharmaceuticals, pesticides and agrochemicals. The strategy favoured today is mergers among purely pharmaceutical companies.

Specialty Chemicals

The specialty chemicals sector, especially in Western Europe, is still going through a

period of reorganisation and streamlining of portfolios. Restructuring of the specialty chemicals sector has resulted in a three-tiered industry: a) mainly European mega-specialty companies, b) medium-sized diversified companies and c) focused niche players. The medium sized companies are especially challenged because they can not compete in cost with larger companies and are vulnerable from inroads by smaller, highly focused companies. Over the coming years the industry is likely to see more consolidation of medium-sized specialty chemical companies or their absorption by mega-specialty companies.

4.2 Key Success Factors in Commodity Chemicals

The profitability of a typical commodity business is mainly influenced by the following factors:

- lowest cost of production (economy of scale and economy of scope)
- capacity utilisation (plant and site)
- number of competitors
- oil price and price of derivatives (naphtha etc.)
- long-term access to technology
- long-term access to feedstock (petrol and gas)

After the restructuring of the chemicals industry described in the previous section, oil and gas companies, as well as chemical companies, have undertaken the manufacturing of first-generation commodity organic chemicals. The former group has gained some market share, as it often

possesses a number of cost advantages that lead to greater production efficiency. Foremost among these are: security of feedstock, or the ability to integrate the chemical production into a refinery, and consequently, gain significant CAPEX advantages; and location in a deep-sea port enabling ease of transport of the end product.

Oil, gas and chemical producers located in the Middle East and other oil-rich zones are expanding their market positions fairly rapidly, taking advantage of stranded natural gas in their locales and exporting the derived chemical products. Some Western producers have entered into joint ventures with local partners to access reserves, owned by local (state-owned) partners. Elsewhere in Asia, backward integration by Reliance and Formosa groups from chemicals to refining and exploration, as well as creation of vertically integrated oil and chemical giants in China, stand testimony to this latest trend in which organic chemical production is becoming a forte of oil companies. In response to these global trends Chinese petrochemicals companies in this sector have already made initial moves to acquire overseas capacities.

4.3 Key Success Factors in Specialities and Consumer Chemicals

Specialty chemical companies have traditionally been viewed as small-volume, high-growth, high-margin businesses that generated high levels of predictable earnings and shareholder value. By the early 1990s, however, several factors contributed to a significant slowdown in growth of earnings, such as:

- the dependence of the specialty chemicals industry on the underlying growth of its relatively mature end-use markets such as automotive, appliances/consumer products and electronics;
- the growing competitive intensity in the specialty chemicals industry and the increasing globalisation and buying power of its end-use customers;
- the commoditisation of certain specialty chemicals,³² with low-cost manufacturers, mainly from outside Europe and North America, selling products on price rather than on performance.
- the maturity and saturation of key markets such as dyes and pigments, plastics additives, surfactants, mining and oil field chemicals, coatings, and colorants during the 1990s.
- During the last decade, the customer base of specialty chemical companies has consolidated. From their increased

position of strength, the automotive, petroleum, paper and electronic industries reduced the number of vendors serving their facilities and put extreme pricing pressure on suppliers.

Typically, competition within the specialty chemical industry is based upon product differentiation and innovation, and certain logistical issues such as distribution capacity. Specialty chemical producers often supply not just a product, but also a much broader range of services to their customers, including research, problem solving, bespoke product development, and storage solutions.

The biggest challenge of the specialty chemical giants is keeping a small-business mentality by retaining customer focus in day-to-day operations and speed of innovation, while at the same time, leveraging the advantages of greater size such as:

- greater financial muscle and greater visibility in the financial markets;
- the ability to take bigger risks when entering new markets and technologies;
- the opportunity to diversify risks and spread central costs across a range of businesses.

Increasingly, specialty chemical companies are trying to raise barriers to entry into their markets by becoming more service-oriented. They are focusing less on their products and more on the services supporting them by concentrating more on niche markets and on building exclusive relations with customers, especially with the help of e-business. As more sectors wrestle with slowing growth rates and encroaching commoditisation, more specialty chemical companies increase their service portfolio to be able to offer customers more than just the chemicals needed. Service offerings include customised product development, on-site technical support, training, and supply chain management with the aim of working more closely with key customers to help improve customers' performance and reduce their costs. It is generally accepted that Chinese competitors are still weak in this area.

4.4 Key Success Factors in Fine Chemicals

While the United States represents the biggest fine chemicals market, for historic reasons the leading producers (Degussa, Lonza, DSM etc.) are based in Europe. The merchant fine chemicals market is still a highly fragmented one with the top ten producers having a combined market share of less than 20%.³³

The following are considered the most important key success factors for the fine chemicals business:

- Customer intimacy, service-oriented approach;
- Technology tool box;
- Reputation and size;
- Development and scale-up capability;
- Efficient use of R&D, sales force, etc.

Chinese companies have only established their international business operation for one decade, yet they already reached a 13.1% market share in the Active Pharmaceutical Ingredient Market in 2004.³⁴

5. COMPETING IN CHINA

To remain competitive, direct contact between European chemicals producers and their customer companies in China are often of pivotal importance. The big chemicals companies mainly want to profit from high demand in the country and lower wage costs. Average labour costs in the Chinese chemicals sector are lower than €1 per hour, compared with about €5 in Poland and more than €20 in Germany. Furthermore, construction costs are relatively low and licensing procedures have become shorter than in Europe. Following labour-intensive sectors, the capital and knowledge intensive chemicals industry is now also increasingly investing in China. European chemicals

manufacturers are currently not only establishing sites for simple production processes, but increasingly also for high-value-added products that incorporate the latest technology and R&D activities.

5.1 Market Entry

The most appropriate entry vehicles for market entry to China have changed significantly over the last 25 years, dictated both by fashion and by government legislation (see **Figure 15**). Originally, foreign companies went into joint ventures with local companies, as required by law. During the 1990s, these strict requirements for foreign entry were relaxed with the introduction of the WFOE implementation regulations.³⁵ A period followed during which most foreign companies tried to avoid joint ventures at all cost. With the introduction of the holding company law this allowed further options for foreign investors to consolidate their Chinese activities. Nowadays, joint-ventures are making a comeback, as more attractive private joint-venture partners appear in the market.

These trends largely hold true in the case of the chemicals industry although ownership restrictions in strategic upstream segments remain firmly in place. Another concern for industry representatives is indications in the 11th Five Year Programme (FYP) that investment caps in the adjacent energy and environment sectors will remain and local content requirements for the construction of new plants will be introduced (these issues are further explored in the scenarios discussed in **Section 7**).

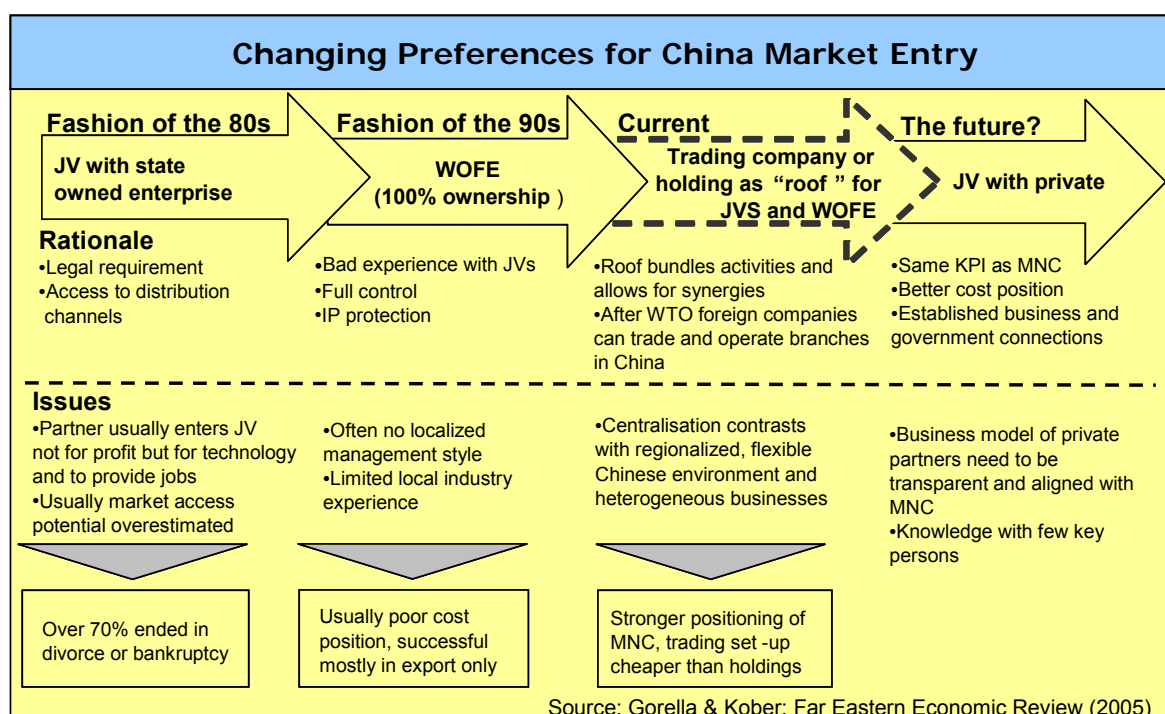


Figure 15: Changing Preferences for Entry into the Chinese Market

Table 8: Status of selected major European chemical companies in 2003

Company	Sales in China (2003)	China sales as % of total sales	Total invested in China	Investment segments	Anticipated production quantity p.a.
Akzo Nobel	EUR 510 m	3.9%	Double-digit millions of euros	Coating powder production Coatings, chemicals, pharma	n.a.
BASF	EUR 1.6 bn	4.8%	US\$ 1,000 m US\$ 300 m US\$ 2,900 m	Production JV for: - MDI and TDI isocyanates - THF/PolyTHF - JV for ethylene and integrated chemical site total	MDI: 240 Tt TDI: 160 Tt 80/60 Tt 600 Tt 1,700 Tt
Bayer	EUR 1.1 bn	3.9%	US\$ 3,100 m In total US\$ 1,100 m US\$ 450 m	Coatings production MDI TDI Polycarbnt production (Makrolon)	50-70 Tt 230Tt 160 Tt 100-200 Tt
Degussa	EUR 280 m	2.5%	> EUR 100 m	Carbon black, Pharma amino acids Polyurethane foam production	70 Tt
DSM	EUR 273 m	4.5%	n.a.	Semi-synthetic cephalosporin Food products (nutritionals) Food premixes Engineering plastics Unsaturated polyester resins Synthetic fibres and plastics	140 Tt

Source: Müller (2005)

5.2 Competing for the Chinese Market: European vs. Chinese Companies

Despite some of the obvious strengths of Chinese chemicals producers such as a lower cost base and cheap access to government funded research, there are a large number of challenges local companies must overcome if they are to compete with foreign competitors within the Chinese market, or indeed, on the world stage:

- Management is an obvious weakness of Chinese enterprises and reform efforts with the introduction of sound corporate governance systems have only just begun. It will take time to catch up with international standards in this regard and the volume of redundant staff remains serious despite massive lay-offs.
- In addition, the large number of Chinese players in several industry segments often results in sub-scale plants with inefficient operations. The average plant size of an acrylic acid manufacturer in China, for instance, is less than one-seventh of the average size of corresponding plants in advanced markets.³⁶
- With the notable exception of the petrochemical industry, China's chemical industry is very fragmented. The lack of critical mass of many companies makes it hard for them to compete with European or US-based multi-nationals. China has over 14,000 chemical companies of which 10,000 are privately owned and the remainder state owned.³⁷ However, consolidation is already underway which should increase the

competitiveness of Chinese chemicals producers in the long term.

5.2.1 European Companies in China

Table 8 displays the status of the year 2003 regarding the involvement in the Chinese Market of some selected major European chemical companies.

5.3 Competition in Commodity Chemicals Sector

Domestic players in the Commodity Chemicals sector are not as competitive as North American or European players, particularly in the more complex downstream intermediates. The biggest players in the commodity chemicals market in China are the three main oil and gas companies, China National Petroleum Corporation (CNPC), China National Petrochemical Corporation (Sinopec) and China National Offshore Oil Corporation (CNOOC), all of which are still primarily owned by the Chinese government.

Multinational companies in the petrochemicals, basic chemicals, and plastics sectors compete with local counterparts on the basis of their significant ownership advantages in access to capital, technological R&D, human resources, service, distribution skills and brands. However, the extent to which foreign companies can fully exploit their ownership advantages is limited because most foreign companies wishing to operate in these sectors have to establish a joint venture with a local partner.

The real competitive challenge for local players therefore will be to cope with higher pressure from overseas imports. Estimates show that compared with the average prices of ethylene products from neighbouring countries such as Japan and ROK, domestic prices are 20 to 30% higher in China. The difference in prices is 8 to 12 percentage points down to higher manufacturing costs, 3 to 5 points to financial costs, 1 to 2 points to management costs, and 3 to 8 points in tax costs. However, most fundamentally these problems are related to the inferior size of Chinese companies' domestic facilities, most of which are sub-scale: Out of 18 ethylene plants, only seven produce more than 300,000 tonnes per year, compared with the world average of 750,000 tonnes per year.³⁸ Only the aforementioned recently established domestic facilities by foreign companies such as BASF, Shell and BP can compete with imports from neighbouring countries.

These companies investing in Chinese chemical capacity will have a significant advantage over companies importing into the region and will be able to displace imports, meaning that new plants should run flat-out soon after start-up. A good example is polyurethanes and polycarbonate where domestic capacity is virtually non-existent. Industry experts see no reason that this should change in the near future and it therefore leaves room for foreign companies such as Bayer and BASF to fill the supply-shortfalls in the local market. The domestic shortage of material should also mean that these plants should remain fully loaded into a downturn. The speed at which Chinese chemical producers can enhance their competitiveness, compared not only to imports, but now also with this new threat taken into account, is critical to their survival. Chinese companies will need to invest substantially to adopt the latest technology and operating practice required to operate large-scale plants. At the same time, local Chinese producers will have to leverage their natural advantages better, such as comparatively small tariffs for imports, lower transportation costs and proximity to customers. While new Chinese ethylene plants cannot compete on costs with Middle Eastern producers, leveraging local advantages could mean they are able to compete with US, other Asian and local producers on the following basis:

1. Lower investment costs: Plants built in China cost typically 20-30% less than an equivalent plant in the US or Europe. The reason the cost savings are not higher is that much of the plant is still imported, although pumps, pipes and valves can now be sourced locally, saving VAT and

transportation costs. Construction costs are lower than in Europe and local constructors are able to finish projects on time and on budget.

2. Favourable tax treatment for investments in China. Tax regimes vary across China. However, in Jiangsu province (includes Nanjing and Caojing), foreign investors pay no tax in the first two years and thereafter half the rate for the following three years.
3. Lower personnel costs: Although these account for only a small percentage of running costs, personnel costs are significantly lower to make a difference. The annual salary for plant operators is in the region of RMB 40,000-50,000 per annum (\$5,000-\$6,250) compared with the \$40,000 or more in the US and Europe.³⁹

It will be critical for China's long term competitiveness in the global marketplace to ensure that these new plants are large-scale, world-class, and able to compete with the best competitor facilities. At the same time Chinese Commodities Chemicals producers will need to take the following tough measures:

- Close small and inefficient plants;
- Cut operating costs;
- Reduce redundant staff;
- Restructure institutional inefficiencies such as corporate governance and accounting systems;
- Upgrade technologies and equipment;
- Integrate refineries and petrochemical plants with sales and distribution companies;
- Expand sales network;
- Strengthen international cooperation.

Only a few Chinese companies such as Shanghai Petrochemical (SPC), the subsidiary of China's top refiner Sinopec, have already achieved the critical mass needed to compete against western companies. SPC, as one of the largest petrochemical companies in the PRC, follows a strategy based on its competitive advantages in economy of scale and scope:

1. World class ethylene production capacity: SPC is China's largest producer of ethylene. In 2003, it had a capacity of 930,000 tonnes as compared to the 2002 capacity of 800,000. This capacity is a source of huge competitive advantage for SPC.
2. Integrated operations: SPC is one of the most integrated petrochemical producers

of the world. Its capacity to offer a range of products is comparable to some of the world's leading petrochemical companies. Due to its integrated style of functioning, it is able to produce synthetic fibres, resins, plastics, petrochemicals and petroleum products, each of which plays a complementary role in the other's production as well as usage. Due to the difficulty for customers to source these related products from a single source, demand almost always outweighs supply. Thus, being able to offer all of these chemicals provides SPC with a competitive advantage.

5.3.1 Restructuring in the Chinese Commodities Chemicals Industry

Other Chinese producers are already seeking to acquire and consolidate activities to upgrade their capacity. China Petroleum & Chemical Corp (Sinopec), the large Chinese chemical maker, acquired assets worth more than \$2 billion from its parent, the state-owned China Petrochemical Corp. The latter retains a 55% stake in publicly traded Sinopec. Sinopec paid for the assets with \$340 million in cash and \$210 million worth of oil-well servicing businesses that it will transfer to its parent. The assets to be acquired are located throughout China and consist of numerous petrochemical plants, several catalyst businesses, and about 1,000

gas stations. Some petrochemical units, such as Zhongyuan Petrochemical's 140,000 metric-tonne-per-year ethylene cracker, are small by global standards. Others are closer to what is considered large-scale.

5.3.2 Chinese Companies Can Now Compete Independently

Since the mid-1990s, foreign companies have discussed or implemented several important joint-venture projects with major Chinese oil and petrochemical companies. But the latter no longer resemble the companies that they were 10 years ago. Sinopec for example, used to be cash poor, severely overstaffed, and painfully aware of its technological shortcomings. Nowadays, China's oil giants are listed on international stock markets, their balance sheets are flush with cash, and their technological proficiency has improved following years of interaction with international companies. However, although the conditions that led foreign and Chinese companies to set up JVs has indeed changed, Sinopec and other Chinese companies still lack the technological proficiency that many European companies have attained in the manufacturing of downstream petrochemicals such as propionic acid or acrylic esters. This is one of the reasons China's oil and petrochemical companies are likely to continue to seek foreign partners.⁴⁰

Box 2: Selected Examples of Strategies in Basic Chemicals

BASF

For more than a decade, BASF's top management has believed that the company's best growth prospects lie in Asia, and particularly in China. BASF has a corporate goal to derive 20% of its global sales from Asia by 2010 - up from 14% in 2004 - and to manufacture in the region 70% of the materials it sells there. Heinz Müller, an analyst at DZ Bank in Germany, recently ranked BASF as the European chemical company - among industry leaders selected for the analysis - best positioned to take advantage of developments in the Chinese market.⁴¹ BASF expects to spend \$1.2 billion in Asian capital expenditures in the next four years, with Nanjing as a prime candidate to receive a significant portion of this money.⁴²

In 2003, BASF's 3,000 employees in China generated sales of EUR 1.6 billion. This was an increase of 23% over 2002. BASF was amongst the front runners in planning major investments in China. Its big integrated plant in Nanjing was mechanically completed in 2004. With investments totalling US\$ 4.3 billion in China (together with partners), BASF heads the ranking of chemical companies investing in China. Its China exposure of 4.8% already represents an impressive order of magnitude. BASF, together with its partner Sinopec, is investing US\$ 2.9 billion into its integrated facility in Nanjing alone, which is similar to their Antwerp site and centres around a naphtha cracker for producing basic chemicals and especially ethylene. Once the plant is on stream, basic chemicals are likely to constitute around 20% of BASF's China-generated products portfolio, which will allow BASF to participate in the basic chemicals boom. BASF together with partners is also investing US\$ 1 billion in an isocyanate production Joint venture (MDI/TDI) and US\$ 300 million in a wholly owned polyTHF production at its Caojing plant.⁴³

In the ethylene chain, BASF looks to move from EG and PE to higher value derivatives, such as ethanolamines. Other higher value derivative plants such as polycarbonate, polyurethanes and acetic acid can be very cost competitive even before taking into account the advantage of the tariff and transportation costs associated with foreign imported material.⁴⁴

Bayer

Bayer first moved into the Chinese market back in 1882. Its 2003 sales in Greater China amounted to EUR 1.1 billion and 2,100 employees work locally for Bayer in all three of its business segments (in 2003). The group is concentrating its investments in China on polymers production. Its China focus in the next few years will increasingly be on the MaterialScience subgroup. The group has a strong position in polymers, a field where local

competitors are still thin on the ground. Bayer has a good opportunity to profit from the booming demand for automobiles in China through the local production and subsequent marketing of plastics (specialty chemicals).

Bayer has accordingly decided to manufacture its top plastics product Makrolon (polycarbonate) in China starting in 2006. Bayer is investing €1.5bn on the Caojing site by 2009, planning to increase production capacity to 100,000 tonnes of polycarbonate in 2006, and an additional 100,000 tonnes by 2009. Bayer also has production targets of 230,000 tonnes of MDI in 2008, and 150,000 tonnes of TDI by 2009. With no substantial domestic players in TDI, MDI or polycarbonate, and strong demand growth, industry experts believe that the Bayer plants are well positioned to benefit from a significant domestic deficit.⁴⁵

BP

Britain's BP was reportedly set to take a stake in Asia's largest petroleum refiner, Sinopec. While BP is refusing to comment, Sinopec had directly refuted the suggestion, saying current talks only concern individual projects between the two companies, and not an equity sale. The reports, much discussed by the foreign media, said the Chinese government has given the go-ahead for a tie-up that would allow BP to take up to a 25% stake in Sinopec at a cost of around US\$14bn. If carried out, the deal would be the largest investment of its kind by a foreign company in China. BP has already invested \$3bn in Chinese projects over the past 30 years, the most by any British company.⁴⁶

Source: Chemicals Weekly (2006)

5.3.3 Competition Chinese Commodity Chemicals Producers in 3rd Markets

Currently, Chinese domestic petrochemical companies are not ready to export their products. Even the technology leader Shanghai Petrochemical, a subsidiary of China's top refiner Sinopec, as one of the largest petrochemical companies in the PRC, has only 5% of its revenues from exports. Instead of supplying foreign markets by making use of their Chinese domestic petrochemicals production, companies like Sinopec or Petrochem are acquiring overseas assets mainly in order to secure long-term access to petrochemical feedstock.

In a bid to improve "energy security", Chinese petrochemical companies have had to expand overseas, a search which has led them to all corners of the globe. In 2005, CNOOC tried to buy America's Unocal, though the U.S. Congress stymied the move. Russia

had already previously blocked Chinese companies from buying stakes in its oil companies at an earlier stage. Chinese state-controlled oil companies are also busy picking up assets in various corners of Africa, Venezuela, and in the former Soviet republics of Uzbekistan and Kazakhstan. China, now the world's second-largest importer of oil, imports 28% of its oil from Africa, mostly from Sudan, Angola, Congo, and Nigeria (see **Box 3**). Chinese petrochemical companies are now starting to acquire not only stakes in oil-fields but also acquiring petrochemical production assets in foreign countries. In 2006, China National Chemical Corporation (ChemChina) acquired Australia's biggest ethylene producer Qenos for an unknown amount. ChemChina said the deal means its total assets now exceed USD 10 billion and its total sales revenues for this year is expected to hit USD 10 billion.

Box 3: China's Petrochemicals Producers Attempt to Expand Abroad

CNPC acquired stake in Sudanese oil field

In 1996, CNPC took a 40% interest in the Heglig and Unity oil fields in Sudan as part of the Greater Nile Petroleum Operating Company, in which India and Malaysia are also investors. In 1998, it participated in building a 1500-kilometer (930 miles) long pipeline from these fields to the Red Sea.

CNOOC failed in taking over US oil and gas producer Unocal

In 2005, CNOOC gave up an \$18.5 billion takeover bid for Los Angeles-based oil company Unocal Corp. after critics complained the deal might jeopardize U.S. security.

CNOOC acquired a stake in a Nigerian oil field

In January 2006, CNOOC disclosed a \$2.27 billion acquisition of a stake in a Nigerian oil field, which will come on-stream in the second half of 2008.

CNOOC, BHP Billiton ink joint exploration deal for Australia

In March 2006, CNOOC reached an agreement with Australian mining giant BHP Billiton to jointly prospect for natural gas in Australia's Outer Browse basin.

China National Offshore Oil Corporation, the country's leading offshore petroleum company, signed the agreement on the transfer of exploration rights, the company said on its website. No financial details were given.

Sinopec teamed up with Indian Company

Hindustan Petroleum (Mumbai) and Sinopec announced that they have signed a preliminary agreement to jointly

pursue projects in China, India, and elsewhere. The companies say that the agreement covers petrochemicals, as well as consulting, exploration and production, refining, and trading. Further details were not disclosed.

Iran, China reported closer to oil deal

In February 2006, China and Iran reportedly are near the final stages of a multi-billion dollar oil deal under which the mainland's state-owned China Petrochemical Corp., or Sinopec Group, would take a 51% stake in the development of an oil field along Iran's southern border near Iraq.

Source: Chemicals Weekly (2006)

5.4 Competition in Specialties and Consumer Chemicals

The customer base of the specialty chemical industry has experienced consolidation and globalisation. This is a competitive advantage for the big-size European specialty giants, since chemical companies with a global reach are preferred global partners of their multinational customers. As mentioned earlier, multinational specialty chemical companies are trying to raise barriers to entry into their markets by becoming more service oriented. They are focusing less on their products and more on the services supporting them by concentrating on niche markets and on building exclusive relations with customers, especially with the help of e-business.

Since China has focused mostly on developing basic feedstock industries in the past, the growth potential for specialty chemicals is especially high. This is why most players in the specialty chemicals field (mainly European companies) have moved aggressively in the last few years to establish themselves in China. China is a particularly attractive destination for chemical specialties to invest, as their production tends to be relatively labour-intensive, while the increasing availability of a well-educated academic workforce also makes establishing local and regional service centres an attractive proposition.

European specialty chemicals are in an advantageous position since their products are usually not made to specification. In other words they offer tailor-made solutions for customers. Products like specialty chemicals, which contain a strong service component, are not as prone to local competition, since local companies tend to lack necessary prerequisites. Since domestic manufacturers in many cases do not fully satisfy the quality standards required for exports, foreign companies have good opportunities in this market although Chinese competitors will try to improve their competitive position by increasing their:

- End-user experience;
- international R&D backup and an R&D pipeline;
- Experience with value selling;
- International sales networks and leverage thereof.

A possible strategy in achieving these capabilities is the acquisition of foreign companies. Already earlier this year, in January 2006, ChemChina's subsidiary, China National BlueStar Group Corporation took over Franco-Belgian Adisseo Group, the largest animal nutrition supplement producer in the world. It is the first case of a Chinese enterprise acquiring an overseas company in the field.

Box 4: Characteristic Business Strategies for Specialty Chemical Companies

Degussa

Degussa has been in China since 1933 and has been producing specialty chemical products locally since 1988. The group has 17 subsidiary companies and several production sites. Degussa's more than 1,000-strong workforce generated 2003 turnover in China of EUR 280 million. It is strong customer demand that has attracted Degussa to China. The group aims to supply not only the domestic market but also other regions of Asia from its local production. The company sees China as the driving force in Asia, and has targeted a medium-term doubling of the Asian component of its total sales (2003 share: 14%). It has defined China as the most important market where it can achieve top-line growth. In May 2004 Degussa signed a cooperation agreement with the Chinese high-tech company Changchun Jida High Performance Materials covering the joint development, production and marketing of high-performance polymers. Degussa is planning to invest over EUR 100 million in the carbon black, pharma amino acids and polyurethane foam business segments. Its local production of these materials is allowing the company to profit from the strong growth of automobile demand in China. Degussa's production of construction chemicals in China is also being boosted by the country's building boom. Degussa is additionally working to transfer the production of commodity fine chemicals products (building blocks) to China, since it is no longer economical to manufacture these in Germany due to the intensification of competition from Chinese rivals.

DSM

DSM's 3,000-strong workforce generated 2003 sales in China of EUR 273 million. Through its acquisition of Roche's vitamins business, DSM has now put itself on a sure foundation in China. Its China sales are already

4.5% of group sales and this proportion will rise due to the full-year consolidation of the vitamins operation in 2004. If one adds in the acquired vitamins sales, pro forma sales total EUR 350 million. DSM is expanding its local production in order to strengthen its leadership position in vitamins, antibiotics and resins. Annual caprolactam production has increased to as much as 140,000 tonnes by the end of 2005. Some of DSM's penicillin products already hold more than 50% market share in China. With DSM predicting annual growth rates of 30 to 40% for industrial plastics with automotive industry applications, the company is aiming to double its China sales to EUR 600 million by 2008 (estimated CAGR 2003 to 2008: 17.1%). DSM is therefore the only company with a formal sales target for China.

Source: Chemicals Weekly (2006)

5.5 Competition in Fine Chemicals

There are as many as 20,000 producers in China capable of manufacturing fine chemicals. However, most of them have very poor technological competence and production capabilities by European standards, with only some 500 possessing GMP-certified production plants. Chinese fine chemicals producers typically concentrate on producing basic intermediates and active ingredients for pharmaceutical and agrochemical industries in China. The technology and equipment used in China's fine chemical industry is 15–20 years behind that of advanced economies. Hydrogenation, continuous nitration, cold nitration and sulphonation using liquid sulphur trioxide have not been adopted on a large scale. The use of automation and distributed control also falls far short of that in developed countries.⁴⁷ Many products in the newer fields of technology - such as functional polymers, fine ceramics, liquid crystals, information chemistry and nanomaterials - are very weak in China.

In the last five years numerous investments have been made and new companies have been established and built up. The average company has sales of less than \$10 million and under 1,000 employees, although some companies have a turnover exceeding \$50 million with focus on the more attractive European and U.S. markets. Nevertheless these companies struggle to be competitive due to a lack of scientific research and pollution management. The Chinese local fine chemicals market is extremely price-driven and this situation will remain in the future. Consequently strategies targeted to achieve

product differentiation, which play a key role when entering into foreign markets (e.g. improving marketing and sales competence or boosting the exchange in information) will not be important even for the next ten years.

5.5.1 Custom Synthesis or Building Block Suppliers

As in the case of specialty chemicals, fine chemical multinationals with a global reach are likely to become partners of choice for their multinational customers. However, in selected market segments,⁴⁸ European custom synthesis or building blocks suppliers face aggressive competition from China as their Chinese competitors are in a superior cost position for the following reasons:

- Access to low-cost research at universities and institutes;
- Low labour costs, which are especially important in labour-intensive custom synthesis/ building;
- Blocks, where production runs are usually small and labour intensive;
- access to low-cost engineering;
- Low capital requirements.

Even in their home markets, European custom synthesis or building blocks suppliers, face aggressive competition from China. The situation in the Chinese market is even worse and European Fine Chemical manufacturers particularly in the area of (Generic) Active Pharmaceutical Ingredients are already losing significant market share against Chinese competitors.

Box 5: European Operators in the Chinese Fine Chemicals Industry

Er

Lonza

The world technology leader in fine chemical manufacturing, Lonza (Switzerland) announced it will invest \$200 million during the next few years to build an undisclosed number of fine chemical manufacturing facilities in China. The investment will focus on expanding the company's production site at Nansha near Guangzhou. Lonza said it has pledged the investment in a letter of intent signed by the company and the local government of Nansha. The company has been active at the site for the past 10 years. The investment program will include a multipurpose active pharmaceutical ingredients (API) plant, and an ISO-regulated chemical intermediates production complex that will include large-scale and pilot-scale production. The facilities will deliver a broader range of capacities, products, and services than Lonza currently has at the Nansha site. Specifics about the capacities of the planned facilities were not disclosed. Lonza firmly believe that the Guangzhou region offers cutting-edge technology platforms, manufacturing excellence, and a competitive cost environment that complements Lonza's other international sites.

Degussa

Degussa's exclusive synthesis and catalysts business unit is close to forming a fine chemicals manufacturing joint venture in China. The JV will produce intermediates, and be based on China's "east coast" according to Bernhard Hofmann, board member (fine chemicals) at Degussa. The move represents a partial shift in Degussa's fine chemicals manufacturing base to Asia. "Production costs of these products are much lower in Asia," he says. "There is no technology gap between western and Asian producers of these products any more." Degussa will keep high-margin products where there is a high degree of sensitivity over intellectual property in the "western hemisphere." Including its R&D and manufacturing facilities in Europe and North America, Degussa can offer a tailor-made cost mixture of western and Asian facilities, the company says.

Source: Chemicals Weekly – Various Issues (2006)

5.5.2 Chinese Competitiveness in Fine Chemicals

Today the fine chemicals market in general still offers attractive margins. It is important to emphasise that the variable costs (raw materials and utilities) for Chinese players are often more or less comparable to those of producers in advanced countries. However, European players in particular suffer from very high fixed costs as their plants' operation rates are currently low and wages are significantly higher than in China. Many European companies maintain a significant marketing staff and R&D capacity as additional services to defend their market position. These cost positions are justified by relatively higher margins, although it is questionable to what extent the market will continue to pay for these higher prices. Due to the aforementioned "free research" that Chinese competitors obtain from local educational institutions, they usually do not have to bear these costs, or the relevant costs are significantly lower compared with their European peers.

These lower costs compensate in many cases the cost advantages derived from the advanced technologies of Western companies. However, low investment, low-cost and often low-tech production also result in very low entry barriers for other new emerging competitors in China. Very often, as soon as the margin for one specific product becomes attractive enough, too much new investment is initiated. This can lead to a dramatic overcapacity and fierce price competition for this specific product. Many of these new Chinese companies manage to have quite

attractive margins at first, but the companies often have a very weak cash position as the investments have been financed to a large extent by bank loans with high financing costs. In the event of possible price erosion or other market turbulence, a company will face real financial problems. Furthermore, in the fine chemicals segment which has a large service element, newcomers lack the business relationships and customer knowledge essential to raise entry barriers for potential competitors.

6. MARKET ACCESS OBSTACLES

In addition to the genuine market driven competitive threats posed by Chinese operators in this sector, European companies also faced with competitive and operational challenges as a result of formal and informal or non-tariff barriers (NTBs). This section lists these barriers to trade (see **Table 9**), and provides a brief qualitative description derived both from desk research, and the results of the industry survey. **Annex 3** provides a visual summary of both the market driven competitive forces as well as those derived from NTBs.

Table 9: Overview of Market Access Obstacles

Section	Topic
6.1	Tariffs
6.2	Project Approvals
6.3	Limitation of New Projects due to Austerity Measures
6.4	Intellectual Property Rights
6.5	Chinese Legislation on New and Toxic Chemical Substances
6.6	Export Controls on Rare Earth Materials

Since 2001, when China joined the World Trade Organisation, obstacles for chemicals imports have been reduced significantly as Chinese companies are no longer obliged to buy raw materials primarily in their home country. However, even though import tariffs for more than 1,000 chemicals were reduced from 15% to about 7%, a process starting in 2005, it is still more advantageous to operate in the domestic market thanks to lower costs for production and transport.⁴⁹ Liberalisation has eliminated structural deficits and highly improved the quality of China as a business location. With less policy protection from state authorities, multinational companies will compete on a more level playing field and will be able to take advantage of their superior funding, technological R&D, human resources, service, distribution skills and brands.

6.1 Tariffs⁵⁰

Given the huge size of China's chemical market and the high competitiveness of China's local production, import tariffs are considered as still relatively high and far from the elimination of all chemical tariffs as proposed in multilateral negotiations initiated at the Doha Round (see recommendations **Section 9** below for further details).

Recently, China has announced a broad range of further reductions in import tariffs as well as an elimination of the 2% tariff on ethylene starting from January 1, 2006. China's ethylene imports have increased in recent years and the elimination of tariffs could further boost volumes. Imports, however, will be limited to companies with storage tanks. The tariff for naphtha however, was left unchanged at 6% even though the government had previously said that it would reduce it to 3% by 2005. This is likely to affect non-integrated cracker operators in the country. Shanghai Secco Petrochemical Co. (Secco) and BASF-YPC have to buy 25% and 10% of their naphtha requirements respectively, while CNOOC & Shell Petrochemicals Co. (CSPC) will have to import all of its feedstock until CNOOC's refinery comes on stream in 2008.⁵¹ Secco and BASF-YPC have been able to keep imports to a minimum by increasing purchases from local refineries.

6.2 Project Approvals

The Chinese government introduced legislation in late 2004 designed to simplify and speed up the approval process for investments by foreign and Chinese companies. Under the new regulations, the relevant Chinese authority is required to decide whether or not to approve a project application within 20 working days of receipt of the application documents.⁵² It is the first

time the Chinese government has spelt out clear deadlines for decisions on applications for permits and approvals. With the introduction of this legislation it is hoped that long delays to chemical investment projects by overseas companies in China caused by government bureaucracy and inefficiency may be a thing of the past. As part of the new legislation, the central government has delegated more power to local authorities to approve foreign investment projects. Local authorities can approve foreign investments of up to \$100 million in the Chinese government's "encouraged and permitted" category, which includes many chemical products, compared with a threshold of \$30 million before the new regulations⁵³ (see **Table 10**). Local governments in China are competing fiercely to attract foreign investment and many have set up special offices to handle and speed up foreign investment approvals.

Table 10: Threshold for approvals for foreign investment projects by Chinese government authorities

Project Type	State Council	NDRC	Provincial / Local
Encouraged and permitted	>\$500m.	>\$100m	<\$100m
Restricted	>\$100m.	>\$50m	< \$50m

Source: Chemicals Weekly (Aug 24, 2005)

Foreign investments bigger than \$100 million still require central government approval, by the National Development and Reform Commission (NDRC) or the State Council. Those projects, including large-scale manufacturing complexes, are nevertheless governed by the new laws and should in theory receive an approval decision within 20 days. However, any large-scale chemical project in China is likely to involve refineries and/or ethylene plants, and downstream units. Refineries are in the Chinese government's "restricted" category for foreign investors, and ethylene projects with a capacity greater than 600,000 m.t./ year must take the form of joint ventures with local companies. Partner selection and subsequent negotiations with the Chinese Partner, rather than the government approval process, may therefore determine the timing of those projects. Whether these timelines will be followed strictly by the central government and whether the overall duration of the setting up period will be substantially reduced remains therefore to be seen.

The new laws might nevertheless be a major step forward in improving the transparency and efficiency of the project approval process in China. An important improvement to the regulatory environment is that written project

proposals are no longer required as part the application procedure for joint ventures involving foreign companies, and feasibility studies are no longer required for WFOEs, under the new laws. The Chinese government also requires far less commercial information about a proposed project, and focuses much more on the plan's environmental impact, as well as the pricing of utilities and public services. This reflects the government's shifting focus on approvals, from being actively engaged in business decisions to being a regulator and rules-setter.

6.3 Limitation of New Projects due to Austerity Measures

The Chinese government has become increasingly concerned with the overheating of the economy and has implemented a number of austerity measures. This effort from the Chinese government is targeted at selected industries, and guidelines are quite specific for its branches to execute. The government has published a long list of industries and products that either prohibit or limit new investment.⁵⁴ The criteria used for the list include projects that might cause overcapacity, require high-energy consumption, use out of date technologies, or are high pollution. Hazardous products and low-quality products are also included in the list.⁵⁵ The Chinese government's decision to limit the over-production of certain chemical products will ultimately benefit the Chinese chemical industry as well as foreign chemicals companies. In addition to hazardous products, the government's list will crack down on the new construction of less efficient and smaller-sized chemical plants (see **Table 11**). This will stop the rampaging of construction projects of inefficient small chemical plants. Below are some chemical projects to be limited by the government:

Table 11: Some Chemical Projects to be Limited by the Government

Product	Criteria
PET	Ether-interchange process based on DMT or < 100,000 tonnes
Ethylene	< 600,000 tonnes
Polyethylene	< 200,000 tonnes
Polypropylene	< 70,000 tonnes
Styrene	< 200,000 tonnes
Polystyrene	< 200,000 tonnes
Calcium Carbide	All

6.4 Intellectual Property Rights

The issue of intellectual property (IP) rights is a major problem for overseas companies wishing to sell and produce chemicals in China. The system formally appears in line with international norms, but in practice this is not the case. While China has the necessary legal machinery, enforcement of regulations is often poor. To correct this situation companies have

to initiate court cases while in the meantime profits are eroded. Companies refrain from introducing patented products or production processes in China for fear of patent infringements. At the same time, producers are confronted with counterfeit products which are floated to the market with associated health and safety risks.

Despite this, no significant improvement in IP law enforcement is expected in the foreseeable future for the following reasons:

- Regulatory capabilities and responsibilities in this field will remain patchy and will be allocated to a confusing network of assorted agencies;
- Many provincial and local authorities are unwilling to crackdown on IP infringement in order to protect local business;
- China's current cultural norms and their perception of fairness regarding IP will be difficult to transform.

In the longer term, however, one might assume that as local Chinese chemicals companies increase their indigenous IP; this will create greater incentives for the government to enforce IPR. The extent to which the current lack of IPR protection retards the development of indigenous innovation at Chinese companies is therefore something which needs to be explored and highlighted to Chinese authorities.

6.5 Chinese Legislation on New and Toxic Chemical Substances

A significant and growing NTB (Non-Tariff Barrier) facing the global chemical industry in general is the divergence of regulatory schemes used to assure the protection of safety, health and environment. A case in point is the latest Chinese legislation on new chemical and toxic substances.

Legislation on New Chemical Substances

In September 2003, the Chinese State Environment Protection Administration (SEPA) issued a regulation on the manufacture and import of new chemical substances. The Chinese legislation requires the notification and registration of any new chemical substance prior to its manufacture in, or import into, China. In December 2003, the "New Chemical Substance Notification Guidelines" were published. Barring some exceptions,⁵⁶ present legislation does not generally provide for intermediate notification requirements as is the case in most other jurisdictions. As a result, the data requirements in China for low volume chemicals are extremely restrictive because there is no differentiation at lower levels. Even the sending of a sample to China for

testing requires a formal submission and approval from the authorities. The present requirements, without a differentiated notification system for new substances (manufactured or imported), are likely to restrict the introduction of new technology and prevent companies from entering the Chinese market with new substances.

Legislation on Toxic Chemicals

On 27 December 2005, China amended the "list of severely restrictive toxic chemicals" (SEPA announcement 65/2005) under the "Regulations for Environmental Management on the First Import of Chemicals and the Import and Export of Toxic Chemicals" of 1 March 1994. In addition, the Chinese authorities submitted on 31 December 2005 a list of toxic chemicals banned in China (Chinese Customs Announcement 116/2005). Both new lists entered into force on 1 January 2006 and contain an extended list of chemicals. The scientific rationale and the relevant risks of the new extended lists of chemicals are unclear. Moreover, there are no uniform rules on toxic chemicals in mixtures and articles, and importers have to pay a registration fee of US\$10,000 per registration, which is only valid a period of two years per importer, thus resulting in extremely high costs for importers and constituting a real barrier to trade. This high registration fee has no equivalent in the world and is arguably not in conformity with GATT 1994 Article VIII stating that fees shall be limited in amount to the approximate cost of service rendered.

6.6 Export Controls on Rare Earth Materials

China has the largest recoverable rare earth resources of any country in the world, representing over 97% of global production. However, since 1998, the Chinese government has operated a rare earth export quota system on critical raw materials, such as rare earth metals, phosphorous and fluorspar. Since then, VAT rebates and other preferential tax policies on the exports of these commodities have been reduced and not always in a transparent way. In addition to these measures, the NDRC and MOFCOM recently further tightened reporting requirements from local governments. In 2006, export quotas amounted to a total of 86,000 tonnes, which after processing recoveries, produces 74,000 tonnes of Rare Earths products. This compares to global consumption last year of over 96,000 tonnes. As a consequence, a tightening of supply of rare earths available outside China has been reported; while China's productive capacity alone is estimated at over 180,000 tonnes. Several Chinese companies both extract and process these raw materials, and therefore,

the government has a strong interest in protecting their processing branches. However, these measures mean that European industry cannot obtain the sufficient quantities of export licences while Europe-based Chemicals producers have difficulties to obtain important inputs, giving their Chinese competitors that have easy access to these raw materials an unfair advantage.

6.7 Survey Results⁵⁷

In the context of this study, decision-makers at European chemical companies active in China⁵⁸ were asked key questions on issues regarding, competitiveness, future developments and market-entry obstacles. **Annex 9** discusses the survey results in more detail.

In the area of market access obstacles, **IP protection** (18.2%) was identified as one of the most common constraints to further expansion in the Chinese market. As often mentioned was the unequal application of **certification** requirements as well as environmental and labour **standards** which create an unequal playing field for Chinese and foreign competitors. This results in domestic producers with a lower cost structure and little regard for environmental protection and safety standards. Also significant are **ownership restrictions** that make it difficult to participate in the Chinese market.

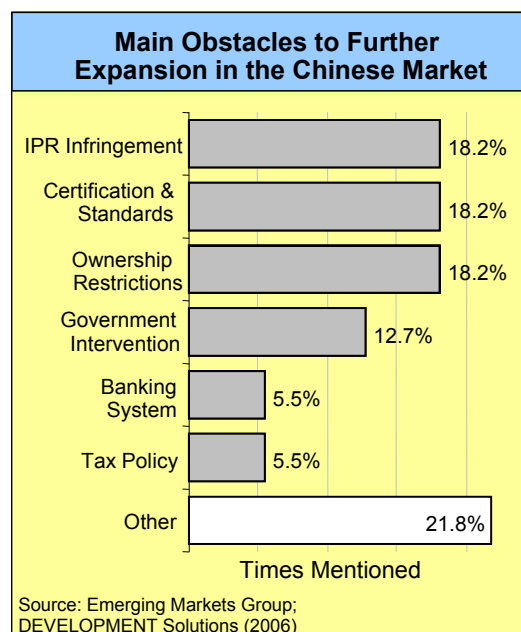


Figure 16: Main Obstacles for EU Companies to Expand Further in the Chinese Market

Government intervention and support was also pointed out as a difficulty for further expansion. In particular, survey respondents complained that the state or local authorities distort the availability or allocation of key inputs, capital and energy. In addition state

share ownership in some companies creates a distortion of a free market for mergers and acquisitions as well as poor corporate governance practices. A **weak banking system** and unclear **taxation policy** that sees a high degree of fluctuation (5.5%) limits the opportunities for market expansion for European companies. Other obstacles that were mentioned included delays in project approvals, unfair or restrictive import/export regulations transport regulations, a lack of human resources, unclear domestic policies, problems in accounts receivable, and immature or illogical investment decisions on the part of local investors.

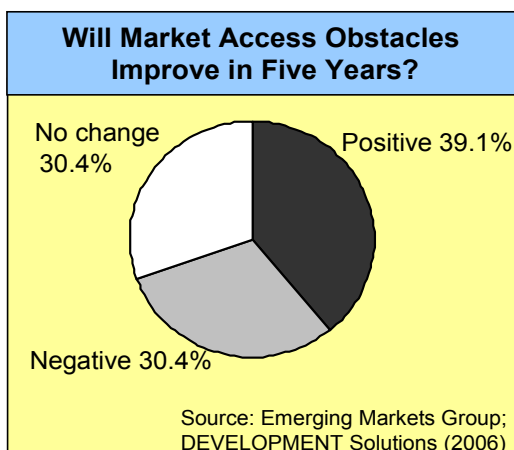


Figure 17: Anticipated Development of Market Access Obstacles in Five Years Time

The largest share of respondents (39.1%) expect there to be some improvement of these obstacles in the mid-term future. Market knowledge and access, local investment logic, IP and the quality of the labour force were identified as areas where improvement is expected to occur. However, overall, there seems to be some pessimism among industry practitioners regarding market access obstacles with 30.4% of respondents expecting no change, or even a worsening of market obstacles. As one respondent put it, "It appears that trade

barriers are getting more subtle and refined. The Chemical sector seems to be regarded as a sector that has already seen enough major foreign investments, Chinese companies might try to exclude foreign involvement with the help of Chinese government".

6.8 Quantification of Market Access Obstacles

To establish the quantitative impact of market access obstacles on EU-China trade, a partial equilibrium (PE) model was applied by the study's quantitative analysis experts. Inputs for the model were based on assumptions derived from the qualitative analysis discussed above, with estimates for the impact of non-tariff barriers to trade (NTBs) and other regulatory restrictions calculated in consultation with trade experts and industry representatives, and compared to existing datasets on *ad valorem* NTBs from the World Bank. The PE model was then used to make several sets of calculations, each assuming a different outlook scenario. The quantitative impact of these market obstacles was then derived by comparing the current situation with a stylised liberalised trade scenario.⁵⁹

The key quantification results from the model for the chemicals sector are outlined in **Table 12**. The model compared current conditions with a scenario where tariffs and NTBs were eliminated. Under the liberal trading regime overall economic welfare increased by 6.34% whereas local production would almost not be affected, decreasing by only 0.83%. In addition, the European-based chemicals industry exports to China increased by \$802 million. The cost in lost business opportunities resulting from NTBs alone amounted to \$379 million. **Table 13**, on the next page, lists a number of selected comments from industry practitioners regarding the economic impact of the aforementioned market access obstacles.

Table 12: Quantification of Market Access Obstacles

Current Conditions	China Imports from EU-25 ⁽²⁾	\$2.4 bn
	Domestic Production Output ⁽²⁾	\$148.5 bn
Conditions Under a Liberalised Trading Regime ⁽³⁾	Welfare Improvements ⁽⁵⁾	6.34% increase
	Change in Domestic Output	0.83% decrease
Cost of Lost Business Opportunities of EU Companies Exporting to China.	Estimated Total Cost	\$801,678,750
	Cost of NTBs Alone	\$379,301.51
Notes: (1) All Percentages in this Table are Weighted Averages of Organic and Inorganic Chemicals Sub-Sectors (2) China imports from the EU-25 and production data uses 2004 figures (3) t = Tariff; ntb = Non-Tariff Barrier (ntb tariff equivalents are based on World Bank Estimates with input from sector-specific trade experts and industry survey results) (4) A "liberalised" regime here denotes a 100% cut in tariffs and non-tariff barriers across sectors covered in the partial equilibrium model and which is applied equally to all major trading partners. (5) Economic welfare is measured by changes in absorption (total consumption) by sector		
Source: UN Comtrade; World Bank; China Industry Annual (Various Years); Author's own calculations		

Table 13: Economic Impact of Market Access Obstacles – Industry Survey Results

Where respondents made specific calculations:				
Comment		Sector		
		Comm. Chem	Specialty & Fine Chem	Other
Certification & Standards	"2-3 % of revenues for registration/testing of imported chemicals"	•	•	
Ownership Requirements and Delays in Project Approvals	"Due to ownership requirements and slowness in project approval we face delays and make lower investments. For example, if we have plans to make an investment which gets delayed, then for each year we are not producing locally our lost gross profit margin minus the (in general lower) gross margin of the – therefore still necessary - import business amounts to a cost of 10-20% of revenues per year . This represents missed opportunities on both sides, as we hesitate to invest in major projects which would otherwise result in employment and cheaper inputs for local industry."	•	•	
Transport Regulations	"The cost impact of transport regulations which do not abide by world-wide standards are as high as 3-5% of the turnover in China, with the consideration of all the delayed shipments, delayed production, extra transportation costs, extra manpower costs...etc."			•
Delays in Project Approvals	"Delay in project implementation due to deferred one-sided negotiations means that by 2010 for all foreign investors might miss out on more than 1-2bn Euro sales p.a. "	•	•	•
Where respondents made general estimates:				
Comment		Sector		
		Comm. Chem	Specialty & Fine Chem	Other
"20% of revenue"-petrochemicals, plastic and synthetic rubber, other special chemicals		•	•	
"5%-10% loss"-plastic and synthetic rubber				•
"20% revenue loss"-fertilizers, plastic and synthetic rubber, other special chemicals			•	
"We suffer around 10% revenue loss in China because of various market access constraints. It must be noted, however, that due to the current lack of standards we do not currently operate in some markets segments (e.g. a lack of safety standards in the gas cylinder market prevents us to enter into the market because competitors can compete with dangerously lower standards which are unacceptable for us)"				•
Where respondents found it difficult to quantify market access obstacles:				
Comment		Sector		
		Comm. Chem	Specialty & Fine Chem	Other
"Very difficult to evaluate as better competitiveness would significantly increase the attractiveness of investments in China."-petrochemicals, fertilizers		•	•	
"In my view the administrative barriers are not substantial. I have worked in many countries in APAC [Asia and Pacific] during the last 20 years and do not find China particularly troublesome in that aspect"			•	

7. SCENARIOS REGARDING THE FUTURE DEVELOPMENT OF THE CHINESE CHEMICALS INDUSTRY⁶⁰

This section constructs two basic scenarios (pessimistic and optimistic) to highlight the different ways China's chemicals industry is likely to develop under a different set of conditions. The intention is to point out the inter-relationship between the factors mentioned in the previous sections and the importance for China to maintain a liberal trade regime in general, and regarding the Chemicals industry in particular.

7.1 Scenario 1 – Pessimistic Scenario

This moderately pessimistic scenario is characterised by no significant improvements, or even worsening⁶¹ of market access conditions in some areas. Consequently, the more discouraging aspects of the new 11th Five Year Programme (FYP) are highlighted in this scenario. The following assumptions are made:

- 1) A relative slow-down in the growth of the Chinese economy, which might see **GDP growth rates dip below 7% p.a.** making further radical reforms beyond current WTO-commitments unfeasible.⁶²

- 2) Due to a relative slowing down in demand of customer industries, a conservative estimate of **5.6% CAGR** of the Chinese Chemicals industry is assumed.⁶³
 - 3) **Ongoing market access restrictions** in up-stream market segments and related industries, for example in construction of production facilities, which limit the flexibility of foreign investors to operate and integrate their operations. Under the 11th FYP, large-scale projects and local content requirement (as is presently already the case in the Energy and Environmental sectors) is **extended to the Chemicals industry**.
 - 4) Despite that foreign investment in commodity chemicals will remain restricted, the **specialty and fine chemicals industry**, where a number of WFOEs already exist will **remain more open** due to China's requirement for more specialised technology for its manufacture. However, the trends in upstream markets sectors discourage some large-scale integrated foreign producers who cover both upstream as well downstream markets segments to make further substantial investments.
 - 5) Faster rules and procedures for the **approval process** of foreign invested projects are **not followed through**, and implantation remains slow in practise.
 - 6) Continued **lack of enforcement of IP legislation**.
 - 7) China's increasing reliance on imported oil, with **prices of raw feedstock materials**, in particular petrochemicals, **retaining their current high levels**, will further encourage China's investment into resource-rich regions.
- whole, due to the resultant production capacity shortfall in the Chinese market. Despite the slowing down of customer demand and plans by Sinopec and PetroChina to invest \$20 billion into eight new crackers by 2010, **self-sufficiency will remain below 50%** in key inputs such as ethylene and styrene. The gap in large-scale, world-class production capacity widens against Middle-Eastern mega-crackers. Foreign investors from the specialty and fine chemicals sectors are discouraged by these trends, reducing the local availability of these inputs.
- 4) High prices and low local availability of inputs, combined with a lack of reform (continued poor management and corporate governance at SOEs) means the Chinese chemicals industry retains its retarded state of development and continues to **struggle to upgrade its capabilities or move into downstream segments**. Consolidation of China's 15,000 small and increasingly loss-making chemicals producers will be slow due to the state's fear of creating unemployment. Consequently, **Chinese chemicals producers increasingly struggle to meet the capacity, quality or differentiation for increasingly demanding customers at home, let alone on the world market**.
 - 5) Due to the Chemical's industry's high proportion of input costs relative to other costs in which China has an advantage (i.e. labour costs), higher prices for raw materials and inputs **will affect Chinese Chemicals producers and Chinese customer industries as a whole more than their European peers**. In the specialty chemical industry for example, raw materials can amount to as much as 65%-75% of total costs,⁶⁵ reducing European industry's higher labour cost disadvantages.

Impact on industry developments:

- 1) **Lack of a political constituency for further reform**, due to the economy's growth rate not being sufficiently high to absorb laid-off workers resulting from reforms of state-owned enterprises (SOEs).
- 2) Instead of further privatisations, China continues to opt for **selective liberalisation** that favours SOEs over foreign investors but also local private entrepreneurs.⁶⁴
- 3) Investment caps and local content requirements mean that foreign investment and technology transfer is discouraged. This hampers the swift development of Chinese industry as a
- 6) Notwithstanding the large-scale publicly owned petrochemical companies, China will continue to see its **private sector struggle against foreign competition**. Difficulties in obtaining financing compared to foreign competitors required for the high levels of capital expenditure essential to upgrade and expand production facilities will not be forthcoming, thereby preventing the development of a viable private chemicals industry with the quality and scale needed to be competitive.
- 7) Due to continued public ownership, **foreign investment into Chinese chemicals producers remains small**, and will not go beyond the \$20-30 million

deals made by foreign companies such as DSM,⁶⁶ Bayer and BASF.

- 8) In the specialty and fine chemicals segments, which are more open to foreign investments, **FDI will continue** although **still hesitant due to a lack of IP protection**. Consequently, China's economy misses out on large-scale technology transfers.
- 9) Longer-term objectives stated in the 11th FYP, particularly in terms of environmental policy and rural development, will take secondary priority as China re-assumes the tried and tested approach of capital expenditure in fixed assets to prop up economic growth. While this will increase capacity in some areas, the lack of a market-driven approach will almost certainly result in **overcapacity in some areas while creating shortages in others** (particularly in key specialty chemicals essential to the development of any advanced economy).
- 10) Lengthy approval processes lengthen the lead time it takes before further capacity is added, **delaying China's self-sufficiency** and making China an increasingly less attractive destination for foreign investment compared to other emerging markets.
- 11) The quantity but also the *quality* of foreign investment will be further held back by a **lack of IP protection**. Less than optimal investment and foreign technology transfer due to fears of IP infringement means **key government policy objectives** (as stated in the 11th FYP) such as upgrading the innovative capacity of local companies, as well as wider objectives such as environmental clean-up, **will not be met**.

In the longer term, the consequences for the Chinese chemicals industry under a pessimistic scenario would be severe. China's role in the global chemicals industry would be limited to producing commodity chemicals (where capital is concentrated) and to the niche exporting sourcing operations of foreign multinationals for some commodity-type-fine-chemicals (such as primary building blocks for pharmaceuticals) as well as for certain rare and inexpensive inputs such as earth oxides.⁶⁷ A lack of a solid institutional framework which protects investors' rights (particularly on IP-related issues), and in which excessive state intervention means that there is no competitive level-playing field, as well as limitations on large-scale projects with foreign participation and local content requirements, means that foreign investment and with it technology transfer are stymied. A competitive Chemicals industry based on

sound corporate governance will not emerge, particularly in downstream market segments. Importantly, Chinese customer industries suffer as commodity inputs remain expensive and more specialised chemicals remain unavailable locally, reducing competitiveness - just as these customer industries try to move higher up the value chain and demand increasingly sophisticated inputs.

7.2 Scenario 2 – Optimistic Scenario

China's chemicals industry currently shows the highest global growth trends in terms of increased output - a direct consequence of multinational chemicals companies increasingly investing there.⁶⁸ Scenario 2 depicts a more optimistic situation in which these trends are sustained. For this to continue, the Chinese government needs to implement a proactive agenda of economic reforms, while significant improvements in market access are realised which go beyond mere WTO-compliance. In this scenario the more encouraging aspects of the new 11th FYP are highlighted (i.e. an emphasis on increased sustainable growth based on quality and innovation) and the more discouraging aspects regarding potential restrictions for foreign investors are assumed not to be followed through. The following assumptions are made:

- 1) The economy avoids overheating, makes a soft landing and is able to sustain **growth rates above 7% p.a.**, avoiding the boom-and-bust cycles of the 1990s.⁶⁹
- 2) Key customer industries (manufacturing, construction and farming) continue their high demand levels. The Chemicals industry grows at a rate of **10.2% CAGR**.⁷⁰
- 3) Market access restrictions in up-stream segments remain, but the government's more flexible **rules and procedures** in approving foreign invested joint venture projects bear fruit. Related to this, a **change in the Company Law** in particular issues related to the legal structure of holding companies of foreign invested which currently make it difficult for foreign companies to integrate their operations.
- 4) China's chemicals exports have increased by 14% p.a. to almost EUR 20bn in the last ten years.⁷¹ China makes substantial strides towards becoming a net exporter in selected specialty chemicals.⁷²
- 5) **IP enforcement** shows progress.

Impact on industry developments:

- 1) High, but stable, economic growth rate makes **reforms palatable** as economic growth is enough to push through tough reforms.
- 2) Historic prejudices against private companies are increasingly put aside which further stimulates the development and consolidation of the Chinese chemicals industry. Increased privatisation brings **new opportunities for cooperation between foreign and Chinese companies**, e.g. joint ventures or even mergers and acquisition of local producers,⁷³ **particularly in specialty and fine chemicals segments**. This will push the ratio of fine/specialty chemicals close to 45%.
- 3) The government hits its target of **ethylene self-sufficiency of 60%** while reaching its declared intention to **increase the ratio of fine/specialty chemicals to 45%**⁷⁴ of total production in China. A key factor in achieving increased capacity is the involvement of foreign investments in large-scale projects.
- 4) High demand has to be fulfilled through a combination of imports and local production. China lacks self-sufficiency in commodity chemicals and a number of key specialty and fine chemicals. **Further lowering of tariffs** for these chemicals will be naturally forthcoming in order to **keep customer industries supplied**. European exporters may benefit mainly in the areas of fine and specialty chemicals especially in the case that the future focus of customer's demand in this product segments will be on value rather than only on price. Middle Eastern suppliers would make up most of the short-fall in petrochemicals.
- 5) The **speeding up of approval processes, selected liberalisation in related industries**, e.g. construction of refineries and production facilities,⁷⁵ and a **new unified Company Law**, which all currently limit the freedom of foreign investors to operate in China are issues which are more or less addressed. Foreign producers are able to integrate their operations and operate more flexibly. Such measures would certainly further encourage foreign investments in large commodity production facilities such as ethylene plants. Such measures drive forward China's ethylene self-sufficiency, approaching 60%.
- 6) Particularly in specialty and fine chemicals segments **better IP**

protection stimulates the development of indigenous innovation.

- 7) Stronger IP protection means foreign companies are provided with the incentives to transfer technology essential to the creation of innovative industry, particularly in being persuaded to **set up R&D centres in China**. IP protection further provides the framework in which foreign Chemicals producers can contribute to the government's **wider goals towards achieving more environmentally sustainable development through technology transfer**.
- 8) **Commitment to the goals of the 11th Five-Year Programme**, particularly in terms of a financial commitment to cleaning up the environment (already a business valued at \$32bn a year)⁷⁶ with **new opportunities** for cooperation and investment by foreign specialised chemicals producers.⁷⁷ Infrastructure development in rural areas and weeding out of local corruption **persuades some companies to invest in Western rural areas**.⁷⁸

Under this more optimistic scenario, China's increasingly sound institutional environment reduces market-entry hurdles for international companies. At the same time tough measures are taken to modernise and consolidate the Chinese Chemicals industry. These two factors combined ultimately improve local industry's capacity and product quality to meet domestic demand, and increasingly global demand as well. China's self-sufficiency targets and relative shift from upstream to increasingly service-orientated downstream activities are achieved particularly successfully in cooperation of foreign investors (i.e. in terms of financial, technological, human capital, and customer networks) but also through increased private sector participation and consolidation. Although apparently necessary to maintain the political constituency for further reform, a high GDP growth rate will increase pollution levels in the short run. However, the negative impact of this trade-off can be softened by cooperation in the area of environmental technologies and services. However, for this to occur on any large scale, China needs to take advantage of its current and potential future high growth to put in motion further economic reforms (privatisation and sustainable corporate governance practice) as well as an investment environment which protects foreign investors' rights. Mutually beneficial cooperation between European and (private) Chinese enterprises under an improved institutional framework, in which the state, who has assumed its role as a regulator

rather than a direct participant in the economy, is the fundamental difference between a "lose-lose" pessimistic scenario and a win-win optimistic scenario fulfilling itself.

7.3 Other Variables:

Due to the complexity of scenario building, a number of simplified assumptions were made while a number of stochastic variables, of which the ultimate impact has an unpredictable element, were not explicitly considered. For the sake of completeness however, these further issues might have a severe (but as of yet unknown) impact on the development of the Chinese chemicals industry.

7.3.1 Availability of Raw Materials and Energy

The availability of raw materials, crude oil and electricity will influence the future competitiveness of the Chinese fine chemicals industry. China will remain an importer of crude oil and commodity chemicals. However, increasing production efficiency and full integration of the local petrochemical base might help the chemicals industry reduce raw material costs.

Power consumption grew by an estimated 15% in China in 2004 and 13% in the first half of 2005. Power shortages and bottlenecks are therefore also a major challenge for local producers, especially electricity-intensive sectors such as chlor-alkali and PVC. Chinese government has ensured continuous power supplies to major state-owned refining and petrochemical complexes in these areas, however. Although the government would probably be able to ensure that big complexes are not affected (they cannot afford to shut down and restart), smaller plastics converters and specialty chemical producers will be hit hard by shortages. This shortage can only be eliminated in the medium-term and will require maximum effort.⁷⁹

7.3.2 Logistics

In China, insufficient freight capacity and the road and rail infrastructure, which have been poor for a long time, are increasingly hampering industrial development. It is the chemicals industry in particular that is dependent on roads in China that are heavily travelled. Rail transportation seems a possible alternative and is inevitable in some remote areas, but the rail network, similar to the roads, is strained to the limit. Some key waterways also cannot be used for

transportation due to government fears of contamination in the event of an accident.

The exact impact of China's infrastructure problems will vary among producers of different products located in different areas. To illustrate, BASF operates a site in Caojing which is located near an ocean frontage which gives it the ability to take ships over and above 150,000 tonnes, thereby avoiding some of the logistical problems other sites face. BASF's other site in Nanjing for example, is relatively less fortunate in terms of logistics, and BASF has had to invest in a dredging project to raise the size of the ships it can take from 25,000 tonnes to a projected 50,000 tonnes.⁸⁰ Needless to say, more specialised producers who run batch runs might face very different logistical difficulties, for example in transporting low-temperature or hazardous inputs/ outputs.

7.3.3 Environmental Issues

Following an explosion at the nitrobenzene plant of Jilin Petrochemical, a PetroChina subsidiary, which caused a 90-km long slick containing more than 100 m.t. of benzene, and nitrobenzene, a SEPA (State Environmental Protection Administration) report compiled after the accident stated that China faces an "environmental disaster" unless it quickly improves environmental protection, particularly in regions where the chemical industry is concentrated. New regulatory changes were made which made it a requirement to include new and more detailed environmental and risk assessments, additional facilities, and relocation of residents living near hazardous sites. Local governments are also required to conduct environment and risk assessments for designated areas.

This new legislation should mean that some local plants will be forced to close down while in others new environmental technology will be installed. However, the extent that this will be achieved depends to a large extent on whether SEPA will be given the power to implement stricter environmental regulations. SEPA has little authority over the thousands - 11,000 in all - of environmental protection bureaus at the provincial, municipal, township, and village levels in China. While these agencies theoretically uphold national standards, they tend to operate in ways that best suit the local government they are attached to. They are aided by the vagueness of national regulation.⁸¹

Box 6: Difficulties of SEPA Monitoring of New Environmental Standards

In February 2006, SEPA ordered checks on 127 petrochemical projects that could pose environmental hazards, representing investments worth RMB 450 billion, which are located at sensitive areas such as major rivers and bays. Beijing officials conducted checks on 20 projects while local environmental officials were responsible for the remainder. Besides examining the 127 projects, SEPA has also ordered 21 companies and projects to clean up problems.

The results showed that petrochemical plants located at major water sources in China pose a large level of risk and yet the required risk-control measures are not in place. Companies are required to carry out changes immediately if the project poses great environmental risk. Those that have not carried out risk assessments are required to do so within a specific period.

The 20 projects conducted by Beijing officials include PetroChina's cracker project at Chengdu, Sichuan province; purified terephthalic acid (PTA) projects at Yizheng Chemical and Fibre Co., Dalian Dahua Group, BP Zhuhai, Mitsui Chemical and Samnam Petrochemical; Shanghai Gaoqiao Petrochemical's bisphenol-A joint venture project with Mitsui Chemicals; and aromatics projects at Dahua Group, Yangzi Petrochemical and Jinling Petrochemical. The 20 projects represent an investment of RMB 60.6 billion (\$7.6 billion), which will increase by another RMB 1.6 billion after the government ordered changes are implemented.

Three of the 20 projects have already completed construction. They are a 1,4-butanediol BDO project at Sichuan Tianhua Co., a diammonium phosphate project at Yunnan Furui Chemical, and an aniline plant at Lanzhou Chemical Industrial Co., a PetroChina subsidiary. A SEPA official declined to say if these companies will be ordered to shut down or say what penalties companies will face if they do not carry out the changes.

Source: Chemicals Weekly (April 10, 2006)

The introduction of higher environmental standards should pose little threat to the expansion of European chemical makers into China. For the most part, foreign companies are putting up plants in well-planned industrial parks where wastewater is treated and air emissions are measured. Stricter regulation could even be considered good news for foreign companies if their Chinese competitors are forced to invest in expensive environmental abatement equipment as a result of increased government controls.

However, the biggest worry for foreign investors is that environmental standards are not applied as strictly on local producers as they are on foreign invested plants. **Box 6** describes some of the difficulties in monitoring the problem.

Arguably, recent directives with the aim of shutting down small carbide plants and improving the environmental standards of the bigger units are a positive illustration of how central government tries to avoid wasting resources and regulate the investments of carbide plants induced by growth in PVC demand. Solving China's pollution problems could therefore not only have a positive impact on environmental aspects, but could also help to consolidate the market and achieve healthy economic growth.

7.3.4 Introduction of Enhanced Safety Standards

Another notable trend that will have an uncertain impact on the Chinese chemicals industry is the relatively recent attention

paid by the government to safety standards. Although there are already some level of environmental regulations in place for the chemical and other industries, safety regulations were virtually nonexistent until recently.⁸²

Recently, some safety regulations have been introduced. Entrepreneurial chemical companies are required to have plant designs approved for operation. Separation of hazardous materials is at least officially required. Most of the safety requirements will translate to higher operational costs for Chinese companies.

7.3.5 Labour Shortage

Amazingly, for a country that has been promoting its practically limitless labour pool, factories in China's coastal regions have been increasingly unable to fill job openings. For the past few years, factory managers in coastal industrial towns such as Dongguan and Shangyu have complained that it is difficult for them to find operators. Higher wages would attract more workers but would also erode China's advantage as a country endowed with low-cost labour.

The reports of labour shortages are typical of the situation in most of the country. Chinese universities graduate 3.5 million students annually, and foreign-invested joint ventures are able to hire them as operators for as little as \$200 per month.⁸³ Government leaders in Beijing still express more concern for China's unemployment problem than for an apparent shortage of operators in coastal cities.

7.3.6 China as an Investment Destination: Chinese Currency Revaluation and Tax Reforms

It is commonly believed that the Chinese Renminbi (RMB) currency is undervalued. A revaluation would most probably reduce the attractiveness of China as a production base. As most China-related business is carried out in U.S. dollars, a stronger dollar coming from its current historic low level will also help the European industry. Increasing industrial legislation and tax reforms expected this year also make the future uncertain for companies trading, or wanting to begin trading, in China.

7.3.7 Anti-Dumping Issues

Finally, a significant 'unknown' to the future development of the Chemicals industry is the impact which likely future anti-dumping cases brought to the WTO will have. As mentioned earlier, EU anti-dumping cases involving chemicals account for 22% of total cases following only the steel industry which is the most in number of total cases (31%). China is at the top of the list of countries affected by European Chemical Industry Council (Cefic) complaints. According to an anti-dumping investigation report by the EU, America, India and other countries, chemical products like polystyrene, nitrite, citric acid etc. from China have suffered the most serious anti-dumping sanctions; closely followed by bicycles, shoes and silk products; while foods like garlic, honey and crayfish etc. also draw the report's attentions.⁸⁴

8. CONCLUSION: CHANGES, CHALLENGES AND CHOICES

This report has attempted to identify the key determinants and larger global trends, as well as indigenous factors which will affect the development of the Chinese chemicals industry and opportunities for European players. As the Chinese chemicals industry gains importance it will increasingly affect global trends as well. The development of China's chemicals industry will be mainly driven by China's drive for self-sufficiency, as well as the importance of geographical proximity, which requires the European chemicals industry to locate close to their customers.

The future competitiveness of China's chemicals producers will depend on China's ability to reform its industrial structure through privatisation and consolidation. In some segments, the specialty and fine chemicals industry in particular, companies will have to go through an industrial reformation process similar to that experienced in Europe during the 1990s. A focus on core competencies and raising entry barriers by locking in customer networks are

key areas which need to be developed by Chinese players. Provided a more secure institutional framework is established which is flexible and adequately protects investor's rights, exciting new opportunities for cooperation between established European players, and emerging local companies might come to the fore. Future cooperation between European and local companies would help to achieve China's desire for increased self-sufficiency in key commodity chemicals and higher value added activities in downstream segments. A number of key wider policy objectives of the Chinese government, namely better environmental protection and, to a lesser extent, rural development will be hastened with extensive foreign participation. The European chemical sector is the world leader in terms of energy efficiency, environmental management and the development of renewable materials. European chemical companies would therefore clearly gain a competitive edge if Chinese authorities would increase stringency of enforcement to comply with environmental standards in order to avoid pollution and wasting of resources. Moreover, a higher degree of environmental regulation in China would create business opportunities for the European chemical companies. In this context however, a primary obstacle to the introduction to the latest technology is down to a lack of IP protection.

9. POLICY RECOMMENDATIONS

In addition to the conclusions reached by this report, the policy recommendations in this section build on the recommendations made by Cefic⁸⁵ (European Chemical Industry Council), with additional feedback incorporated from the Chemicals working group which took place at the Brussels conference for this study on the 7th July, 2006.⁸⁶

9.1 Policy Recommendations in the Frame of China's Entry to the WTO

Whereas the importance of China's accession to the WTO cannot be understated, the feedback from the industry consultation for this study has demonstrated that there are still numerous problems which need to be addressed where a stronger commitment from the Chinese authorities is required. While China requires support with its further integration into the world economy, pressure needs to be applied at the WTO and local political level to promote a level playing field and the equalisation of trade barriers and market protection mechanisms.

When formulating policies, it has to be kept in mind that the chemical industry tends to have a range of vertical inter-relationships

across its manufacturing and supply chains. Access to, and cost of key raw materials is a key starting point for competition in that it provides a critical building block for intermediates and/or finished products. When considering market competition and free trade it is important to recognise the critical nature and dependency of the inter-relationship that exists between upstream and downstream chemicals. To generate free and fair trade at all levels in the chain it is important that these relationships are therefore considered both independently and across the chain, and that a test is applied to ensure that distortion does not exist or remain isolated at any one level.

9.2.1 Chemical Tariffs

In the accession negotiations, China accepted the quasi-totality of the Chemical Tariff Harmonisations Agreement (CTHA) that was agreed during the Uruguay Round. The CTHA harmonised chemical tariffs among the participating countries at the end of adapted phasing periods (5-10-15 years) at a level of 6.5 or 5.5%. After the Uruguay Round, acceptance of the CTHA has become a standard condition for entry of new members to the WTO. The lowering of Chinese chemical tariffs to bound CTHA levels has greatly contributed to the expansion of chemical trade and indeed to China's overall economic development, since all manufacturing sectors use chemicals as inputs for their products.

Together with its sister associations in the International Council of Chemical Associations (ICCA), the European chemical industry is advocating the elimination of all chemical tariffs in the context of a multilateral agreement at the Doha Round. This would apply to all countries having a viable chemical industry (production > \$3 billion per annum) which, given the fact that it has become the fourth biggest chemicals producer worldwide, includes China. It is important that China demonstrates to all other WTO members that it is prepared to liberalise in those sectors where it already is competitive. In chemicals, China should not take recourse to flexibilities as a newly acceded member of the WTO. As Cefic argues "Strength necessitates responsibility". With a view to the current status of multilateral trade talks, notably the Doha round, it is Cefic's position that, while the multilateral path would always be first choice, any bilateral deals in this area between Europe and China must not be ruled out, certainly if other key economic regions would engage in concluding Free Trade agreements (FTAs) with key markets for the EU.

In particular, the new generation of FTAs that the EU is pursuing, including issues such as regulatory convergence, dispute settlement, investment, IPR, etc. allow for going far beyond what is presently achievable in the context of the WTO. The EU is advised to closely monitor activities relating to bilateral and regional trade agreements of other key economic regions and to react promptly to avoid European companies suffering from reduced competitiveness as a result of such agreements on foreign markets.

9.2.2 Non-tariff barriers to trade

Considering the high competitiveness of the Chinese chemical industry, it is of particular importance to ensure that Chinese products enter the EU market at fair prices and conditions, while at the same time ensuring EU industry's free and non-discriminatory access to the Chinese market. A competitive level-playing field on the EU and the Chinese market is a key factor in maintaining European industry's competitiveness. Unfortunately, it has proven difficult, and time and resource consuming to tackle trade barriers in China - often with only meagre results. As also highlighted by those surveyed in the frame of this study, the European chemical industry is facing an increasing number of new and long-standing non-tariff barriers in its trade relations with China. Chemicals Industry representatives urge the Commission to ensure that the strategy for trade and investment takes corrective measures into consideration. Examples of these are Chinese import barriers against Active Pharmaceutical Ingredients, Chinese legislation on toxic chemicals, on new chemical substances, and export taxes on chemicals which have been brought to the attention of the European Commission.

A significant and growing NTB facing the global chemical industry is the divergence of regulatory schemes used to assure the protection of safety, health and environment. Incompatibilities among national regulatory systems that seek equivalent levels of protection pose considerable barriers to chemical exporters. The Chemicals Industry's key concern with China's present legislation is that it does not provide for intermediate notification requirements as is the case in most other jurisdictions. As a result, the data requirements in China for low volume chemicals are extremely restrictive because there is no differentiation at lower levels. Even the sending of a sample to China for testing requires a formal submission and approval from the authorities. The total cost for the testing requirements for one substance amounts to about €150, 000.

The present requirements, without a differentiated notification system for new substances (manufactured or imported), are likely to restrict the introduction of new technology and prevent companies from entering the Chinese market with new substances, which are most commonly supplied in quantities below 1000kg. One industry representative surveyed for this study had this to say: "There is still a lot of protectionism in the Chemicals industry. Sending samples overseas, moving chemicals and chemicals classification are all issues for us. The Chinese do not follow the international Global Harmonised System but they should. Under the current classification system, chemicals are not classified based on 'flash point' (as is the case in the US and EU). This means flammable chemicals are classified close to others. With our new plan to export 50% of our fine chemicals produced in China we would have to abide by these rules and these delays therefore benefit no-one."

The Commission should therefore call to extend the conditions made under Article 13 of the Law on the Registration of New Chemicals Substances for reduced testing schemes for low volume chemicals, thereby helping to develop a meaningful notification scheme that can continue to protect the population and the environment in China, but also allows business to introduce new technology through innovative substances.

9.2.3 Anti-Dumping and Implementation of the Reform Criteria for Market Economy Status (MES)

An open EU market for chemicals brings not only healthy competition but also potentially unfair trade practices, such as dumped or subsidised imports. The European chemical industry needs effective means to defend itself against such unfair trade practices and to restore fair competition. The EU's trade policy instruments are already amongst the most liberal in the world (e.g. lesser duty rule, granting of market economy treatment to specific companies, Community interest). On the other hand however, in the last five years, EU-based industries have been increasingly hit by anti-dumping proceedings brought by third countries, including China, which are not always conducted according to the letter and the spirit of the WTO Agreement.

As mentioned a number of times in this study, with regards to anti-dumping measures taken by the EU, chemicals are one of the most affected sectors, second only after steel products. As regards the main targeted countries, China is at the top of the place-list of countries affected by Cefic complaints. On this respect Cefic has expressed its concerns

in relation to the possible premature granting of market economy status to China, certainly if that step would not also be taken by the United States. Although Cefic has indicated that it recognises that China has made significant progress in its transition towards a market economy, the following are the key reasons why Cefic have requested to the Commission to grant MES for China only when:

- The rules and practices of a functioning market economy are fully implemented in China, which is clearly not yet the case. European chemical companies consider in particular that the Chinese government still holds an influence which largely distorts market conditions and companies' decisions.
- A thorough and impartial assessment of the business environment in China has been carried out, and the objective conditions that the EU has clearly spelt out for any country to graduate to MES have been fulfilled.
- The EU industry's possibility to act against unfair trade practices is not hampered. Transparency in Chinese Anti-dumping legislation is an issue.

9.2.4 Effective Enforcement of Intellectual Property Rights

Although China is supposed to respect the TRIPS Agreement, the enforcement of IP rights generally remains problematic. The European chemical producers are confronted with counterfeit products which are floated to the market with associated health and safety risks. To correct this situation, companies have to initiate court cases and in the meantime profits are eroded. Companies refrain from introducing patented products or production processes in China for fear of patent infringements.

9.2.4 Transparency of Policies Regarding Export Restrictions

The Commission should continue to urge China to present a comprehensive table on the export taxes, VAT reimbursement schemes, and other export restrictions, in particular on chemical industry raw materials such as fluorspar and phosphorous. The Commission reports that, so far, attempts to obtain such information have met with failure and show some deficiencies in the current implementation of WTO transparency requirements.

Box 7: Overview of policy recommendations for the EU:

1. Continue to pursue **agreement on an ambitious NAMA Agreement in the Doha Round that includes a chemical sector deal** in which all major chemical producing countries are participating, and notably China.
2. To take a much stronger stance **with China on non-tariff and technical barriers to trade, infringements and enforcement of intellectual property, and national treatment rules** (e.g. local content).
3. To convince China to implement the **WTO anti-dumping agreement** in line with global practice (no excessive questionnaires).
4. **Not to grant Market Economy Status to China unless** a number of key criteria have effectively been met and **overall progress regarding compliance with WTO agreements has been made**, and take this step only together with the USA to avoid distortion of trade.
5. To seek **regulatory dialogues with relevant Chinese ministries to work on non-tariff obstacles to trade** which are not necessarily WTO incompatible but which hinder trade.
6. Develop European strategy **anticipating bilateral Free Trade Agreements** between China and other emerging countries in the Asian region.
7. When formulating policies, a test must be applied to **ensure that distortion does not exist or remain isolated at any one level**.

9.2 General Policy Recommendations

Arguably, the lack of a level playing field in some chemical manufacturing and trading markets has generated significant competitive pressure upon European industry. European industry has responded by restructuring, reducing costs and, in some areas, closure of uncompetitive assets. Unfair competitive advantage remains for Chinese companies in some areas and this could generate further industry restructuring.

A growing volume of EU chemical exports actually reflects efforts to develop new, offshore markets – before massive new production capacity comes on stream in Asia and other parts of the world. Petrochemical imports from the Middle East meanwhile, are on the rise, reflecting substantial investment in local capacity. In the longer run, Europe's current high share of world exports are therefore unlikely to be sustained. Under certain scenarios, it is not unfeasible that the EU's chemicals trade surplus could turn into a deficit.

Within Europe, there is increasing concern among chemicals industry representatives that Europe's position as a major production and R&D base for the chemical industry is further being eroded largely due to self-inflicted burdens. This is the conclusion reached by a major Cefic study published in March, 2004 entitled 'Horizon 2015' (see **Annex 5**). In this report it is argued that the industry's long-term competitiveness can only be secured if industry and public authorities take decisive action together.

Cefic highlights three key policy areas of vital importance to the health of the chemicals industry. These are regulation, energy and transport. On all three counts, Cefic argues, Europe compares increasingly unfavourably to other regions.

- **Regulation:** On the regulatory front, the EU is continuing to tighten its health, safety and environmental laws, more than in most other parts of the world. Introducing a new chemical substance in the EU takes three times longer and costs 10 times more than in the US. A large number of industry representatives worry that further legislation is unlikely to make things easier or less costly in the future.
- **Energy:** The chemical industry is energy intensive. The liberalisation of EU gas and electricity markets however, is still far from completed, resulting in higher energy costs than in North America and Asia. European producers, meanwhile, are making successful efforts to meet the EU's greenhouse-gas commitments under the Kyoto Protocol.
- **Transport and logistics:** Europe's transport infrastructure is severely overloaded. Meanwhile, the liberalisation of transport services such as rail remains unfinished as is completion of a seamless, cross-border pipeline network for ethylene, propylene and other olefins. The result is that logistics costs are 13% higher in Europe than in the U.S., another important disadvantage for the EU chemical industry.

The extra cost burden is reflected in the European chemical industry's operating margins, which are substantially lower than those of its US-based competitors. This profitability gap has widened consistently over the past 10 years, reflecting Europe's weakening competitive position. As an importer of raw materials and as a major exporter of chemicals, it is all the more important for the EU to address the key competitive factors of regulation, energy and transport.

In securing the future innovative capability of the European chemicals industry (with important spill-over effects for the economy as a whole) investment in skills, primary research and R&D by the chemical sector in the EU compares unfavourably with other regions. In 2002, R&D expenditure as a percentage of sales amounted to 1.9% in the EU chemical industry – down from 2.4% in 1998. This is significantly less than R&D spending of 2.5% in the U.S. and 3% in Japan during 2002. Even more worrying for the long term, is the fast dwindling number of students graduating in chemical-related disciplines in Europe.

9.3 Recommendations for Competitiveness

Maintain competitiveness in sustainable technologies: European companies are world

leaders in terms of energy efficiency, environmental management, and the development of renewable materials. With these strengths maintained, they will be best-placed to benefit from new environmental standards and efficiency targets under the 11th Five Year Programme.

Leverage China cost advantages: Utilising China as a base for the production of specialty chemicals, which is particularly labour-intensive, will allow European companies to improve profit margins. Furthermore, the advantages of China's low-cost base could also be applied to certain R&D investments, providing companies with additional resources to improve competitiveness.

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ANNEX 1: THE CHINESE PETROCHEMICAL INDUSTRY

Development of the Petrochemical Industry in China

Historically there were no specifically defined segments for the chemicals market in China. Most chemical companies were organised under the roof of the Ministry of the Chemical Industry, and some others were either state- or commune-owned. These companies fulfilled dedicated tasks within the state-planning program to produce the relevant materials.

The development of China's petroleum and petrochemical industry can be roughly phased into three stages⁸⁷:

- 1) The first stage started with the discovery of the famous Daying Oil Field in northern Heilongjiang province and ended in 1978. During this stage several large-scale oil fields were developed and the capacities of some oil refining enterprises in the provinces of Gansu, Liaoning and Shandong were expanded. Yanshan Petrochemical Company in Beijing became China's first enterprise to boast ethylene production facilities with an annual capacity of 300,000 tonnes. This was the starting point of the petrochemical industry in China.
- 2) The second stage from 1978 to 1998 saw the establishment of a series of large-scale petrochemical industrial bases in the country. They are in Daqing, Yangzi (Jiangsu), Qilu (Shandong), Shanghai, Jilin and Maoming (Guangdong).
- 3) The period since 1998 is viewed as the third stage. In that year the government divided its assets into new corporations. The northern region with the larger oil reserves went to China National Petroleum Corp. (CNPC), whereas the southern region with less resources yet the large coastal market went to China Petroleum and Chemical Industry Corp. (Sinopec). China National Offshore and Oil Corp (CNOOC) was kept offshore. These three local giants in the industry, were later successfully listed on the stock-exchanges in London, New York and Hong-Kong in 2000, and their listed companies are called PetroChina, Sinopec Corp. and CNOOC Ltd. respectively.

Current Structure

The Chinese petrochemical and chemical industry is dominated by Sinopec (chemical business worth RMB 92bn in 2003) and

PetroChina (chemical business worth RMB 39bn in 2003), Sinochem and CNOOC (until 2003 virtually no chemical business). They are the big four in China. Yet other companies are getting stronger either by means of mergers and acquisitions (e.g. ChemChina) or organic growth. These Chinese companies might become very strong competitors in their respective fields. CNPC and Sinopec have formed a complete business system ranging from oil and gas exploitation to sales of finished products. They dominate production of ethylene, petrochemical intermediates and downstream products in China, with their combined capacity accounting for over 90% of the country's total. In 2004, of the 18 ethylene plants in China, 16 were owned by the two giants⁸⁸. Consequently, China's market for petrochemical and chemical products is served by large domestic petrochemical producers, by imports brought in by many local fragmented companies and by some multinationals. **Figure 18** displays the structure of the petrochemical and chemical market in China

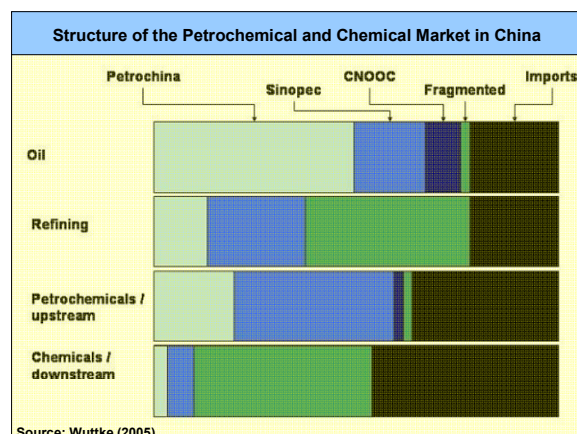


Figure 18: Structure of the petrochemical and chemical market in China

Table 14 shows China's Top 20 domestic players in the petrochemical and chemical industry: With sales in 2004 of over RMB 624.37bn, Sinopec has emerged as the biggest Asian chemical company - a measure of the growing international importance of China's chemical industry. Chinese chemical companies are also restructuring to bring their efficiency and profitability up to international standards. This involves mainly cost cutting, but several merger and acquisition deals have taken place, the most notable being the merger that created ChemChina.

Table 14: China's Petrochemical and Chemical – Top 20

Rank	Company	Sales 2004 [R bn]
1	Sinopec	624.37 (1)
2	Petrochina	560.36 (1)
3	Sinochem	162.00 (1)
4	China National Offshore Oil Corp.	70.08 (1)
5	Shanghai Huayi Group	25.75
6	Tianjin Bohai Chemical	16.20
7	Shandong Haihua Group	10.72
8	Shandong Binhua Group	10.40
9	GITI TireInvestment Co.	8.62
10	Xianglu Petrochemical Xiamen Co.	5.67
11	Shandong Chengshan Group	5.19
12	Liaoning Huajin Chemical	5.18
13	Hangzhou Zhongce Rubber Co.	5.13
14	Doublestar Group Corp.	4.58
15	Jiangsu Lingguang Group	4.43
16	Jiangsu Cheng Xing Phosph Chemicals	4.36
17	Shandong Lubei Enterprises Group	4.35
18	China Shenma Group	4.16
19	Yuntianhua Group Co.	4.13
20	Kaiping Polyester Enterprises Group	4.00

(1) Includes non-chemical sales.

Sources: Chemicals Weekly 2005, SRI Consulting (Beijing)

Sinopec

China Petroleum & Chemical Corporation (Sinopec) was set up on February 28, 2000 by China Petrochemical Corporation (Sinopec Group) as the sole sponsor. The rationale behind the creation of Sinopec Corp. was to "diversify the ownership structure, abide by the rules of the market economy, and establish a modern enterprise system"⁸⁹

China Petrochemical Corporation, the sole initiator of Sinopec, is a super-large petroleum and petrochemical group restructured and established by the State in 1998 on the basis of the former China Petrochemical Corporation. It is a state-owned company invested by the State, functioning as a state-authorized investment institution in which the State holds the controlling share.

Sinopec Corp. is a vertically integrated energy and chemical company. The scope of business covers:

- exploration, development, production and marketing of crude oil and natural gas,
- oil refining and marketing
- production and sales of petrochemicals, chemical fibres, chemical fertilisers, and other chemicals

- storage and pipeline transportation of crude oil and natural gas
- import and export and import/export agency business of crude oil, natural gas, refined oil products, petrochemicals, chemicals, and other commodities and technologies

It is China's largest producer and marketer of oil products (both wholesale and retail of gasoline, diesel, jet fuel), and No.1 supplier of major petrochemical products (intermediates, synthetic resin, synthetic fibre, synthetic rubber, fertiliser) as well as the 2nd largest crude oil producer. As **Table 15** shows, chemicals account only for 13% of Sinopec's sales in 2004

Table 15: Sinopec's Sales by Division (sales in 2003, 2004, CSFB's estimation for 2005)

Year	2003	2004	2005e
Refinery	273,830	358,273	449,369
E&L	70,263	85,305	103,059
Chemicals	92,333	166,765	214,636
Marketing	29,134	36,425	38,256
Total	465,56	646,768	805,32

Source 2005 estimates: CSFB (2005)

Sinopec does not report sales from different chemicals segments. The capacities for various chemicals are listed in **Table 16**:

Table 16: Sinopec's Capacities or Various Chemicals

Capacity listing	'000 tons
Ethylene	3,895
Styrene	464
PX	1,759
PE	2,663
PP	2533
PVC	322.5
PS	216
PTA/DMT	2360
EG	732.6
Acrylonitrile	250
Polyester chips	2,606.6
Polyester fibre	1,448.4
Acrylic fibre	314.8
Rubber	510.5
Others	2,096.9

Sinopec Shanghai Petrochemical Company (SPC)

Shanghai Petrochemical, a subsidiary of China's top refiner Sinopec, is one of the largest petrochemical companies in the PRC. Located in Jinshan District in the southwest of Shanghai, it is a highly integrated petrochemical complex which processes crude oil into a broad range of synthetic fibres, resins and plastics, intermediate petrochemicals and petroleum products.

Business Description

SPC is one of the largest petrochemical enterprises in China. It is also one of the largest Chinese producers of ethylene, an important intermediate petrochemical used in the production of synthetic fibres, resins and plastics. It also produces petroleum based fuels and oils and other intermediate petrochemicals such as benzene. The company produces over 60 different types of products. Its business is divided into five reportable divisions: synthetic fibres, resins and plastics, intermediate petrochemicals, petroleum products and others⁹⁰. Synthetic fibre includes products like acrylic and polyester yarn. The petrochemical division produces some important chemicals like naphtha, benzene and PTA among others. SPC also produces various fuels like LPG, lead free gasoline, diesel and industrial fuel. SPC sells its products in the Chinese markets, deriving most of its revenues from customers in eastern China. The company has 66 main production plants (2004) that are involved in oil refining, petrochemical processing and manufacturing of synthetic fibres and plastics⁹¹.

Major Products

SPC is one of the largest petrochemical enterprises in China offering a range of petrochemical products:

- Synthetic fibre
- Resins
- Plastics
- Intermediate petrochemical and petroleum products

Revenues

The company recorded revenues of RMB 29.5 bn (approximately \$ 3.555 m.) during the fiscal year ended December 2003. SPC generates revenues through its five business divisions⁹²:

- petroleum products (36.7% of total revenues during fiscal 2003)
- resins and plastics (30.2%)
- intermediate petrochemicals (12.9%)
- synthetic fibers (13.9%)
- others (6.1%).

Revenues by Geography

Eastern China, SPC's largest geographical market, accounted for 89.1% of the company's total revenues in the fiscal year 2003. Revenues from Eastern China reached RMB 26.2 bn (approximately \$3,169 mio.) in 2003. Other regions in China accounted for 5.7% of the total revenues. Exports accounted for 5.1% of the total revenues.

PetroChina

China's second-biggest chemical producer, PetroChina, is also best known as an oil company. PetroChina does not publish separate sales and earnings figures for its chemical business. However, the company is preparing to increase its chemical sales substantially, and is building ethylene plants at Chengdu, Dushanzi, and Lanzhou.

SinoChem

Sinochem, China's third-biggest player, is best known as a trader of petrochemicals, as well as oil and petroleum products. But the company is also China's biggest producer of phosphate and NPK fertilizers, as well as a leading producer of nitrogen and potash fertilizers. Sinochem transferred its fertilizer business to its Hong Kong-listed subsidiary Sinochem Hong Kong Holdings (SHK) last July, giving Sinochem its first overseas listing. SHK is striving to become the largest and strongest fertilizer producer and distributor in China.

CNOOC

China's fourth-biggest chemical company, CNOOC, is likely to post a big increase in chemical sales and profits in 2005. CNOOC started up an ethylene complex at Daya Bay, near Huizhou, in a JV with Shell Chemicals--

project that will soon have a major impact on CNOOC's financial results.

ChemChina

ChemChina was created in 2004 by the merger of China National BlueStar Group and China National Haohua Chemical. The merger brought together businesses with combined 2004 sales of RMB 60 billion, which would have placed ChemChina fifth in the Chinese chemical company rankings. ChemChina is

expanding its presence overseas via acquisitions. The company completed the purchase last month of animal nutrition business Adisseo (Antony, France) from private equity capital company CVC Capital Partners and agreed last year to buy the Qenos (Melbourne) olefins and polyethylene business from Orica and ExxonMobil . ChemChina says it plans to increase sales to RMB 100 billion/year by 2010 through further acquisitions and investment projects.

ANNEX 2: SWOT SUMMARIES (PER SUB-SECTOR)

Chemicals Market Overview

Strengths	Weaknesses
<ul style="list-style-type: none"> • Growth in chemicals demand in recent years: CAGR 10+ percent • China No. 2 chemical market worldwide behind the US • Main clients of chemical shifted business activities to China - attracted by the Chinese sales prospects and cost advantages • High competitiveness of domestic capacity: 1) Lower investment costs in China; 2) Lower personnel costs; 3) Favourable tax treatment 	<ul style="list-style-type: none"> • Commodity-type chemicals dominate: Basic chemicals (including plastics & polymers) share about 60% • Environment problems • Poor logistics: Insufficient freight capacity and poor road and rail infrastructure • Power shortage; especially electricity-intensive sectors such as chlor-alkali and PVC are affected
Opportunities	Threats
<ul style="list-style-type: none"> • Chinese demand will grow at 5.5%, almost twice the growth rate of global chemical demand • Import growth 10%, since domestic capacity build-up not fast enough to keep up with the growth in local demand • Markets for specialty chemicals, consumer chemicals and fine chemicals will show strong growth • Chinese domestic production base will benefit from governmental decision to crack down on certain chemical products (in order to avoid overheating of economy) 	<ul style="list-style-type: none"> • Legislation regarding manufacture and import of new chemical substances does not provide for intermediate notification requirements → data requirements for low volume chemicals are extremely restrictive (even for sending samples) → restricted introduction of new technologies & new substances • Labour shortage for chemical companies in some coastal areas

European Chemical Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • Technology • Global customer base • International sales & marketing network • Economy-of-scale • Locations in areas of good logistics (Caojing and Nanjing sites) 	<ul style="list-style-type: none"> • Unfavourable labour cost position • Costs due to high environmental standards in Europe
Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • Participating from domestic growth (see “The Chinese chemicals markets/ strengths”) • Acquisition opportunities due to consolidation in Chinese chemical industry • Growing imports into China (CAGR 10%) • Reduced obstacles for chemicals imports since 2001. Import tariffs reduced from 15% to about 4-7%. (<u>Nevertheless</u>, given the huge size of China’s chemical market and the high competitiveness of Chinas local production, import tariffs are considered as still relatively high) • Local governments in China competing fiercely to attract foreign investment • Favourable tax treatment for investments in China: No tax in the first 2 years in Jiangsu province (includes Nanjing and Caojing); half the rate for the following three years) • Timing for approvals <u>might</u> no longer be a major issue: More authority for local authorities to approve foreign investment projects. Time will show, however, whether this will really lead to a speed-up in project approvals. • Expansion of higher environmental standards would favour European chemical makers in China 	<ul style="list-style-type: none"> • Chinese companies will become larger and more competitive • Long delays to chemical investment projects by overseas companies in China, caused by government bureaucracy and inefficiency • Very strict environmental standards for foreign investments; whereas provincial and local governments still try to help local industries • Divergence of regulatory schemes used to assure the protection of safety, health and environment • Poor IPR compliance of Chinese competitors
	Threats in international markets from Chinese competitors
	<ul style="list-style-type: none"> • Poor IPR compliance of Chinese competitors • As regards anti-dumping measures taken by the EU, chemicals are one of the most affected sectors (22% of total cases); as regards the main targeted countries, China is at the top of the place-list of countries affected by Cefic complaints • Threats due to increased competitiveness of Chinese competitors: for fine chemicals already existing; for specialty chemicals: threats in the mid-term; for basic chemicals companies: threats in the long term

Chinese Chemical Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • Advantage labour costs • Access to low-cost technology and low cost R&D 	<ul style="list-style-type: none"> • Most Chinese companies have sub-scale plants with fairly inefficient operations • Management is often a weakness
Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • Participating from domestic growth (see “The Chinese chemicals markets / Strengths”) 	<ul style="list-style-type: none"> • Increased operational costs for Chinese companies due to recently introduced safety requirements; some poorer performing companies forced to reduce certain economic activities • Chinese competitors forced to invest in expensive environmental abatement equipment (result of increased government control) • Government decided to crack down on certain chemical products (hazardous) and investment in less efficient and smaller-sized chemical plants (in order to avoid overheating of economy)
Opportunities in international markets	
<ul style="list-style-type: none"> • Opportunities exist especially for Chinese companies from fine chemicals sub-sector, in the mid-term also for companies from the specialty chemicals sub-sector 	

The Chinese Petrochemicals Market

Strengths	Weaknesses
<ul style="list-style-type: none"> • Huge demand for polymers, driven by domestic consumption and China's process export business • Huge demand for basic chemicals 	<ul style="list-style-type: none"> • Overcapacity for selected polymers such as polyethylene terephthalate (PET)
Opportunities	Threats
<ul style="list-style-type: none"> • China will continue to be a net importer for polymers and basic chemicals 	<ul style="list-style-type: none"> • See under “Chemical industry – general aspects”

European Commodity Chemical Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • Economy-of-scale • Technology • Long-term access to feedstock (petrol and gas) • Cost competitiveness of the new ethylene domestic plants of BASF, BP and Shell against local producers and importers from Asia • Favourable cost position in the ethylene chain for higher value derivatives, such as ethanolamines, polyurethanes and acetic acid due to recently established plants 	<ul style="list-style-type: none"> • Domestic production of basic chemicals or polymers started with delay (project approval) in mid 2005
Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • In the short and medium term, those European chemical companies having invested in basic chemical plants in China, will especially benefit from current chemical demand. • The start-up of 3 major ethylene crackers co-owned by Western companies (BASF, BP, Shell) will likely reduce China's import on plastics • Most products in the petrochemicals chain likely to remain in domestic deficit 	<ul style="list-style-type: none"> • US (Exxon Mobile) and most probably Taiwanese (Formosa) and Saudi Arabian (Sabic, Aramco) companies start ethylene crackers before 2010
	Threats in international markets from Chinese competitors
	<ul style="list-style-type: none"> • Chinese petrochemical companies will compete with European companies for access to global petrochemical feedstock • China likely to become a net exporter of polyvinyl Chloride (PVC) soon

Chinese Commodity Chemical Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • Consolidation led to 3 strong Chinese petrochemical players • Major petrochemical players such as Sinopec progressed considerably in the past few years 	<ul style="list-style-type: none"> • Lack of economy-of-scale • World-scale plants of Chinese basic chemical manufactures are based on JVs with Western Partners. • Even technology leader Shanghai Petrochemical, has only 5% of its revenues from exports • Domestic prices are 20 to 30 percent higher compared with the average prices of ethylene products from neighbouring countries like Japan and ROK (no valid for the new JVs) • No substantial domestic players in TDI, MDI or polycarbonate - despite strong domestic demand

Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • Consolidation of Chinese basic chemical industry (efficiency and profitability up to international standards): Cost cutting, M&A deals • Chinese basic chemical manufactures will be able to set-up world-scale plants on their own 	<ul style="list-style-type: none"> • Higher pressure from overseas companies which have recently invested in China. Chinese companies as domestic facilities are mostly sub-scale. • Chinese electricity-intensive sectors such as chlor-alkali and PVC affected from power shortages
Opportunities in international markets	
<ul style="list-style-type: none"> • Companies like Sinopec or Petrochem are acquiring overseas assets to secure long-term access to petrochemical feedstock. • Chinese petrochemical companies starting to acquire production assets in foreign countries 	

The Chinese Fine Chemicals Market

Strengths	Weaknesses
<ul style="list-style-type: none"> • Annual growth rate of Chinese fine chemicals market 10% 	<ul style="list-style-type: none"> • Low entry barriers for new emerging competitors due to low investment, low-cost and often low-tech production • Dramatic overcapacity and fierce price competition • Highly fragmented industry
Opportunities	Threats
<ul style="list-style-type: none"> • Growth rate of 10% will continue 	<ul style="list-style-type: none"> • See under “Chemical industry – general aspects • Market will continue to be extremely price-driven. Strategies targeted to achieve product differentiation not be important even for the next ten years

European Fine chemicals Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • European companies are global leaders (Degussa, Lonza, DSM etc.) • Technology competence 	<ul style="list-style-type: none"> • See under “Chemical industry – general aspects” • Unfavourable Labour cost position (R&D, marketing)
Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • Acquisition opportunities for European fine Chemical companies due to industry consolidation 	<ul style="list-style-type: none"> • Increased competitiveness of Chinese competitors
	Threats in international markets from Chinese competitors
	<ul style="list-style-type: none"> • Even in their home markets, European custom synthesis or building blocks suppliers, face aggressive competition from China

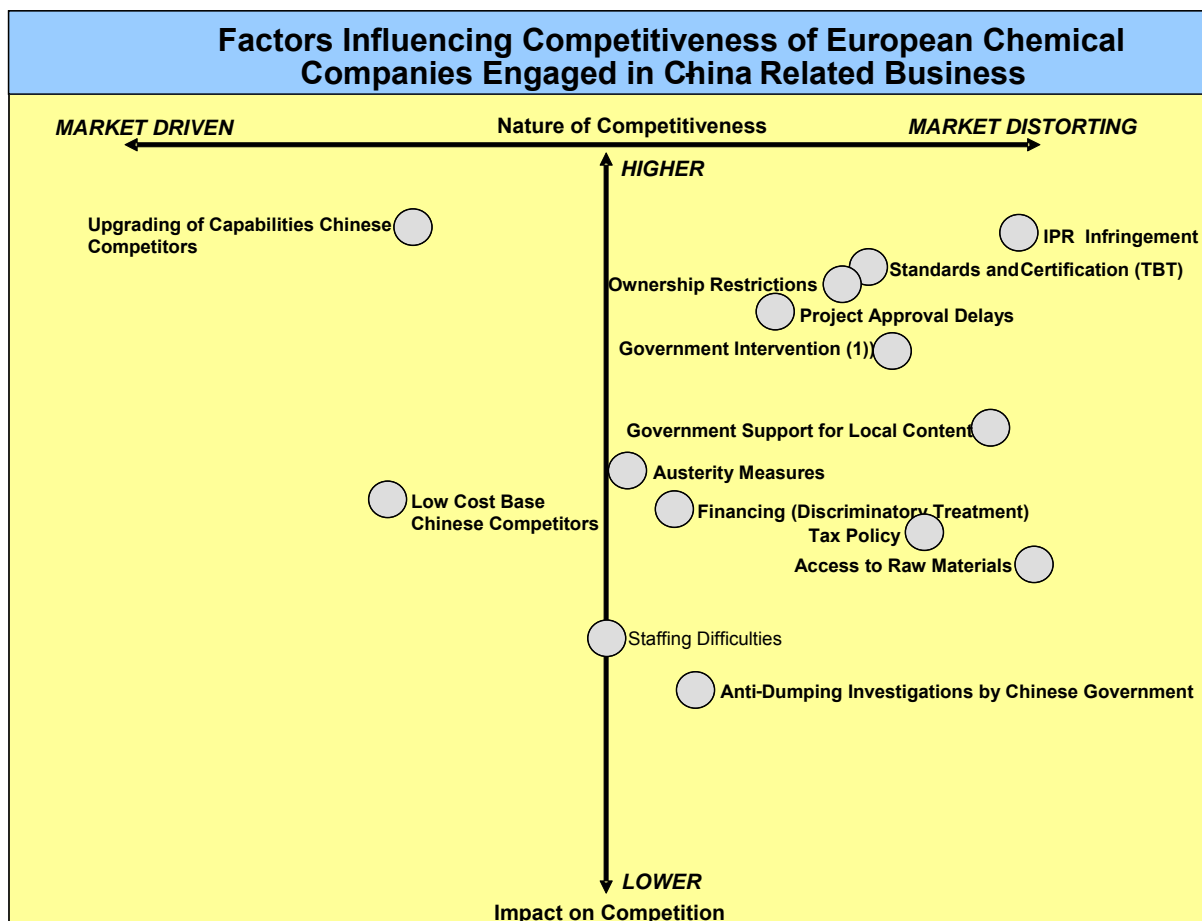
Chinese Fine Chemicals Companies

Strengths	Weaknesses
<ul style="list-style-type: none"> • Superior cost position for the following reasons: access to low-cost research at universities and institutes; low labour costs, (especially important in custom synthesis/ building blocks, where production runs are usually small and labour intensive); access to low-cost engineering; low capital requirements. • Recent competitiveness improvements: improving marketing, implementing an IT platform, upgrading technology competence) • Knowledge of local niche markets 	<ul style="list-style-type: none"> • Lack of track record • Barriers to build business relationships (different business and cultural practices) • Reliability of supply is still low
Opportunities in the Chinese market	Threats in the Chinese market
<ul style="list-style-type: none"> • Benefit from 10% growth in domestic market 	<ul style="list-style-type: none"> • See under “Chemical industry – general aspects”
Opportunities in international markets	Threats in international markets
<ul style="list-style-type: none"> • improve competitive position by acquisitions 	<ul style="list-style-type: none"> • None identified

ANNEX 3: FACTORS INFLUENCING COMPETITIVENESS IN THE CHINESE MARKET

In addition to the genuine market driven competitive threats posed by Chinese operators in this sector, European companies also face competitive forces as a result of non-tariff or 'behind the border' barriers. The following sections list these NTBs, and provide a brief qualitative description derived both from desk research, and the results of the industry survey. Those NTBs which are deemed to result from strong Chinese government intervention are plotted on the

right of the horizontal axis while those derived from genuine competition are plotted to the left. The author has indicated the relative importance of these competitive forces in terms of their position on the vertical axis with those nearer the top deemed as the most significant. The graph is designed as a guide only to give some perspective to the descriptions of competitive forces in this sector.



Notes: (1) Government Intervention here refers to: State and local authority influence upon availability and allocation of capital, energy and government set ROI targets limiting progress towards a free market. In addition state share ownership in some companies creates a distortion of a free market for M&A.

ANNEX 4: TARIFFS ON SELECTED CHEMICALS

Product	2000 tariff [%]	WTO agreed term		
		tariff [%]	Effective Year	
Crude oil		RMB 16 per ton	0	2000
Naphtha	6	6	6.5	2000
PE	18	6.5	6.5	2008
PP	16	6.5	6.5	2008
PS	16	6.5	6.5	2008
Styrene	9	2	6.5	2005
ABS	16	6.5	6.5	2008
Ethylene	5	2	6.5	2003
Ethylene glycol	14	7	6.5	2003
Acrylic esters	9	6.5	6.5	2001
Acrylic acid	9	6.5	6.5	2001
Methylamines	9	6.5	6.5	2001
C4-oxo alcohols	8.5	5	6.5	2001
Formic acid	9	6.5	6.5	2001
Propionic acid	6	5.5	6.5	2000
DMF	8	6.5	6.5	2001
Isocyanates	10	6.5	6.5	2003
Nylon-66	16	6.5	6.5	2005
Nylon-6	10	9	6.5	2005
Polyester	19	5	6.5	2005

ANNEX 5: CEFIC SCENARIOS REGARDING THE FUTURE DEVELOPMENT OF THE EUROPEAN CHEMICAL INDUSTRY

In 2002, the EU authorities requested a view allowing them to understand better the long-term prospects of the European chemical industry and to act accordingly. Therefore the European chemical industry Council Cefic (www.cefic.be) started a scenario initiative. The decision was made to establish a consensus on a set of scenarios based on a comprehensive analysis of the global market environment. The geographic scope was focused on the EU 15 with additional consideration of the 10 new EU member states.

In a first step, four macroeconomic scenarios ("deep dive", "slalom", "heavy weight", "high jump") were developed to differentiate the future development with regard to the driving forces of Globalisation, EU Enlargement, EU Governance, Social Responsibility, EU Competitiveness, Sustainability, Demographics/Migration and Innovation / Lisbon Agenda. Despite the enormous efforts invested in the modelling of the four macroeconomic scenarios, they seem not to differentiate a lot with respect to the expected GDP growth rate (ranging between "deep dive": GDP 1.7% p.a.: "high jump" GPP 2.6% p.a.). But, because of the huge leverage effect, even small differences count.

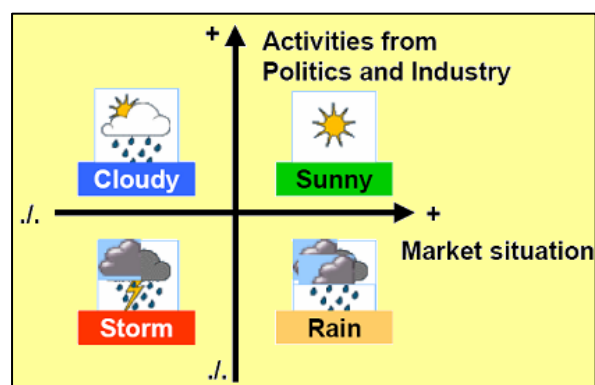
The next step after macroeconomic modelling was the development of chemical industry specific scenarios. At the centre of all reflections on the future of the European chemical industry is the competitiveness of the industry in the global context. Competitiveness is threatened by a combination of factors, first of all by the regulatory environment, especially the new REACH chemicals policy [sic]. But also higher energy prices, higher logistics costs and a business environment that is generally not promoting innovation are playing an important role. The pressure on chemical prices caused by increasing commoditisation,

customer trends and growing competition from Asia and the Middle East is seen as an already considerable threat. On the other hand, the industry itself has the power to increase its competitiveness by restructuring and improving its operational performance, by making use of improved marketing & sales excellence and more market and customer orientation, and by more, and sustainable innovation.





These driving forces are reflected in the four industry scenarios:

- Sunny: A revitalized EU chemical industry with increased innovation and customer orientation
- Cloudy: A focused EU chemical industry with strengths in high-end products and sustainability
- Rain: A EU chemical industry without confidence in the attractiveness of the European market
- Storm: A shrinking EU chemical industry not able to beat imports

The four scenarios reflect two major dimensions (see figure below): a) the market situation and b) activities from politics and industry.



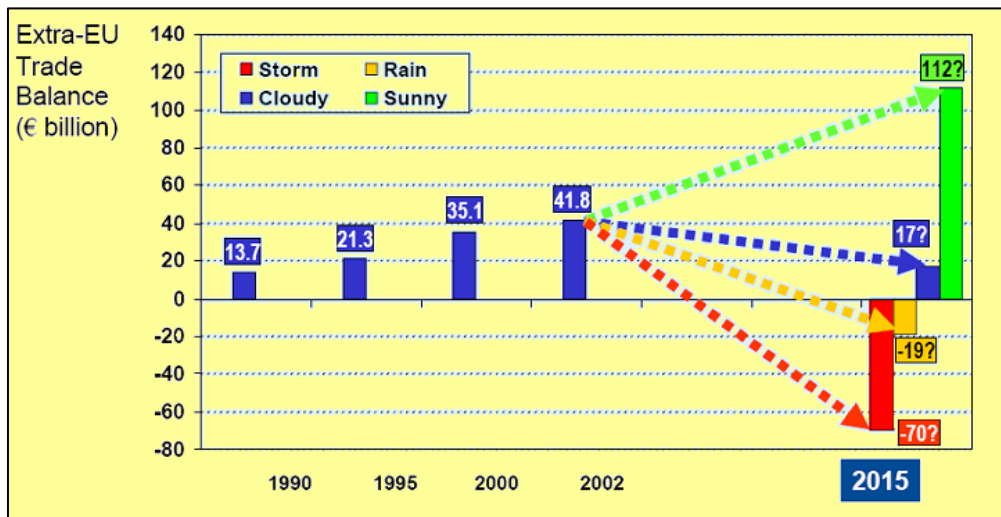
In terms of quantification of the four chemical industry scenarios, the future chemical demand growth differs only by 1.0 % p. a.

	 Sunny	 Cloudy	 Rain	 Storm
EU Chemical Industry	++	- +	+ -	--
GDP *)	2.5	2.2	2.1	1.7
Chemicals Demand *)	2.5	2.1	1.9	1.5
Petrochemicals / Plastics **)	3.5	3.0	2.1	1.7
Specialties / Fine Chemicals **)	3.7	2.7	2.5	1.7
Chemicals Production	3.3	1.6	0.8	- 0.6
Petrochemicals / Plastics **)	3.5	2.0	- 0.5	- 2.0
Specialties / Fine Chemicals **)	5.0	1.0	1.5	- 1.5

*) Global Insight Data, August 2003;
 **) Petchems / Specialties = working groups, July/ September 2003

But looking at the production side, which reflects competitiveness, the negative scenarios show slow or negative growth in contrast to the positive scenarios with moderate and strong growth. What that

really means is even better reflected by looking at the; chemical trade position which turns negative if industry and politicians do not act proactively.



The general lesson from this scenario approach is that, by joint action of politicians and industry, the competitiveness of the EU chemical industry could be defended or even improved. But without political support the EU chemical industry would lose competitiveness and, in a negative market situation, this could even lead to a shrinking EU chemical industry with a negative impact on the whole European manufacturing industry because of the high importance of chemicals for the production and innovation

of finished goods. However, the scenario approach also showed the importance of actions by the industry itself. It has the chance to improve even by increasing competition, but there is a high risk of losing out if it does not take proactive action. The demands for actions from the political side are

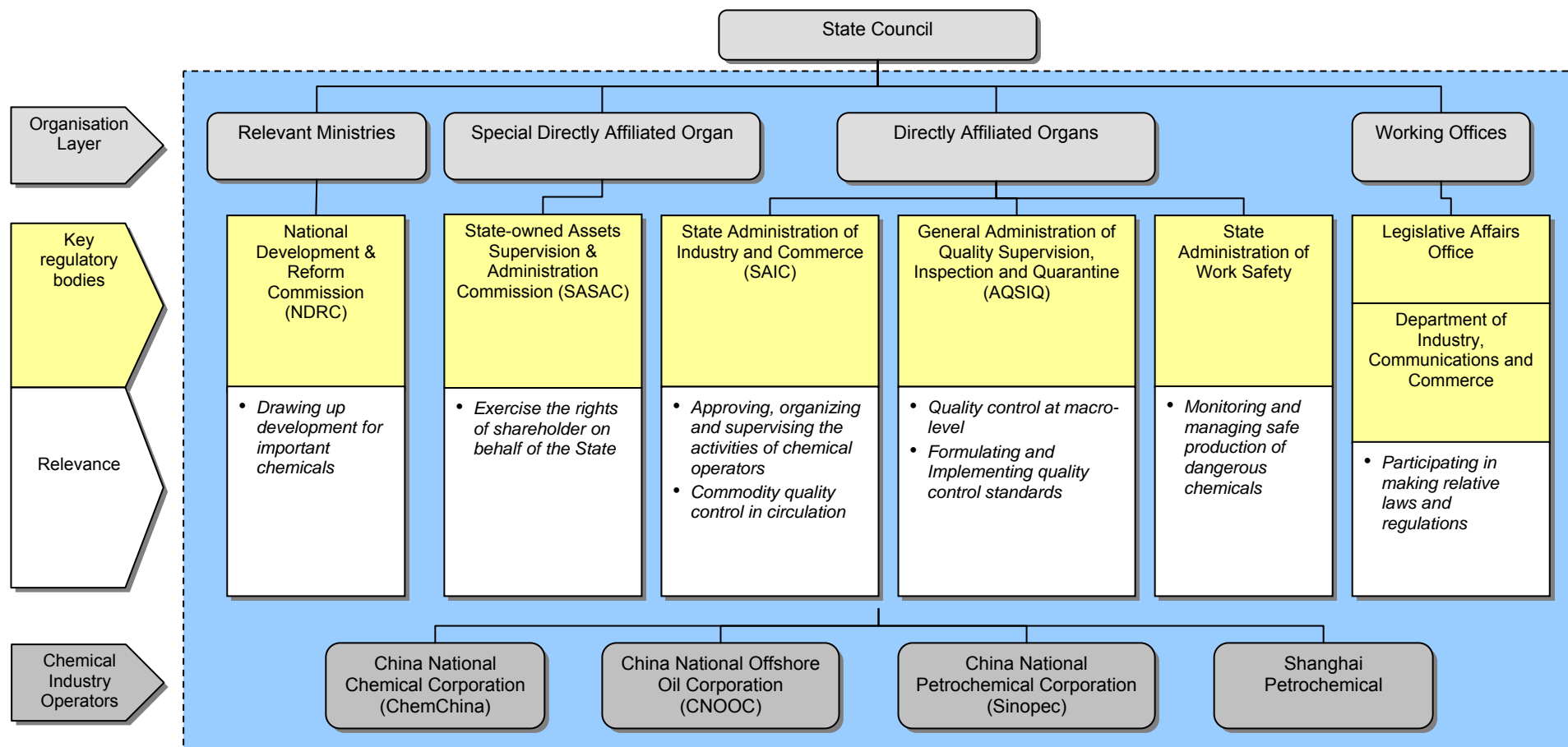
- a balanced chemicals policy
- incentives for innovation
- non-bureaucratic regulations

ANNEX 6: CHINA STRATEGIES OF SOME SELECTED MAJOR EUROPEAN CHEMICAL COMPANIES

Company	Nature of activity and business model	Current products in China	Strategy	Positioning
Akzo Nobel	Trading in all three segments; more than 20 production plants	Coating powders, other coatings, dyes	To expand leading role in coating powders through local production; investment in double-digit millions planned	Leader in powder coatings
BASF	Trading in four out of five segments; oil and gas the exception, both production sites (12) and sales offices (18); BASF has then wholly owned subsidiaries and 9 JVs	Chemicals, performance products, plastics, agricultural products and nutrition	Focus on ethylene and plastics production; China destination for two thirds of Asian investment in the years 2000 to 2005. Invests with partners US\$ 2.9 billion in Nanjing until 2005 and EUR US\$ 1.3 billion in Caojing until 2006	One of biggest international players in China, but still on small side compared with local players
Bayer	Trading in all three segment; both production and sales subsidiaries	Rubber chemicals, leather chemicals, pharmaceuticals (Canesten, Talcid, Blucobay and Nimotop), crop protection products, pigments, polycarbonate intermediates, veterinary medicines, coating raw materials, polyurethane production systems	Focus on polymers production (polycarbonate, coating raw materials incl. starter materials, raw materials for polyurethane production); start made in Nov. 2001 on biggest investment project in Caojing (total US\$ 3.1 billion)	Strong position in polymers; therefore investment focused mainly on this segment where local producers are still thin on ground; local players dominant in chemicals.
Degussa	Four out of five divisions; Degussa sees China as the driving economic power in Asia and intends to significantly expand its activities in China in future. Is pursuing a "strategy of three developments": developing employee skills, new technologies and the market	Carbon black, amino acids, polyurethane foam additives, water treatment chemicals, construction chemicals, initiators for plastics production	Planned investment: more than EUR 100 million; Degussa is planning to build a so-called "multi user site" in China that will create the infrastructure for all Degussa's divisions (kick-start function) and also a large number of smaller projects.	Market leadership already achieved in individual divisions

Status: End of 2003

ANNEX 7: RELEVANT GOVERNMENT INSTITUTIONS FOR CHINA'S CHEMICALS SECTOR



ANNEX 8: TABLE OF KEY LAWS AND REGULATIONS PERTAINING TO CHEMICALS SECTOR

Table 17: Key laws and regulations pertaining to Chemicals sector

Sub-Sector	Key Laws and Regulations
<p>I) All</p>	<p>Regulations for Safety Control of Dangerous Chemical Products amended on : 26th January 2002 Effective Date: 15th March 2002, Decree 344 promulgated by State Council</p> <p>Provisions on the Environmental Administration of New Chemical substances (reference translation) issued on: 12 September 2003. Effective as of: 15 October 2003 With supporting “New Chemical Substance Notification guidelines” published in December 2003</p> <p>Circular on Issuing the Management Provision on the Import/Export of ODS(SEPA [1999] No. 278)</p> <p>“Provisions of the People's Republic of China on Environmental Management of Chemicals imported for the First Time and the Import and Export of Poisonous Chemicals” 1 March 1994 effective on March 16, 1994, and related detailed rules for implementation.</p> <p>“List of severely restrictive toxic chemicals” amended by SEPA on 27 December 2005) In addition, the Chinese authorities submitted on 31 December 2005 a list of toxic chemicals banned in China (Chinese Customs Announcement 116/2005).</p>
<p>II) Commodity Chemicals</p>	<p>Regulations of the People’s Republic of China on the Exploitation of Offshore Petroleum Resources in Cooperation with Foreign Enterprises amended on Sep.23, 2001.</p> <p>Regulations of the People’s Republic of China on Sino-foreign Cooperation in the Exploitation of Continental Petroleum Resources, amended on Sept.20, 2001 according to China’s Commitments concerned.</p> <p>Provisional Measures for Administration of the Market of Processed Oil amended on 1 Jan 2005</p>
<p>III) Specialty and Fine Chemicals</p>	<p>Regulations on the Export Control of Certain Chemicals and Related Equipment and Technologies Oct 19, 2002</p>

ANNEX 9: INDUSTRY SURVEY RESULTS

Chemical Industry

SECTION 1: SECTOR OVERVIEW

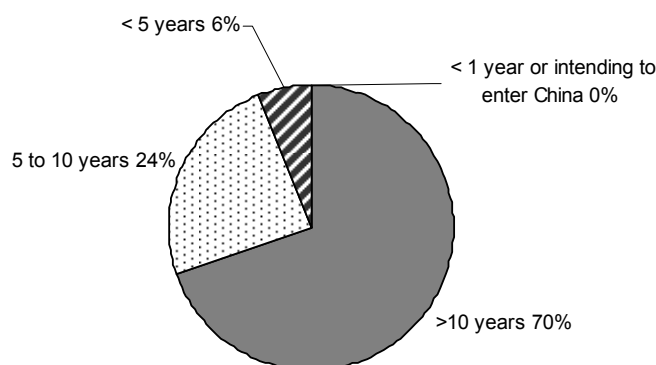
1.1 Sample group profile

Table 1 – Sample Group Profile

Company Type	#	Total	% of sample
MNC		29	97%
WFOE	4		
JV	2		
Both	3		
Unknown	20		
SME	1	1	3%
WFOE			
JV		-	
Total		30	100%

1.2 For how many years has your company engaged in China-related business?

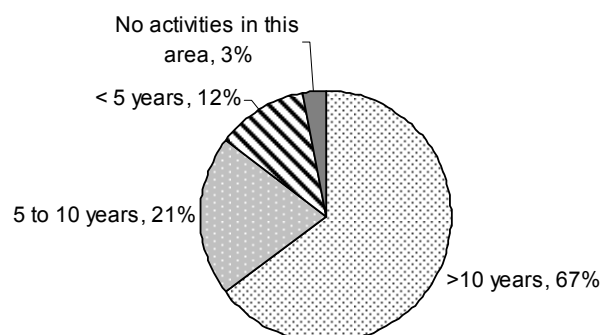
Chart 1 – Length of Engagement in China-related Business Activities



A large majority (94%) of companies interviewed has been engaged in China-related activities for 5 or more years, and 70% have been in China for more than 10 years. This reflects how well established European chemical companies are in China. Market entrants (those entering in the last 5 years) are few and made up only 6% of those surveyed.

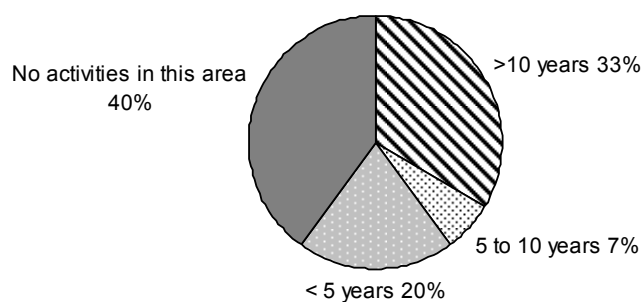
1.3 Please specify which business activities you have in China and for how many years.

Chart 2 – Length of Engagement in China-related Sales Activities



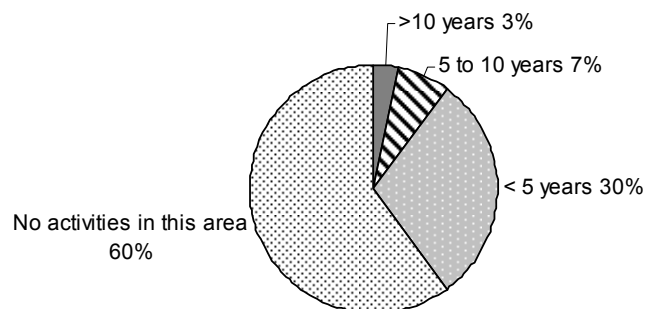
Companies with more than 10 years of sales activities in China comprise 67% of the sample group. 21% has between 5 and 10 years of sales experience in China and 12% had less than five years. 3% of companies were not engaged in any sales activities in China.

Chart 3 – Length of Engagement in China-related Production Activities



Approximately one-third of respondents (33%) reported having more than 10 years of production activity in China. 7% reported between 5 and 10 years of engagement in production activities, and a significant proportion have less than 5 years (20%) or no engagement at all (40%) in China-related production.

Chart 4 – Length of Engagement in China-related R & D Activities



The majority of the European companies interviewed (60%) are not engaged in R&D activities in China. 30% reported less than 5 years of engagement, and only 3% reported having more than 5 years of R&D experience in China.

1.4 Which market segments does your China business operate in?

a) Your company’s segments (as used in your annual reports, company presentations, etc.).

Table 2 – Market Segment Involvement (as defined by company)

Market Segment	Total	%
Base Chemicals	9	21.4%
Fine & Specialty	22	52.4%
Cosmetics & Perfumes	0	0.0%
Other	11	26.2%
Total	42	100%

Many European companies reported being involved in more than one market segment. 52.4% of the respondents indicated involvement in Fine and Specialty chemicals. 21.4% of companies described involvement in the Base Chemicals sector. None of the respondents in this sample group are involved in Cosmetics and Perfumes. Responses in the category of “other” market segments include: technology licenses, other specialty chemicals, food, photo, and industrial gases.

b) Segments as used by CEFIC (European Chemical Industry Council). (Please specify percentage of sales in China (rough estimation).)

Table 3 – Market Segment Involvement (as defined by CEFIC)

Market Segment	No. of responses	~% of sales	No. of responses %
Other spec Chem	17	81	31.5%
Fine chemicals	8	40	14.8%
Plastic & Synth.	8	30	14.8%
Petrochemicals	7	34	13.0%
Paints & Inks	6	<5	11.1%
Soaps & detergent	2	<5	3.7%
Other basic inorg	2	<5	3.7%
Industrial gases	2	100	3.7%
Man-made fibres	1	60	1.9%
Crop protection	1	<5	1.9%
Perfumes & cos	0	*	0.0%
Fertilizers	0	*	0.0%
<i>Total</i>	54		100.0%

Many companies reported being involved in more than one market segment. Similar to responses to question 1.4a, most respondents placed their company's involvement in the areas of "other specialty chemicals" (31.5) or "Fine chemicals" (14.8%) and "Plastic & Synthetic Rubber" (14.8%).

1.5 What is the nature of your engagement in China?

Table 4: Nature of Engagement

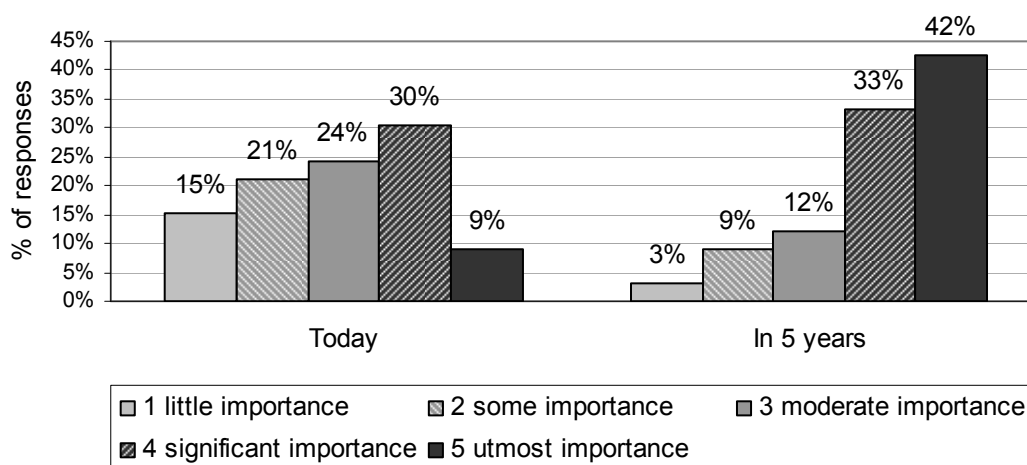
	Total	%
EU exports to China	23	37.1%
China-based prod for export to EU and other destinations	6	9.7%
China-based prod for local market	12	19.4%
Sourcing	18	29.0%
Other	3	4.8%
	62	

A majority of the European companies surveyed are engaged in EU exports to China (37.1%) or sourcing activities (29%) in China. Slightly fewer companies reported being involved in China-based production for the local market (19.4%), and others are engaged in China-based production for exports to Europe (9.7%) and other destinations (4.8%).

SECTION 2: CHINA MARKET OPPORTUNITIES

2.1 How important is the Chinese Market for your business?

Chart 5 – China Market Importance⁹³



On average, responses indicated that the overall importance of the Chinese Market will greatly increase from today into the next five years, with the average response rising from some importance (3.0) for today's market to significant importance (4.0) for the mid-term future.

In the current market, perceptions are distributed quite evenly across the range, with descriptions of some, moderate or significant importance receiving 21%, 24% and 30% of responses each. In looking at the mid-term future, this situation changes dramatically. The percentage of respondents believing the Chinese market to be of little or some importance drops from 36% to 12% and those European companies believe the Chinese market to be of significant or utmost importance increases to 75%.

2.2a What is the percentage of your company's turnover in China today compared to overall/global turnover in sales and market share?

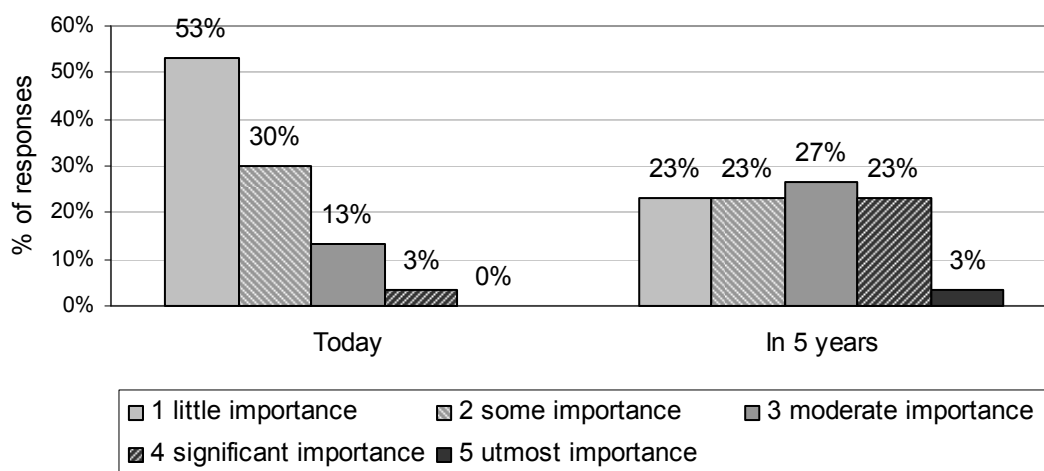
Few responses were received for this question. The companies that responded placed their sales turnover in China at 5% to 15% of global turnover. Their company's turnover in relation to global turnover in market shares was estimated to be very small (less than 10%).

2.2b Over the next 5 years, how do you expect business opportunities to evolve in your sector of operation in China? How will this likely impact on your sales/ market share figures?

There were also few responses to this question. Companies who responded indicated that they expected a growth in business opportunities of 10% to 20%.

2.3 How important is China as an investment destination for Research and Development?

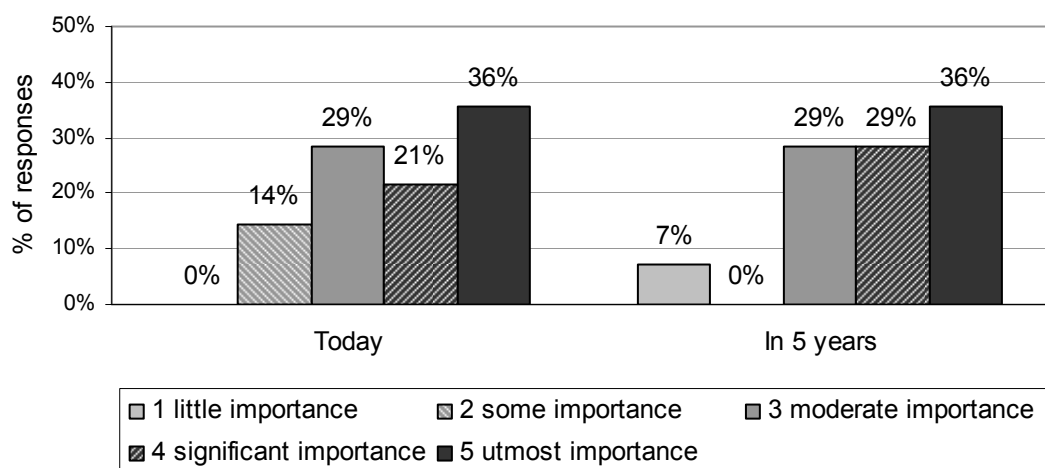
Chart 6: Importance of China as an Investment Destination⁹⁴



For the present time, none of the European companies surveyed described China as being of utmost importance as an investment destination for R&D. That changed slightly with 26% believing that it will be of significant or utmost importance in five years time. 83% of the surveyed described China as an investment destination for R&D of little or some importance today. However that number dropped to approximately 46% regarding the expectations for the coming five years.

2.4 How important is China as an investment destination?

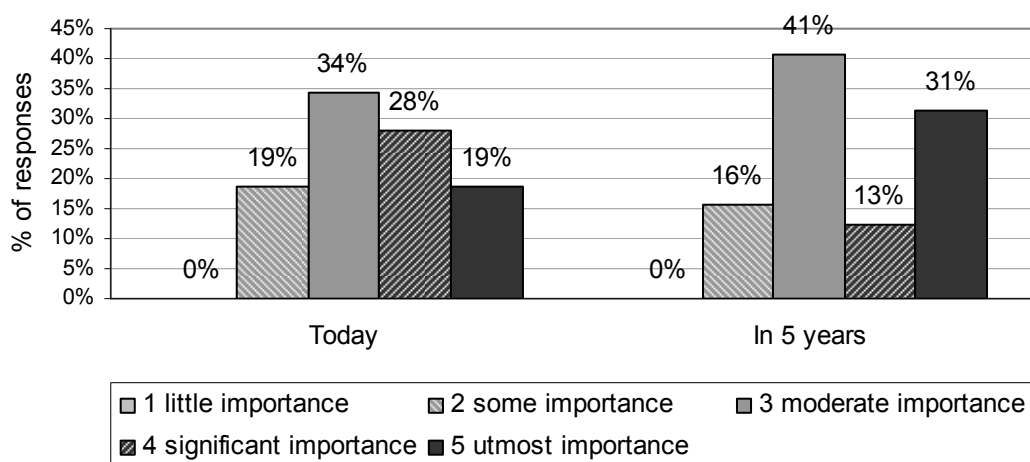
Chart 7 – China as an Investment Destination⁹⁵



Looking at today, 14% of the companies interviewed attached little or some importance to China as an investment destination today. This number slightly decreased to 7% in the five year projection. Those considering China to be of moderate, significant or utmost importance rose from 86% to 94% demonstrating considerable optimism for the Chinese market. In the case of both today and the five year projection, 36% of companies described China in terms of being an investment destination as being of utmost importance.

2.5 How much of a problem would you rate market access and other commercial practices by China?

Chart 8 – Market Access and other Commercial Practice Problems in China⁹⁶

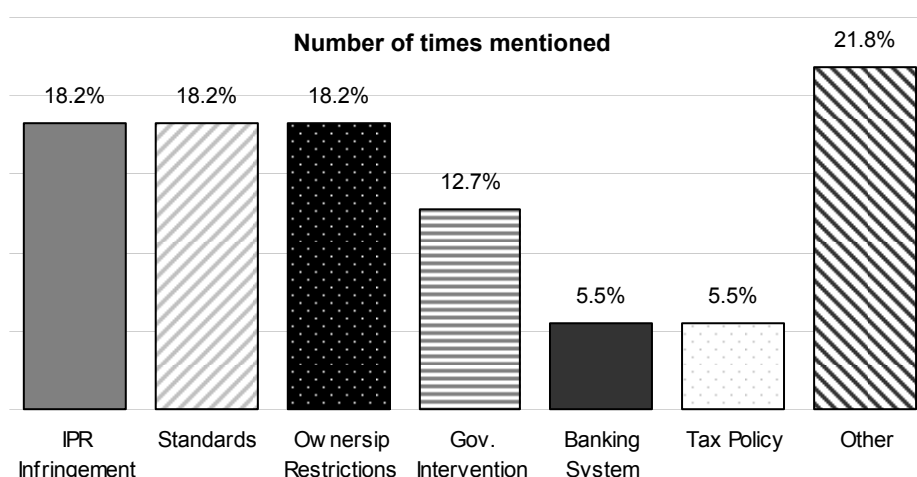


The European companies interviewed indicated that market access and other commercial practice problems in China are of moderate to significant importance today, with an average 3.5 response score that remained unchanged for expectations in the next five years.

Approximately 62% and 54% of respondents rated these problems to be of moderate to significant importance today and in the next five years respectively. The percentage of those rating these problems as being of utmost significance surveyed rose substantially from 19% today to 31% in the near future. A minority of 19% for the present and 16% for the 5 year projection attributed some importance to these problems.

2.6 What are the main current obstacles preventing you from expanding further in the Chinese market? Please list in terms of priority (e.g. market access constraints, IP protection, Chinese standards/ operating practices, etc.).

Chart 9: Main Current Obstacles to Market Expansion

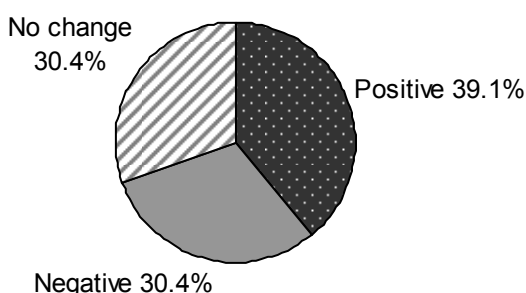


IPR infringement (18.2% of times mentioned) is identified as one of the largest and the most common constraint on entry into the Chinese market. Unequal standards creating an unequal playing field for Chinese and foreign competitors are also mentioned by 18.2% of respondents. It leads to competition with low-cost domestic producers who pay little regard to environmental considerations and safety standards. Also of great significance, many companies discussed

market access constraints including trade barriers, and unfair or restrictive import/export regulations and practices. Government intervention and support are also highlighted as a difficulty for further expansion. State/local authority influence upon availability /allocation of capital, energy and ROI targets limits progress towards a free market. State share ownership in some companies creates a distortion of a free market for M&A. A weak banking system and taxation fluctuation (5.5%) limits the opportunities for market expansion for European companies. Other obstacles that are mentioned by many European companies are the lack of human resources, unclear domestic policies, no foreign majority ownership in JV's, getting paid by Chinese customers, and immature or illogical investment decisions on the part of local investors.

2.7 How will this situation likely evolve in the next 5 years?

Chart 10: Evolution of Market Obstacles



Approximately 40% of the European companies interviewed expected there to be some improvement with regard to these obstacles in the mid-term future. Market knowledge and access, local investment logic, IP and the quality of the labour force are all identified as areas where improvement is hoped for or is likely to occur. Slightly fewer respondents (30.4%) stated that the situation would not improve or would in fact worsen over the next 5 years. Many of these companies (30.4%), and other companies who stated they are unable to predict the evolution of these problems, qualified their answers by stating that any possible improvement would depend on political/ government backing, law enforcement, and/ or WTO pressure.

2.8 What are the quantitative costs or impacts resulting from these obstacles on your business today? This can be indicated as a percentage of turnover, revenues, etc. Please specify.

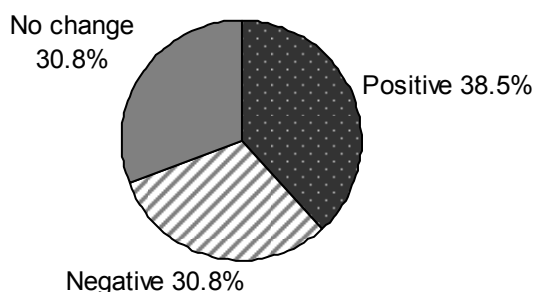
Among respondents who quantified this impact, the average cost of these obstacles to their business is estimated at approximately 15%. A majority of respondents however stated that it is difficult or impossible to quantify this impact. Some companies expressed costs in terms of delayed project implementation, unacceptably low prices, unwillingness to enter certain sector segments because of a lack of standards, or unwillingness to export to China.

Table 5 – Quantitative Costs or Impacts of Market Access Obstacles

Where respondents made specific calculations:			
Comment	Sector		
	Comm. Chem	Specialty& Fine Chem	Other
“20% of revenue”-petrochemicals, plastic and synthetic rubber, other special chemicals	●	●	
“3%-5%” –other specialty in chemicals		●	
“5%-10%”-plastic and synthetic rubber			●
“20%”-fertilizers, plastic and synthetic rubber, other special chemicals		●	
Where respondents made estimates:			
Comment	Sector		
	Comm. Chem	Specialty& Fine Chem	Other
“2-3 % of revenues for registration/testing of imported chemicals”	●	●	
“The cost impact would be as high as 3-5% of the turnover in China, with the consideration of all the delayed shipments, delayed production, extra transportation costs, extra manpower costs...etc.”			●
“We suffer around 10% revenue loss in China because of various market access constraints. It must be noted, however, that due to the current lack of standards we do not currently operate in some markets segments (e.g. in the gas cylinder market.)”			●
“Delay in project implementation due to deferred one-sided negotiations by 2010 for all foreign investors might miss out on more than 1-2bn Euro sales p.a.”	●	●	●
Where respondents found it difficult to quantify market access obstacles:			
Comment	Sector		
	Comm. Chem	Specialty& Fine Chem	Other
“Very difficult to evaluate as better competitiveness would significantly increase the attractiveness of investments in China.”-petrochemicals, fertilizers	●	●	
“In my view the administrative barriers are not substantial. I have worked in many countries in APAC [Asia and Pacific] during the last 20 years and do not find China particularly troublesome in that aspect”		●	

2.9 How is the situation likely to evolve in the next 5 years?

Chart 11: Evolution of Quantitative Costs



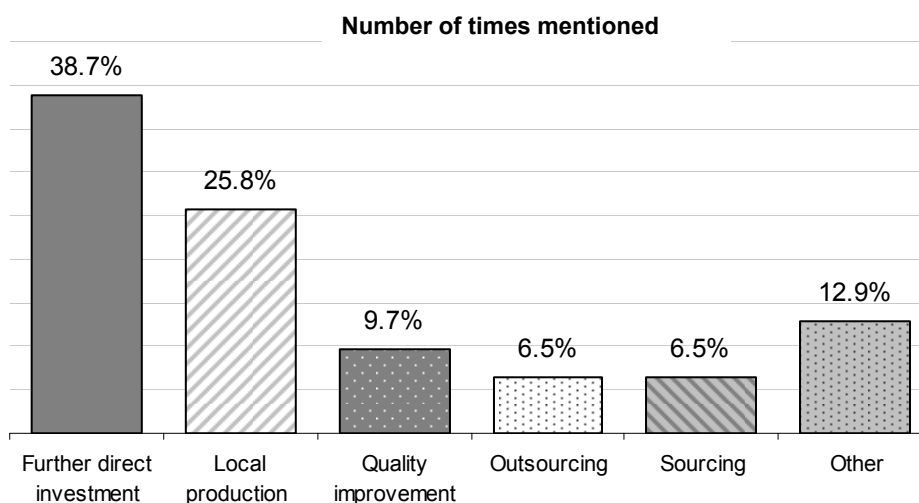
38.5% of respondents stated that the situation is likely to improve, but they realise that this improvement will likely only occur if there are increases in law enforcement (e.g. regarding IPR protection) and China's compliance with the WTO. 30.8% indicated that the situation will worsen or that they doubt there will be any improvement of these obstacles in the future. They emphasised that the only way this can change will be through improvements to the regulatory framework such as enforcement of international accounting practices. State-run companies should also move into market logic, as e.g. employment protection is a very short-term solution for employees in very critical situations.

Table 6 – Situation in 5 Years

Selected Comments	
Positive (1)	"Chinese company's costs will increase, our costs will relatively improve."
Positive (2)	"More opportunities should arise as Chinese consumers demand higher quality products and government imposes more stringent environmental and safety standards."
No change	"The only way this can change is due to e.g. enforcement of international accounting practices. State-run companies should also move into market logic, as e.g. employment protection is a very short-term solution for employees in very critical situations."

2.10 How does the European chemicals sector plan to maximise the opportunities brought about by the Chinese market (e.g. outsourcing and exporting to home markets/ investment in China, etc.)?

Chart 12: Methods to Maximise Opportunities



Most companies interviewed stated that they plan to maximise opportunities brought about by the Chinese market through increased and/or new investments (38.7% of times mentioned). Increased production and manufacturing in China is also a common response (25.8%), as is a plan to focus on technology, innovation and offering specialty products, in order to stay ahead of Chinese competitors. Increasing and/or utilising local sourcing is mentioned by a few companies, as is outsourcing (6.5%). Other opportunities that are identified are acquisition of mid-sized efficient private companies in China and strengthening market and sales activities.

2.11 China's 11th 5-year programme (2006 to 2011) set ambitious targets and priorities for rural development, environmental protection (rural and urban), energy efficiency (rural and urban context), as well as the need for a home grown innovation society, affecting all sectors. This direction would represent a major step change in China's approach to sustainable development.

- a) **Please consider how the direction of China's sustainable development, as described above, provides opportunities and challenges within your own sector and business units (e.g. new markets, new investment opportunities, partnerships, etc.).**

There is a low response rate for this question. For those who responded stated that many companies are already involved in promoting or developing "sustainable" or "environmentally friendly" products in the Chinese market.

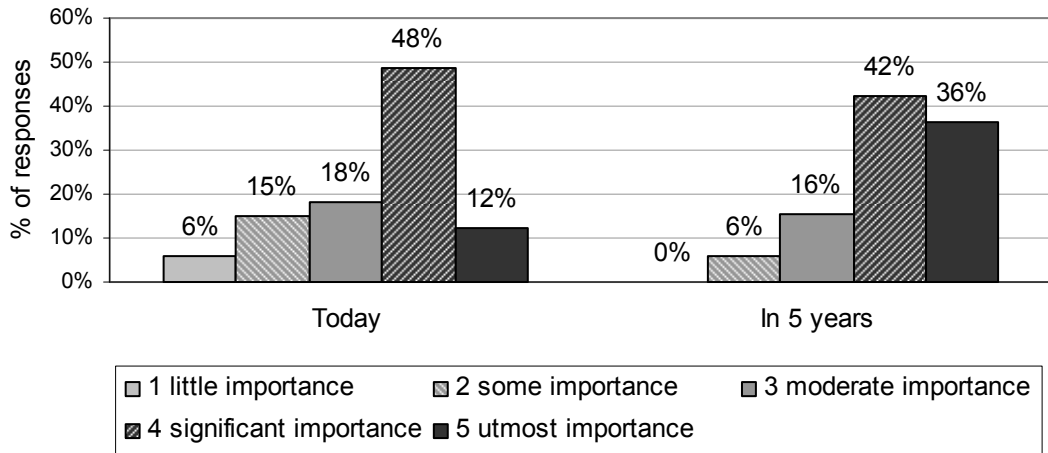
- b) **What will likely be the challenges and constraints of realising these opportunities?**

Companies identified a likely growth in the Chinese market, increased financial backing among Chinese competitors and increased competition for foreign enterprises. Concerns related to this increase in competition are focused on whether or not Chinese companies will be pressured into meeting higher international and domestic standards, and if foreign enterprises will be able to compete with low competitor pricing. Another concern is that of IP protection. One company stated that they will not sell new products to China because of IP issues and pricing.

SECTION 3: CHINESE SECTOR COMPETITION

3.1 How significant is the competitive challenge of Chinese enterprises operating in your core sectors in the Chinese Market?

Chart 13 – The Competitive Challenge of Chinese Enterprises Operating in the Chinese Market⁹⁷

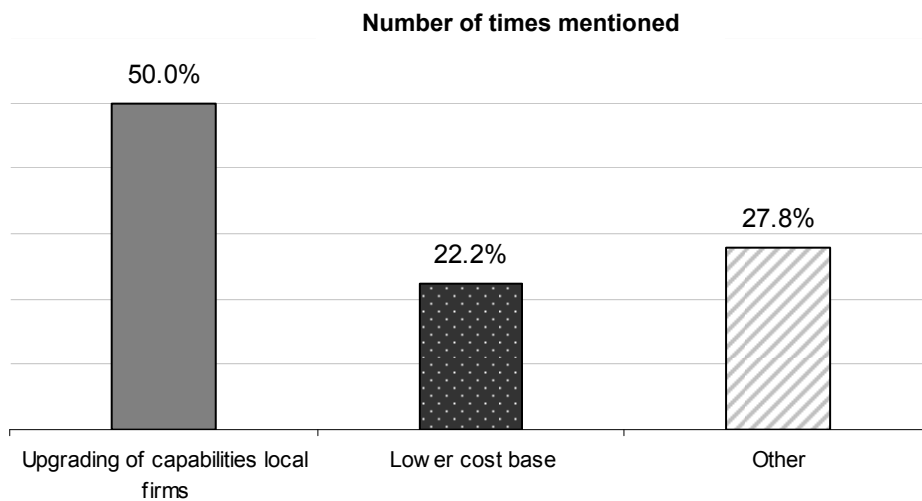


The average response on competition from Chinese enterprises indicates that companies expect this challenge to increase in the mid-term future. Today’s average response rate of 3.5 places the challenge of Chinese enterprises at a level of moderate to significant importance. This perception increases to 4.1, however, indicating that companies expect local enterprises to pose an increased and significant challenge in the next five years.

A 60% majority of companies rated this challenge to be of moderate or significant importance today, while the majority (78%) shifts the challenge to significant or utmost importance in the next five years. This shift is especially pronounced in the 24% increase in companies believing the challenge to become of the utmost importance in the near future. 21% of companies surveyed placed less than moderate importance on the challenge of Chinese enterprises in the current market, and that number decreases to 6% in the mid-term evolving market.

3.2 Please describe the nature of this challenge. Include the role of SOE’s in your description. How is it evolving?

Chart 14: Competitive Challenge of SOEs



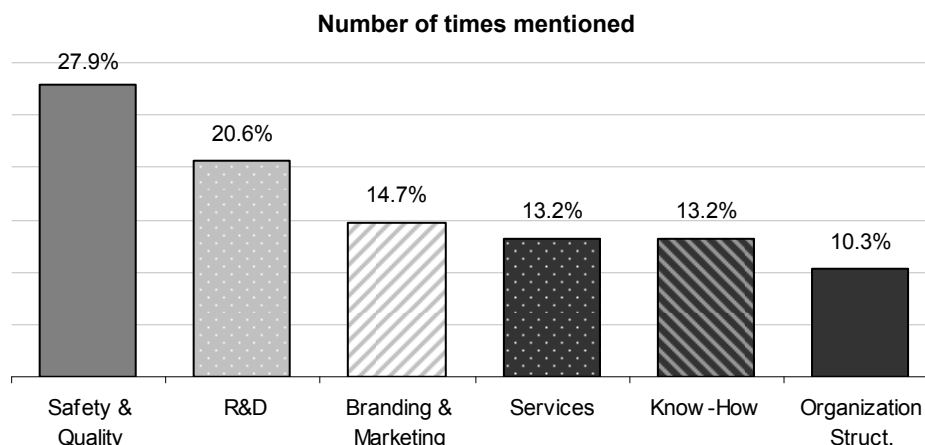
There is no overall consensus in the respondent's replies. However, the most mentioned (50%) challenge is that advantages European companies have in quality could possibly diminish as Chinese companies adopt modern management, business and technological practices. A second challenge that is pointed out is production based on locally-manufactured equipment and inferior EHS standard that lead to a lower cost base (22.2%) for Chinese enterprises. Other factors (27.8%) that are indicated include, access to raw materials anti-dumping investigations into European chemicals exporters to China, government support for local content, and, when patents run out that copying would ensue.

Table 7 –Challenges of Chinese Companies

Selected Comments	
Upgrading of Capabilities Local Firms (1)	“In some markets, local companies possess better customer network and cost competitiveness. This trend will move from low value-added products to high value-added products.”
Upgrading of Capabilities Local Firms (2)	“Our quality advantages may disappear and Chinese companies will adopt modern management systems.”
Lower Cost Base	“Low cost and low quality competition depresses the pricing in the market.”

3.3 What are the main advantages your company has in China compared to Chinese competitors? Please list in terms of priority (e.g. Product/ innovation, brand, service/ maintenance, people, etc.).

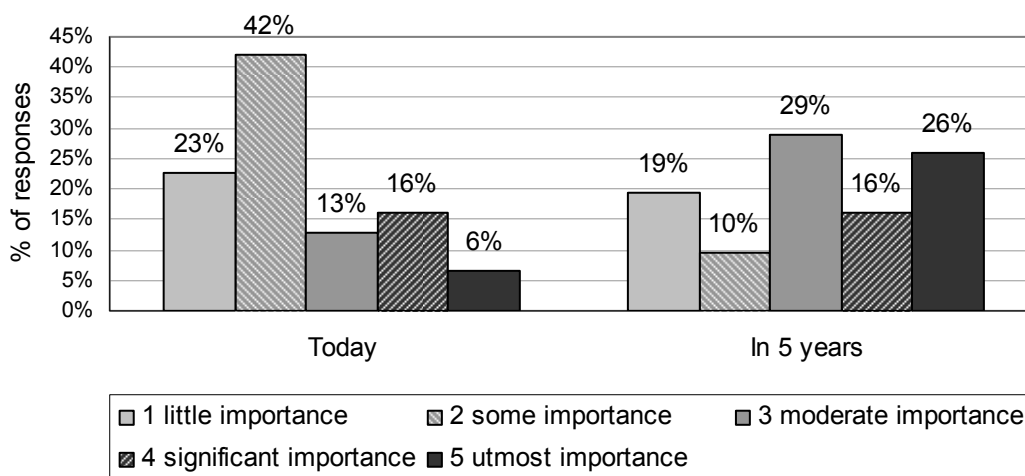
Chart 15: Main Advantages of European Companies Over Chinese Competitors



Overall surveyed companies indicated that their quality and safety levels (27.9%) and their superior innovation and R&D (20.6%) are the main significant advantages they have over their Chinese counterparts. Another advantage that is highlighted is branding & marketing (14.7%). The advantage of expert know-how on products & technologies, engineering & process technologies and customer services is also mentioned (13.2%). A few companies emphasised the advantage of organisation structure (10.3%).

3.4 How significant are Chinese manufacturers operating in your sector within the US market?

Chart 16 – Significance of Chinese Manufacturers in the US Market



On average, responses indicated that the importance of Chinese companies in the US Market will shift in the range of some to moderate importance from today into the next five years, with the average response increasing from 2.4 for today’s market to 3.2 for the mid-term future.

While more than half (65%) of respondents consider the current presence of Chinese manufacturers in the US market to be of little importance or some importance, mid-term future perceptions are distributed more evenly across the range. 19% of responses place little significance on Chinese involvement in the US market in the coming five years. 29% attach moderate importance to this presence, and 16% assign it significant importance. The largest shift in perceptions for the next five years is seen in the 20% increase in those companies surveyed that believe Chinese involvement in the US market to be of utmost importance.

3.5 Please describe the nature of this challenge and its likely future evolution (5 yrs).

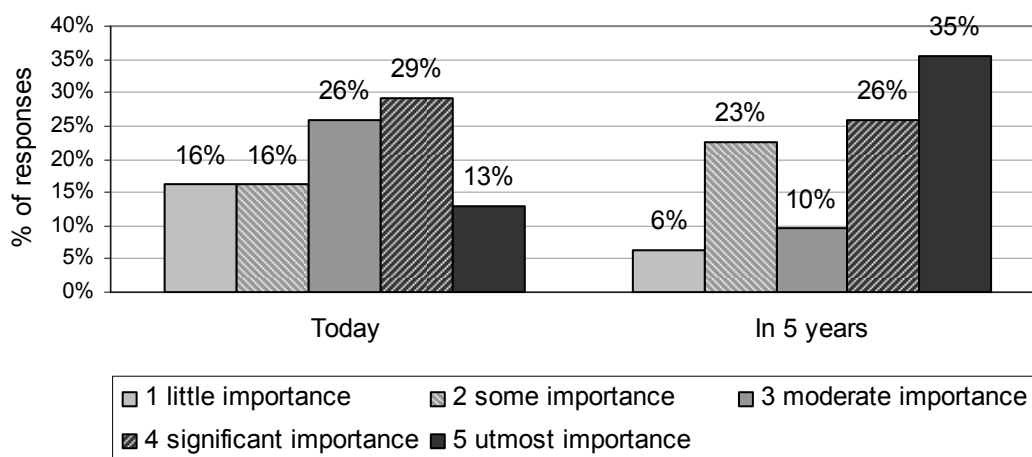
The majority of respondents indicated that when it came to the competitive nature of Chinese companies operating in the US, price competition is their biggest edge over European chemical companies. Chinese companies have lower production costs, lower cost to market and lower product costs. The potential for dumping would mean that the US market could potentially be flooded with cheap alternatives to European companies causing a possible market share loss. However, some companies indicated that they do not expect a challenge from Chinese companies in the US market since the quality of their goods would not be high enough.

Table 8 – Expected Challenges of Chinese Companies

Selected Comments	
US market prospect (1)	“In some product areas, Chinese companies are over-investing and subsequently exporting to the US at rather low prices. This erodes the business margin and even destroys the market.”
US market prospect (2)	“Increasing exports from expanding Chinese competitors enhance competition and threaten market share”

3.6 How significant is the competitive challenge of Chinese enterprises operating in your sector in the ASEAN market?

Chart 17 – The Competitive Challenge of Chinese Enterprises Operating in the ASEAN Market



The average response to China-specific operating practices in the ASEAN market indicates that companies do expect this problem to increase in the mid-term future. Today’s average response rate of 3.2 places the challenge at a level of moderate importance. This perception increases slightly to 3.7, however, indicating that companies expect the problem to pose an increasingly significant challenge in the next five years.

The largest shift occurring over time can be observed in the 22% increase in respondents that believe the challenge that China poses in the ASEAN market to be of the utmost importance. The overall number of companies believing this challenge to be of some or little importance decreases only slightly over time, but the percentage of companies attaching moderate importance to this challenge experienced a significant drop (16%).

3.7 Please describe the nature of this challenge and its likely future evolution (5 yrs).

Companies overall indicated that the major competitive edge that Chinese chemical companies have operating in the ASEAN market is low costs. Due to the proximity of China to ASEAN countries, logistics costs are lower than those of European companies, as well as their overall cost advantages in areas such as production and raw materials.

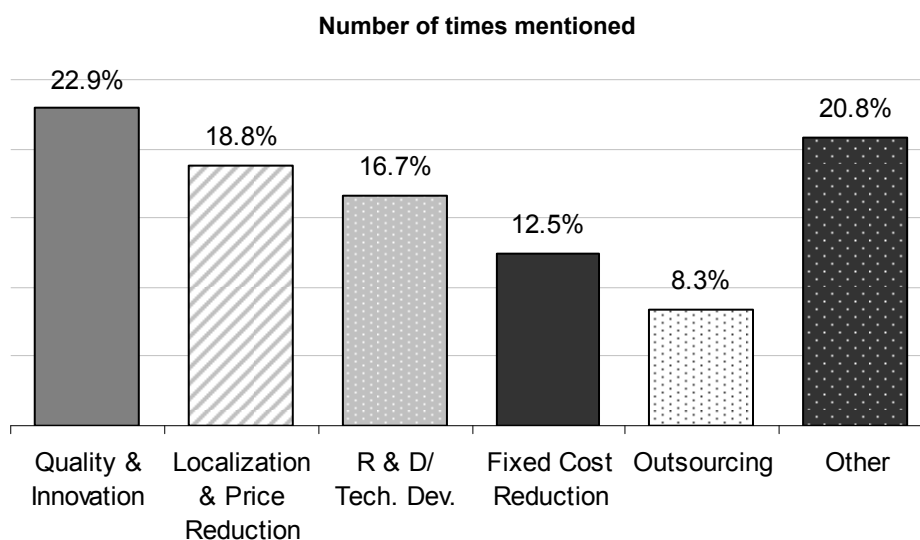
Some companies indicated that they do not see China as a potential rival in the ASEAN market since certain types of chemicals are not represented abroad by Chinese companies. However, they expected them to be so in the future.

Table 9 – Expected Chinese Competition in the ASEAN Market

Selected Comments	
ASEAN market prospect (1)	“Chinese enterprises pose a very significant threat to business operating in this sector in the ASEAN and other Asian markets. This is perhaps best demonstrated by an examination of the Japanese market which has experienced a significant erosion of its domestic chemical manufacturing industry and in some instances a closure of assets and/or a migration of production from Japan into China”
ASEAN market prospect (2)	“China is taking more shares from ASEAN countries / other Asian countries on polyester and downstream textile products, and we see this is going to be even more severe in the next 3-5 years.”
ASEAN market prospect (3)	“Production cost and cost-to-market advantages due to low investment into environmental protection and related costs that are high in Europe in our industry segment.”

3.8 What are the overall efforts undertaken in your industry's field of operation to maintain competitiveness vis-à-vis China?

Chart 18: Methods of Maintaining Competitiveness



European chemical companies focus on improving quality and innovation (22.9%) in order to maintain competitiveness in the Chinese market. Efforts that are undertaken include developing new products and achieving a high level of reliability in product quality, delivery and service. Furthermore, increasing local production in China and price reduction (18.8%) is also expected to be of positive influence in strengthening their position. Steps taken with this aim in mind include improving technological processes and moving future R&D (16.7%) to China. A few European companies surveyed mentioned fixed costs reduction (12.5%) and outsourcing (8.3%) through investment in local staff. Other companies have indicated that they would focus on certain niche markets where Chinese companies might not possess the adequate technology and know-how to produce the chemicals. In addition, they pointed out to build up a strong distribution network and undertake lobby activities for an equal playing field on IPR and ESH.

3.11 What is your priority in dealing with the challenge posed by the emergence of China/ Chinese industry as competitors? Please list and specify (e.g. improving your competitiveness, improving market access, seeking improvement in overall issues of commercial transparency).

A majority of the respondents indicated the importance of improving China's records in commercial behaviour though building partnerships and working in associations e.g. EUCCC. Another priority that is mentioned is investing further into China in order to develop the domestic market. Additionally, attempts at industry lobbying in order to improve non trade barriers and make legislation a level playing field are also seen as significant future challenges.

3.12 Please highlight ideas for acceptable investment scenarios in China outside those currently permitted by the Chinese government. Please be creative in considering EU-China win-win approaches to investment and cooperation.

Respondents identified a large number of different scenarios for China in which they would consider further investments. The main scenarios include consistent and transparent regulations, equal standards for both Chinese and foreign companies in regards of international chemical regulations, the ability to set up wholly owned subsidiaries in China (which should also be made more transparent) and a big improvement in IP protection enforcement.

Table 10 – EU-China Win-Win Investment Scenarios

Selected Comments
“The EU should support the Chinese government in developing a sustainable economic growth model with emphasis on environmental protection, health and safety. This will help to level the playing field for MNCs since Chinese chemical producers will eventually be subjected to the same EHS standards and costs that apply internationally”
“Balancing standards & setting targets for movement toward a common level of operation /qualification could reduce entry barriers & promote inward investment from overseas companies encouraged by development of a level playing field.”
“We would like to see China become more relaxed about the legal structure of holding companies (‘Foreign Investment Company’).”

ENDNOTES

- ¹ VCI.(2006) [Private Communication]
- ² CEFIC (2005) Horizon 2015
- ³ It must be noted that - since the chemical businesses is very heterogeneous - the range from "commodities" to "specialties" is a continuous spectrum with overlapping segmentations.
- ⁴ Budde, F., Krämer, K.(2001)
- ⁵ *Ibid.*
- ⁶ *Ibid.*
- ⁷ Deutsche Bank Research (2005b)
- ⁸ Excluding pharmaceuticals, global chemicals turnover in 2004 figures was € 1.3 trillion with a 32% share for the EU-25. Per country: USA € 312bn, Japan € 133bn and Germany € 110bn and China € 105bn.
- ⁹ It must be noted however, that if one does not consider EU-25 intraregional exports, the EU-25 has a much smaller 33% share in world chemicals exports. This is still enough to be the world biggest player in this area VCI (2005b).
- ¹⁰ By comparison the economic power-house that is Japan accounts only for 3.8% of global imports.
- ¹¹ Deutsche Bank Research (2005b)
- ¹² PWC (2005)
- ¹³ Chemical Week (05-Sep-05)
- ¹⁴ Wuttke (2005)
- ¹⁵ This prediction is in line with estimates by DB Research (2005b)
- ¹⁶ For a more in-depth exposition of the development of China's petrochemicals industry please refer to Annex 1
- ¹⁷ Chemicals Weekly (06-Jan-2004).
- ¹⁸ CNCIC Chemdata (2005)
- ¹⁹ *Ibid*
- ²⁰ *Ibid*
- ²¹ *Ibid*
- ²² *Ibid*
- ²³ *Ibid*
- ²⁴ *Ibid*
- ²⁵ *Ibid*
- ²⁶ *Ibid*
- ²⁷ Chemical Engineering News (2006)
- ²⁸ The merchant market refers goods sold to customers outside the producing company. Therefore this figure does not take into account the extensive the internal business unit "trade" of large vertically integrated corporations.
- ²⁹ Dechema (2004) 'The chemical industry as a catalyst for economic growth in China'
- ³⁰ *Ibid*
- ³¹ Please note that this figure is a simplification of the overall process intended for illustrative purposes only, it does not try to capture a complete picture.
- ³² The loss of the specialty status is affecting surfactants, pigments, some plastics additives, and water treatment and paper chemicals markets as well as products serving the construction and automotive industries.
- ³³ Yu, 2005
- ³⁴ Chemical Engineering News (2006)
- ³⁵ Although the WOFE law was promulgated as early as 1986, implementation regulations were not released until 1990
- ³⁶ Budde & Kramer (2001)
- ³⁷ Morgan Stanley (2005)
- ³⁸ Wuttke (2005)
- ³⁹ Morgan Stanley (2005)
- ⁴⁰ Chemical Engineering News (2005)
- ⁴¹ DZ Bank Research (2004)
- ⁴² Chemical Engineering News (2005)
- ⁴³ Müller (2005)
- ⁴⁴ Morgan Stanley (2005)
- ⁴⁵ *Ibid*
- ⁴⁶ Asia Pulse Businesswire (March 27, 2006)
- ⁴⁷ Dechema (2004)
- ⁴⁸ In rare oxides for example, China has an 88% global market share
- ⁴⁹ DB Research (2005b)
- ⁵⁰ See **Annex 3** for a more detailed list of tariffs on specific chemicals
- ⁵¹ Chemical Weekly (Jan9, 2006)
- ⁵² The authority may extend this period by 10 working days and inform the parties of the reasons for the delay, if it is unable to make a decision within 20 days - Chemicals Weekly (Aug24, 2005)
- ⁵³ *Ibid*
- ⁵⁴ A complete list can be found at Chinese National Development and Reform Commission website: <http://www.sdpc.gov.cn/>
- ⁵⁵ Fulcrum (2004)
- ⁵⁶ Although the Chinese law on the registration of new chemicals substances does not provide for intermediate notification requirements, it does provide under Article 13 the applicant to apply for an exemption from declaration in one of the following conditions: (1) The annual production and import volume of the new chemical substances for scientific research purpose does not exceed 100 kilograms; (2) The polymer contained in the monomer of the new chemical substance is less than 2%; (3) The total production and import volume of the new chemical substance for technological research and development does not exceed 1,000 kilograms. For such a new chemical substance, the applicant may apply for one year's exemption from declaration, and no extension shall be granted; (4) The samples of new chemical substances are imported for the purpose of performing the eco-toxicological tests of new chemical substances in the territory of China by using Chinese organisms
- ⁵⁷ The survey results are discussed in more detail in Annex 6.
- ⁵⁸ In all 40 Chemicals companies were surveyed as part of the larger survey for this study.
- ⁵⁹ Further details regarding the methodology for deriving the partial equilibrium model can be found in the quantitative analysis **Technical Appendix**.
- ⁶⁰ The author would like to thank Michael van der Meer of DEVELOPMENT Solutions for his contributions in constructing the scenarios for this study.
- ⁶¹ With 60.8% of survey respondents expecting no change or even a worsening of current market conditions a fairly pessimistic assumption in the baseline scenario seems in order. The baseline scenario therefore extrapolates the current situation
- ⁶² Economists at a leading European Bank have suggested that if GDP growth rate slips under 7% any further reforms would become increasingly politically unsustainable as this rate of growth will not be able to compensate for increased short-term unemployment resulting from such reforms and might therefore cause a relapse in conservatism.
- ⁶³ This conservative growth rate is made by BASF (Wuttke, 2005)
- ⁶⁴ Huang (2006)

⁶⁵ KPMG (2006)

⁶⁶ DSM bought 100 percent of a resin coatings company in Guangdong and 51 percent of an additives business in Zhejiang (KPMG, 2006)

⁶⁷ In 2002, China accounted for 88% of world production of these oxides (PWC, 2005)

⁶⁸ DB research

⁶⁹ At time of writing, China experienced 11.3% growth in the 2nd quarter of 2006 although evidence point towards a successful attempt by the government to slow down spending. Urban fixed-asset investment in August rose 21.5 per cent compared with a year ago, a marked slowdown from the 30.5 per cent expansion from January through July and the slowest for a single month since December 2004. (FT, September 12 2006)

⁷⁰ DB research estimate.

⁷¹ By comparison Germany's rose by 7% p.a. to about EUR 100bn (BD Research, 2005).

⁷² According to one optimistic assessment by DB research, China will become an overall net exporter of Chemicals by 2015.

⁷³ According to a recent report from KPMG, deals with private companies were completed within two to six months with purchases of businesses owned by local governments taking much longer (*see also* Section 5.1)

⁷⁴ PWC (2005)

⁷⁵ Large scale foreign invested chemical projects often involve refineries and / or ethylene plants, and downstream units.

⁷⁶ US Department of Energy and Environmental Industries.

⁷⁷ For example France-based Suez environment has a 50-year joint-venture contract to provide water treatment and supplies for the Shanghai Chemicals Industry Park. Further emphasis on environmental sustainability would certainly increase the market for related goods and services.

⁷⁸ Some Chemicals producers already operate successful production facilities in Western regions.

⁷⁹ DB Research (2005b)

⁸⁰ Morgan Stanley (2005)

⁸¹ Chemicals Weekly (Sep-26, 2005)

⁸² Fulcrum (Aug, 2004)

⁸³ Chemical Engineering News (2004)

⁸⁴ China Construction Project Net, Page 1, Friday, May 12, 2006

⁸⁵ The author of this study wishes to thank Mr Van Sloten, head of Cefic, for his valuable contributions to this study.

⁸⁶ For more information and background documentation related to this conference visit: http://ec.europa.eu/trade/issues/bilateral/countries/china/confer070706_en.htm

⁸⁷ Wuttke (2005)

⁸⁸ *Ibid*

⁸⁹ Sinopec Website (2006)

⁹⁰ *Ibid*

⁹¹ *Ibid*

⁹² Datamonitor (2004)

⁹³ These percentages have been rounded to two significant figures.

⁹⁴ These percentages have been rounded to two significant figures.

⁹⁵ These percentages have been rounded to two significant figures.

⁹⁶ These percentages have been rounded to two significant figures.

⁹⁷ These percentages have been rounded to two significant figures.