OXFORD ECONOMICS

Evolution of competitiveness in the European chemical industry: historical trends and future prospects

A report for Cefic – October 2014

OXFORD ECONOMICS

Contents

1 Executive summary

The chemical industry (defined in this report to exclude pharmaceuticals) is one of the EU's most successful sectors, boasting €527 billion in sales in 2013, making it the second-largest global producer But despite this strength, the current situation appears to be cause for worry. The chemical sector was severely affected by the 2008-09 global recession, and after a rapid cyclical turnaround, production has stagnated since early 2011. Over a longer time horizon, the EU's share of global production and exports has fallen considerably, potentially suggesting a decline in competitiveness, amongst other factors.

In order to better understand the competitive performance of the EU chemical industry in the global market, Oxford Economics has applied the constant-market share methodology to chemical exports coupled with econometric analysis.

Using constant-market share analysis of chemical exports at the aggregate and subsector level for the EU and several other large developed and developing countries that are significant chemical producers, this report confirms that the majority of the decrease in extra-EU export market share observed over the past 20 years (including that since the 2008-09 financial crisis) is due to declining competitiveness as opposed to slow-growing destination markets. Declines have also been seen in other developed nations at the expense of China and Saudi Arabia, although the magnitude of the European decline is larger than that of the United States. The decline has been driven primarily by petrochemicals and polymers. Due to the erosion of competitiveness, the EU has slipped from number three to four out of seven leading global chemical exporters with regard to absolute levels of competitiveness. Within the EU, the countries with the highest level of competitiveness are the Netherlands, Belgium and Germany, while Spain and Poland have leapt in the rankings at the expense of France and the UK.

There are many potential reasons for the EU's competitiveness decline, including high energy prices, lagging innovation, currency appreciation, high labour costs, regulatory and tax burdens, among others. This report uses an econometric model that links changes in chemical competitiveness to these potential drivers, and finds that sector R&D intensity, energy prices and the exchange rate all have strong quantitative links to competitiveness. Higher labour costs are associated with declines in competitiveness, but the quantitative effect is not large.

The results provide rigorous evidence-based support to two hypotheses about chemical competitiveness:

- The US shale gas boom has improved the competitiveness of US producers (particularly in petrochemicals and polymers) relative to European countries and Japan

- Product and process innovation are a critical factor in delivering more value to the customer to compensate for cost disadvantages in developed countries.

We also think that the regulatory burden and quality of infrastructure are important drivers of competitiveness, but a lack of chemical sector specific data prevented us from rigorously testing this hypothesis.

The econometric results allow scenario analysis, by which alternative assumptions about the future path of the drivers in the EU can show us the implied change in export competitiveness, and hence export market share.

In terms of magnitude, a reduction in European energy prices would provide the most pronounced boost in competitiveness. Encouraging more R&D investment is also critically important, in order to sustain these competitiveness gains and form the foundation for the longer-term growth of the sector. Taken together, they hold the potential of halting the secular decline of chemical export market share observed over the past decade, adding €35 billion to EU GDP and creating more than half a million new jobs across the economy over the next 15 years.

2 Importance of European chemical competitiveness

The chemical industry is one of the European Union's most internationally competitive and successful industries. Indeed, modern chemistry was for all intents and purposes invented in Europe, with companies such as Solvay, BASF Air Liquide, AkzoNobel, Bayer and L'Oréal growing from humble beginnings to help build a diverse industry embracing a wide field of processing and manufacturing activities.

It is also important to note that the European chemical industry includes numerous non-EU-headquartered companies (such as Dow Chemical and SABIC) with production facilities in the EU.

Output from the EU chemical industry is essential to thousands of products ranging from basic polymers that are the building blocks of all products made out of plastic, to fertilizers that help keep us fed, to soaps and detergents that help keep us clean, to perfumes and cosmetics that help us become (or stay) beautiful.

The chemical industry underpins most sectors of the economy, and accounts for over 7% of EU manufacturing output. Its activities impact directly on downstream chemicals users, with the largest industrial customers being rubber and plastics, construction, and automotive.

The chemical industry is also an important employer. Chemical companies in the EU directly employed a total of about 1.2 million people in 2012. Their activities also generate additional indirect jobs in the value chain – approximately two to three times the number of direct jobs.

The EU chemical sector is the second-largest in the world after China, with sales of €527 billion in 2013. This production is spread across a diverse array of subsectors. The largest – petrochemicals – accounts for just over one-quarter of the total, and the closely-related polymers segment accounts for about a fifth. Specialty chemicals (which consists primarily of paints, inks and dyes

and other related industrial chemicals) also account for about one-quarter of production. The smallest segments are basic inorganics (fertilizers, industrial gases, etc.) at 15% and consumer chemicals at 12%.

This diversity masks some differences across the EU member states. For instance, Germany is relatively specialised in petrochemicals and polymers; its production share for these two segments is ten percentage points higher than the EU average. In France, the share of consumer chemicals is 5 percentage points higher than the EU average, with slightly less emphasis on petrochemicals and polymers. But despite these national differences, all EU countries are relatively diversified in terms of subsectors, which is in and of itself a competitive advantage.

Despite its long history of strength in chemical manufacturing, the EU's current situation appears to be cause for worry. The chemical sector was severely affected by the 2008-09 global recession, during which production fell by 20% peak to trough. Sectors such polymers, basic inorganics and man-made fibres experienced more dramatic declines of about 30%. After a rapid cyclical turnaround that brought production above its pre-recession peak by late 2010, production has stagnated since then, in contrast to the 2½% average annual growth seen in the decade preceding the crisis.

Many would argue that the recent poor sector performance is due primarily to the sluggish European economy, but we believe other factors relating to competitiveness are also at play. The first reason is that not all industrial sectors in Europe are experiencing the stagnation of production seen in the chemical sector. Transport equipment production (including automotive, aerospace, ships and trains) also rebounded rapidly after a sharp drop during the global recession, but has managed to increase by a further 6% since 2011.

The second reason often cited is that the competitiveness of European chemical production is potentially already being affected by the rapid expansion of shale gas production in the United

States that has dramatically lowered energy and feedstock costs there.

A final potential reason is demographic patterns that favour stronger growth outside of Europe independent of the economic cycle, which encourages capacity additions there at the expense of European production.

While these pieces of evidence are suggestive, they do not constitute conclusive evidence of a competitiveness problem in the EU chemical sector, nor do they prove that energy costs (or any other factor such as R&D, regulation, etc.) is an important factor driving national chemical-sector competitiveness.

At the outset, it is important to clarify what is meant by competitiveness. For the purposes of this report, we view it as a national rather than firm-specific concept, i.e. the ability of one country's (or, in the case of the EU, region's) chemical sector to sell goods and services in a given market relative to sectors in other countries. In practice, this means that products must be of good quality, meet a demand in the marketplace and be priced to what the market will bear while generating sufficient profits. Our definition is distinct from firm-level competitiveness, and means that a loss of national competitiveness does not necessarily imply that all producers in that country are losing market share or becoming less profitable.

The purpose of this report is to bring evidence-based research to bear on the following questions, about which there are many opinions, but few facts:

■ Has the EU chemical sector gained or lost competitiveness over the last 20 years? Which subsectors are driving the changes?

■ What is the quantitative relationship between sector competitiveness and its hypothesised drivers, and which ones are the most important?

We attempt to provide answers to these questions in the remainder of this report. In the first part, we quantify and analyse the evolution of competitiveness in the European Union over the past 20 years and compare them to those seen in

important chemical-producing countries in both the developed and developing world. We use the constant-market-share analysis of exports, a well-tested and rigorous methodology for isolating the extent to which patterns in export growth and market share are due to shifts in competitiveness, providing an answer to the first question above.

We then analyse trends in the factors that could be potential drivers of national chemical competitiveness, including measures of energy and feedstock prices, labour costs, innovation, capital spending, regulation, and several other factors, again benchmarking the European situation relative to its own past as well as against that faced by other countries.

The final and most important part of the report is econometric analysis that models changes in competitiveness developed in the earlier part of the report as a function of factors that we believe could be important drivers of competitiveness. The results of this exercise will provide an answer the second question and, more importantly, allow us to do scenario analysis of how European chemical sector competitiveness might evolve in the future under alternative assumptions about the drivers and the ultimate impact on output and jobs in the chemical sector and the economy more broadly.

3 Measuring competitiveness: the constant market share approach

Key countries: Chemical export market share
% of world exports

Source: Oxford Economics/UN Comtrade
Note: Excludes intra-EU trade
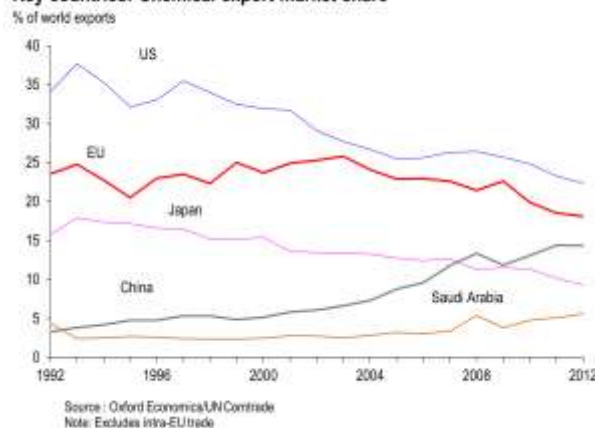
3.1 Overview of methodology

The constant market share (CMS) approach to analysing competitiveness, originally developed in the early 1970s for analysis of trade, is based on the principle that changes in the geographic structure and product structure of exports will affect a country's export growth relative to that of the world, and hence its global export market share.[1]

Thus, even if a country maintains its export share in destination markets and sectors it serves, if demand in those countries and sectors is growing more slowly than the average, its global export market share will decrease.

In theory, this should mean that if one corrects for the fact that a country's export product mix and geographic distribution is different from the average (termed the **structural effect**), its export growth should equal world export growth, thus maintaining a "constant market share" of exports in markets and sectors it serves.

In practice, a country's export growth often differs from the world average even after accounting for the structural effect. This residual difference is termed the **competitiveness effect**, and it measures change in market share *in the destination markets and sectors that the country serves*. If this is declining, it is assumed to indicate a reduction in competitiveness and vice versa.

3.2 Strengths and weaknesses

The great strength of the CMS approach is its ability to decompose export growth into that driven by global growth trends (which are arguably beyond the direct control of individual countries) and that due to national competitiveness (which can be influenced by economic policies). It thus provides a useful, rigorous, and easy-to-understand way of gauging the extent to which trade performance is driven by external vs internal factors. Other measures of changes in competitiveness, such as movements in the trade balance or exchange rates, do not have this ability.

Another important strength is that the indicators are consistent across countries, thus facilitating international comparisons. Furthermore, export data quality is very good compared to other economic indicators because of the administrative information that needs to be collected when goods cross international borders.

A final strength is the granularity of the sectoral information. We have conducted this analysis in five subsectors of chemicals for the EU and six other countries. If we were to undertake analysis using other indicators of sector activity, such as production, such subsector disaggregation would not be possible.

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[1] For a more technical discussion of the CMS methodology on which this analysis is based, see European Central Bank, "Competitiveness and the export performance of the Euro area," occasional paper no. 30, June 2005, section 2.

Box 3.1: Countries and sectors analysed

Countries/regions

- EU: Defined as aggregate of 8 largest exporters (Germany, France, Italy, UK, Spain, Netherlands, Belgium, Poland), accounting for over 90% of extra-EU exports.

- Developed countries: US, Japan

- Developing countries: Brazil, China, India, Saudi Arabia

Subsectors

- Petrochemicals

- Polymers

- Basic inorganics

- Specialty chemicals

- Consumer chemicals

While we believe that CMS is the best analytic approach to evaluating and understanding competitiveness, it does have some weaknesses that must be acknowledged. The main one is that it measures the change in competitiveness rather than its absolute level. As a result, it cannot tell us whether China, for instance, is more competitive than the EU in an absolute sense. In the conclusion of the report we will bring in additional information to construct absolute competitiveness rankings, but it is important to stress that the analytic work in sections 4, 6 and 7 analyse changes in, rather than levels of, competitiveness.

Secondly, because it is a residual term, the competitiveness effect may capture some factors that are not directly related to competitiveness. For example, if a country's chemical exports are very small (as was the case in Saudi Arabia prior to the global financial crisis), the opening of a single plant intended to serve export markets would yield large and potentially overstated increases in measured competitiveness. In addition, some of the observed increase in market share in developing countries may be due to patterns that one would expect as a country industrialises, in much the same way that GDP per capita tends to grow more quickly than in the developed world due to "catch-up."

By the same token, some of the structural effect may in fact reflect a competitive strength or weakness of a country. This is particularly the case for countries that are geographically proximate to fast-growing markets, such as Japan. This gives it a competitive edge relative to the EU with regard to transport costs and time to market in fast-growing China. We would argue, however, that geography cannot be changed by government policies, and if government want to focus on the part of export market share that they can influence, geographic location should not be included in the competitiveness measure.

A second weakness is that, by focusing solely on exports for the important reasons of data quality and country coverage just mentioned, our analysis does not include the EU home market, and thus make an implicit assumption that trends in export competitiveness accurately reflects trends in the home market. However, CMS does examine the home impact indirectly, in that the export competitiveness of other countries will manifest itself in changes in import penetration in the EU. Furthermore, Cefic has carried out production-based CMS analysis of the EU home market and trends are broadly similar to the results presented here.

3.3   Interpretation of results

To facilitate interpretation of the CMS results in the next section, the chart below shows the evolution of the EU's export market share (excluding intra-EU trade). The "Actual" line is the actual market share[2] as measured by international trade data, and the horizontal line shows the EU's share in 1992. The third line shows the "constant market share" adjusting for sectoral and geographic growth dynamics, and thus splits the actual decline in market share into the structural effect (difference between the blue and pink lines) and
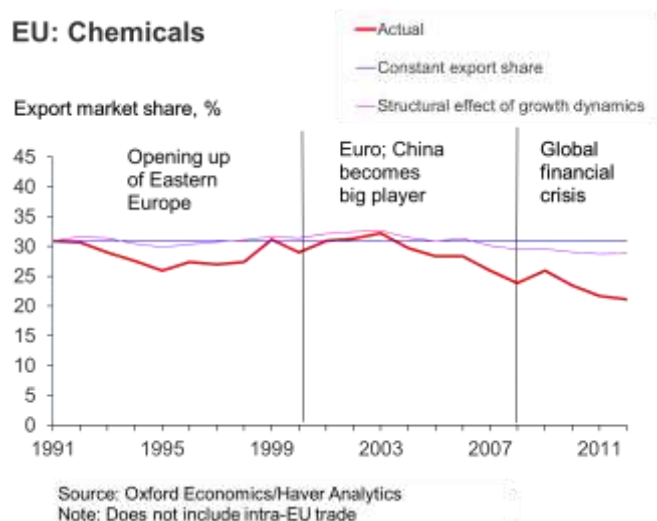
competitiveness effect (difference between the pink and red lines. We can immediately see that the EU's global export market share dipped in the early 1990s but then recouped those losses later in the decade, with the movements primarily driven by changes in competitiveness. Since 2003, however, it has declined fairly steadily, with the majority of this decline due to declining competitiveness rather than slower-growing export markets.

The table presents the CMS results in a slightly different way, showing the average annual growth rate of EU and world chemical exports in the top section and then decomposing the gap between the two into that due to growth dynamics (structure effect) and competitive effect. So, for instance, in the post- crisis period, average annual EU chemical export growth was 5.3 percentage points less the 10.6% increase in world exports, and we can see that this gap was mainly due to worsening competitiveness, though slower-growing markets were also an important reason.

EU: Chemicals

Export market share, %

Source: Oxford Economics/Haver Analytics
Note: Does not include intra-EU trade

EU: CMS analysis results			
	1992 - 2000	**2000 - 2008**	**2008 - 2012**
	Average annual growth rate		
Growth of EU chemical exports	9.7	10.8	5.3
Growth of World chemical exports	9.6	13.6	10.6
	Percentage points		
Difference between World and EU export growth	0.2	-2.7	-5.3
Due to Structure effect	0.3	-0.8	-1.5
Due to Competitive effect	-0.2	-1.9	-3.9

Source: Oxford Economics
Note: Does not include intra-EU trade

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[2] Because inclusion of the exporting country in the CMS analysis would bias the structure effect, "world" exports must exclude the country for which market share is being calculated in order to maintain consistency. As a result the EU export market shares reported in this and similar charts in section 4 will be slightly higher than those in the charts on pages 4 and 7. The larger is the country's share of global exports, the greater will be the difference. In addition, the market share in the charts on pages 4 and 7 are expressed as a share of extra-EU exports for consistency, whereas the individual country charts in section 4 are expressed as share of total exports.

4 EU chemical competitiveness in international perspective

Trade in chemicals is big business: total world exports excluding intra-EU trade increased nearly sevenfold to €525 billion from 1995 to 2012. For comparison, non-EU chemical production reached €2.7 trillion in 2012, implying that nearly 20% of production is exported. The EU remains the second-largest chemical exporter after the US and ahead of Japan (and would be the largest if intra-EU trade were included). Nonetheless, a closer look at the charts below reveals some dramatic changes in these shares over the past 20 years. The EU's share has declined to 18% (smaller than the declines in the US) at the expense of dramatic increases in key developing countries. The goal of this section is to describe and understand these trends.

4.1 Overview of EU competitiveness trends since 1992

Referring back to the chart on the previous page, the period of analysis can be usefully divided into 3 distinct parts. The first, in the 1990s, was characterised by dramatic changes in the European economy. In the early part of the decade, market share declined in the wake of the collapse of the Soviet Union and reunification of Germany, both of which imposed large adjustment costs on Germany in particular and had indirect adverse effects on other western European countries.

But the strengthened linkages between Eastern and Western Europe worked to the eventual benefit of nations such as Poland and the Czech Republic. After a period of adjustment during which they moved to more market-oriented economies and modernised their industrial capacity, they were able to offer chemical products of comparable quality but with significantly lower wages and production costs. Thus put pressure on Germany, the UK and other large Western European exporters within Europe, but also helped the EU improve its export market share later in the 1990s.

In addition, the global economy picked up considerable momentum in the late 1990s, particularly in the US, where industrial production grew 5.1% annually from 1995 to 2000. As the US is a key market, this gave a boost to European exporters and contributed to a recovery of market share. Also by the late 1990s, exchange rate integration was well underway with the introduction of the euro as an accounting unit on January 1, 1999 and as a currency in 2002. The euro weakened considerably in the two years after its launch. The effect on the cost of exports may have helped boost the EU's global export market share in the early 2000s.

Subsequent to that, however, competitive pressures started to mount with the accession of China to the World Trade Organisation in December 2001. As China gained expanded access to foreign markets and continued its rapid process of industrialisation and development of low-cost manufacturing, the EU's share of chemical exports began a steady decline.

Chemical exports by country of origin, 1992

Chemical exports by country of origin, 2012
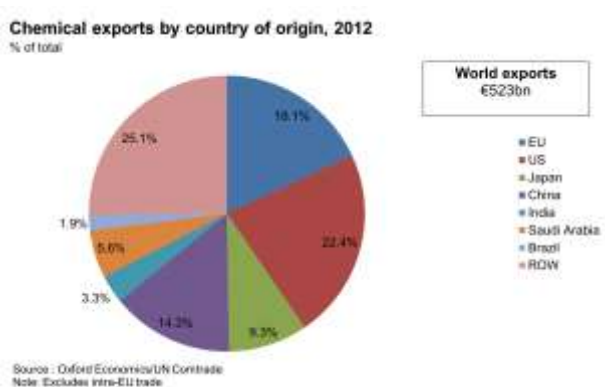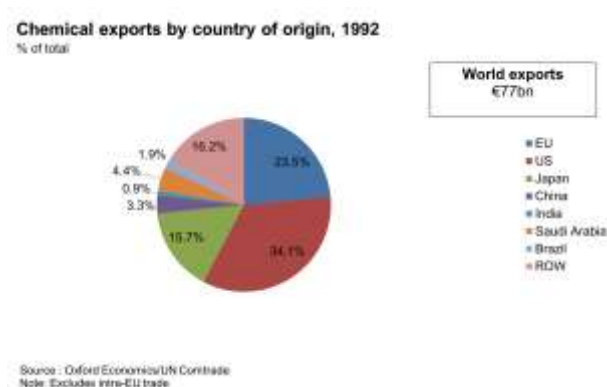
In the wake of the 2008-09 global financial crisis and recession, the EU share slid further, partly due to a slow recovery in its key destination markets (the US and non-EU Europe), but mainly due to a further deterioration of competitiveness.

4.2   Benchmarking the EU against other developed nations

The three charts to the right show the split of market share for the largest developed economies. The US, like the EU, has seen a considerable decline in market share, and the large majority is due to declining competitiveness. However, the damage had largely been done by the mid-2000s. Since then, export competitiveness has stabilised. As noted earlier, the EU is not alone among developed countries in facing competitive pressures in the chemical sector.

Japan shows a completely different pattern, which illustrates the advantage of being located near a high-growth region. Its actual global export market share has declined significantly less than that of the US, and about as much as the EU's share. But the reason for this is not better competitiveness; rather, it is the structural effect of growth dynamics. Japan has become an important exporter to China, which has the most rapid industrial production growth in the world, and accounting for this would actually have implied an *increase* in market share in the 2000s. In essence, proximity to rapidly growing markets is helping offset a very large and growing competitiveness gap in Japan.

4.3   Benchmarking the EU against key emerging markets

Chemical export market shares are on the increase across the developing world, but as in the developed world, there are marked contrasts in trends over time. The most meteoric increase is in China, where market share increased fourfold to exceed that of Japan by 2012 by a comfortable margin. This increase is evident across most
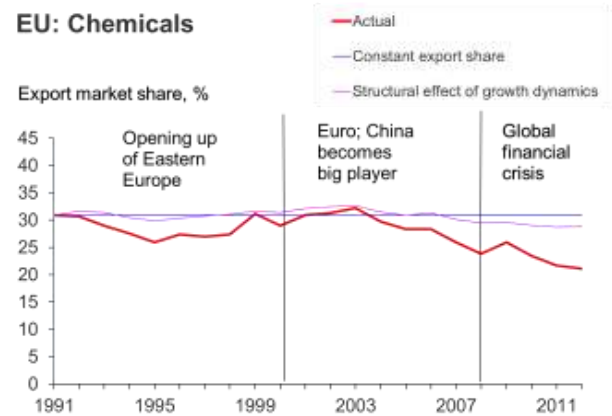
EU: Chemicals
Export market share, %
Source: Oxford Economics/Haver Analytics
Note: Does not include intra-EU trade

US: Chemicals
Export market share, %
Source : Oxford Economics/Haver Analytics
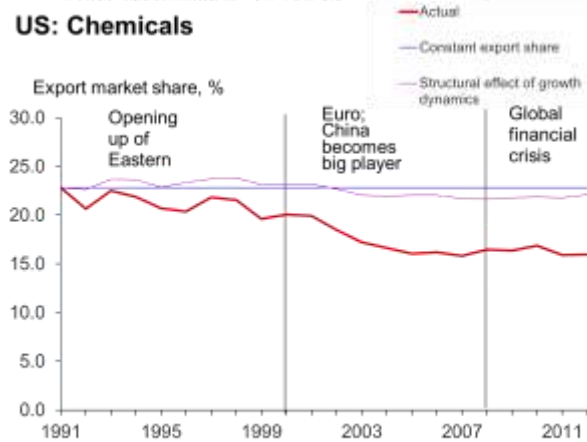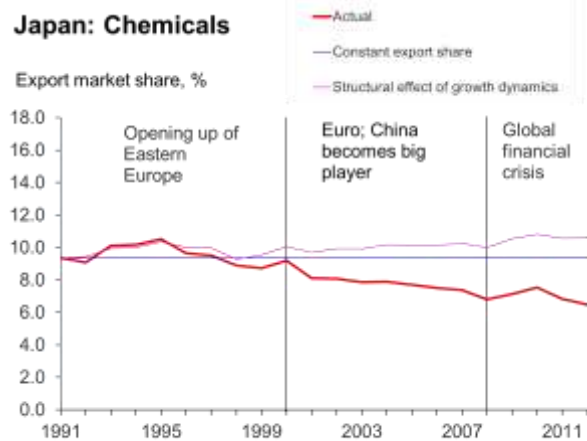
Japan: Chemicals
Export market share, %
Source : Oxford Economics/Haver Analytics

subsectors, illustrating the development of a diversified chemical industry in China. Not surprisingly, most of the increase in market share occurred after China's entry into the WTO in 2001.

Interestingly, the structural effect was flat to slightly negative in the 1990s and 2000s, reflecting the fact that one of China's largest destination markets during that time was Japan, which was dealing with 2 decades of deflation and meagre economic growth. Since the financial crisis, it has

increasingly focused its attention on India and other fast-growing Asian markets, resulting in a positive structural effect. Nonetheless the lion's share of the increase in market share is due to increasing competitiveness. Broadly similar patterns are evident in India, though the scale is smaller.

Saudi Arabia's export market share has increased as well, with nearly all of it occurring within the past seven years. The sharp spike in 2008 is undoubtedly due to the opening of a plant that serves export markets (and hence overplays the competitiveness effect), but the increase has continued rapidly in the post-crisis years. Unlike for China, the rise is concentrated in petrochemicals and polymers; other sectors have very low export market shares and have not seen any significant rises over the sample period. Furthermore, a larger proportion of the increase in market share is explained by high growth in destination markets, although the improvement in competitiveness is substantial as well.

Brazil is a completely different story, where export market share (a very small 1% of world exports in 1992) has struggled to increase. There was a slight increase in the mid-2000s as the government of Lula da Silva successfully implemented structural reforms designed to improve the business environment. Since then, however, reform has stalled and the tangle of red tape, regulation, and taxes known locally as the *"custo Brasil"* has stymied further improvements in competitiveness.

4.4   Subsector trends and comparisons

As noted earlier, one of the key advantages of using export data to assess competitiveness is the ability to drill down to the subsector level. This allows us not only to understand which ones are driving the trends observed for aggregate chemicals, but also to draw contrasts between subsectors, the competitiveness of which are likely to evolve in different ways depending on their particular characteristics.

China: Chemicals — Export market share, %
Source : Oxford Economics/Haver Analytics

India: Chemicals — Export market share, %
Source : Oxford Economics/Haver Analytics

Saudi Arabia: Chemicals — Export market share, %
Source : Oxford Economics/Haver Analytics
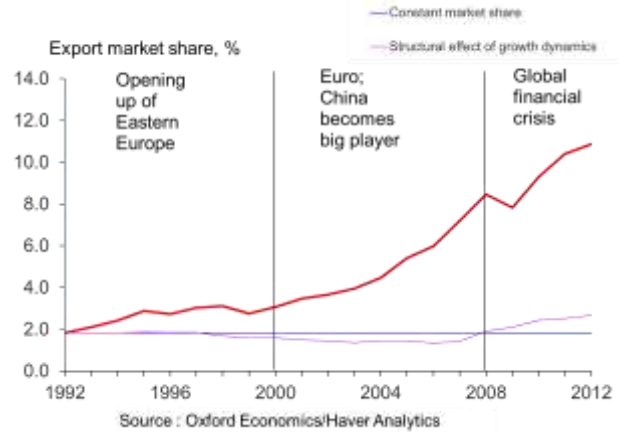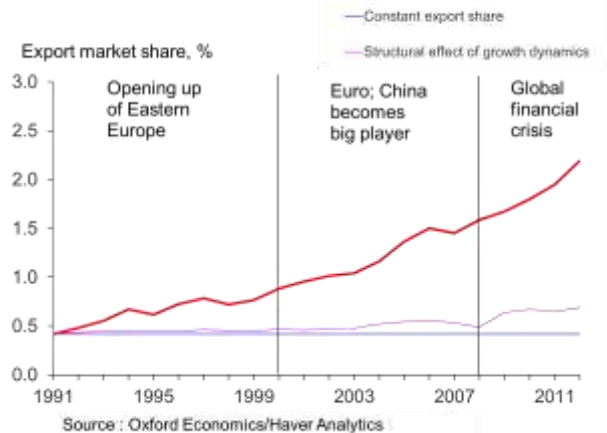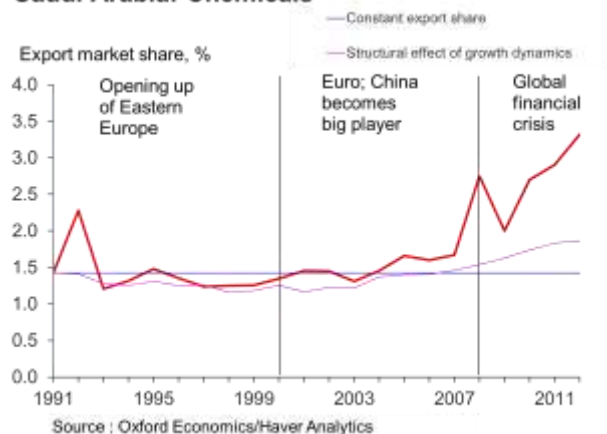
Brazil: Chemicals — Export market share, %
Source : Oxford Economics/Haver Analytics

For the EU, the most striking observation is that the vast majority of the erosion of export competitiveness since the early 2000s is attributable to the petrochemicals subsector. In some sense, this is not surprising: petrochemicals accounted for one-third of total extra-EU chemical exports, a figure which rises to 50% if we include polymers. But chart 4.1 illustrates that the drop in petrochemicals' global export share has been much more severe than the chemical sector as a whole: down to just over 20% from a peak of more than 40% in the early 2000s.

Chart 4.1

Source : Oxford Economics/Haver Analytics
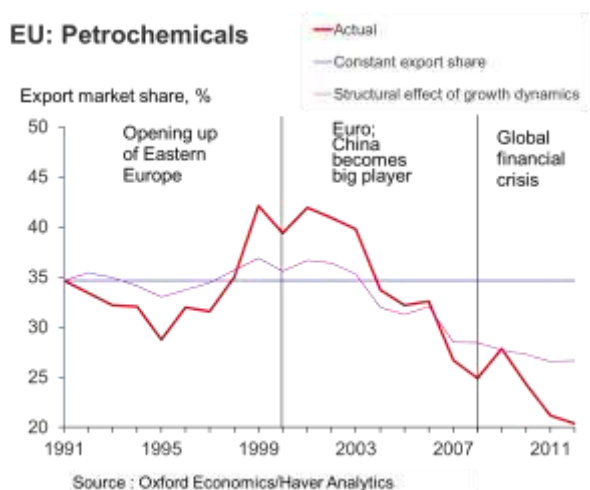
Some of the drop in market share during the 2000s was due to slow growth dynamics in destination markets, particularly later in the decade (evidenced by the line showing expected market share based on structural growth dynamics). But since the global financial crisis, virtually all of the drop in market share is due to ebbing competitiveness – possibly driven by lower energy and feedstock prices in places like the US and Saudi Arabia. Similar trends are present, albeit to a less dramatic degree, for polymers, which saw global sectoral export market share diminish from 17% in the early 2000s to 13% in 2012.

The poor performance of the petrochemicals and polymers subsectors means that other chemical subsectors must be doing relatively better, and that is indeed the case. A notable example is consumer chemicals. The EU dominates this market, accounting for nearly half of global extra-EU exports. There has been a decline in

competitiveness since the early 2000s, but it has been modest enough to keep sectoral export market share just under 40% by 2012, only slightly below its level throughout most of the 1990s and early 2000s. This decline is entirely due to worsening competitiveness, and the persistent, if gradual, decline over the past decade is worrying. Other sectors such as basic inorganics and specialty chemicals have not seen substantial declines in competitiveness over the past 20 years, and have thus helped offset the decline in petrochemicals. (Charts for all subsectors and countries can be found in the appendix.)

Chart 4.2

Source : Oxford Economics/Haver Analytics
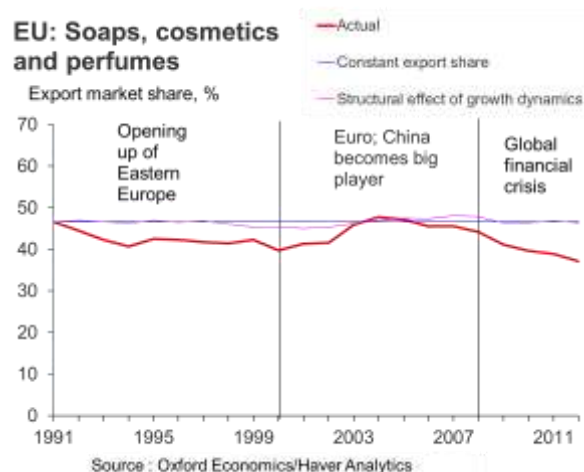
4.5 Trends in individual EU member states

Within the EU, there are considerable differences in competitive dynamics. Before examining them, however, it is necessary to point out a crucial methodological difference when considering individual member states. In the preceding analysis, the CMS methodology treated the EU as a "country," and thus did not incorporate intra-EU trade. When looking at individual countries, however, intra-EU trade is included in the CMS calculations. Because there is a large amount of chemical trade within the EU, comparisons of individual countries provide a good indication of the relative performance of each country within the EU market.

The largest EU countries generally saw a marked deterioration of competitiveness in the 1990s. In Germany's case, this was likely related to the aftermath of reunification as well as strengthening trade links of Eastern European countries both inside and outside the EU. Lower production costs in countries like Poland and the Czech Republic eventually allowed them to take export market share from Germany (and other higher-cost Western European nations, for that matter). However, Germany's market share and competitiveness was fairly stable through the 2000s before deteriorating again in the wake of the global financial crisis.

Unlike Germany, France continued to lose competitiveness and export market share through the 2000s, a pattern that accelerated after 2008. As a result, export market share declined by nearly 50% over the entire period. Italy shows a similar pattern to France, although the decline in market share is not so dramatic.

The UK is the only major EU country that saw increasing competitiveness in the mid-1990s, but since then, the erosion of the Billington cluster mentioned earlier has resulted in a dramatic competitiveness-driven decline in export market. The UK has had a modest advantage with regard to structural dynamics relative to other European countries due to a heavier exposure to the faster-growing US market, but this has not supported market share.

Among the smaller EU countries, the erosion of competitiveness has not been so dramatic. In the Netherlands, there was a sharp deterioration in the late 1990s, but through the 2000s export market share clawed back some of those losses, driven primarily by improvements in competitiveness. The competitiveness gap has narrowed further since the global financial crisis: export market share has held fairly steady even as growth in destination markets has lagged. Belgium also made significant competitiveness progress in the 2000s, but the decline in market share since the financial crisis has been due as much to worsening competitiveness as to slow-growing markets.

Germany: Chemicals
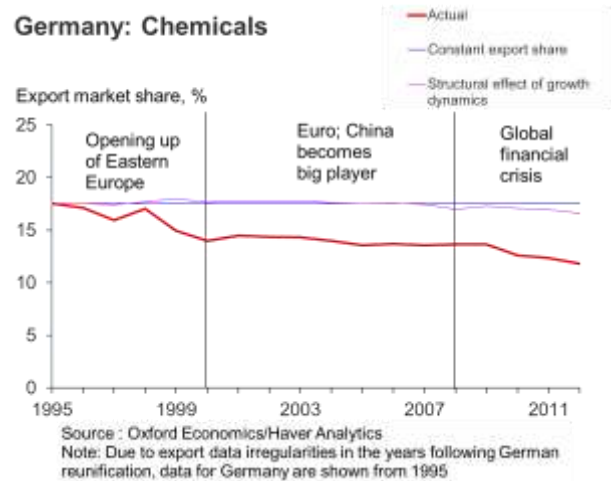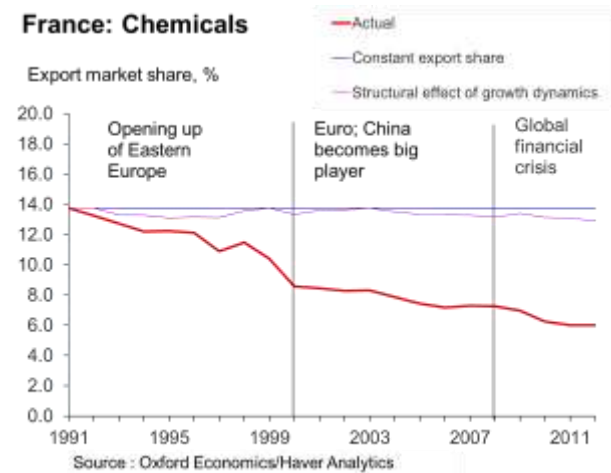
Export market share, %

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

France: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics

UK: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics

Italy: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics
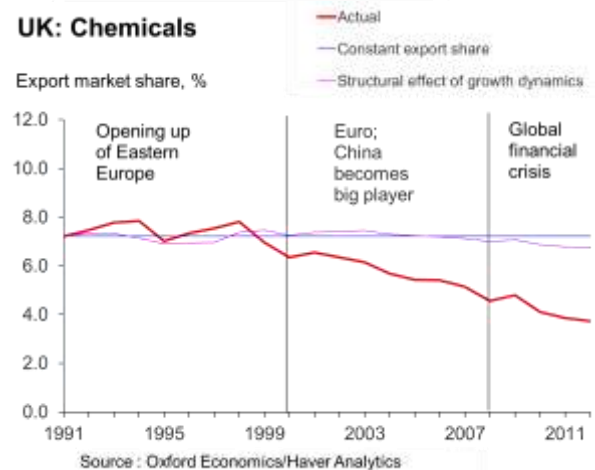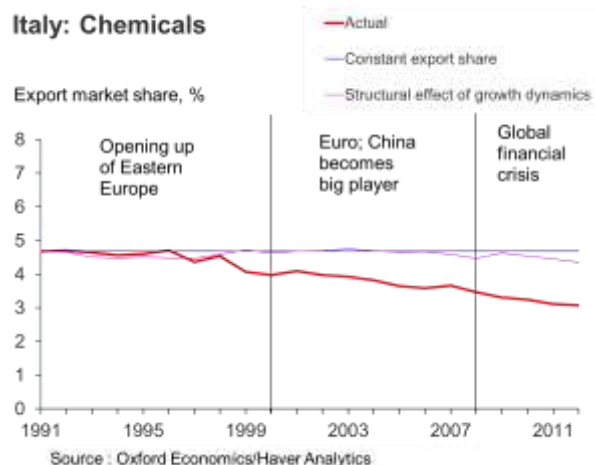
Spain stands out as the only Western European country to maintain export market share above 1991 levels. This is all the more remarkable when one considers that the relatively slow growth dynamics might have led one to expect a decline in export market share – making Spain something of a competitiveness success story (at least relative to the rest of Western Europe) over the entire period. Nonetheless, the absolute increase in Spanish market share is fairly small.

The outlier is Poland, which has taken advantage of its 2004 entry into the EU to grow its market share significantly, even though the structural effect of slower growth in Russia and Western Europe weighed on demand in destination markets. The result is that the competitiveness index grew more strongly than any other EU country examined in this report.

(Note that information for all countries and subsectors can be found in the appendix.)

Netherlands: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics

Belgium: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics
Note: Belgian data unavailable prior to 1999

Spain: Chemicals

Export market share, %

Source : Oxford Economics/Haver Analytics

Poland: Chemicals

Export market share, %
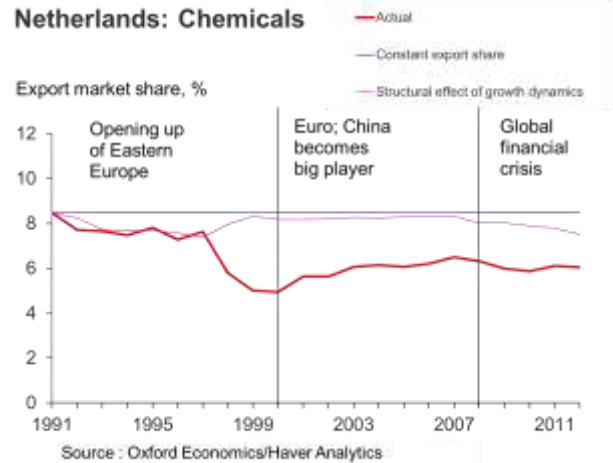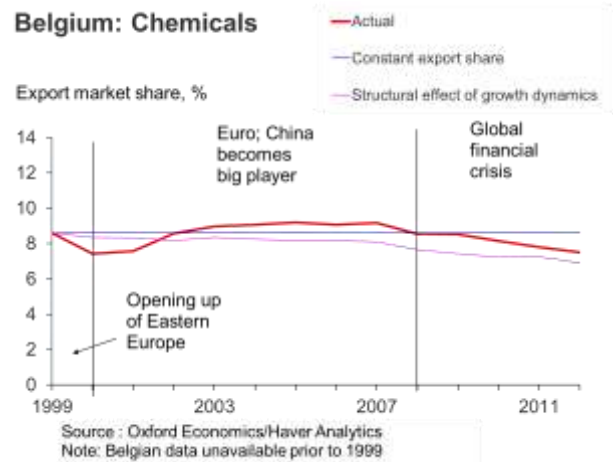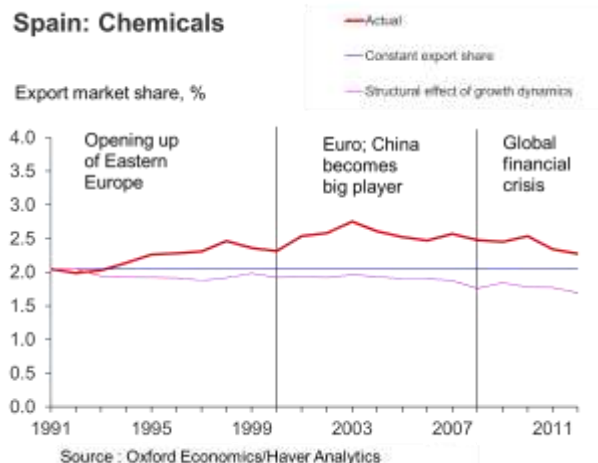
Source : Oxford Economics/Haver Analytics
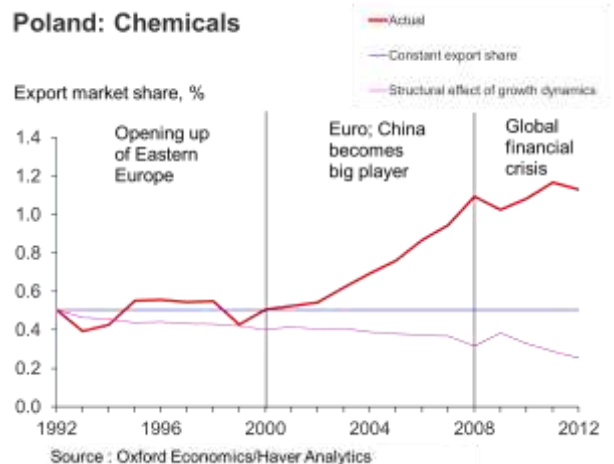
5 Drivers of chemical competitiveness

5.1 Identification of potential drivers

There is a long research literature on the factors that are potentially important to industrial competitiveness, and many of them are important not only for the chemical industry but for the whole spectrum of tradable goods. Because competitiveness is fundamentally about offering superior customer value at an attractive price, all drivers are in one way or another related to production costs or product quality.

On the cost side, in many industries labour is a large enough share of overall production costs that international differences in wages can have a large bearing on competitiveness, and indeed is one of the reasons that some industries, such as mass-market apparel, have largely migrated to the developing world over the past several decades. While the chemical industry is less labour intensive than manufacturing as a whole, there is reason to believe that labour costs could nonetheless matter.

Another cost that is particularly important in the chemicals industry is energy and raw materials costs. The chemical industry is the most energy-intensive of all manufacturing sectors: in the EU, it accounts for 20% of industrial energy consumption, well above its 7% share of manufacturing output. For certain subsectors like petrochemicals and basic inorganics, energy and feedstock costs are larger than payroll costs, so we would expect this to be especially important – indeed anecdotal evidence from the US shale gas boom is highly suggestive in this regard.

Exchange rates also affect the cost of goods purchased by foreign buyers, and macroeconometric research consistently demonstrates that a weaker currency tends to be followed (generally with a lag of 1 to 2 years) by an acceleration of export growth. We would expect the same to be true in the chemicals industry, though the impact of higher import prices could

have an offsetting impact in subsectors that are significant importers of raw materials.

Costs are also affected by a variety of government policies. On the negative side, complex and burdensome tax systems reduce after-tax profits (and hence the resources to invest in activities that improve competitiveness) and also increase compliance costs. Similarly, regulations, if not well structured, needlessly increase the resources that companies must devote to compliance and, in some cases, have unintended consequences that actually stymie new product development and innovation.

On the positive side, governments have a large role to play in the development and quality of infrastructure such as transport networks, with ports and roads being the most important with respect to international trade. To the extent that it reduces transportation costs, complements private business investment and stimulates supply chain breadth, the quality of a country's infrastructure could enhance competitiveness.

With regard to product quality, the most important potential factor is innovation, which opens up new possibilities both in terms of new products and more efficient processes for producing existing products. The internet is the archetypal example, having spawned not only new products, but entirely new industries. But the chemical sector is also rife with examples of wider innovation impacts, such as lightweight materials for automotive and aerospace efficiency, development of cleaner-burning fuels, and many others.

5.2 International comparison of trends

Comparing the EU to other countries yields important information on the extent to which the necessary conditions for strong competitiveness are in place. As noted earlier, the shale gas boom in the US has opened up a wide gap in natural gas costs relative elsewhere in the world, with US prices now just one-third of European levels – but still well above the subsidised $0.75 per million BTU in Saudi Arabia. However, within Europe there are some differences. For example,

Germany has a smaller disadvantage than other major countries, particularly the UK (where industrial natural gas prices are 30% higher than in Germany). The same regional trends hold for feedstock prices such as naphtha and propylene. But Japan is arguably in a worse situation, because the reduction of nuclear energy capacity in the wake of the Fukushima disaster has dramatically increased demand for fossil-fuel-based electricity generation.

Chart 5.1

Natural gas prices
US$ per Mn/BTU

Source : Oxford Economics/Haver Analytics
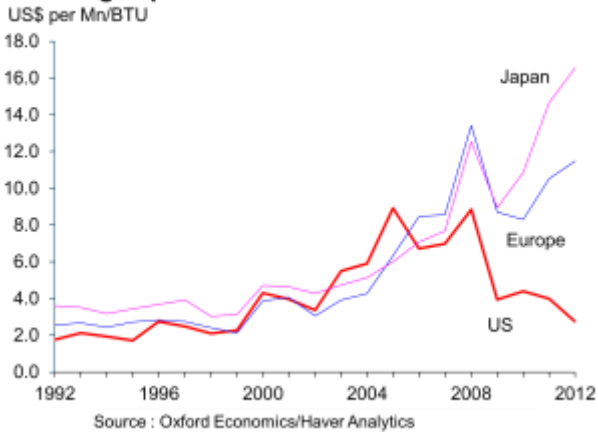
With regard to labour costs, there is very little chemical-specific data, and what data exist are confined to the developed world. Nonetheless, they reveal that EU chemical-sector wages are significantly higher than in the US, while the gap with Japan has all but disappeared. The gap with the US has been widening since 2010. This would be acceptable if labour productivity were rising to keep pace, but in fact EU chemical sector productivity has actually declined somewhat (unlike for manufacturing as a whole) since the beginning of the financial crisis.

By looking at labour cost trends in manufacturing as a whole, we can get a more complete picture of relative positions, because (1) we have information on the growth rate of unit labour costs, which corrects for the fact that wage increases accompanied by equivalent increases in productivity do not signal a deteriorating competitiveness and (2) information is available for many more countries. It shows that developing

countries are seeing the most pronounced growth, particularly China. So while we know there is a wage gap between Europe and developing countries, strong wage growth in excess of productivity is narrowing it rapidly.

Chart 5.2

Chemical hourly wages
Euros

Source : Oxford Economics/CEFIC
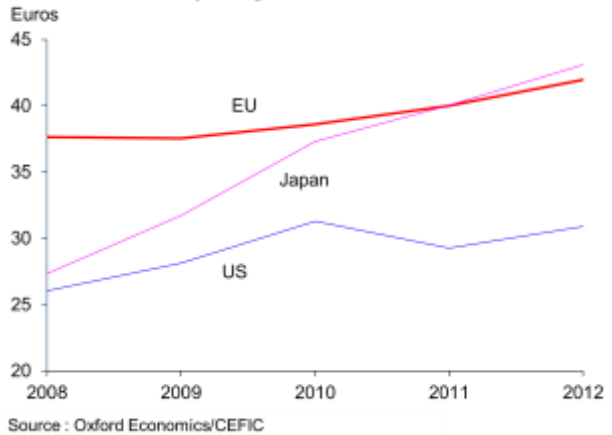
Chart 5.3

Manufacturing unit labour costs
2001 = 100

Source : Oxford Economics/Haver Analytics
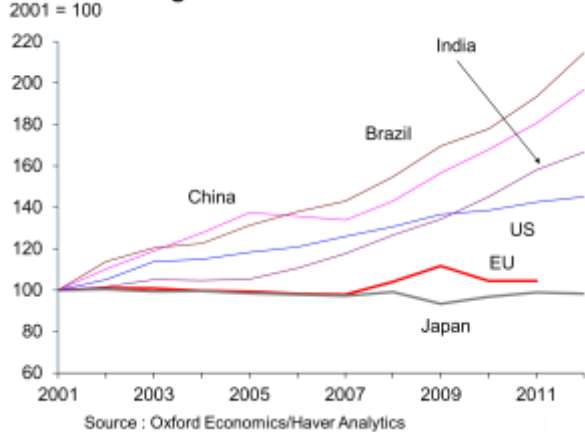
There has been a secular decline in chemical-sector R&D intensity over the past 20 years in the developed world, although patterns in individual countries vary. In the EU, the decline has been fairly steady, from about 2¾% of sector output in 1992 to 1½% today. In Japan, R&D intensity is significantly higher than elsewhere, and the mid-2000s drop was not large enough to narrow the gap with other countries.

But perhaps the most surprising trend is China, where R&D intensity increases dramatically in the

early 2000s as China entered the WTO, but has since drifted down to 0.75% of sector output and has been, like in the developed world, flat in recent years. Part of this is due to the fact that sector growth was so rapid during that period: Even with declining intensity, R&D spending in absolute terms is growing more rapidly than in developed countries. But it may also signal that China continues to rely on imported technology and imitation of existing production processes to drive sector competitiveness (which will eventually bump up against obstacles as China reaches the technological frontier) or that it is specialised in relatively low-value commoditised products (meaning that the future competitiveness impact on high-value EU exporters could be muted).

Chart 5.4

Chemical R&D spending
% of sector output
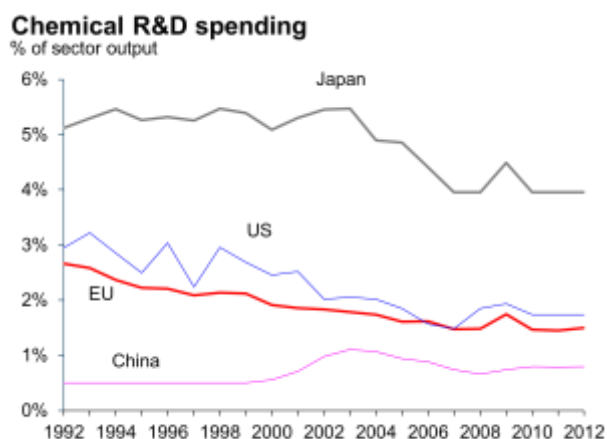
Source : Oxford Economics/CEFIC

Exchange rates worked significantly in Europe's favour through most of the 2000s, with the euro depreciating more than 35% against the dollar from 2000 to 2008. This may have limited the decline in extra-EU export market share in chemicals over that period. However, the Euro has strengthened somewhat in the post-crisis period, while at the same time there have been considerable currency depreciations in Japan and China.

With regard to the regulatory burden, there is no consistent international data on the burden of regulations specifically targeted at the chemical industry, but the World Economic Forum publishes an index of the overall business regulatory burden

based on a survey of more than 13,000 business executives in 144 countries. This information is distilled into an index, with larger values indicating a lower burden. Chart 5.6 shows that despite improvements over the last several years (shown by the positive growth rate), the EU still has a heavier burden than all other major countries except Brazil. In contrast, the US regulatory burden has become heavier over the past seven years.

Chart 5.5

Exchange rates per US$
1992=100

Source : Oxford Economics/Haver Analytics

Chart 5.6

Business regulatory burden, 2013
7 = least burdensome
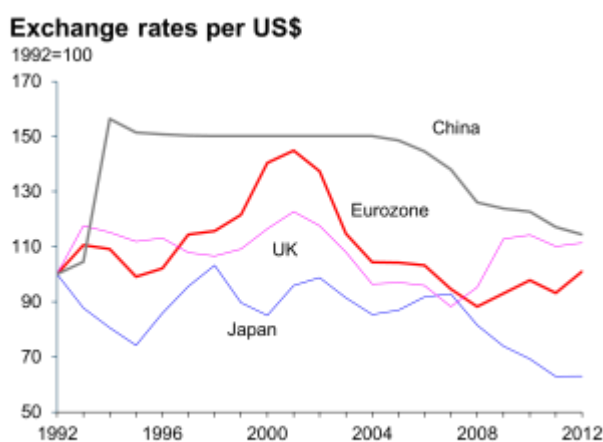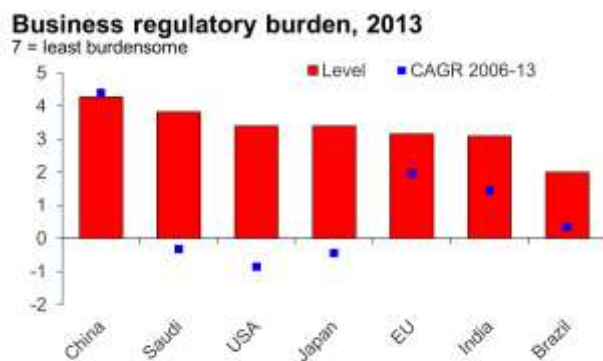
Source : World Economic Forum

6 An econometric model of chemical competitiveness

6.1 Overview of methodology

The foregoing analysis has laid the groundwork that allows us to investigate the quantitative links between a reliable measure of competitiveness for each of the five chemical subsectors to a set of drivers that are believed to have an impact on it. While there have been many efforts to assert such relationships and use qualitative and anecdotal evidence to support those claims, we know of no previous work that examines these relationships in a rigorous quantitative manner using a consistent dataset spanning multiple countries and time periods.

We seek to explain the changes in the competitiveness index developed and described in sections 3 and 4 by modelling those changes as a function of changes in the hypothesised drivers and performing multiple regression analysis on data from 13 developed and developing countries. The results will tell us (1) whether the hypotheses about the links between competitiveness and energy prices, innovation, labour costs, exchange rates, and other potential drivers are in fact supported by the data; and (2) what is the relative quantitative importance of each of the drivers. Because we do separate analyses of each subsector as well as the aggregate chemical sector, we will be able to identify the key contrasts.

Our hypotheses about the relationship between the change in the competitiveness index and the drivers can be summarised as follows:

- **Exchange rates:** negative (as a currency weakens competitiveness should increase, and vice versa).

- **Energy costs:** negative (if a country has relatively high and/or rising energy costs, competitiveness should decrease and, vice versa).

- **Labour costs:** negative (if a country has relatively high and/or rising labour costs, competitiveness should decrease, and vice versa).

- **R&D:** positive (as R&D increases, more innovation occurs and competitiveness should eventually increase, and vice versa).

- **Investment and infrastructure:** positive (as they increase, the associated new technologies and lower transport costs should improve competitiveness, and vice versa).

- **Government barriers:** negative (tax and regulatory compliance burdens can increase costs and discourage product development, which should reduce competitiveness, and vice versa).

6.2 Data description and sources

For each of the drivers we assembled a number of potential indicators, which are summarised in box 6.1. Having multiple indicators compensates for the fact that any single one is likely to capture only a part of the driver we are seeking to quantify, and that the quality of the data is likely to be uneven.

The data come from a variety of sources, but the main ones include Oxford Economics (capital expenditure, exchange rates, manufacturing unit labour costs, natural gas prices; all drawn from official government sources), VCI Chemdata (R&D intensity), World Economic Forum (scientific indicators, supply chain breadth, infrastructure, taxes and regulation). In addition, a number of sector-specific indicators, such as feedstock prices and labour costs, were obtained from IW Köln and the Bundesarbeitgeberverband Chemie.

Constructing the data set proved to be challenging, for several reasons. The most important was that, for many developing nations, data for some key drivers were limited or non-existent, meaning that those countries would be excluded from the sample unless we constructed proxy data. For instance, national natural gas prices were unavailable outside of Japan, the US and Europe. In order to include countries like China, Saudi

Arabia and India in the econometric analysis, we made assumptions about prices in emerging markets relative to the US and Europe based on anecdotal information.

Box 6.1: Overview of drivers data

- **Exchange rates:** Local currency per US$

- **Energy costs:** Regional and national natural gas prices, national electricity prices, regional chemical feedstock prices (naphtha, ethylene, propylene, benzene)

- **Labour costs:** Unit labour costs (chemical-specific and manufacturing as a whole), hourly wages in chemical sector

- **Innovation:** R&D spending intensity, availability of scientists and engineers, quality of scientific institutions, supply chain breadth

- **Capital expenditure:** Subsector investment in equipment and structures

- **Infrastructure:** Quality of roads and ports

- **Taxes and regulation:** Corporate tax rate, executive opinion on regulatory burden, number of days to start a business, trade tariffs

The other challenge was that many of the drivers that had complete country coverage had very little historical data. This was the case for the World Economic Forum indicators, which only extend back to 2006. Because they are among the potentially important determinants of competitiveness, we could not leave them out of the estimation. As a result, the model and core results are based on historical relationships between competitiveness and its potential drivers over the past seven years, although we did examine statistical relationships from 1992 to 2012 for countries and drivers for which data were available in order to cross-check and validate the core model.

The final issue was that for some drivers we had difficulty finding information specific to the chemical sector. This was particularly the case for the regulatory environment. All of the available quantitative indicators are intended to measure the overall national regulatory environment. Clearly, there are specific regulations that could have a disproportionate impact on the chemical sector such as REACH and the Toxic Substances Control Act, but we know of no source that collects quantitative chemical-specific regulation indicators that are consistent across countries. Efforts to develop such indicators would be a worthwhile priority for future research.

6.3   Estimation approach

As noted earlier, we estimated separate models for each of the five chemical subsectors as well as for the sector as an aggregate. But because of the short sample period, we have used a panel approach to set up the data and estimation. Such an approach identifies each observation uniquely based on the country and observation date. This involves stacking the data for all countries to create a joint econometric estimation. This approach enables us detect patterns shared by all, or by groups of countries, and ensures the maximum use of information contained in the data.

We took a theory-based approach: the initial model specification included only the drivers that theory and prior belief strongly suggested should have a quantitative link, and then was "tested up" by including other drivers for which we believed the links were less certain.

The initial core specification for all subsectors was

$$\%\Delta(C) = \beta_1 \%\Delta(E) + \beta_2 \%\Delta(L) + \beta_3 \%\Delta(RD) + \beta_4 \%\Delta(I) + \beta_5 \%\Delta(XR) + \varepsilon$$

where

C = CMS competitiveness index

E = Energy prices

L = Labour costs

RD = R&D and innovation

I = Sector investment

XR = Exchange rate

Within this core framework, we examined intertemporal relationships (such as the fact that an increase in R&D or an exchange rate depreciation may only have an influence on competitiveness with a time delay), levels versus differences in the drivers (such as the fact that it may be the absolute level or change, rather than the percent change, in energy costs that has the bigger impact on the change in competitiveness), as well as the standard econometric diagnostics such as error autocorrelation and heteroscedasticity. We also controlled for the level of economic development to account for the fact that some of the increase in competitiveness observed in the developing countries is likely due to technological "catch-up" which could be considered a natural pattern independent of the core drivers.

Once a robust core model was identified for each subsector, we jointly and individually tested indicators for investment, taxation, regulation, supply chain breadth and infrastructure and included them in the final specification.

6.4 Results

The econometric results broadly supported our hypotheses. For the chemical sector as a whole, there were large and statistically significant relationships between the changes in the competitiveness index and energy prices, labour costs and R&D, and the direction of the effect was consistent with economic theory and our prior view. Table 1 shows summary results, with the direction of the relationship indicated by a plus or a minus sign and the relative strength of the relationship indicated by the number of pluses and minuses. An (i) indicates that the point estimate is nonzero, but statistically insignificant.

6.4.1 Energy prices

Not surprisingly, energy and feedstock prices – natural gas more so than others – had a strong negative impact on competitiveness in petrochemicals, which filters through to closely related downstream sectors such as polymers. Energy consumption can account for as much as

Summary econometric results - Total chemicals		
Driver	**Indicator**	**Relationship**
Energy costs	Natural gas price	- - -
Labour costs	Manufacturing unit labour costs	-
Innovation (short-term)	R&D intensity	Nil
Innovation (long-term)	R&D intensity	+ + +
Capital spending	Sector investment	+ +
Exchange rate	Local currency per US$	- -
Regulatory burden	WEF index	-
Tax burden	WEF index	Nil
Value chain breadth	WEF index	Nil
Transport infrastructure	WEF index	Nil
Adjusted R-squared		0.51-0.55

Source: Oxford Economics

85% of total operating costs in the petrochemicals sector, both as a feedstock and as a source of energy for crackers. Downstream sectors use less energy in the production process, but feel the impact of high energy prices via the petrochemicals on which they depend for intermediate inputs.

Consequently, we would expect that the competitiveness of less energy-intensive sectors, as well as those more downstream in chemical supply chains would be less affected by international differences in energy prices, and that is what the results indicate. There is no statistical relationship evident for consumer chemicals and (somewhat more surprisingly) basic inorganics.

6.4.2 Labour costs

Labour costs relative to other countries had a relatively marginal impact on export competitiveness, with most sectors showing a small or nonexistent relationship. This is not

surprising, since labour intensity across chemical subsectors is generally lower than that for manufacturing as a whole. Thus, while lower labour costs are commonly thought to be a primary driver of national competitiveness, policy makers and businesses should be more focused on other costs – particularly energy costs – when thinking about strategies to bolster chemical competitiveness

6.4.3 R&D, innovation and investment

The dynamics of R&D's relationship to competitiveness were complex. As noted earlier, our hypothesis was that R&D intensity should be positively related to competitiveness, but with a time lag, since the path from discovery to production can take years. For many subsectors, the data revealed both a near-term (2-3 years) and long-term (7-10 years) relationship, with the latter generally being stronger. This is consistent with the notion that downstream product development and process improvement can have positive effects within a relatively short time, whereas breakthrough basic discoveries can be game changers in terms of competitiveness, but take a long time to manifest themselves.

Unlike for energy prices, the influence of innovation is more broadly spread across the subsectors, with soaps, cosmetics and perfumes the only one for which the data show no relationship.

Investment growth has a similarly broad-based positive effect on competitiveness, although the effects are (not surprisingly) more immediate than for R&D, since there is an immediate impact on production. However, the quantitative importance is notably smaller than for R&D. This is because the main effect of investment is to expand production capacity (some of which will not be destined for export), with an ancillary benefit of improving overall competitiveness by embodying better technologies.

6.4.4 Exchange rates

Exchange rate movements also had the expected negative relationship to competitiveness – as a country's currency weakens, prices in the currency

Econometric results
Energy prices

Sector	Statistical relationship
Petrochemicals	- - - - -
Polymers	- -
Basic inorganics	Nil
Specialty chemicals	- -
Consumer chemicals	Nil

Source: Oxford Economics

Econometric results
Labour costs

Sector	Statistical relationship
Petrochemicals	-
Polymers	Nil
Basic inorganics	-
Specialty chemicals	- -
Consumer chemicals	- (i)

Source: Oxford Economics

Econometric results
R&D/Innovation

Sector	Statistical relationship	
	Short-term	Long-term
Petrochemicals	+ + (i)	+ + +
Polymers	Nil	+ + +
Basic inorganics	+ + + + +	+ + + + +
Specialty chemicals	Nil	+ + +
Consumer chemicals	+ +	Nil

Source: Oxford Economics

of foreign buyers decrease (although this can be partly offset by the associated increase in the cost of imported raw materials). In addition, the effect acted with a one to two year lag, consistent with economic theory and macroeconometric studies. The effects are typically stronger than most of the other core drivers, with every 10% change in the exchange rate associated with a 4% change in

competitiveness and illustrates how efforts to increase competitiveness by policy means (such as encouraging R&D or attempting to reduce energy costs) may be partly offset by a significant strengthening of the currency.

6.4.5 Other drivers

As was the case for total chemicals, the indicators measuring the quality of infrastructure, supply chain interventions, and potential government-imposed obstacles to competitiveness such as high tax rates and heavy regulatory compliance burdens were not generally important drivers in the econometric model. There were, however, some notable exceptions that validate anecdotal evidence.

For instance, the index of value chain breadth was positively related to competitiveness in the petrochemicals and polymers subsectors. This suggests that agglomeration and clustering effects are at play: geographic proximity of different links in the petrochemical value chain contributes not only to reduced transport costs, but also the exchange of information and technology that foster innovation and competitiveness.

This is illustrated by the erosion of the chemical production footprint in Billingham in the UK. Once a vibrant cluster anchored by ICI, the largest firm in the British Empire in its heyday, it is now a shadow of its former self, with just a handful of much smaller companies operating there. UK chemical competitiveness has likely suffered as a result. While this evidence is merely suggestive, it illustrates the importance of maintaining the diversity of chemical manufacturing clusters in order to sustain sector competitiveness.

The measures of the regulatory, tax and infrastructure burdens showed little statistical relationship to changes in the competitiveness index at the subsector level. However, that does not rule out the possibility that these factors are important.

In the case of infrastructure quality, the EU (and Japan and the US, for that matter) ranks near the top of the list according to the World Economic Forum rankings, so it may be the case that the

Econometric results Sector investment	
Sector	Statistical relationship
Petrochemicals	+ +
Polymers	+ +
Basic inorganics	Nil
Specialty chemicals	Nil
Consumer chemicals	+ (i)

Source: Oxford Economics

Econometric results Exchange rate	
Sector	Statistical relationship
Petrochemicals	- --
Polymers	- - - -
Basic inorganics	- (i)
Specialty chemicals	- -
Consumer chemicals	- (i)

Source: Oxford Economics

competitiveness benefits of incremental improvements would be negligible – that is certainly what our econometric analysis suggests.

Another factor explaining the weak quantitative relationships is likely because none of the available tax, regulatory and infrastructure indicators was specifically focused on the chemical sector. While the econometric analysis here is inconclusive, we do not conclude that these factors are unimportant. Further research on developing appropriate measures of chemical-specific measures of the regulatory burden and quality of infrastructure in particular would be worthwhile.

7 Scenario analysis

The foregoing econometric analysis provides a powerful tool to examine the potential future of "Platform Europe" as a strong and vibrant producer of chemicals, because it provides evidence-based quantitative links between export competitiveness and R&D activity, exchange rates, energy costs, and other drivers. By making alternative assumptions about the future path of these indicators in Europe, we can derive the implied change in export competitiveness, and hence export market share.

7.1   Descriptions of scenarios

Because R&D spending, energy costs and exchange rates are both the most important quantitative drivers of competitiveness and the ones that arguably are most able to be influenced by policy decisions, we have developed an upside scenario for each of them.

With regard to chemical sector R&D intensity, recent years have seen a flat profile at just over 1½% of sector sales in recent years, and our baseline assumes that that percentage will continue. We examine two alternative upside scenarios:

- R&D intensity returns to 2000 levels (about 2% of sector sales) by 2018.

- R&D intensity doubles to nearly 3½% of sector sales by 2018. This is a less likely (though possible) scenario, because it would mean R&D intensity would reach levels higher than in the early 1990s.

With regard to energy costs, our baseline assumes that US gas prices will begin to rise in the next several years as demand begins to outstrip growth in supply as the shale gas boom moderates. In the EU, there may be considerable scope for developing shale gas – the UK and Poland in particular have considerable proved reserves, but environmental worries have impeded their development. We examine two alternative paths for energy prices:

- **Moderate EU shale gas development:** The gap between natural gas prices in Europe and the US narrows somewhat by 2020 as EU shale gas reserves are tapped. Note that because US prices are forecast to rise somewhat during that period, the absolute decline in European natural gas prices is much smaller than that seen in the US in recent years.

- **Continuing European-US energy price gap:** While our baseline forecast assumes that US gas prices will begin to rise in the next several years, many observers believe that the current price gap will persist at least through the rest of this decade. We thus look at a downside scenario by which the current US-EU gas price gap persists through 2020.

Finally, for exchange rates, many economic observers (including Oxford Economics) have been surprised at the strength of the euro. While our baseline forecast calls for a 5% depreciation against the dollar over the next five years, we examine a scenario in which reductions of US monetary stimulus as well as further actions by the ECB in the opposite direction move the euro/dollar exchange rate down.

7.2   Competitiveness forecasts under alternative assumptions

The results of the scenario analysis indicate that the recent declines in EU chemical competitiveness are to some extent reversible. Looking first at increasing R&D and innovation, a doubling of R&D intensity by 2018 would put an end to the secular decline in export market share expected in the baseline. Even the more modest assumption of returning to early 2000s levels of R&D intensity has positive effects on export market share.

However, these benefits take time to appear, because the pipeline from new discovery to an actual product or process improvement can take years. But by the same token, the benefits are cumulative, meaning that the EU could expect the

increase of its market share to persist beyond the forecast horizon in the optimistic scenario.

Chart 7.1

Scenario: Export market share - EU R&D total chemicals
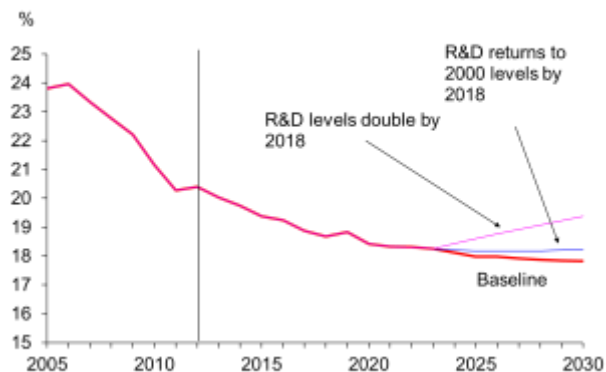
Source : Oxford Economics/Haver Analytics

A fall in natural gas prices would also have a positive impact on the EU's chemical competitiveness, but the forecast profile is quite different to that of R&D. The "moderate" scenario in which the gap between US and European natural gas prices narrows somewhat by 2020 would be enough to cause a marked deceleration of the decline in export market share for the next decade, after which a gradual increase in gas prices would cause the secular decline to resume.

Chart 7.2

Scenario: Export market share - EU energy prices total chemicals
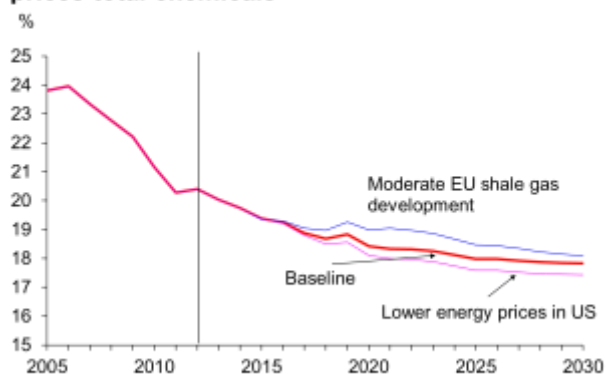
Source : Oxford Economics/Haver Analytics

To the extent that European petrochemical producers would need to shift from oil-based naphtha to natural gas-based ethylene and

propylene for cracking, the benefits may be overstated, because making this transition would increase costs in the near term. Nonetheless, we believe the extensive non-feedstock uses of energy would mean that such transition costs would have a relatively small impact.

In contrast, if US gas prices stayed low for longer than we expect, causing the price gap between Europe and the US to persist, the forecast decline in EU export share would accelerate considerably relative to the baseline. This is partly due to the direct effect of the energy price differential, but the more important impact is the large amount of investment that will take place (and indeed already is taking place) in the US, providing an additional boost to US chemical sector competitiveness in the medium term. By 2030, the EU's global export market share would be more than ½ percentage point below baseline.

The huge petrochemicals investment boom in the US is expected to serve primarily the domestic and Asian markets. This will put further pressure on EU petrochemicals exports to those regions, while it could also mean that Middle East petrochemicals exports will increasingly be directed to its nearest market – Europe – as China's basic chemicals production capability continues to develop. This possibility presents further downside risks to the EU chemicals export outlook.

As noted in section 6, the exchange rate is an important driver of sector competitiveness, but the prospects for a weakening of the euro are not large enough to have a significant quantitative impact. Even if the euro were to fall to 1.20 – its level at the depths of the Eurozone sovereign debt crisis in 2012 – European chemical market share would increase by less than ½ percentage point, since this would only be a 10% currency depreciation relative to now. Thus, chemical manufacturers should not depend on a weaker currency to boost sector competitiveness.

7.3 Impact on output and jobs

The benefits of an increase in export market share brought about by policy measures to boost competitiveness would reverberate across the wider economy, both due to the ability of chemical firms to compete better in the home market against imports, and the fact that higher wages and profits would provide second-round economic benefits.

To gauge the overall economic impact of the upside energy price and R&D scenarios, we used Oxford Economics' integrated global macroeconomic and industry models to estimate the supply chain and spending-multiplier impacts of an increase in export market share. The first part of the simulation calculated the expected increase in total manufacturing production (taking into account that increasing activity in the chemical sector would stimulate economic activity to varying degrees throughout the supply chain). The second part estimated the total increase in spending and employment across the economy (taking into account the fact that the wages and income from this additional economic activity would be spent and invested, yielding macroeconomic multiplier effects.

Chart 7.3

Scenarios: EU export market share - R&D + energy prices, total chemicals

Source : Oxford Economics/Haver Analytics
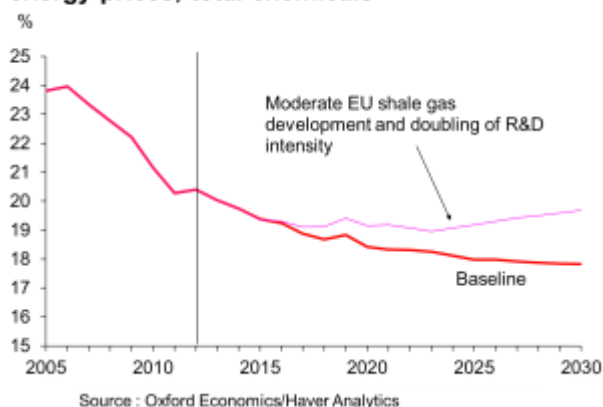
The results of this exercise indicate that policy changes to lower energy prices and stimulate innovation in the chemical sector could add as much as €35 billion to EU economic activity over

the next 15 years, creating over half a million new jobs. Most of this (about 55%) would be in the chemical sector[3], but the remainder of the benefits would accrue to the broader economy as the additional chemical demand feeds through the supply chain to related industries and the increase in chemical-sector wages and profits stimulates investment and household consumption. Thus, such policy measures would have positive impacts beyond the competitive posture of chemical manufacturers.

7.4 Potential policy implications

The foregoing has clearly demonstrated that future EU chemical competitiveness can be influenced by policy actions, and a concerted push to lower energy prices and increase R&D and innovation would have substantial positive effects, which would benefit European chemical manufacturers in both home and export markets. In terms of magnitude, a reduction in European energy prices would provide the most pronounced boost in competitiveness. Encouraging more R&D investment is also critically important, in order to sustain these competitiveness gains and form the foundation for the longer-term growth of the sector. Taken together, they hold the potential of halting the secular decline of chemical export market share observed over the past decade, adding €35 billion to EU GDP and creating more than half a million new jobs across the economy over the next 15 years.

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[3] It is important to bear in mind that these figures represent the difference from baseline. In the case of employment, the secular decline in chemical-sector employment over the past 15 years, if it continues, would mean the absolute increase in chemical sector jobs would be smaller than the figures reported here.

8 Conclusion

The inescapable conclusion from the analysis in this report is that the competitiveness of the EU as a platform for chemical exports has diminished over the past 20 years. The 1990s saw an initial dip related to the structural challenges following the breakup of the Soviet Union and the reunification of Germany, but the development of Poland and other Eastern European nations, combined with strong world growth prospects and the introduction of the euro helped recoup the early-decade losses. Since the early 2000s, however, there has been a secular decline in both export market share and competitiveness.

But the EU is not alone: all developed economies have had to cope with the arrival of lower-cost developing countries on world markets. More importantly, the developed countries were more competitive in an absolute sense in the 1990s, so improvements in the developing world may not have closed this gap.

The table below shows the competitiveness ranking in absolute levels of the EU as an aggregate (excluding intra-EU trade) benchmarked against other countries

Because the CMS methodology does not allow us to calculate absolute levels of competitiveness (only its evolution over time), we have used the ratio of the chemical sector trade surplus (or deficit) to total sector exports in 1995 as a proxy. We have then applied the changes in competitiveness calculated from the CMS analysis to derive the level of competitiveness in 2012.[4]

The table reveals that, in absolute levels, the EU fell from number 3 to number 4, as India and Saudi Arabia rose significantly and Japan fell dramatically. The US fell from the top ranking to number 2 behind Saudi Arabia (whose competitiveness level is inflated by heavily subsidised natural gas prices), but, like the EU its level of competitiveness declined throughout the period

Interestingly, China, despite its strong improvements in competitiveness since 1992, remains behind the US and EU in absolute terms – though this may well change in the future if current trends persist. Brazil saw its ranking fall to last, consistent with the increasing burden of the "*custo Brasil"* highlighted earlier.

Recent trends in energy prices are a key reason why the US has actually been able to hold its

National competitiveness rankings: Total chemicals					
Countries	Competitiveness rank in 1992*	Change in competitiveness (CAGR)			Competitiveness rank in 2012
		1992 - 2000	2000 - 2008	2008 - 2012	
Saudi Arabia	4	2.1	7.6	6.0	1
US	1	-0.9	-1.6	-1.4	2
India	6	5.2	5.6	4.6	3
EU	3	-0.8	-2.0	-3.3	4
China	7	5.4	9.0	4.1	5
Japan	2	-0.9	-4.3	-4.0	6
Brazil	5	-1.6	5.9	-1.4	7
Based on sector trade balance as share of sector exports					

Source: Oxford Economics

[4] It is important to caution that the trade balance is an imperfect measure of competitiveness (particularly at an economy-wide level), because it is as much a function of the difference between aggregate domestic production and aggregate spending as it is of business cost competitiveness. However, at a sector level, the trade balance provides a fairly reliable benchmark for a starting level of competitiveness.

number 2 ranking despite the rise of China and India. The shale gas boom has been an important part of this in recent years. But looking ahead, the massive increase in chemical sector investment (on the order of €100 billion over the next five years according to the American Chemistry Council) means that US chemical competitiveness is likely to continue to improve even as energy prices there begin to rise. So the EU will face challenges not only from China and Saudi Arabia, but from the US as well.

The table below shows the competitiveness rankings for the 8 EU countries analysed in this report. Bear in mind that, unlike the previous table, these are based on both intra- and extra-EU exports and thus show how they stack up against each other in both EU and global chemical export markets.

There have been quite a number of significant shifts. The top three positions continue to be held by Germany, Belgium and the Netherlands, but Germany has ceded its number 1 ranking, due in part to its poor competitiveness performance since the global financial crisis. Spain and Poland have moved into the number 4 and 5 positions, with the former having bucked the trend of declining competitiveness in the 1990s and the latter benefiting from entry into the EU in 2004.

Returning to the EU as a whole, the improvement in ranking since 1992 is a silver lining to an otherwise worrying cloud, as trends in export market share and competitiveness are decidedly

downward for the latter half of that period. While some of this decline is due to economic factors that have affected other industries outside of chemicals, several sector-specific factors have played a role in the decline in chemical competitiveness in recent years, notably relatively high energy and feedstock prices (particularly for petrochemicals and polymers) and declines in chemical-sector R&D intensity.

But Europe's slip in the rankings may be able to be stopped, and potentially reversed, in the future. In terms of magnitude, a reduction in European energy prices would provide the most pronounced boost in competitiveness. Encouraging more R&D investment is also critically important, in order to sustain these competitiveness gains and form the foundation for the longer-term growth of the sector. Taken together, they hold the potential of halting the secular decline of chemical export market share observed over the past decade, adding €35 billion to EU GDP and creating more than half a million new jobs across the economy over the next 15 years.

EU competitiveness rankings: Total chemicals

Countries	Competitiveness rank in 1992*	Change in competitiveness (CAGR)			Competitiveness rank in 2012
		1992 - 2000	2000 - 2008	2008 - 2012	
Netherlands	2	-3.4	2.3	0.8	1
Belgium	3	-3.4	1.9	-0.8	2
Germany	1	-5.2	0.3	-3.0	3
Spain	6	2.7	1.6	-1.1	4
Poland	8	2.1	7.3	2.2	5
France	4	-5.2	-1.8	-3.5	6
Italy	7	-2.3	-1.3	-1.6	7
UK	5	-2.3	-4.0	-4.1	8

*Based on sector trade balance as share of sector exports

Source: Oxford Economics
Note: Due to lack of data, Belgian competitiveness is assumed to behave like the Netherlands from 1992 to 1999

9 Oxford staff

Jeremy Leonard, Director of Industry Services

Jeremy Leonard joined Oxford Economics in July 2012, where he oversees and coordinates the work of the industry team, including maintenance and development of Oxford's 69-country, 100-sector Global Industry Model, quarterly forecast updates and associated reports, conference presentations and client meetings, and bespoke consultancy projects.

 Jeremy's knowledge and experience span a broad range, including competitiveness and offshoring/reshoring, commodity price modelling, and applied economic research on sectors ranging from biotech to heavy manufacturing to telecoms. His current consulting work focuses on the global chemical sector and the impact of shale gas development on energy costs and relative levels of national competitiveness.

Prior to joining Oxford, Jeremy ran his own consulting firm based in Montreal for 15 years, providing a variety of economic analysis and forecasting services related to commodity prices, competitiveness, and the Canadian and US economies for the Washington, DC-based Manufacturers Alliance for Productivity and Innovation. He also served as economic research director for the Montreal-based Institute for Research on Public Policy.

Born and raised in Washington, DC, Jeremy was educated at the University of Pennsylvania and McGill University, where he received his MA in Economics summa cum laude.

Amit Sharda, Economist

Amit Sharda is an economist for Oxford Economics' International Industry Service, where he is responsible for the chemical sector forecasts. He has been with the firm since 2010, and over that time has developed an increasingly thorough understanding of the key economic drivers of sectoral economic activity across all sub-segments. In addition, he has been the lead analyst on a number of chemical-related

consultancy projects relating to competitiveness, most recently for the UK Chemical Industries Association, as well as doing extensive forecasting work analysing the global chemical industry prospects for BASF.

Amit was educated at the University of the West of England, where he received a first-class BA degree in Economics of Money, Banking and Finance.

10 Appendix charts and tables

10.1 Total chemicals

EU: Chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source: Oxford Economics/Haver Analytics
Note: Does not include intra-EU trade
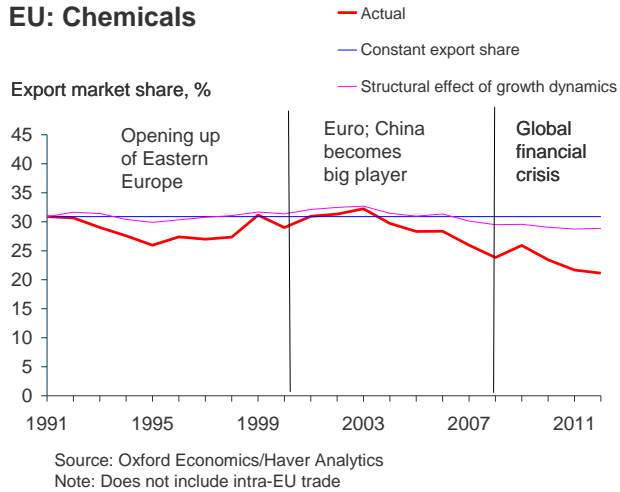
EU: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	28.3	29.5	23.2
Growth of EU ex-pharmaceutical exports	9.7	10.8	5.3
Growth of World ex-pharmaceutical exports	9.6	13.6	10.6
Difference between World and EU export growth	0.2	-2.7	-5.3
Due to Structure effect	0.3	-0.8	-1.5
Due to Competitive effect	-0.2	-1.9	-3.9

Germany: Chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995
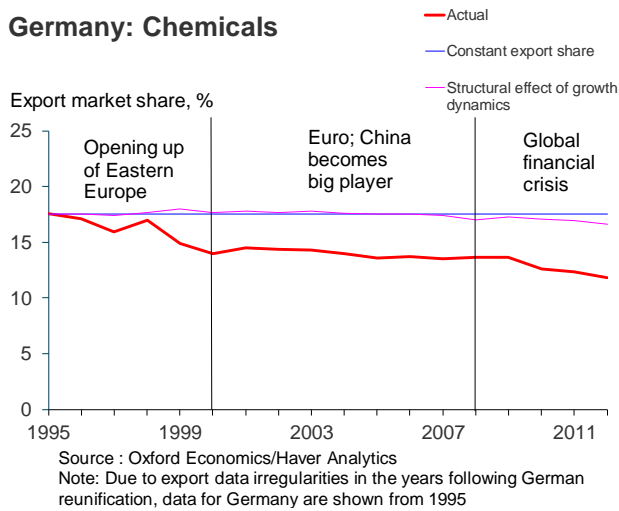
Germany: Total chemicals			
	1995 - 1999	2000 - 2007	2008 - 2012
Export market share	16.5	14.0	12.8
Growth of German ex-pharmaceutical exports	4.2	10.7	4.3
Growth of World ex-pharmaceutical exports	8.5	12.1	7.3
Difference between World and German export growth	-4.3	-1.4	-3.0
Due to Structure effect	0.5	-0.5	-1.6
Due to Competitive effect	-4.8	-0.9	-1.4

Source: Oxford Economics

US: Chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics
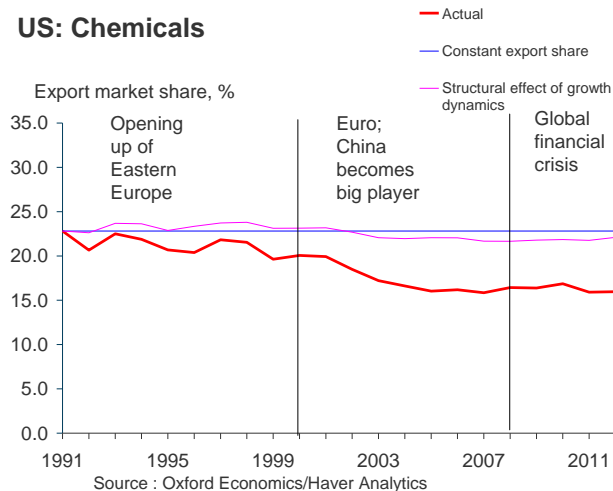
US: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	21.1	17.5	16.3
Growth of US ex-pharmaceutical exports	6.1	9.5	7.3
Growth of World ex-pharmaceutical exports	8.3	12.5	7.1
Difference between World and US export growth	-2.2	-3.0	0.2
Due to Structure effect	0.1	-1.2	0.5
Due to Competitive effect	-2.3	-1.8	-0.3

Japan: Chemicals

Export market share, %

Legend: Actual | Constant export share | Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
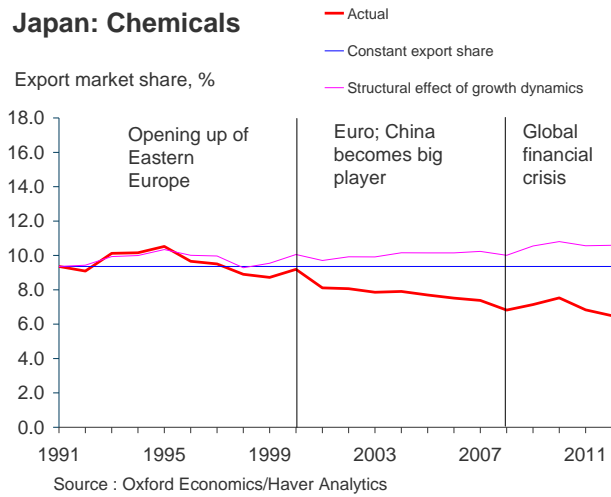
Japan: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	9.6	8.0	7.0
Growth of Japan ex-pharmaceutical exports	8.0	10.2	4.0
Growth of World ex-pharmaceutical exports	8.8	12.2	6.8
Difference between World and Japanese export growth	-0.8	-2.1	-2.8
Due to Structure effect	0.5	1.6	1.5
Due to Competitive effect	-1.3	-3.6	-4.3

China: Chemicals

Export market share, %

Legend: Actual | Constant market share | Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
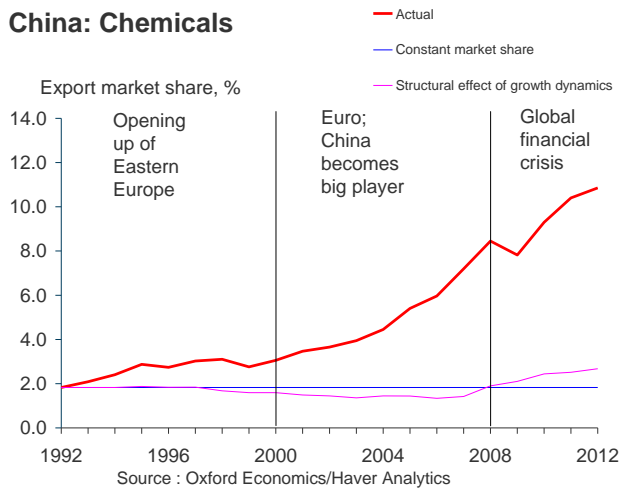
China: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	2.6	4.6	9.4
Growth of Chinese ex-pharmaceutical exports	13.2	25.7	17.2
Growth of World ex-pharmaceutical exports	8.5	11.4	6.2
Difference between World and Chinese export	4.8	14.3	11.0
Due to Structure effect	-5.2	0.5	3.2
Due to Competitive effect	10.0	13.8	7.8

India: Chemicals

Export market share, %

Legend: Actual | Constant export share | Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
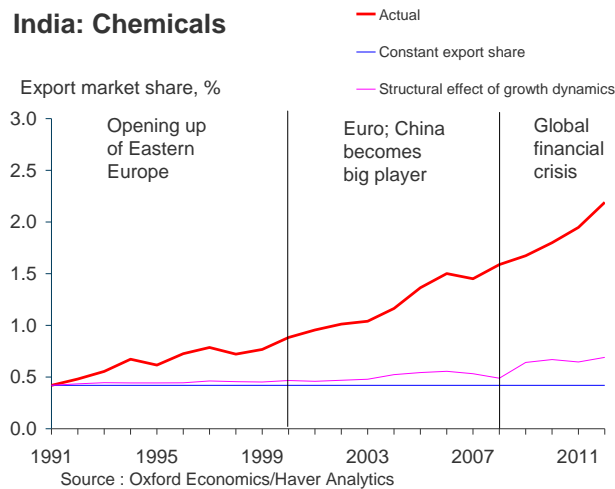
India: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	0.7	1.2	1.8
Growth of Indian ex-pharmaceutical exports	17.6	21.4	15.9
Growth of World ex-pharmaceutical exports	8.6	12.0	6.6
Difference between World and Indian export growth	9.0	9.4	9.3
Due to Structure effect	0.6	0.7	0.4
Due to Competitive effect	8.4	8.8	8.9

Saudi Arabia: Chemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
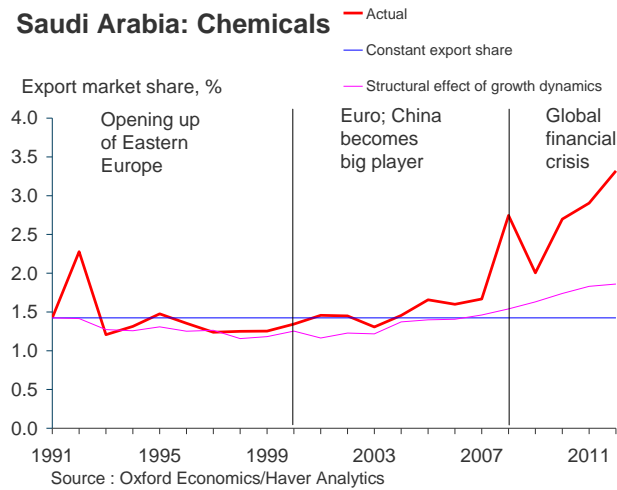
Saudi Arabia: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	1.4	1.5	2.7
Growth of Saudi Arabia ex-pharmaceutical	12.7	16.4	30.2
Growth of World ex-pharmaceutical exports	8.6	12.1	6.9
Difference between World and Saudi export growth	4.0	4.3	23.3
Due to Structure effect	-1.3	3.1	2.5
Due to Competitive effect	5.4	1.2	20.8

Brazil: Chemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
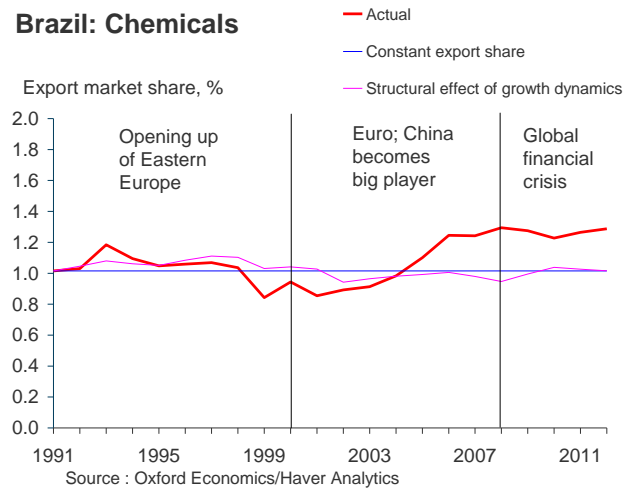
Brazil: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	1.0	1.0	1.3
Growth of Brazilian ex-pharmaceutical exports	6.0	18.2	7.7
Growth of World ex-pharmaceutical exports	8.6	12.1	6.8
Difference between World and Brazil export growth	-2.6	6.1	0.9
Due to Structure effect	0.3	-0.6	0.4
Due to Competitive effect	-2.9	6.7	0.5

UK: Chemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
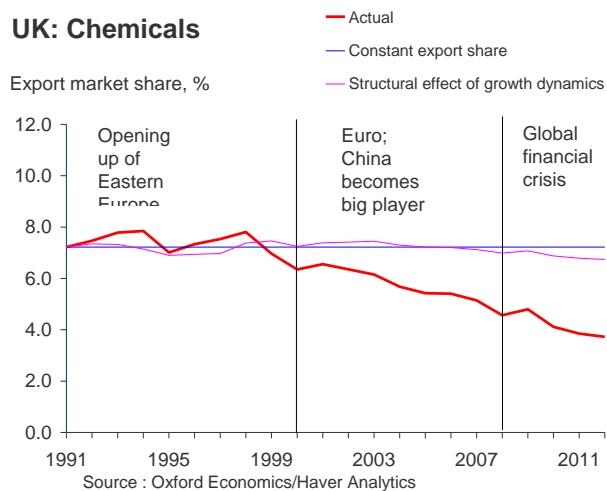
UK: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	7.5	5.9	4.2
Growth of UK ex-pharmaceutical exports	7.9	8.0	-0.2
Growth of World ex-pharmaceutical exports	8.6	12.3	7.2
Difference between World and UK export growth	-0.7	-4.3	-7.4
Due to Structure effect	0.3	-0.7	-2.3
Due to Competitive effect	-1.0	-3.5	-5.1

France: Chemicals

Export market share, %

Legend: Actual — Constant export share — Structural effect of growth dynamics

Chart annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics
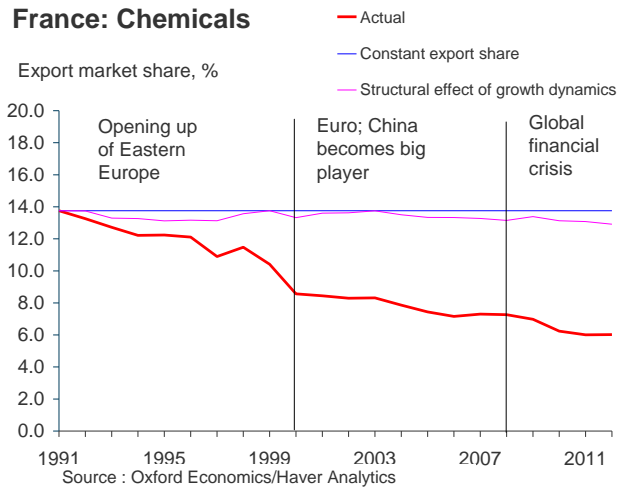
France: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	11.9	7.9	6.5
Growth of French ex-pharmaceutical exports	4.9	7.6	3.0
Growth of World ex-pharmaceutical exports	8.6	12.3	7.2
Difference between World and French export growth	-3.7	-4.6	-4.2
Due to Structure effect	0.0	-0.8	-1.7
Due to Competitive effect	-3.7	-3.8	-2.5

Italy: Chemicals

Export market share, %

Legend: Actual — Constant export share — Structural effect of growth dynamics

Chart annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics
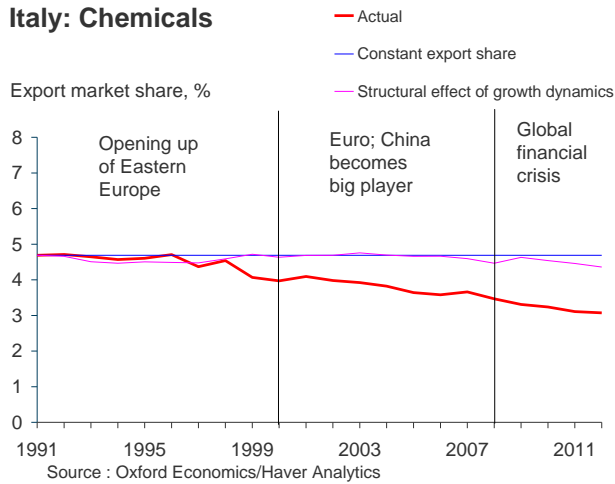
Italy: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	4.5	3.8	3.2
Growth of Italy ex-pharmaceutical exports	6.8	10.7	3.5
Growth of World ex-pharmaceutical exports	8.7	12.2	7.1
Difference between World and Italian export growth	-1.9	-1.5	-3.6
Due to Structure effect	0.1	-0.5	-2.0
Due to Competitive effect	-2.0	-1.0	-1.6

Spain: Chemicals

Export market share, %

Legend: Actual — Constant export share — Structural effect of growth dynamics

Chart annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics
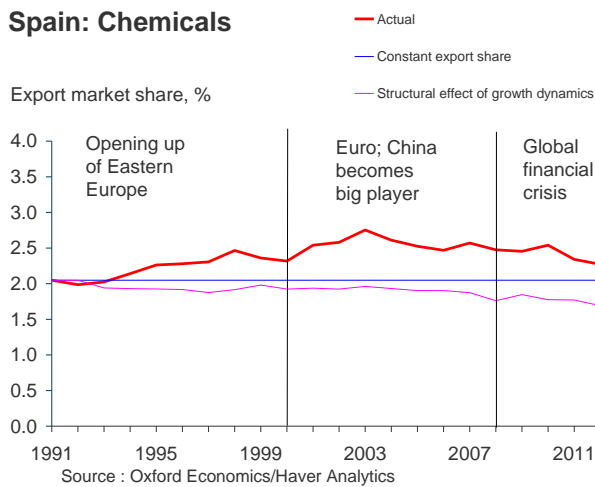
Spain: CMS analysis results			
	1992 -1999	2000 - 2007	2008 - 2012
Export market share	2.2	2.5	2.4
Growth of Spain ex-pharmaceutical exports	10.6	13.3	4.5
Growth of World ex-pharmaceutical exports	8.5	12.2	7.1
Difference between World and Spanish export growth	2.0	1.2	-2.6
Due to Structure effect	-0.3	-0.5	-2.0
Due to Competitive effect	2.4	1.7	-0.6

Netherlands: Chemicals

Legend: — Actual — Constant export share — Structural effect of growth dynamics

Export market share, %

Chart labels: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics
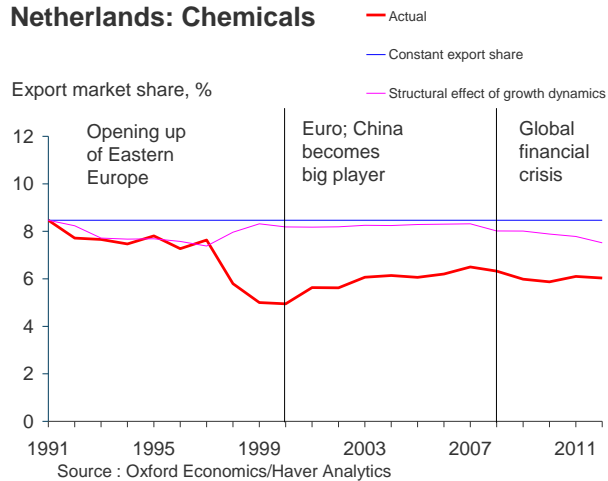
Netherlands: CMS analysis results			
	1992 - 1999	2000 - 2007	2008 - 2012
Export market share	7.0	5.9	6.1
Growth of Netherlands ex-pharmaceutical exports	2.7	15.9	5.8
Growth of World ex-pharmaceutical exports	8.7	12.2	7.0
Difference between World and Dutch export growth	-6.1	3.7	-1.2
Due to structure effect	-0.6	0.1	-2.7
Due to competitive effect	-5.5	3.6	1.5

Belgium: Chemicals

Legend: — Actual — Constant export share — Structural effect of growth dynamics

Export market share, %

Chart labels: Euro; China becomes big player; Global financial crisis; Opening up of Eastern Europe

Source : Oxford Economics/Haver Analytics
Note: Belgian data unavailable prior to 1999
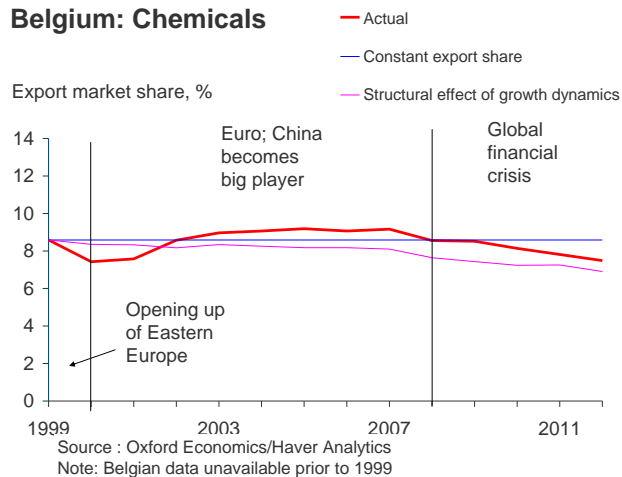
Belgium: CMS analysis results			
	1995 - 1999	2000 - 2007	2008 - 2012
Export market share	-	8.6	8.1
Growth of Belgium ex-pharmaceutical exports	-	13.2	2.8
Growth of World ex-pharmaceutical exports	-	12.0	7.2
Difference between World and Belgian export growth	-	1.2	-4.4
Structure effect	-	-0.7	-3.1
Competitive effect	-	1.9	-1.3

Poland: Basic inorganics

Legend: — Actual — Constant export share — Structural effect of growth dynamics

Export market share, %

Chart labels: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics
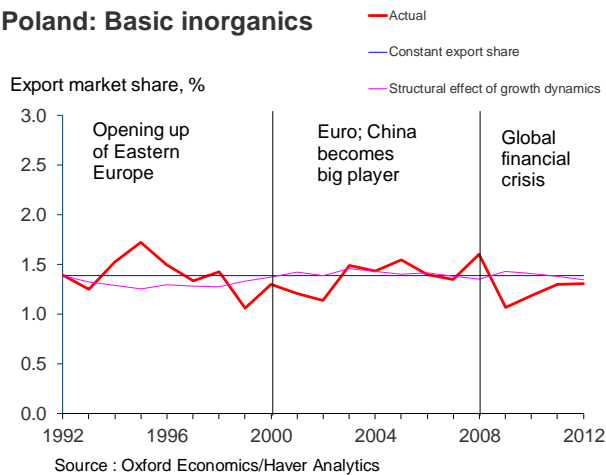
Poland: CMS analysis results			
	1992 -1999	2000 - 2007	2008 - 2012
Export market share	0.5	0.7	1.1
Growth of Poland ex-pharmaceutical exports	7.1	24.0	12.1
Growth of World ex-pharmaceutical exports	8.5	12.1	7.0
Difference between World and Polish export growth	-1.5	12.0	5.1
Due to Structure effect	-3.5	0.6	-2.0
Due to Competitive effect	2.0	11.4	7.2

10.2 Petrochemicals

EU: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Germany: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

US: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Japan: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

China: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

India: Petrochemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend for charts:
- Actual
- Constant export share
- Structural effect of growth dynamics

(China chart: Constant market share)

Competitiveness of the EU chemical industry

Saudi Arabia: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Brazil: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

UK: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

France: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Italy: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Spain: Petrochemicals

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

33

Netherlands: Petrochemicals

Export market share, %

Legend: Actual — Constant export share — Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Belgium: Petrochemicals

Export market share, %

Legend: Actual — Constant export share — Structural effect of growth dynamics

Euro; China becomes big player

Global financial crisis

Opening up of Eastern Europe

Source : Oxford Economics/Haver Analytics

Poland: Petrochemicals

Legend: Actual — Constant export share — Structural effect removed

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

34

10.3 Basic inorganics

EU: Basic inorganics

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Germany: Basic inorganics

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

US: Basic inorganics

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Japan: Basic inorganics

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

China: Basic inorganics

Export market share, %

— Actual
— Constant market share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

India: Basic inorganics

Export market share, %

— Actual
— Constant export share
— Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

35

Competitiveness of the EU chemical industry

Saudi Arabia: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Brazil: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

UK: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

France: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Italy: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis
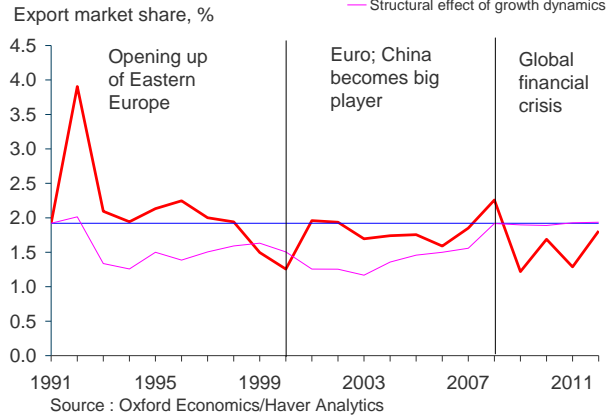
Source : Oxford Economics/Haver Analytics

Spain: Basic inorganics

Export market share, %

Legend: Actual · Constant export share · Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

36

Netherlands: Basic inorganics

Export market share, %

- Actual
- Constant export share
- Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Belgium: Basic inorganics

Export market share, %

- Actual
- Constant export share
- Structural effect of growth dynamics

Euro; China becomes big player

Global financial crisis

Opening up of Eastern Europe

Source : Oxford Economics/Haver Analytics

Poland: Basic inorganics

- Actual
- Constant export share
- Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

37

10.4 Consumer chemicals

EU: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend: Actual, Constant export share, Structural effect of growth dynamics

Germany: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

Legend: Actual, Constant export share, Structural effect of growth dynamics

US: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend: Actual, Constant export share, Structural effect of gorwth dynamics

Japan: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend: Actual, Constant export share, Structural effect of growth dynamics

China: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend: Actual, Constant market share, Structural effect of growth dynamics

India: Consumer chemicals

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Legend: Actual, Constant export share, Structural effect of growth dynamics

Saudi Arabia: Consumer chemicals

Export market share, %

Legend: Actual; Constant export share; Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Brazil: Consumer chemicals

Export market share, %

Legend: Actual; Constant export share; Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

UK: Consumer chemicals

Export market share, %

Legend: Actual; Constant market share; Structure effect of growth dynamics

Opening up of Eastern | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

France: Consumer chemicals

Export market share, %

Legend: Actual; Constant export share; Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Italy: Consumer chemicals

Export market share, %

Legend: Actual; Constant export share; Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Spain: Consumer chemicals

Export market share, %

Legend: Actual; Constant export share; Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

39

Netherlands: Consumer chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Belgium: Consumer chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Euro; China becomes big player

Global financial crisis

Opening up of Eastern Europe

Source : Oxford Economics/Haver Analytics

Poland: Consumer chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

10.5 Polymers

EU: Polymers

Export market share, %

Source : Oxford Economics/Haver Analytics

Germany: Polymers

Export market share, %

Source: Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

US: Polymers

Export market share, %

Source : Oxford Economics/Haver Analytics

Japan: Polymers

Export market share, %

Source : Oxford Economics/Haver Analytics

China: Polymers

Export market share, %

Source : Oxford Economics/Haver Analytics

India: Polymers

Export market share, %

Source : Oxford Economics/Haver Analytics

41

Competitiveness of the EU chemical industry

Saudi Arabia: Polymers

Export market share, %

Legend: Actual / Constant export share / Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Brazil: Polymers

Export market share, %

Legend: Actual / Constant export share / Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

UK: Polymers

Export market share, %

Legend: Actual / Constant export share / Structural effect of growth dynamics
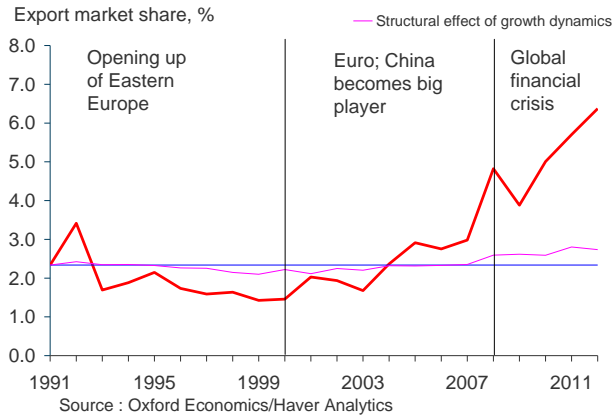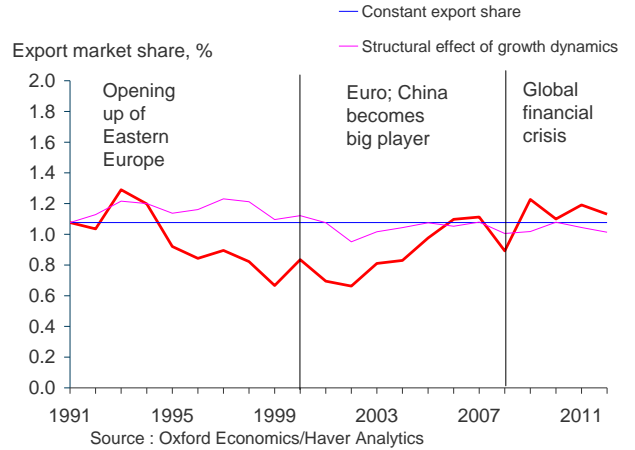
Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

France: Polymers

Export market share, %

Legend: Actual / Constant export share / Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Italy: Polymers

Export market share, %

Legend: Actual / Constant market share / Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Spain: Polymers

Export market share, %

Legend: Actual / Constant market share / Structural effect of growth dynamics

Opening up of Eastern Europe | Euro; China becomes big player | Global financial crisis

Source : Oxford Economics/Haver Analytics

Netherlands: Polymers

Actual
Constant market share
Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Belgium: Polymers

Actual
Constant market share
Structural effect of growth dynamics

Export market share, %

Euro; China becomes big player

Global financial crisis

Opening up of Eastern Europe

Source : Oxford Economics/Haver Analytics

Poland: Polymers

Actual
Constant market share
Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

10.6 Specialty chemicals

EU: Specialty chemicals

— Actual
— Constant market share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Germany: Specialty chemicals

— Actual
— Constant market share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics
Note: Due to export data irregularities in the years following German reunification, data for Germany are shown from 1995

US: Specialty chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

Japan: Specialty chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

China: Specialty chemicals

— Actual
— Constant market share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

India: Specialty chemicals

— Actual
— Constant export share
— Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

Source : Oxford Economics/Haver Analytics

44

Saudi Arabia: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

Brazil: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

UK: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

France: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant export share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

Italy: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant market share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

Spain: Specialty chemicals

Export market share, %

Legend:
- Actual
- Constant market share
- Structural effect of growth dynamics

Annotations: Opening up of Eastern Europe; Euro; China becomes big player; Global financial crisis

Source : Oxford Economics/Haver Analytics

Netherlands: Specialty chemicals

Export market share, %

Actual
Constant market share
Structural effect of growth dynamics

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

12.0
10.0
8.0
6.0
4.0
2.0
0.0

1991   1995   1999   2003   2007   2011

Source : Oxford Economics/Haver Analytics
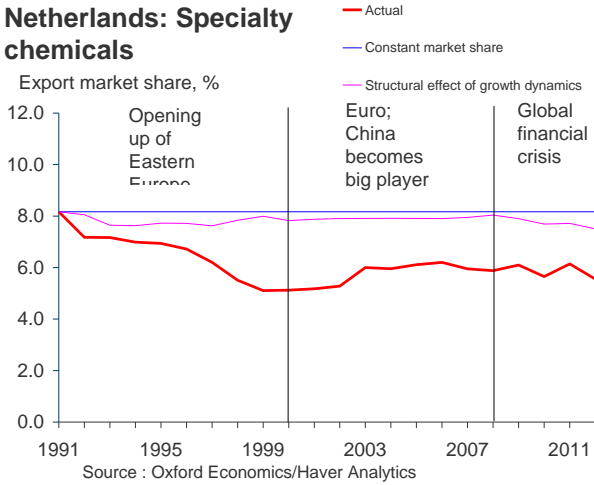
Belgium: Specialty chemicals

Export market share, %

Actual
Constant market share
Structural effect of growth dynamics

Euro; China becomes big player

Global financial crisis

Opening up of Eastern Europe

12.0
10.0
8.0
6.0
4.0
2.0
0.0

1999   2003   2007   2011

Source : Oxford Economics/Haver Analytics

Poland: Specialty chemicals

Actual
Constant market share
Structural effect of growth dynamics

Export market share, %

Opening up of Eastern Europe

Euro; China becomes big player

Global financial crisis

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

1992   1996   2000   2004   2008   2012

Source : Oxford Economics/Haver Analytics

46

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