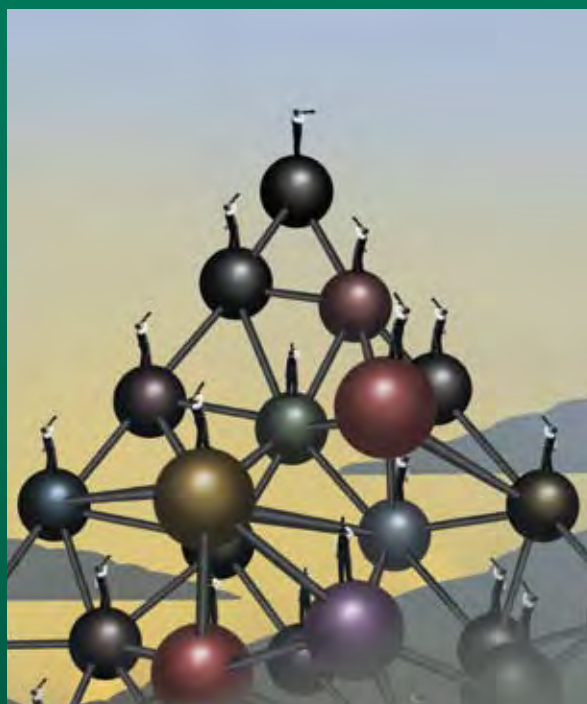


THE 2012 CHEMICAL INDUSTRY
VALUE CREATORS REPORT

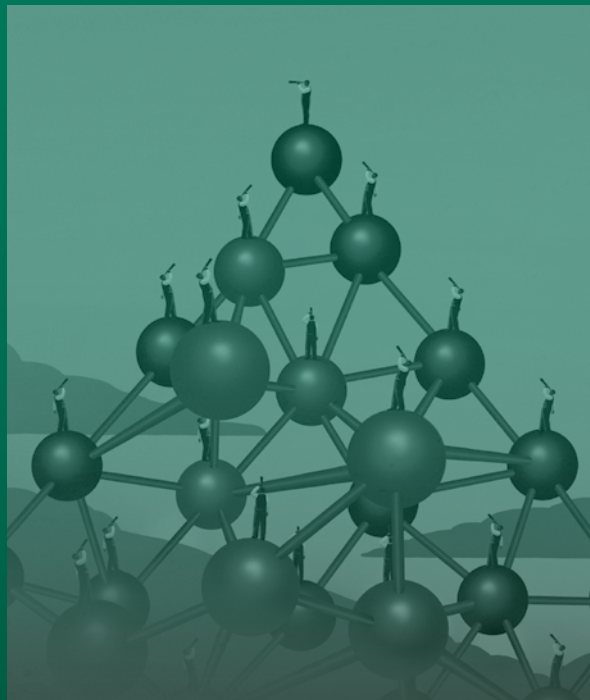
REBOUNDED FROM THE STORM



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THE 2012 CHEMICAL INDUSTRY VALUE CREATORS REPORT

REBOUNDED FROM THE STORM

JAN FRIESE

SARAH GEHRLEIN

ANDREAS GOCKE

FRANK PLASCHKE

HUBERT SCHOENBERGER

YVES-PIERRE WILLERS

CONTENTS

3	EXECUTIVE SUMMARY
6	UNDERSTANDING THE PERFORMANCE GAP: AN INDUSTRY RETROSPECTIVE Survey Criteria and Scope The Industry Postcrisis: Holding Its Own but Still Hurting Value Creation in the Three Periods The Value Champions: The Chemical Industry's Top Ten The Long-Term Value Creators: Making the Most of Natural Advantage
20	LONG-TERM VALUE CREATION: BACK TO BASICS Three Levers Value Creation Winners: "Diversified" Specialties, Specialty Inorganics, and M&A Champions
27	ANTICIPATING THE FUTURE Four Smart Bets Setting a Course for Sustained Superior Performance
32	VALUE CREATION QUESTIONS FOR CHEMICAL COMPANY EXECUTIVES
33	NOTE TO THE READER

EXECUTIVE SUMMARY

ANALYZING THE PERFORMANCE OF roughly 100 of the world's top chemical companies through three time periods, *The 2012 Chemical Industry Value Creators Report: Rebounding from the Storm* examines five key industry subsectors: base chemicals and basic plastics, agrochemicals and fertilizers, industrial gases, focused specialty chemicals, and multispecialty chemicals.

From 2007 through 2011, the chemical industry ranked fourth in value creation among the 21 industries analyzed in The Boston Consulting Group's 2012 Value Creators report, an annual review that ranks the performance of the world's top value creators.

- During the five-year period, the chemical industry had an average annual total shareholder return (TSR) of 4.7 percent versus the 2.4 percent average annual TSR of the cross-industry sample.
- Within the chemical industry, the top ten chemical companies fared even more impressively than their peers overall, with an average annual TSR of 39 percent over the five-year period. The chemical top ten ranked first among all 21 industries' top ten companies in TSR performance. Over the decade 2002–2011, the industry averaged 11 percent TSR annually, and over the 20-year period 1992–2011, TSR averaged 8 percent annually.
- Nonetheless, value creation overall suffered during the five-year period 2007–2011. The low TSRs that prevailed in most subsectors stemmed from many factors: the anemic global economy, the lack of volume recovery, and margin erosion caused by feedstock inflation.

Companies based in emerging markets have registered particularly strong TSR performance.

- Taking a 20-year view (1992 through 2011), regional differences were more pronounced than subsector differences. Companies

based in Asia-Pacific (excluding Japan) and Latin America registered the highest TSRs.

- From 2007 through 2011, the average annual TSR for companies based in emerging markets was twice the average across all locations. U.S.- and Europe-based chemical companies also generated most of their growth in emerging markets during this time period.
- Japanese companies performed dismally. Over the 20-year period, annual TSR for Japanese companies averaged 1 percent; it dipped to -12 percent in the period from 2007 through 2011.

Subsector performance has varied on the basis of macroeconomic megatrends and business and management strategies.

- Over a 20-year review period, specialty companies (multispecialty and focused specialties taken together) outperformed the other three sectors (base chemicals and basic plastics, agrochemicals and fertilizers, and industrial gases).
- From 2002 through 2011, the two top-performing subsectors—base chemicals and basic plastics and agrochemicals and fertilizers—averaged, respectively, 22 percent and 20 percent annual TSR. Multispecialties turned in the worst performance (5 percent annual TSR).
- The reversal of fortune in both specialty-chemical subsectors during the 2002–2011 period was in part a result of the M&A frenzy that had occurred from 1998 through 2002, as many pharmaceutical-chemical hybrids dissolved.
- It is no surprise that value creation across the board suffered during the five-year period 2007–2011. European specialty companies and Japanese companies were particularly hard hit—for the latter, this was largely because of chronic energy challenges caused by the Fukushima nuclear-plant crisis.

The value creation “stars” of the 10- and 20-year periods succeeded in large part by making the most of their natural advantages; they generally fall into three categories.

- *South Korean “Growth Champions.”* These companies have benefited over the long term from higher export rates, as well as by chaebols through which they consolidated their portfolios to focus on growth. These factors enabled them to realize ambitious growth plans while improving their net-debt positions.
- *Mining-Based Chemical Entities.* These companies have created value-adding downstream derivatives from a backbone of strong mining feedstock.
- *Polymer Powerhouses.* Companies in this category have enjoyed strong demand for basic-need products in emerging markets. This,

along with constant innovation and the pursuit of cost efficiencies, helped propel them successfully into higher-value segments.

In the past decade, the value creation model of top performers has shifted markedly, from applying financial levers to applying operational levers and adopting thoughtful portfolio and acquisition strategies.

- Companies have gotten back to basics, relying on three key operational levers to achieve value: sustaining sales growth, expanding EBITDA margin, and reducing debt.
- In addition, two strategies had a significant impact on value creation: savvy portfolio composition (especially investments in specialty chemicals and inorganic chemicals) and an “always on” approach to M&A. Companies that emphasized specialty chemicals successfully ward off the threat of commoditization, and those that pursued specialty inorganics were insulated from the effects of the petrochemical “squeeze.” Those that engaged in serial M&A programs came out ahead of companies that took big single bets.

We expect the following four trends to have particular influence over value creation in the coming years.

- Products designed for an era of resource constraints will enjoy growth. This bodes well for chemical companies with strong feedstock positions, as well as for those that produce additives and ingredients that boost resource efficiency.
- Emerging markets and the agrochemical and fertilizer subsector (along with other food-production-related subsectors) will likely remain key growth drivers, given macroeconomic trends and customer-industry dynamics. The sources of demand will shift even further, with nearly 50 percent of worldwide demand coming from Asia by 2020.
- The shale gas revolution in North America will favor the resurgence of U.S.-based chemical companies to the top ranks.
- European chemical companies may well find themselves in a macroeconomic situation reminiscent of the one that sank the fortunes of their Japanese counterparts; with foresight, they can avoid a similar fate.

Chemical companies can make use of three fundamental principles to safeguard value and stimulate value creation.

- Improve the rigor and discipline of their capital-allocation process.
- Pursue M&A excellence as a means of competitive advantage, with an always-on M&A program.
- Revisit the traditional complexity of business models and build agile processes and structures.

UNDERSTANDING THE PERFORMANCE GAP

AN INDUSTRY RETROSPECTIVE

WHEN IT COMES TO value creation, the global chemical sector has proved itself to be, yet again, one of the best-performing industries. From 2007 through 2011, it ranked fourth among the 21 industries analyzed in The Boston Consulting Group's 2012 Value Creators report. (See *Improving the Odds: Strategies for Superior Value Creation*, BCG report, September 2012.)

For the roughly 100 top publicly listed chemical companies worldwide, total shareholder return (TSR, our measure of value creation) averaged 4.7 percent per year during that period—dramatically lower than the chemical sector's ten-year average (2002–2011) TSR of 11 percent, but well ahead of most other industry sectors, which returned only 2.4 percent overall during the ten-year period. (See the sidebar “The Components of TSR.”) More impressive still was the performance of the top ten companies, which achieved an average annual TSR of 39 percent, a return that surpassed that of the top ten of any other industry. Such performance, remarkable in good times, is nothing short of spectacular in a period that encompassed the global financial crisis and recession.

To what do we attribute this enormous gap between the top performers and the industry average? Identifying the underlying causes, particularly the microeconomic and management-driven ones, is the focus of this report.

Survey Criteria and Scope

Our review spans three time periods. It focuses on companies of significant size and includes perspectives based on region and sub-sector.

The top ten's average return surpassed that of any other industry top ten.

Time Periods. Because the chemical industry is comparatively more capital-intensive than most industries, we analyzed company performance across three historically important time periods:

- A *five-year period*, from 2007 through 2011, to reflect performance immediately preceding the global financial crisis and through the ensuing recession
- A *ten-year period*, from 2002 through 2011, to show the value creation since the bursting of the dot-com bubble and the rise of the BRICS (Brazil, Russia, India, China, and South Africa) economies, which started in 2003
- A *20-year period*, from 1992 through 2011, to reflect the boom period that began

THE COMPONENTS OF TSR

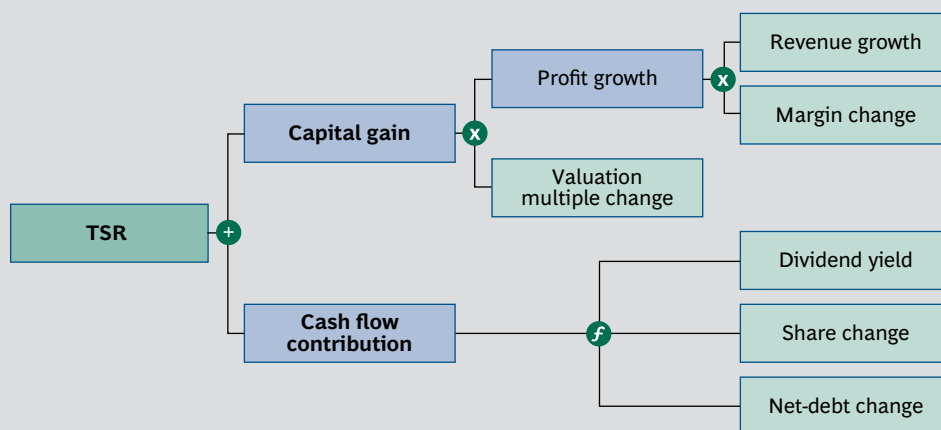
Total shareholder return (TSR), which accounts for the share price development in a given time period (including the value of all dividend payouts), is the product of multiple factors. Regular readers of BCG’s Value Creators series will be familiar with BCG’s methodology for quantifying the relative contribution of the various sources of TSR. (See the exhibit below.) The methodology uses the combination of revenue (that is, sales) growth and change in margins as an indicator of a company’s improvement in fundamental value. It then uses the change in the company’s valuation multiple to determine the impact of investor expectations on TSR. Together, these two factors determine the change in a company’s market capitalization. Finally, the model also tracks the distribution of free cash flow to investors and debt holders

in the form of dividends, share repurchases, or repayments of debt in order to determine the contribution of free-cash-flow payouts to a company’s TSR.

These factors all interact—sometimes in unexpected ways. A company may increase its earnings per share through an acquisition and yet not create any TSR, because the new acquisition has the effect of eroding the company’s gross margins. And some forms of cash contribution (for example, dividends) have a more positive impact on a company’s valuation multiple than others (for example, share buybacks).

TSR is a useful way to assess value creation, but as a retrospective form of analysis, past TSRs are not a reliable predictor of future TSR.

TSR Is the Product of Multiple Factors



Source: BCG analysis.

Note: “Share change” refers to the change in the number of shares outstanding, not to the change in share price.

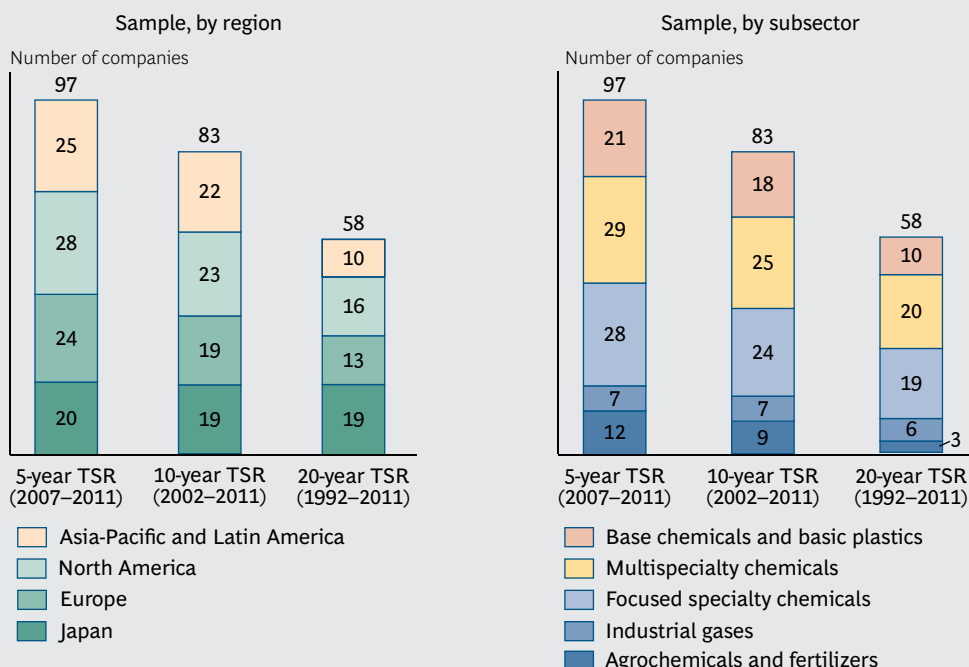
with the collapse of the Soviet Union in 1991 and extended through the dot-com and housing bubbles to the global financial crisis and recession

Company Size and Liquidity. We included all chemical companies listed on at least one of the world’s stock exchanges for the five-year period 2007–2011. (See Exhibit 1.) Moreover, companies had to meet a specific size and

liquidity threshold: they had to have a market valuation of at least \$2 billion (in 2011) or have at least 25 percent of their shares traded on public capital markets.

Based on our size and liquidity criteria, the 5-year industry sample (with 97 companies) is much larger than the 10-year and 20-year samples (83 and 58 companies, respectively). These changes in sample size reflect the wave

EXHIBIT 1 | Sample Size Varies over Time as Measured by Listings on a World Stock Exchange



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.

of breakups and portfolio restructurings that occurred over the past two decades, through the dissolution of chemical-pharmaceutical hybrids and the wide-scale divestment of chemical assets by oil and gas companies. Many sizable players have emerged from the wave of spinoffs (including Lanxess, Arke-ma, and Clariant) and IPOs (among them Symrise and Celanese).

Also included are companies with large, albeit secondary, nonchemical activities that might warrant their classification in other industry sectors such as mining or biophar-maceuticals. We excluded companies whose large chemical operations are nonetheless eclipsed by another, more dominant, industrial activity; for example, oil and gas, mining, and pharmaceutical companies that own large petrochemical activities.

Regions and Subsectors. The chemical industry is highly diverse, in terms of both location and structure, in its business models and market segments.

The companies we analyzed for our five-year view are headquartered (and generate the

bulk of their revenues) in four regions or countries: 28 are North American, 24 are European, 20 are Japanese, and 25 are based in rapidly developing economies (for example, the Asia-Pacific region and Latin America).

Recognizing that the structural diversity of the chemical industry has important implica-tions, we took a different approach from that of most industry analysts in classifying the various industry subsectors and segments. We identified five broad industry subsectors, which account for about 150 different seg-ments; most companies are active in multiple segments. For the purposes of comparison, we defined five distinct subsectors that repre-sent the most prevalent business models in the chemical sector:

- **Base Chemicals and Basic Plastics.** Most of the 21 companies (in our five-year view) in this subsector generate a large share of their revenues from cracking products or basic derivatives, such as polyolefins, solvents, and surfactants. Some have another product focus (for example, other polymers) but in their business model

closely resemble petrochemical companies. A few also have sizable specialty-chemical businesses.

- Agrochemicals and Fertilizers.** In our sample, 12 companies generate all or most of their revenues from agrochemicals or fertilizers. This group also includes some companies with substantial but minority specialty-chemical operations. For some of these companies, mining is also an important activity. (For more on mining companies, see *Value Creation in Mining 2012: Taking the Long-Term View in Turbulent Times*, BCG report, January 2013.)
- Industrial Gases.** This subsector, clearly demarcated from the others, is also highly consolidated, with just seven companies. Even those that engage in other businesses (such as Air Products, which also produces specialty chemicals) derive the overwhelming share of their revenues from industrial gases.
- Focused Specialty Chemicals.** This subsector consists of 28 companies, mainly from the coating, adhesive, flavor and fragrance, construction chemical, chemical distribution, and electronic material segments. All have a stated focus on highly refined chemical-product areas that serve a

narrowly defined customer industry or functional application.

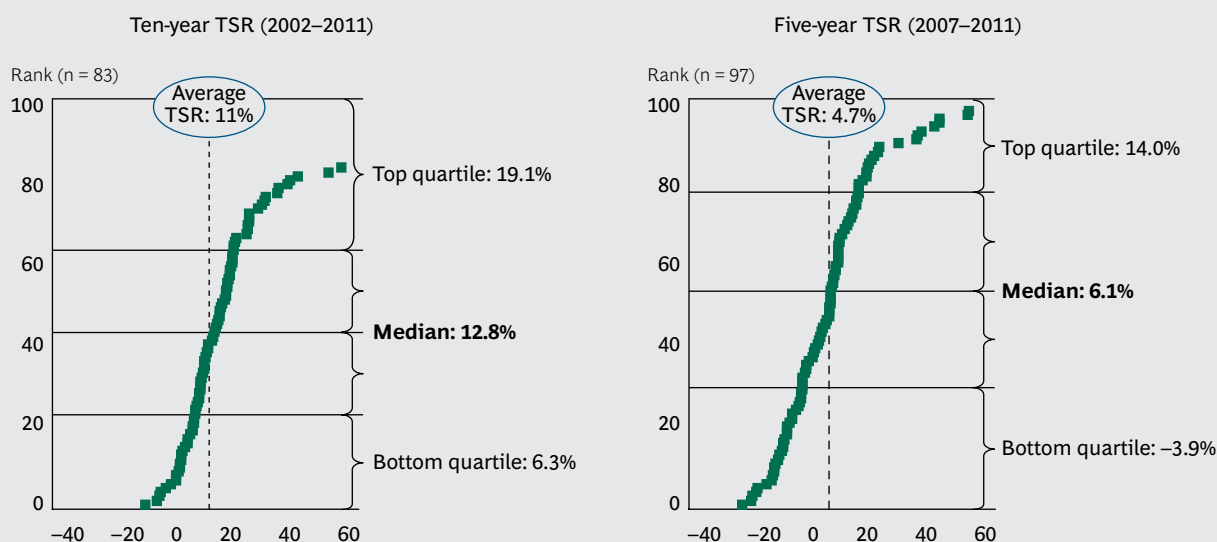
- Multispecialty Chemicals.** The 29 companies in this subsector have diverse portfolios and earn a sizable portion of their revenues from their specialty-chemical businesses. Compared with focused specialties, multispecialty companies serve a broader range of customer industries and functional applications. Nearly all dedicate a significant part of their business to “semispecialties” or “narrow commodities,” and some are also active in petrochemicals, agrochemicals, pharmaceuticals, or some combination thereof.

The Industry Postcrisis: Holding Its Own but Still Hurting

Since the launch of BCG’s annual Value Creators report, the chemical industry has been a reliable source of value creation in the global economy, consistently ranking among the top five industries.

When we compare the average annual TSR of the five-year period with that of the ten-year period, we clearly see the impact of the global financial crisis on all performance quartiles since 2008. (See Exhibit 2.) TSR for the top quartile fell more than 5 percentage

EXHIBIT 2 | The Economic Crisis Drove Average TSR from 11 Percent to 4.7 Percent



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

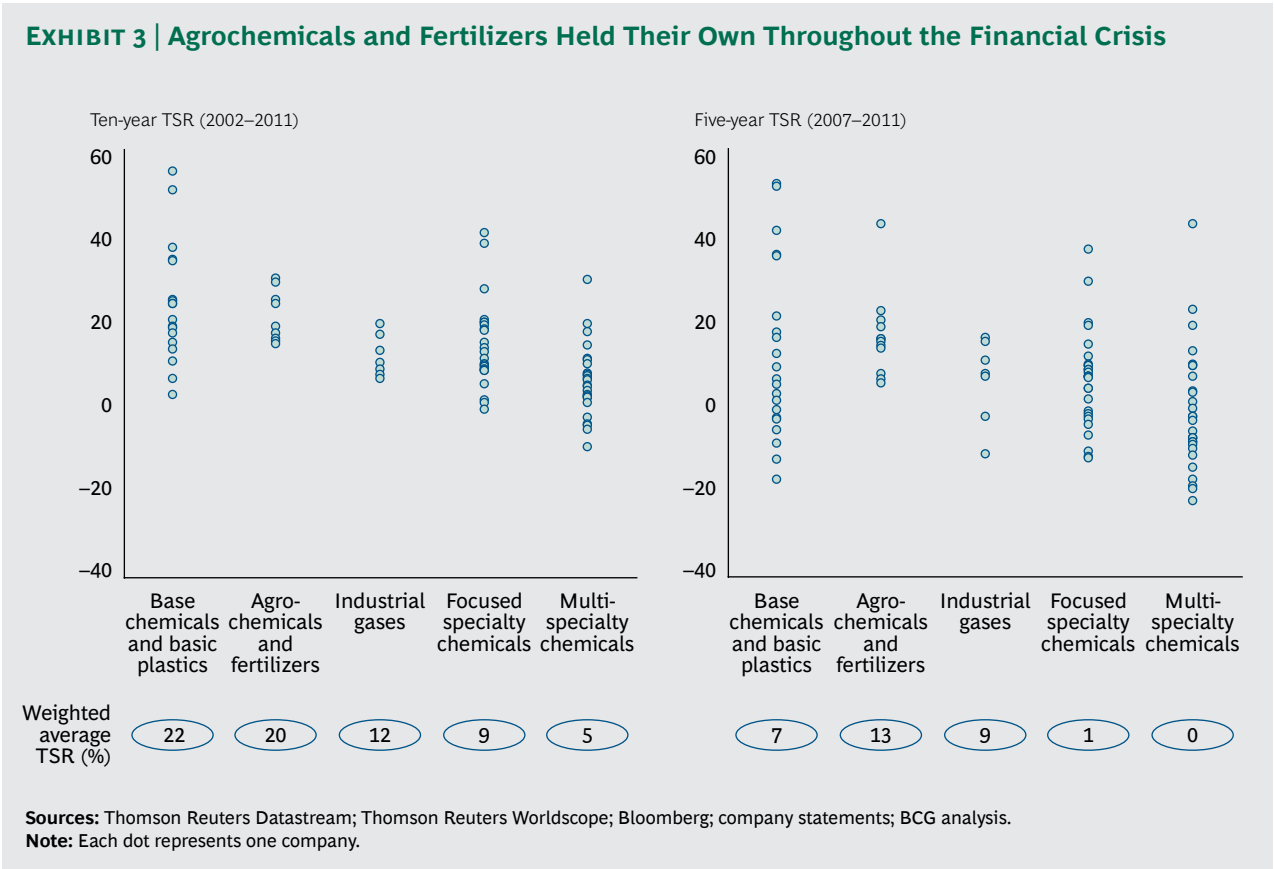
points, from 19.1 percent to 14 percent. (According to BCG’s Value Creators research, top performers in any industry generally achieve a TSR of at least 15 to 20 percent.) For the median, TSR dropped by nearly half, from 12.8 percent to 6.1 percent, and for the bottom quartile, it fell from 6.3 percent to –3.9 percent. Few companies consistently produced TSR below 5 percent over the ten-year period; most (but not all) of them were Japan-based and thus subject to the particular difficulties of that country’s deflationary markets.

The global financial crisis affected the five industry subsectors in very different ways. Most of the agrochemical and fertilizer companies were industry outperformers. This subsector, a top performer in the ten-year analysis, remained relatively healthy during the crisis, with TSR falling from 20 percent to a still-impressive 13 percent. (See Exhibit 3.) This is not surprising, given the accelerated worldwide need for greater productivity in food production. (In emerging countries, rising incomes have fueled demand for protein, while globally, food production

requires increasingly greater inputs—the result of a combination of soil degradation and the higher crop yields required for livestock feed.) Within the sector, fertilizer companies—especially those with a mining (potash, phosphate) or energy (natural gas) feedstock base—outperformed agrochemical companies.

The financial crisis affected the five subsectors in very different ways.

Industrial-gas companies also performed respectably, with most of them adhering closely to their subsector’s decade-long TSR average. Base-chemical and basic-plastic companies experienced a considerable drop in TSR, although there were a few high performers—all of them Asian companies. The crisis hit multi-specialty and focused-specialty companies hard; most of the underperformers in both time periods fell within these subsectors.



Nearly every company with a negative five-year TSR was a multispecialty company, and few multispecialty companies were able to climb into the top two quartiles.

Value Creation in the Three Periods

How did the subsectors respond to global economic and industry developments over each of the three time periods? Consider these highlights.

The 20-Year View: Specialties Ascendant.

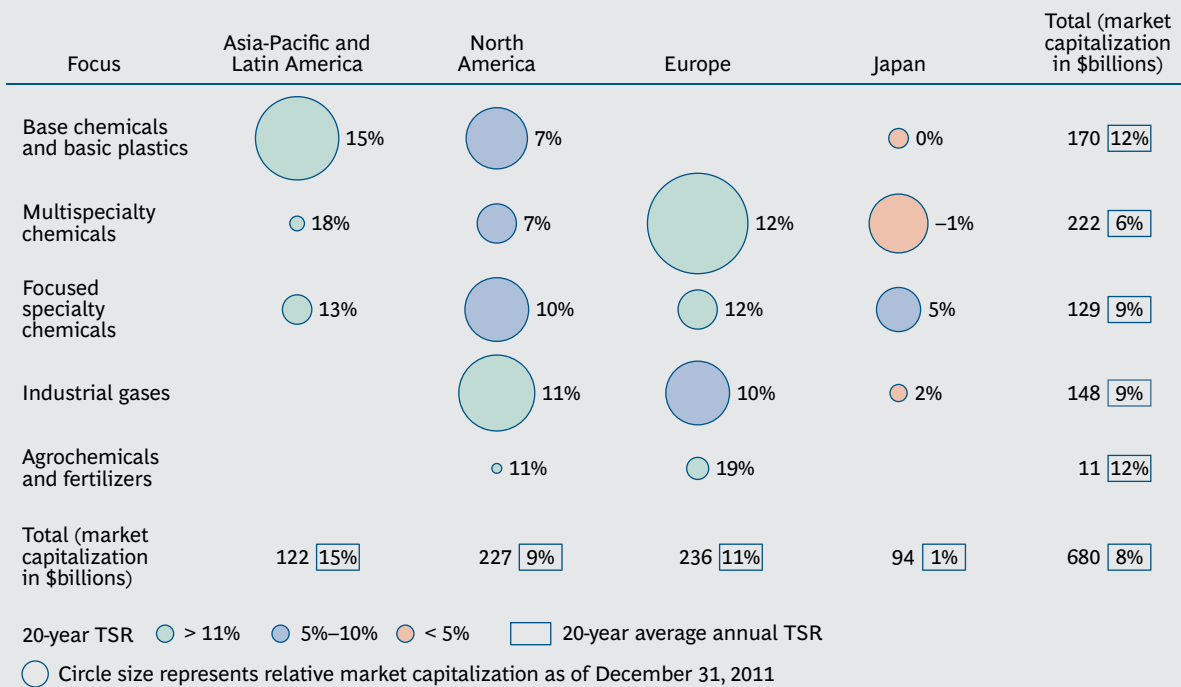
From 1992 through 2011, the chemical industry earned an average annual TSR of 8 percent. Over the 20-year period, regional differences were more pronounced than subsector differences: Asia-Pacific (excluding Japan) and Latin America registered the highest TSRs. Chemical companies in both regions achieved average annual TSRs of 15 percent, compared with the global average of 8 percent. (Japan, in contrast, fared poorly, with a 1 percent average annual TSR over the two decades.) The chronically low TSRs of North American chemical companies reflect

the anemic performance of manufacturing in that region until manufacturing began, in 2008, to experience a resurgence.

The gap between subsectors was less drastic, with a differential ranging from 6 to 12 percent. The specialty companies, both multispecialties and focused specialties, when combined, proved to be the most winning subsectors during the 20-year period. (See Exhibit 4.) European multispecialty companies outperformed North American and Japanese multispecialty companies, averaging an annual TSR of 12 percent—again, robust long-term performance compared with the global average. In Japan, focused specialties’ annual TSR of 5 percent constituted remarkable performance, when one considers that the Nikkei peaked in 1992 and that TSRs in Japan’s chemical sector declined in concert with the equity market’s contraction. (Some Japanese companies offered high-quality, high-value-added chemicals for the electronics industry and for leading global OEMs in other industries.)

Toward the end of the first ten-year period, in the late 1990s, specialty chemicals experi-

EXHIBIT 4 | In the 20-Year View, Specialty Chemicals Showed Strong TSR



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.
Note: n = 58 companies.

enced a flurry of portfolio restructurings, spinoffs, and acquisitions—particularly in Europe but also in the U.S. This activity was largely the consequence of the breakup of the so-called pharmaceutical-chemical hybrids, many of which were trying to position their portfolios in the specialty chemical subsector.

As more companies sought entry into specialty chemicals, M&A activity heated up.

The late 1990s also saw the emergence of large agrochemical and fertilizer companies. Some arose out of divestitures; others simply achieved scale organically.

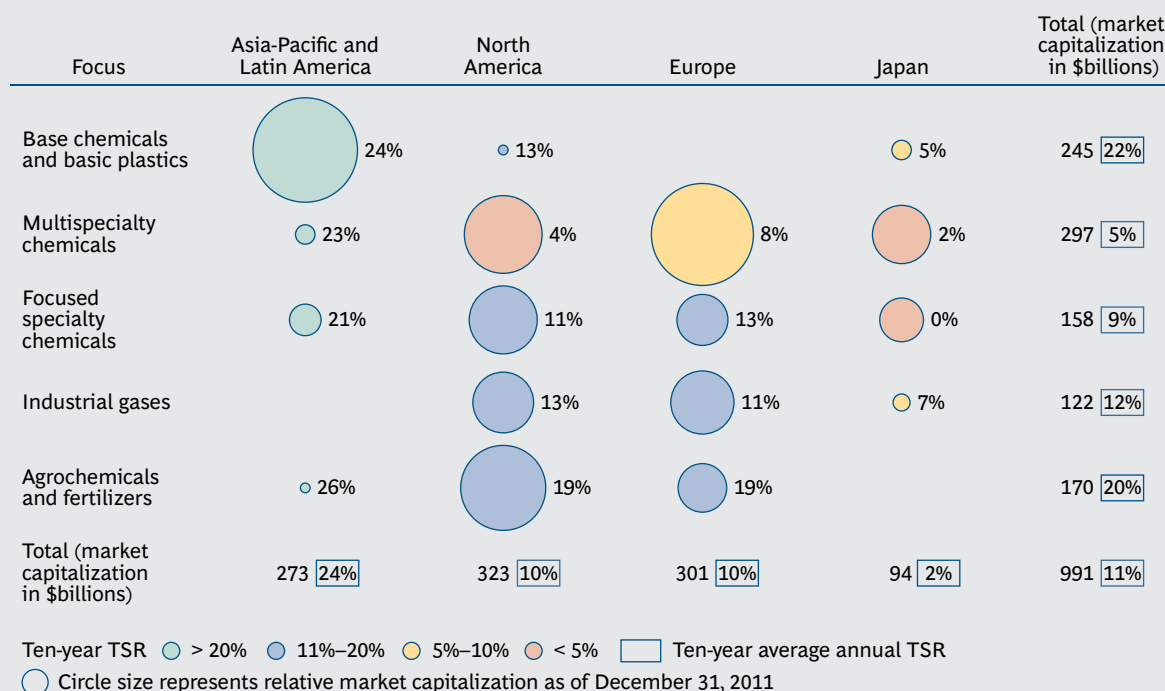
The Ten-Year View: The Rise of Agrochemicals and Fertilizers. The performance disparities between industry subsectors were greater during the 10-year period 2002–2011 than during the 20-year period. Base chemicals and basic plastics earned an average annual

TSR of 22 percent, whereas multispecialty chemical companies earned an average TSR of just 5 percent. Focused-specialty-chemical companies did slightly better, at 9 percent. (See Exhibit 5.)

The regional gap was equally wide, with a 24 percent average annual TSR for Asia-Pacific and Latin American companies (that is, those based in emerging markets) versus 2 percent for Japanese companies. The gap between North American and European companies, meanwhile, closed entirely; in both regions, companies averaged 10 percent.

The reversal of fortune in both specialty-chemical subsectors during this period was in part a result of the M&A frenzy that had occurred from 1998 through 2002. The breakup of many pharmaceutical-chemical hybrids created more market participants; the number of companies in our sample, for instance, grew from 58 to 83. As more companies sought entry into the coveted specialty-chemical arena, M&A activity heated up in Europe and the U.S. Many such deals soured, as typically happens when M&A rises to the level of fad, and value creation overall suffered.

EXHIBIT 5 | In the Ten-Year View, Agrochemicals and Fertilizers Emerged Among the Leaders



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.
Note: n = 83 companies.

The heated growth in emerging markets over the past decade spurred demand for commodity products for basic needs, especially foods. This demand fueled the high TSRs of emerging-market-based companies in base chemicals and basic plastics and agrochemicals and fertilizers, which achieved 22 percent and 20 percent TSRs, respectively.

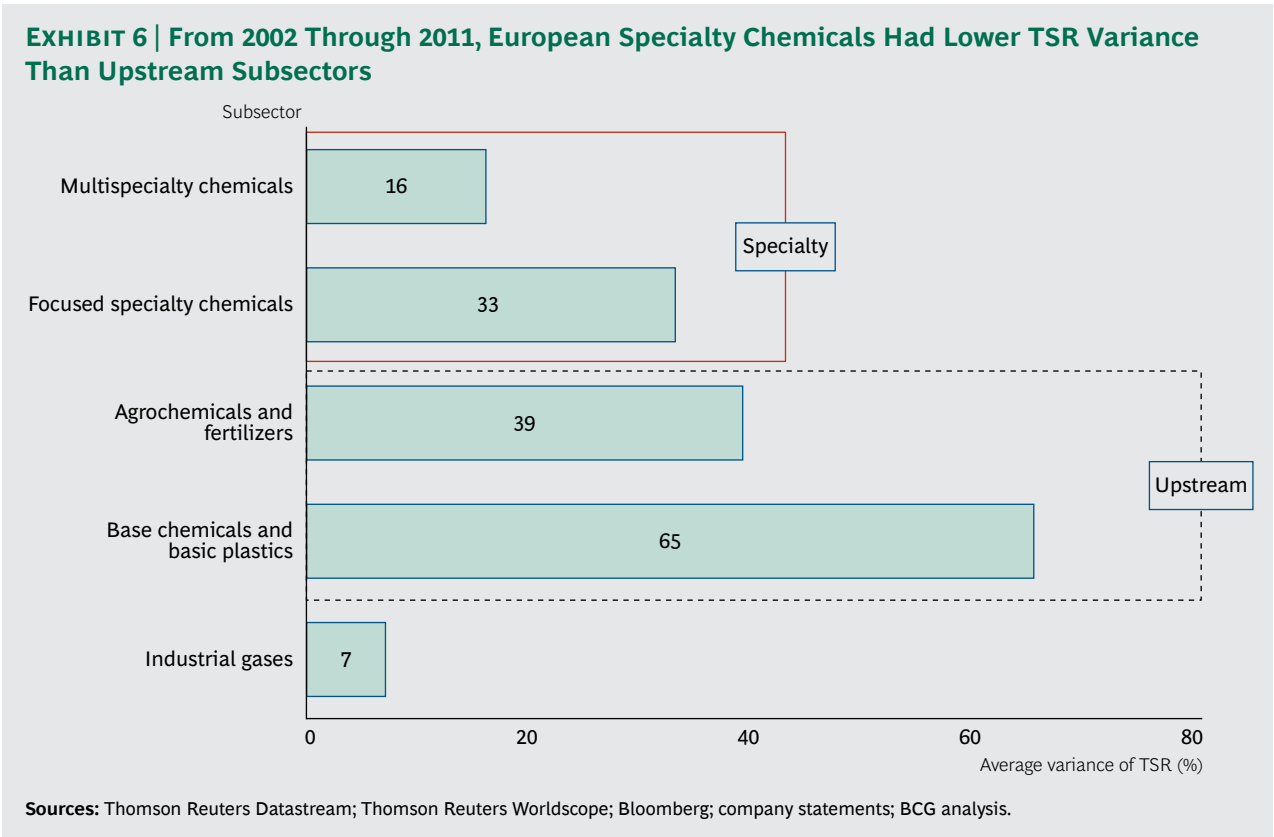
In Europe, the 10-year TSR in multispecialties (which included most of the industry newcomers) was 8 percent, below the industry average of 11 percent and 4 percentage points below the 20-year average for European multispecialties. Large consolidations were common among North American multispecialty companies, as was the creation of new multispecialty companies out of the mergers of focused players. But these companies earned an even lower average annual TSR: 4 percent, down from 7 percent over the 20-year performance period.

Although their value creation sputtered during the decade, European specialty-chemical companies—both multispecialty and focused-specialty companies—enjoyed more stable performance, as shown by their

lower TSR variance relative to the upstream subsectors. (See Exhibit 6.)

The decade’s rising star, however, was the agrochemical and fertilizer subsector, with an average annual TSR of 20 percent (closely rivaling the 22 percent achieved by the highest subsector) and the highest regional TSR of all the subsectors: 26 percent for Asia-Pacific and Latin American companies. The divestment of base-chemical units by multispecialty companies delivered a TSR windfall for the companies that remained in the business (as well as for the private-equity firms that invested in them). Agrochemicals and fertilizers, along with base chemicals and basic plastics (22 percent average TSR), squarely outperformed the industrial-gas subsector (12 percent TSR), which once posted a more comparable TSR. For many companies, casting off their basic commodity business to pursue specialties proved to be a “flavor of the month” move—and a losing bet.

The Five-Year View: Recovery in Name Only. The five-year period from 2007 through 2011 encompassed extremes, spanning the last of the boom years and the global financial crisis



and its aftermath. For Europe and Japan in particular, we see no signs that global economic woes will abate much in the foreseeable future. (See Exhibit 7.)

Base chemicals and basic plastics, the TSR performance stars of the 20- and 10-year periods, saw their TSRs decline dramatically during the 5-year period to an average of 7 percent per year—third place among the five subsectors. Agrochemicals and fertilizers secured their position as the top sector performer, although their average annual TSR slipped from the ten-year level of 20 percent to 13 percent. The most respectable TSR performance during the five-year period—from agrochemicals and fertilizers, base chemicals and basic plastics, and industrial gases—reflected the steady, if somewhat muted, demand for food- and nutrition-related chemical inputs.

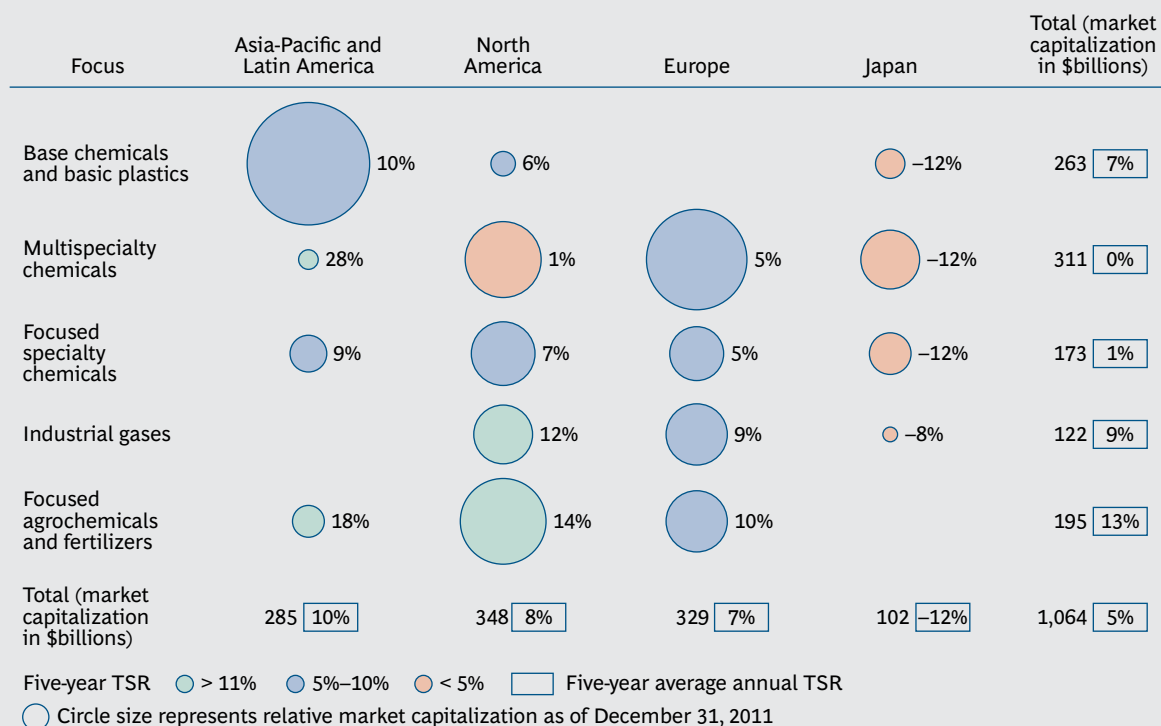
Nonetheless, value creation overall suffered during the five-year period. The low TSRs that prevailed in most subsectors stemmed from

many factors: the anemic global economy, the lack of volume recovery, and margin erosion caused by feedstock inflation. Weakened portfolios, in turn, undermined both growth and margin improvement. European specialty-chemical companies (the worst performers outside of the Japanese companies) were particularly hurt by troubled portfolios, unrealized growth, and margin slippage. The Japanese companies, which produced negative TSRs across all subsectors, were—and are—in a singular situation, owing to the huge energy challenges unleashed by the Fukushima nuclear-plant crisis.

The Value Champions: The Chemical Industry’s Top Ten

While most companies were eking out a 5 percent average annual TSR during the five-year period 2007–2011, the industry’s top ten performers beat them more than fourfold; they achieved annual TSRs of more than 22 percent, with the top two exceeding 50 percent. (See Exhibit 8.) Such performance

EXHIBIT 7 | In the Five-Year View, Most Subsectors and Regions Still Suffered the Effects of the Global Financial Crisis



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.
Note: n = 97 companies.

EXHIBIT 8 | The Chemical Industry Top Ten, 2007–2011, Shows the Strength of Companies Based in Emerging Markets

					TSR Disaggregation ¹					
	Company	Location	TSR ² (%)	Market value ³ (\$billions)	Sales growth (%)	Margin change (%)	Multiple change ⁴ (%)	Dividend yield (%)	Share change ⁵ (%)	Net-debt change (%) ⁶
1	LG Chem	South Korea	51.6	18.4	15	7	14	3	–1	14
2	Mexichem	Mexico	51.0	6.2	32	2	19	2	–3	0
3	Zhejiang Juhua	China	42.1	2.8	16	28	–13	2	–2	12
4	CF Industries	United States	42.0	10.3	25	56	–29	1	–5	–5
5	Kumho Petrochemical	South Korea	40.5	3.7	6	–8	–23	2	–4	68
6	OCI	South Korea	36.1	4.6	14	26	–15	1	–4	13
7	Honam Petrochemical	South Korea	34.9	8.4	23	–5	20	1	0	–5
8	SQM	Chile	34.7	15.1	16	9	5	3	0	1
9	Croda International	United Kingdom	28.7	3.9	17	11	–10	4	0	7
10	Cheil Industries	South Korea	22.3	4.7	14	–10	17	1	–2	1

Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

Note: n = 97 global companies with a market valuation of at least \$2 billion.

¹Contribution of each factor shown in percentage points of five-year average annual TSR; any apparent discrepancies in TSR totals are due to rounding.

²Average annual TSR, 2007–2011.

³As of December 31, 2011.

⁴Change in EBITDA multiple.

⁵“Share change” refers to the change in the number of shares outstanding, not to the change in share price.

⁶As of June 30, 2012.

places the chemical top ten in the number one spot on BCG’s cross-industry list of top-ten industry performers.

Most of the top ten companies from the 2007–2011 review period are based in Asia-Pacific and Latin America. Only one (Croda International) is headquartered in Europe,

and only one (CF Industries) is based in North America. (See the sidebar “The Regional Divide.”)

When we disaggregate the sources of TSR performance, it becomes clear that the top performers pursued three distinct value-creation paths: aggressive growth (Cheil Indus-

THE REGIONAL DIVIDE

Since 2007, regional origin has influenced the TSR of chemical companies more powerfully than in any other period in the 14-year history of BCG’s Value Creators series. The heightened economic activity in the BRICS countries (Brazil, Russia, India, China, and South Africa) has proved to be a decisive factor for achieving TSR in the chemical industry.

From 2007 through 2011, annual TSR was twice as high for emerging-market-based

companies than for those based in mature markets. Companies based in Asia-Pacific and Latin America earned a median annual TSR of 16 percent, compared with 9 percent earned by North America–based companies and 7 percent by Europeans. Japanese companies, meanwhile, sustained a median annual loss of 12 percent. More than 40 percent of the Asia-Pacific and Latin American companies in our sample, in fact, achieved an average annual TSR of more than 20 percent over the five-year

THE REGIONAL DIVIDE

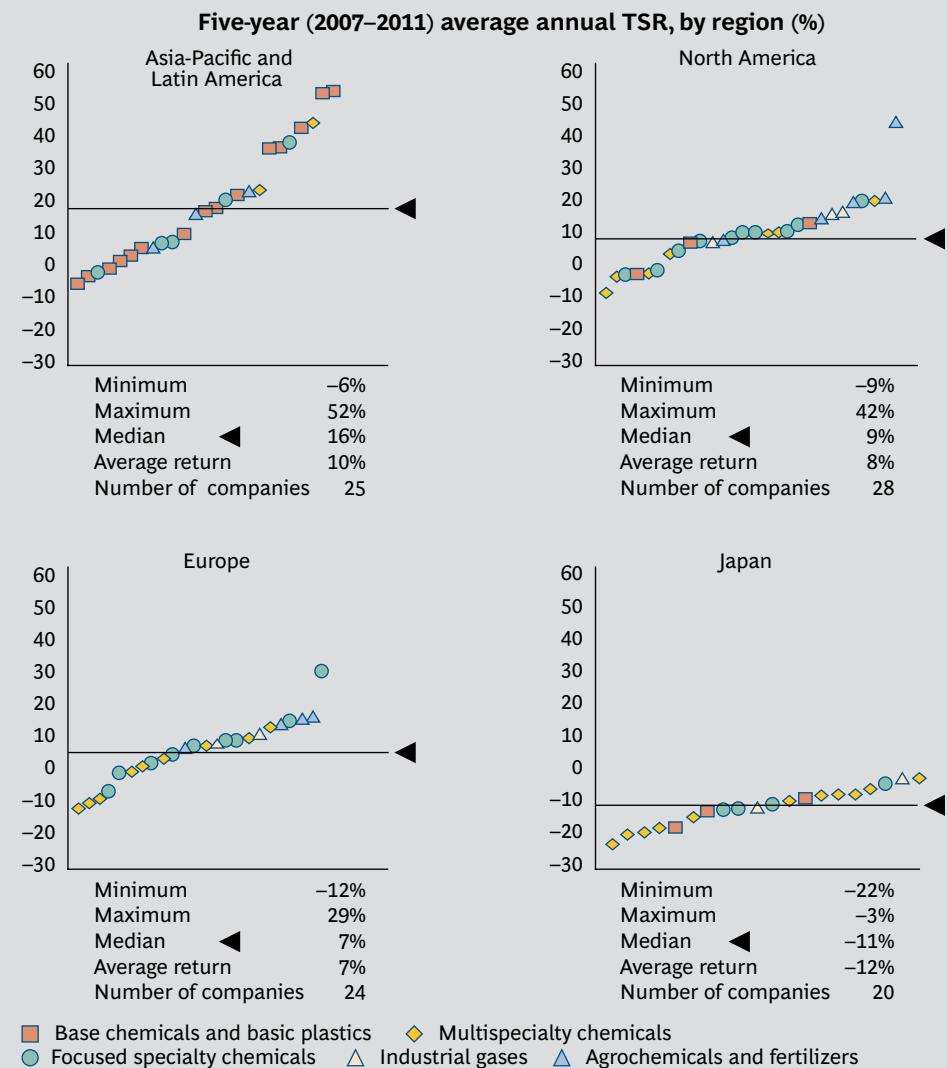
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period. In North America and Europe combined, only 2 of more than 50 companies were able to reach that mark: Croda International and CF Industries. (See the exhibit below.)

This regional disparity reflects the value-creating momentum from sales growth in those regions. During this period, U.S.- and Europe-based chemical companies generated most of their growth in Asia and Latin

America. Had these companies not systematically expanded their investments and exports into emerging markets, their value-creation path would look much more like that of the Japanese companies, whose overreliance on domestic sales consistently depressed their sales growth and value creation over the five-year period—indeed, over the past decade.

Postcrisis, Asia-Pacific and Latin American Companies Were Top Performers; Japanese Companies Still Lagged Behind



Sources: Thomson Reuters Datastream; BCG analysis.

tries and Honam Petrochemical are exemplars of this approach), pricing-power-based margin expansion (CF Industries and Zhejiang Juhua), and valuation-multiple improvement (LG Chem Power and Mexichem).

The Long-Term Value Creators: Making the Most of Natural Advantage

Looking at each of the three periods, it appears that top-ten performers consistently come from a narrow set of hypervertical enterprises. (See Exhibit 9.) This is compelling, given the size of the industry samples (97, 83, and 58 companies, respectively) and the number of segments (more than 150) and countries (more than 20). These value creation stars skillfully leveraged natural advantage—whether location, market, or resource—to come out ahead and prevail. They generally fall into three categories:

- *The South Korean “Growth Champions.”* South Korean chemical companies

consistently outperformed the market during the two decades through 2011. They also accounted for five of the top ten value creators for the period 2007–2011. South Korean chemical companies have followed some of the most ambitious, and most profitable, growth trajectories of the chemical industry. Although several also experienced margin erosion, most of those were able to improve their net-debt position—a combination that created a virtuous circle resulting in high TSR. (See the sidebar “Insights from South Korea.”) However, since the beginning of 2012, South Korean companies have faced strong headwinds from the yen devaluation, demand slowdown in China, and higher energy costs.

- *Mining-Based Chemical Entities.* Fluorine chemical companies (such as Mexichem and Zhejiang Juhua) and potash- or phosphate-based fertilizer companies (such as PotashCorp, SQM, and ICL) have consistently generated high TSRs. In our

EXHIBIT 9 | The Top Ten Value Creators Over the Three Time Periods

Rank	5-year (2007–2011) TSR ¹			10-year (2002–2011) TSR ²			20-year (1992–2011) TSR ³		
①	LG Chem	South Korea	Base	Kumho Petrochemical	South Korea	Base	Kumho Petrochemical	South Korea	Base
②	Mexichem	Mexico	Base	Mexichem	Mexico	Base	PotashCorp	Canada	Agro
③	Zhejiang Juhua	China	Multi	W.R. Grace	U.S.	Focus	Reliance Industries	India	Base
④	CF Industries	U.S.	Agro	OCI	South Korea	Focus	K+S	Germany	Agro
⑤	Kumho Petrochemical	South Korea	Base	SQM	Chile	Base	Airgas	U.S.	Gas
⑥	OCI	South Korea	Focus	Honam Petrochemical	South Korea	Base	Cheil Industries	South Korea	Multi
⑦	Honam Petrochemical	South Korea	Base	LG Chem	South Korea	Base	Honam Petrochemical	South Korea	Base
⑧	SQM	Chile	Base	ICL	Israel	Agro	Croda International	U.K.	Focus
⑨	Croda International	U.K.	Focus	Cheil Industries	South Korea	Multi	Ecolab	U.S.	Focus
⑩	Cheil Industries	South Korea	Multi	Saudi Basic Industries	Saudi Arabia	Agro	BASF	Germany	Multi

Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.

Note: Base = base chemicals and basic plastics, Agro = agrochemicals and fertilizers, Gas = industrial gases, Focus = focused specialty chemicals, and Multi = multispecialty chemicals.

¹n = 97.

²n = 83.

³n = 58.

INSIGHTS FROM SOUTH KOREA

Among Asia-based chemical companies, the differences in value creation between South Korean companies and all others (especially Japanese companies) are profound. South Korean companies garnered an average ten-year TSR of 39 percent, versus the average 15 percent of other Asian companies and the -12 percent for Japanese companies. (See the exhibit at right.) This disparity is surprising, considering the striking similarities between the South Korean companies and other Asian companies. Many, for example, supply the world's leading automotive and electronic OEMs. They also face high energy and feedstock costs, as well as the challenges of a rapidly aging workforce and local end-user customer bases.

The South Korean *won*'s 30 percent depreciation against the Japanese yen during the decade certainly gave South Korean companies a competitive boost. But industry-specific and management factors also played an important contributing role in the South Koreans' performance. Two in particular: export ratios and portfolio restructuring.

South Korean companies, unlike Japanese companies, could never rely on domestic demand alone for their survival; historically, their domestic sales have accounted for 40 percent of their total sales, whereas Japanese companies have enjoyed 60 to 70

percent domestic sales rates. As a result, South Korean companies' consistently higher export rates, which seemed unremarkable in any given year, had a dramatic compounding affect over the years. Japanese companies' high proportion of domestic sales has turned from a boon to a burden.

From a portfolio perspective, South Korean companies have followed two key practices. Since the beginning of the millennium, South Korean chaebols have been restructuring their chemical assets, creating larger, more homogeneous portfolios that enable them to concentrate their growth investments. South Korean companies have also typically dedicated a sizable portion of their portfolios to upstream chemicals. Having more secure feedstock and intermediate positions has buffered them from recent years' feedstock-price inflation.

The South Korean advantage relative to Japan began evaporating in 2012. But the lesson it provides nonetheless has implications for all chemical companies, particularly European ones, which face many of the same major challenges that Japanese companies have grappled with: ballooning public debt, a rapidly aging population, high energy costs, high feedstock costs that threaten cracker sites, and a dependence on sales of high-quality and high-performance specialty chemicals to local export-

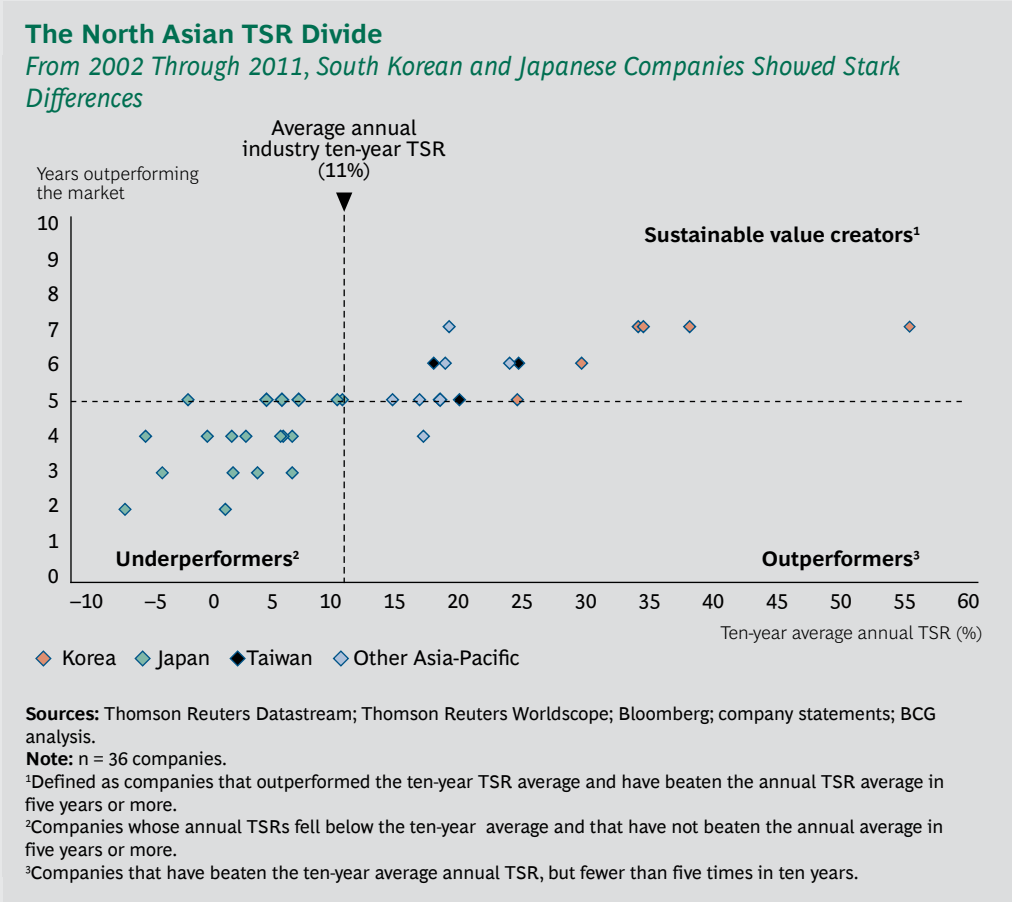
view, companies that create value-adding downstream derivatives from a backbone of strong mining feedstock have earned some of the steadiest returns in the industry—witness the producers of soda ash, bromine, lithium, sulfur, and tungsten.

- **Polymer Powerhouses.** Base polymers, especially polypropylene, are among the chemical sector's great success stories. Base-polymer producers outperformed most of the engineered and high-performance materials while serving basic needs

in emerging markets such as construction and packaging. At the same time, through constant innovation, base-polymer manufacturers have made successful inroads into higher-value segments. Regional and global leaders in this industry, such as Honam Petrochemical, Saudi Basic Industries Corporation (Sabic), and Reliance Chemicals, have some of the most stable TSR records in the industry. Both Sabic and Reliance have skillfully combined backward-integrated low-cost assets with large, cost-competitive innovation capabilities.

driven OEM industries. Companies might want to consider some of the strategies adopted by South Korea's high performers, such as aggressively pursuing regional growth, establishing a stronger foothold in emerging markets (for example, through an R&D center or global functional center, and

beefing up their feedstock chains and further consolidating portfolios. The latter would go a long way toward mitigating a risk particular to European multispecialty companies: relying on businesses that are not market leaders for a significant proportion of their sales.



Having natural advantages, as do the companies in these three categories, helps. But it certainly doesn't guarantee top status as a value creator. Nor does being a top value creator depend on such advantages. In the next chapter, we explore the value of adhering to a sound long-term strategy that incorporates disciplined financial and operational management and risk management.

LONG-TERM VALUE CREATION

BACK TO BASICS

THE FINANCIAL IMPACT OF consistent long-term value creation is well established, and huge: \$100 invested in a top-ten value creator in 2001 would have yielded more than \$1,800 by 2011. In contrast, a \$100 investment in an average performer would have yielded a mere \$261 by 2011. (See Exhibit 10.)

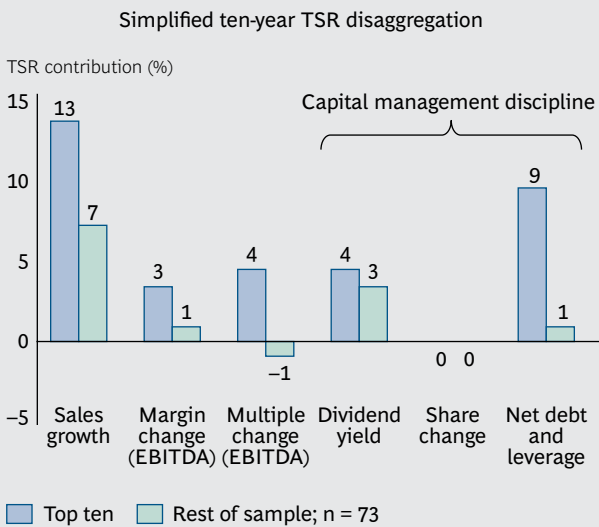
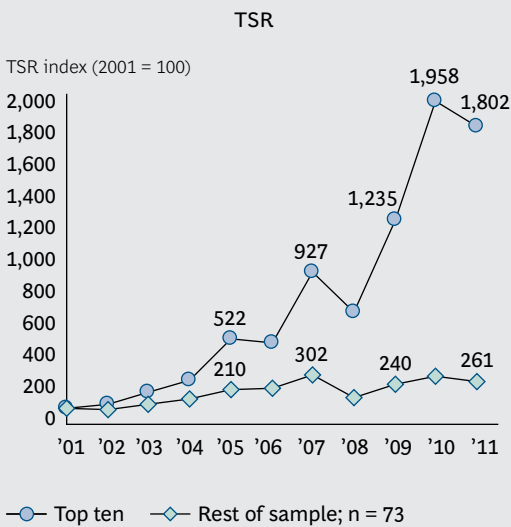
This performance differential boils down to two fundamental questions: What levers did the top value performers apply to create

value? And how much did each lever contribute to overall TSR?

Three Levers

Over the past decade, the value creation model of the top-performing chemical companies has shown a marked shift away from financial levers and toward operational levers. (See Exhibit 11.) Perhaps the most striking change is that, by the end of the ten-year review period, the EBITDA multiple no lon-

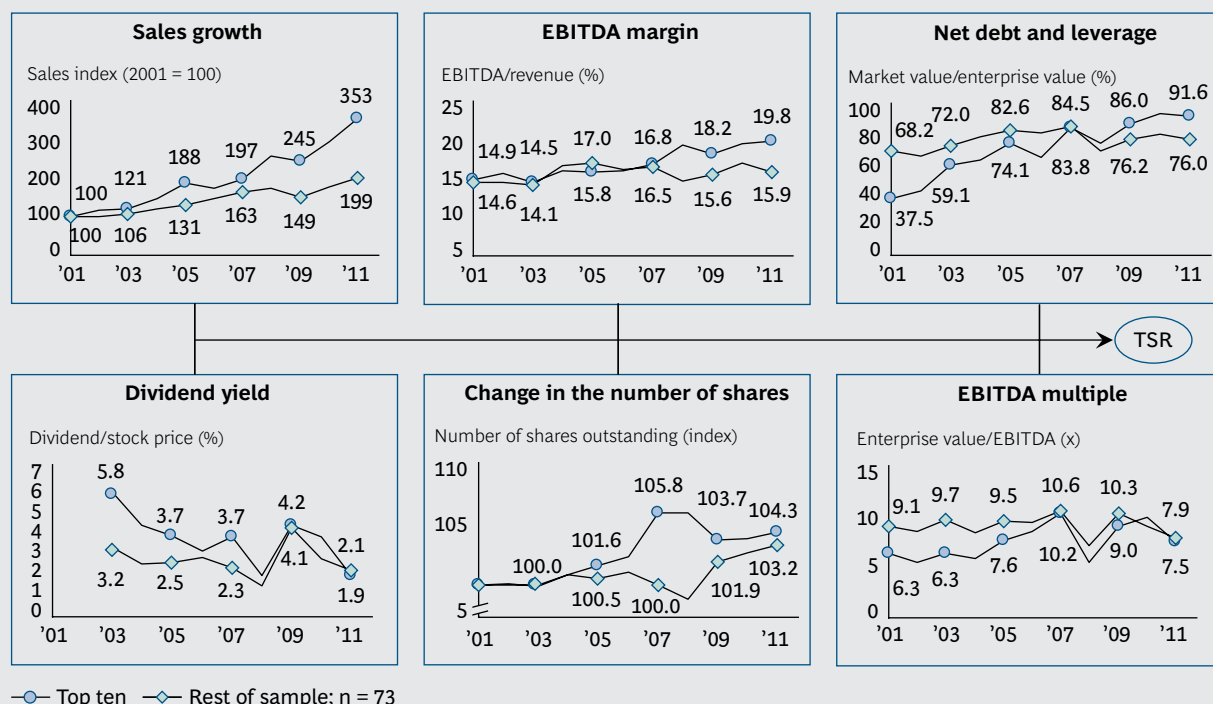
EXHIBIT 10 | \$100 Invested in a Chemical “Top Ten” in 2001 Would Have Yielded More Than \$1,800 by 2011



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

EXHIBIT 11 | Operational Levers Have Supplanted Financial Levers as the Key Sources of Value for the Top Ten

Breakdown of TSR Sources for the Top Ten Versus the Industry Sample, 2002–2011



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; annual reports; BCG analysis.

ger made the definitive difference. Ten years ago, the EBITDA multiple was among the most powerful levers, with top performers producing an average multiple of 9.1 percent versus the market average's 6.3 percent. As of year-end 2011, the EBITDA edge was razor thin: top performers registered a multiple of 7.9 percent versus 7.5 percent for the average. Nor do dividends matter much: top performers enjoyed a 2.1 percent yield versus 1.9 percent for the rest of the sample. Three fundamental operational levers have emerged as the critical differentiators. First, the top performers realized strong growth momentum—more than twice that of the overall sample. They also demonstrated superior margin discipline, earning margins three times greater than the sample's. These practices, combined with debt reduction, helped them achieve their impressive TSR differential.

Growth Momentum. Sales growth has traditionally been the key differentiator for top-ten performers; over the ten-year review period, the top ten companies enjoyed an annual growth rate of 13.4 percent, com-

pared with the average of 7.1 percent (expressed in Exhibit 11 in terms of a cumulative index). The strategies supporting such growth vary, but we consider four to be the most common keys to success:

- Organic growth, especially the ability to profitably tap into the BRICS markets
- A continuous “buy and build” mindset regarding M&A, instead of one involving sporadic large-scale transformational acquisitions
- Strong commercial and innovation partnerships with leading-edge OEMs
- The expansion of complex, value-adding, high-profit “tail” business models

Margin Discipline. In 2001, top and average performers alike experienced 15 percent EBITDA margins; as of 2011, top-ten performers were enjoying an EBITDA margin of nearly 20 percent, while the average had barely budged (15.9 percent). Here, too, there

were a variety of strategies behind the top companies' performance, but two stand out.

First, the top ten companies are skilled at practicing raw-material procurement and at linking it effectively to product pricing and contracting. This alignment allows not only for tactical adjustments to feedstock price trends but also for faster adjustment (relative to competitors) to fluctuating feedstock prices within each region.

Second, these companies take a no-nonsense approach to portfolio management. Their management teams demonstrate the ability to strategically assess the competitive, technological, and value positions of their businesses with rigor and objectivity. Given the huge investment required to build businesses in major emerging markets (especially China), as well as the intensified competition in both the chemical sector and emerging markets in recent years, companies

can no longer afford to be overly optimistic in assessing business unit performance. Nor can they afford to reinvest in businesses that have long since proved to be unsustainable. In today's less stable environment, such moves are more likely than ever to erode margins and destroy value.

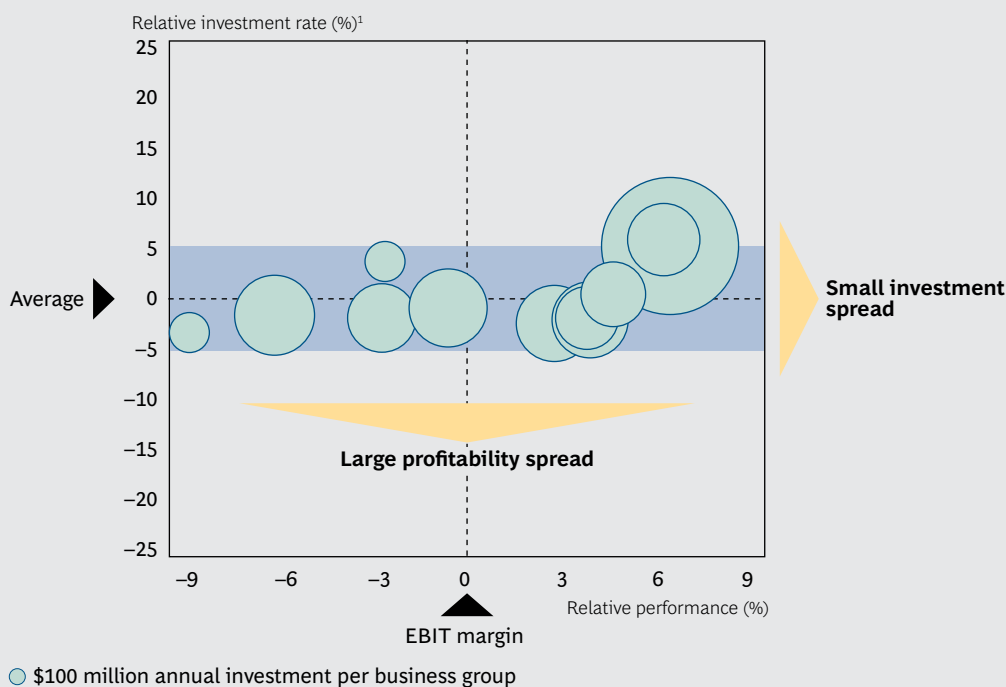
Companies that continue to allocate capital without realistically considering the payoff will suffer much harsher consequences today than in the past. Exhibit 12 illustrates fairly typical behavior: over six years, a diversified chemical enterprise invested at similar rates across all of its businesses, despite huge differences in ROI.

Debt Reduction. Top-ten performers stand out in one additional important way: they carry less debt. Their less-leveraged balance sheets reflect greater capital discipline, a more focused approach to allocating capital across their portfolios, and concentration on

EXHIBIT 12 | Companies Often Keep Investing at the Same Rate Across Units, Despite Huge Differences in Returns

BCG case example: multispecialty chemical company

Average investments (2000–2006) versus ROI (as of 2006)



Source: BCG case database.

¹Investments 2000–2006 versus the installed base (that is, cumulative gross investments); 0% represents the group average; each bubble represents each business group's deviation from the average group investment rate.

less-capital-intensive growth strategies. The results of these strategies suggest that disciplined margin management, along with above-average revenue growth, will likely be one of the main paths to superior value creation in the coming years. Rigorous portfolio management will be particularly critical for specialty chemical companies, as we discuss in the next chapter.

Value Creation Winners: “Diversified” Specialties, Specialty Inorganics, and M&A Champions

Our data indicate that portfolio composition, along with a chemical company’s growth strategy, had a significant impact on value creation in the past several years. Two strategic elements appeared to have had particular influence: the degree to which a company embraced specialty chemicals and the share of sales from inorganic chemicals. As for strategy execution, we found that serial M&A was a more effective catalyst for value creation than single-bet moves.

Resisting the Threat of Commoditization: “Diversified” Specialties. Specialty chemicals have been the darling of the investment community, thanks to their reduced cyclicality, higher margins, and greater growth. Many multispecialty companies have sought to broaden their exposure within specialty segments by investing in organic and inorganic businesses. Still, they have generally considered intermediate or feedstock chemical assets to be something to be “managed for cash”—or divested.

Although multispecialty companies generally underperformed in the ten-year and five-year time periods, closer scrutiny reveals a number of success stories within this subsector. Of the 17 Europe- and U.S.-based multispecialty companies whose recent record of M&A transactions we analyzed in detail, we identified two distinct strategies. (For this calculation, we excluded 12 multispecialty companies on the basis of their small size or headquarters in Japan.)

One strategy, “rapid specialization,” is the divestment of upstream businesses and the emphasis on larger-scale M&A transactions;

the other, “diversified buy and build,” de-emphasizes large-scale M&A moves into downstream specialty segments in favor of smaller M&A transactions and also seeks to retain profitable feedstock and intermediary businesses.

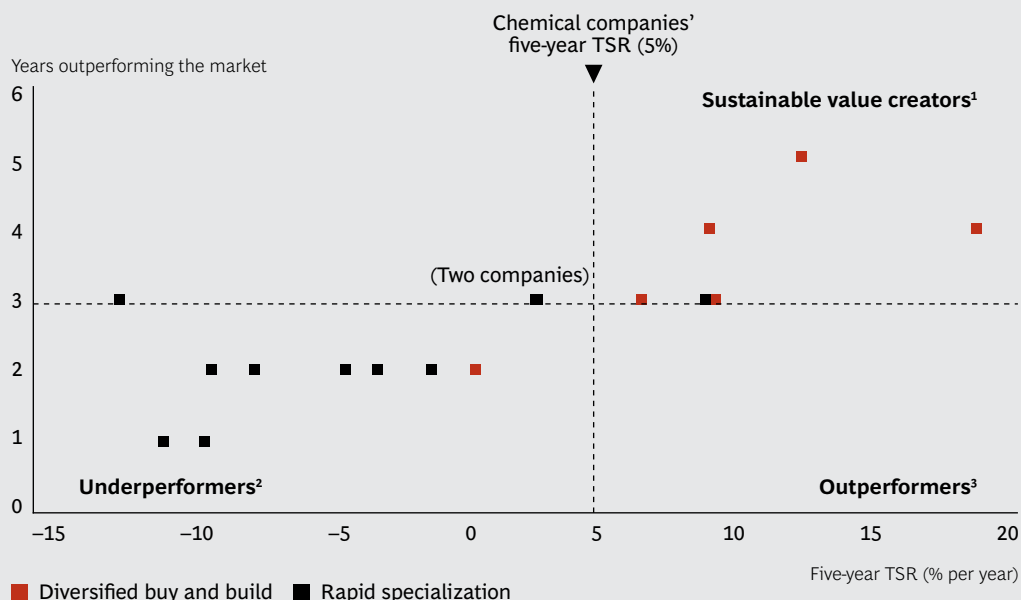
We believe that rapid specialization was ultimately a dubious strategy. The Europe- and U.S.-based specialty companies that adopted it underperformed. In contrast, the diversified-buy-and-build companies outperformed their peers over both the ten-year and five-year periods. (See Exhibit 13.) Moreover, 10 of the 11 rapid-specialization companies underperformed significantly in the past decade and had greater difficulty returning to precrisis performance levels than the diversified-buy-and-build companies (and most other chemical companies).

Rapid specialization was ultimately a dubious strategy.

At first glance, this outcome seems surprising; after all, the whole point of pursuing specialty chemicals, ostensibly, is to create less-cycle-sensitive, more robust, more resilient portfolios that are poised to capitalize on megatrends. But for several reasons, rapid specialization backfired. Generally speaking, companies that divest upstream assets to become downstream specialty players end up shifting the mix of customer industries to which they are exposed.

In several cases in our chemical-industry research, such divestitures reduced companies’ direct or secondary exposure to agriculture, construction, and basic materials. Company portfolios became more dependent on the health care, food, cosmetics, and automotive industries. These specialty-chemical companies ended up taking a double beating. The 2008 financial crisis hit their automotive and other retail-dependent customers hard. The specialty chemicals were also squeezed by their pharmaceutical-industry customers, which have been fighting mounting cost pressures associated with pipeline shortfalls and payers’ belt-tightening.

EXHIBIT 13 | For Multispecialties, “Diversified Buy and Build” Beat “Rapid Specialization” from 2007 Through 2011



Sources: Thomson Reuters Datastream; Thomson Reuters Worldscope; Bloomberg; company statements; BCG analysis.

Note: n = 71 companies; five-year TSR sample that does not include Japan and South Korea.

¹Defined as companies that outperformed the five-year TSR average and have beaten the annual TSR average in three years or more.

²Defined as companies that were below the five-year TSR average and have not beaten the annual average on three or more occasions.

³Defined as companies that have beaten the average five-year TSR, but fewer than three times in five years.

Diversified-buy-and-build companies, on the other hand, benefited from the growth in emerging economies, which has fueled the need for intermediates that provide inputs for agriculture, construction, and consumer goods. In some cases, the intermediates proved to have a more flexible asset base that could more easily weather demand shifts and adapt to new applications.

There's yet another fallacy behind the move to rapid specialization: the notion that specialty chemical inputs are generally less cyclical than those of other subsectors. One need only look at the volatility of demand in some customer industries over the short term; the automotive industry during 2008 and 2009 is a prime example. Ultimately, the rapid-specialization adherents experienced performance results that scarcely differed from the so-called commodity segments, such as polyolefins and polyvinyl chloride.

Going forward, companies should beware of chasing customer-industry flavor-of-the-month fads. The automotive, electronic, water

chemical, food ingredient, construction material, photovoltaic material, and wind-energy-material industries all went through short-term boom-and-bust (or gloom-to-boom) periods over the past few years. Companies should be especially wary of concentrating their investments in specialty chemical segments that rely extensively on government-subsidized markets (such as renewable energy, pharmaceuticals, and defense). Amid the protracted global sovereign-debt crisis, government financing and favorable regulatory treatment can quickly shrink or disappear. In addition, exports to those markets in rapidly developing economies may suddenly become subject to trade restrictions, as countries grow increasingly protectionist; the recent tussle between the U.S. and China on the wind and solar industries provides a cautionary example.

Escaping the Petrochemical Squeeze: Specialty Inorganics. Producers of specialty inorganic chemicals (these companies exist within and span the five subsectors we have defined) fared well in the past decade. Of the

seven companies in the ten-year sample that focus on specialty inorganics—excluding fertilizer manufacturers—six were outperformers and only one was a laggard. (See Exhibit 14.)

One important reason: although their processes are often energy intensive, specialty inorganic companies are otherwise insulated from the petrochemical “squeeze” because their feedstock production doesn’t depend directly on hydrocarbons. Another factor in their favor is simply their widespread use. In many applications, the miniaturization of industrial systems has increased the need for high-performance, high-purity, narrowly specified materials, additives, or process inputs. This is the case mainly in electronics, but it also applies to coatings, plastic additives, and other segments.

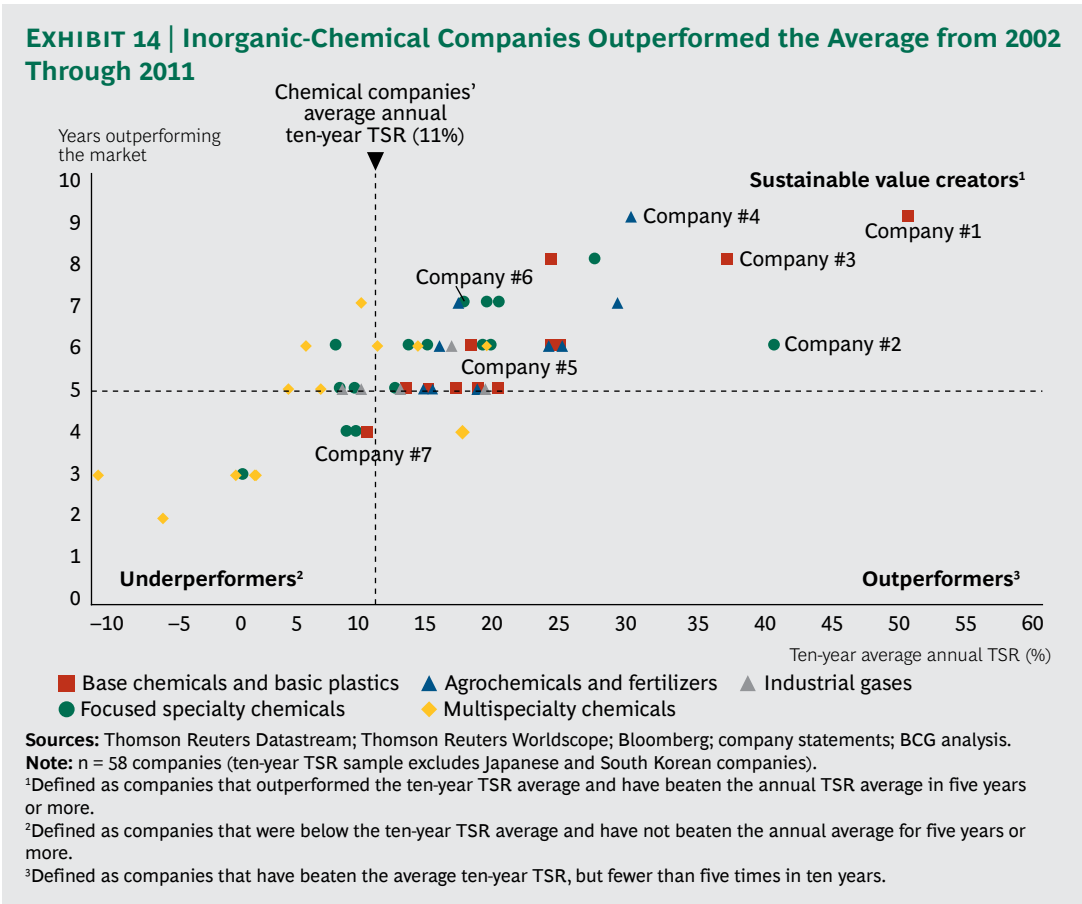
Finally, although many inorganic-chemical companies derive a hefty share of their revenues from low-margin, mass-volume, highly commoditized products, most of the industry leaders successfully manage a range of quali-

ties, including low-volume, high-quality, customized grades. This successful “tail management” has been easier to protect in inorganics than in polymers or organics because production of inorganics relies on processes that are more complex and elusive—and thus less easily replicated.

Although our sample is too small to be conclusive, we nonetheless believe these findings have important implications. Certainly, businesses with significant barriers to entry have a starting advantage. That, combined with complex (manufacturing) process capabilities, application development expertise, and product customization capabilities, supports superior value creation. In the future, it’s likely that the process differences alone—more complex, less replicable processes—will give inorganics a value creation edge over organics.

Winning at Dealmaking: M&A Champions.

M&A can be a powerful way for a company to achieve high growth and margin expansion. But it can just as easily damage the



balance sheet and rattle management’s confidence for years to come. We’ve witnessed as many examples of the latter scenario as the former.

As our data show, companies with high M&A activity—measured as the ratio of divested and acquired revenues to market capitalization—deliver disappointing TSRs, whereas low M&A activity correlates with high TSRs. (See Exhibit 15.) Simply put, high M&A activity in the chemical industry can thwart value creation.

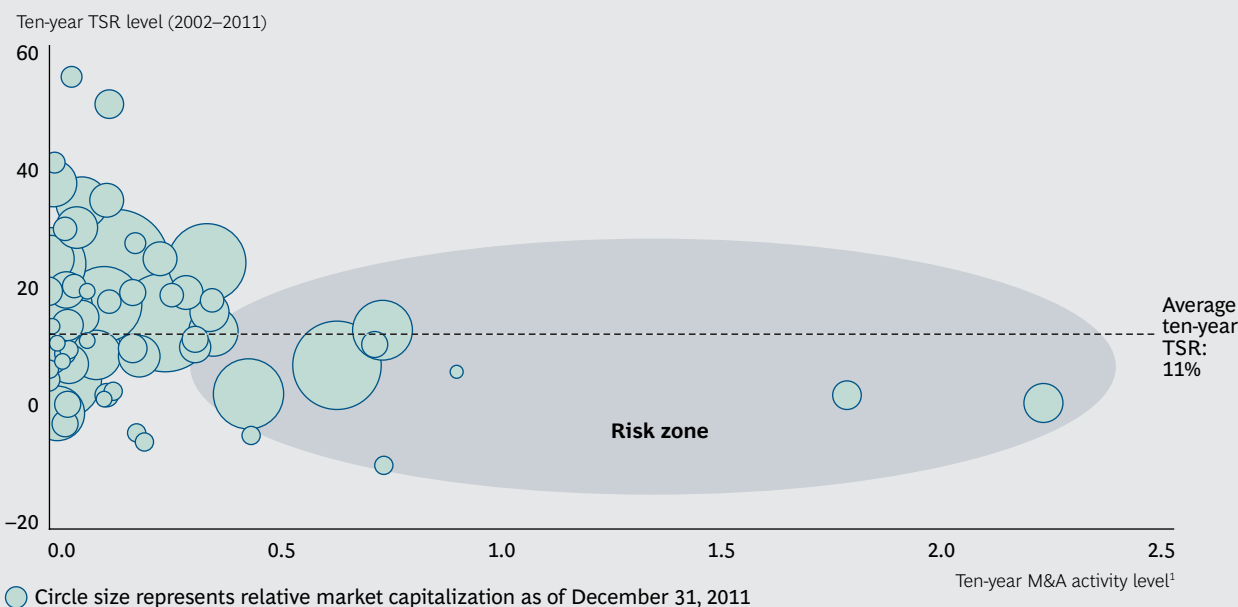
On closer examination, the data indicate that M&A ratios above 0.25 fall within a “risk zone” for value creation. That’s because such ratios are typically associated with a twofold strategy: one, divesting sizable, profitable assets that are considered noncore, and two, making single, large-scale acquisitions, often as adjacency moves into new business areas favored by megatrends. Each approach in itself would represent a big, high-risk bet. Interestingly, seven of the nine companies shown in the risk zone in Exhibit 15 are European multispecialty companies.

This two-pronged approach runs the risk of seriously eroding value, in that it can set a

company on a “sell low, buy high” M&A trajectory. Furthermore, adjacency moves made without regard for bottom-line synergies often impair a company’s ability to achieve high TSR. Large-scale, single-bet acquisitions are the most challenging type of M&A. Studies show that, across industries, a minority of companies execute the M&A transaction itself well, and less than 50 percent manage to achieve successful postmerger integration. Lower M&A ratios indicate an emphasis on business model innovation rather than on divestment. They are also often associated with smaller-scale, serial M&A.

One advantage of this lower-key, steadier approach over the big-bang approach is that it provides companies the opportunity to learn from their mistakes and constantly improve execution at every step. Serial M&A is important for yet another reason: it builds M&A capability. Management teams tend to overlook the lack of M&A skills more than any other management skill. Because M&A capability varies widely among companies, we believe it will become an even greater source of competitive advantage in the chemical industry.

EXHIBIT 15 | Greater M&A Activity Tends to Impede Value Creation



Sources: Thomson ONE Banker; Thomson Reuters Datastream; BCG analysis.

Note: n = 65 (all companies for which 10-year TSR and deal values were available; two outliers were omitted).

¹M&A activity level = deal values from acquisitions and divestments, 2002–2011, divided by market capitalization, 2011.

ANTICIPATING THE FUTURE

THROUGHOUT THE PAST DECADE, the greatest impact on performance in the chemical industry has come from two developments: the shift in wealth from Organisation for Economic Co-operation and Development countries to emerging economies and the growth of agrochemicals, fertilizers, and other food-production-related inputs. Will these developments continue to drive value creation in chemicals over the coming years? Current macroeconomic trends and customer industry dynamics suggest so. In addition, we foresee a shift in the top ranks of value creators: more U.S.-based companies will return to the list, thanks in large part to the competitive boost they've received from the shale gas revolution under way in North America.

Four Smart Bets

So what should chemical company executives do today to position their companies for value creation over the next several years?

Anticipate resource-constrained growth. Even as it abates, China's growth will likely remain strong and steady (as will growth in other emerging markets), owing to infrastructure improvements and the rising middle class. At the same time, dwindling natural resources and mounting agricultural needs also bode well for the industry, as nutritional demands worldwide increase.

Resource scarcity, moreover, is here to stay. Chemical companies can count on high energy costs and scarce feedstocks for the foreseeable future. As we saw over the past decade, a strong feedstock position—whether having an inorganic-mining backbone, inexpensive hydrocarbon reserves, or biomass—will remain a source of competitive advantage. Chemical companies can ensure that they translate that advantage into value creation in a number of ways: by implementing commercial strategies quickly, by prioritizing capital allocation, and by making organizational changes to adapt to disruptive shortages or shifts in demand.

At the downstream end of the chemical value chain, producers of additives and ingredients that boost resource efficiency—for example, water membranes, mining chemicals, oilfield chemicals, and feed additives and fertilizers—will benefit from increased resource scarcity. Beyond capitalizing on natural advantage, companies that orient their business portfolios, industrial strategies, and R&D priorities toward these developments will be well positioned for growth and superior value creation.

Further globalize for growth. The center of gravity for demand and growth will shift even further. By 2020, nearly 50 percent of the global demand for chemicals is projected to come from Asia. Although European chemi-

cal companies have for years been establishing production sites “in Asia, for Asia,” they will need to do even more. All functions must be more closely aligned with regional markets: not just sales and production networks but also global decision-making centers and processes. And although the talent shortage in Europe and Japan will continue to worsen (finding skilled technical workers is increasingly difficult for European chemical companies), China and other Asian countries are equipped to fill the gap. Thanks to abundant productivity reserves, these nations can largely make up for the talent shortage in the mature economies, even despite their aging workforces.

Companies that do not generate above-average TSR stifle their ability to reinvest and grow.

Greater localization allows global business units to be moved, strong regional centers to be established, and global functional hubs to be collocated with R&D centers and technical customer-service centers. Strong regional centers will increasingly become a prerequisite for serving emerging-market customers as well as for tapping local talent markets. The days of “fly in, fly out” management are decidedly over.

Memo to Europeans: Learn from Japan’s mistakes. European chemical executives would do well to regard Japan as an important object lesson—acknowledging the gloomy demographic and fiscal outlook their region shares with Japan and shoring up their defenses accordingly.

Japan’s powerhouse corporations managed to stay healthy for years despite the country’s macroeconomic slide, but no company can remain untouched indefinitely by its home country’s long-term economic decline. European companies must find answers to the challenges posed by their region’s deteriorating macroeconomic condition. The ability to achieve strong organic growth, M&A excel-

lence, portfolio management rigor, and financial discipline will be even more essential than ever.

Heed the U.S. as the “comeback kid.” Preliminary results of our 12-month TSR analysis for 2012 show widespread underperformance by most Asian chemical companies compared with prior years. In fact, not one Asian company ranks among the top 20 value creators. Most South Korean companies—traditionally, growth champions—are struggling with the slowdown in global growth and with high feedstock prices. Instead, look for U.S. companies to dominate the top-ten list in the coming years.

Although the U.S. economic recovery is still fragile, the experience of some top performers in our three key time periods suggests that important opportunities lie ahead for U.S. companies. Value creation from the shale gas boom, which now ensures vast stores of cheap energy, bodes well for the global competitiveness of U.S.-based chemical companies—and for the country’s manufacturing sector. The U.S. also retains other fundamental advantages relative to other mature markets: a productive workforce (and large immigrant pool), a low rate of unionization in the private sector, and much larger fiscal reserves to smooth out the macroeconomic imbalances. And, beyond shale gas, the U.S.’s more promising macroeconomic outlook relative to that of Europe and Japan may offer some of the most attractive opportunities for chemical industry investors.

Setting a Course for Sustained Superior Performance

Twenty years of research affirm our conviction that companies that regularly fail to create value—that is, companies that do not generate above-average TSR—stifle their ability to reinvest in their businesses and grow. Take Sony and Sharp, two industrial icons of the 1980s and 1990s. Year after year, BCG’s Value Creators report consistently showed the TSR performance of the two companies to be trailing, although their reputations remained untarnished. But by 2012, their lackluster performance had finally become headline news. In the short term, failing to outperform the

markets doesn't pose a major risk. Yet because standard financial reporting is not correlated with value creation, it can easily mask a company's failure to deliver value to investors over a period of years.

Our data show that more than 25 chemical companies are in what we call the "yellow (caution) zone"; 12 others are in the "red zone"—they have underperformed either in TSR or against the market for at least seven of the past ten years. Furthermore, longtime "stars" can fall quickly once their momentum slows; in 2012, for example, the slowdown in regional demand dealt a harsh blow to South Korean chemical companies after years of stellar performance. In other words, true performance is not always apparent, and in a fast-changing world, a value creation edge can rapidly disappear. Company leaders—boards and management alike—must be proactive about monitoring the panoply of risks they face, from economic and market to regulatory and labor related, and must manage them with discipline and agility.

For publicly held companies, it's not enough to create value; they must do so in a way that puts them ahead of the pack—and keeps them there. How can a company differentiate itself from competitors? What improvements can leaders make now that will yield near-term payoffs and that represent investments in future performance? How can companies anticipate and respond to macro trends to seize opportunity while also mitigating risky bets? We have identified three fundamental principles.

Improve the rigor and discipline of your capital-allocation process. Does your company have a clear conception of the different roles its businesses play? On what basis do individual units pursue growth and expansion? Does your capital expenditure (capex) planning anticipate and extrapolate long-term industry trends and challenges? To ensure a capital allocation process that strengthens value creation and minimizes value "leakage," companies need to address several key areas:

- *Ensure that the investment strategy of each business aligns with the business's purpose.*

Are the roles of your investment portfolios adequately defined and their boundaries for growth clearly delineated? Are cash-rich businesses overspending and depleting an important source of subsidy for future growth? Do your metrics provide enough visibility to guard against value leakage?

- *Clarify capex risks.* The challenge is not how to direct the typical 50 percent of capex that goes to greenfield projects; rather, it is how to properly allocate the 50 percent that is typically earmarked for brownfield projects. That means removing bottlenecks, maintaining and upgrading infrastructure, conducting maintenance, and enhancing environmental, health, and safety practices.
- *Make the capex allocation for each project match the project's defined strategic priorities.* Do you have established policies on capex allocation practices? Is routine capex spending monitored through your standard governance activities?

Leaders must be proactive about monitoring the panoply of risks they face.

We have observed that chemical companies differ significantly in their cash-deployment discipline. Few companies match investment thresholds according to the maturity of the business.

Another common mistake is not differentiating between "mature" and "emerging" sites. It makes no sense, for instance, to invest in improving old sites that are no longer competitive or to meet home-country engineering standards that have little to do with local geography or weather in customer markets. Sites receiving tactical funding (for, say, modernizing logistics or administrative facilities) should have a clearly defined role—and more differentiated "access rights" to investments. Why make an improvement that will extend the life of a

plant for 20 years when that plant will likely be shuttered well before 20 years have passed? Or invest heavily in infrastructure improvements for a site that will likely double in capacity soon, requiring new investment?

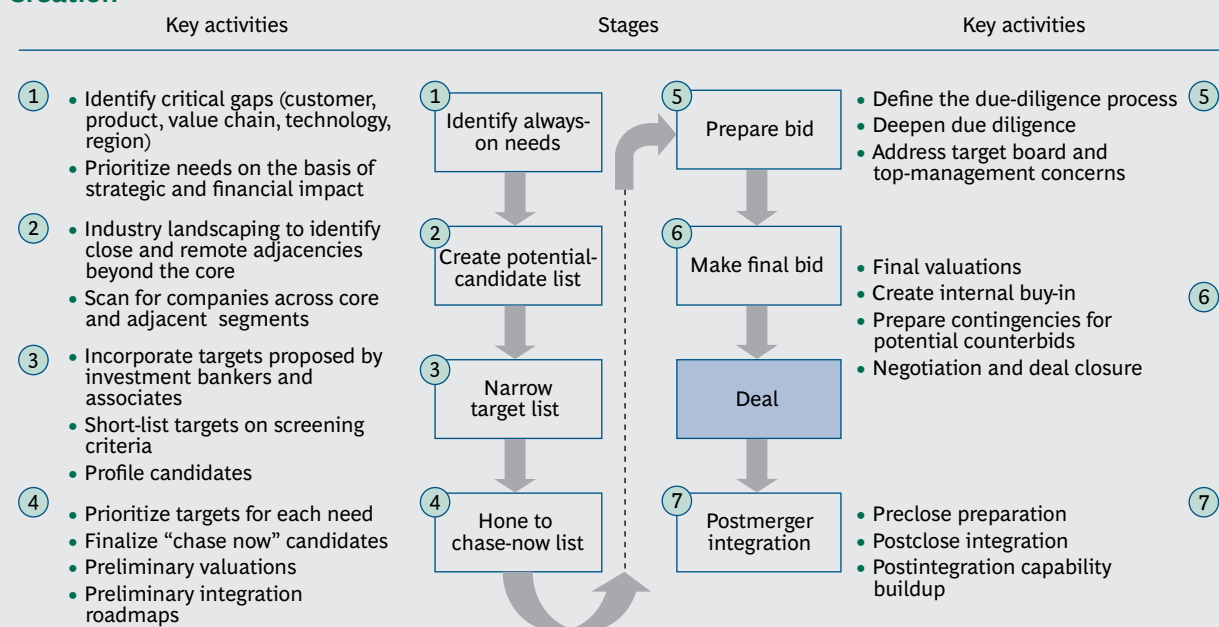
Overall, technical specifications, engineering standards, and suggested lifetime should be consistent with the maturity of the sites and the business. Finally, to ensure that post-launch project reviews—a vital means of gauging investment plan success—actually take place, companies should consider tying the project reviews to performance reviews.

Pursue M&A excellence as a means of competitive advantage. One of the biggest risks a chemical company can take is combining sell-low, buy-high timing with a single-bet acquisition. As we showed earlier in the section “Value Creation Winners: ‘Diversified’ Specialties, Specialty Inorganics, and M&A Champions,” several of the multispecialty companies within the rapid-specialization subgroup followed this path—betting on a single transaction to achieve a corporate vision. Sadly, many such companies are now trailing in the ten-year value-creation ranks.

In our view, the best—and possibly only—way to avoid the single-bet trap is to have an “always on” M&A program. (See Exhibit 16.) The risks of bad timing and of selling low and buying high are much greater for companies that suddenly embark on M&A activity after a long hiatus. When they do, these companies are forced to rely heavily on external advisors, because their lack of experience has prevented them from accumulating internal expertise. An always-on M&A process provides three major benefits:

- Regularly gathering market price information on potential targets and divestitures lends reliability to the information and allows a company to time transactions favorably.
- An always-on approach enhances a company’s credibility as a transaction partner, increasing the opportunities for beneficial noncompetitive transactions such as joint ventures and strategic alliances.
- It fosters alignment throughout the leadership team, ensuring both that the team is able to react quickly to emerging opportunities and that it can identify

EXHIBIT 16 | An Always-On M&A Process Is a Key Precondition for Translating M&A into Value Creation



Source: BCG case experience.

attractive windows of opportunity for anticyclical transactions.

Build agile processes and structures to accelerate growth. Whether upstream, downstream, or vertical, chemical companies are asset-intensive enterprises. They are also far-reaching, typically serving multiple regions and highly differentiated customer industries. As a result, they have traditionally had complex, highly matrixed organization structures; their functions, businesses, and regions rely on large interface layers including industrial marketing, technical service, and supply-chain management. This complexity is, in theory, efficient: it supports all possible business models in the corporate portfolio while ensuring a uniform system of governance, policies, and processes for all the businesses.

But such complexity comes at a cost. The decision-making process is lengthier. It also introduces the risks inherent in a one-size-fits-all management approach—a risk that has grown in recent years, largely because emerging markets often require different business approaches and internal processes.

Recognizing the constraints of the traditional organization structure, some companies in the chemical industry today have introduced a more flexible, agile structure. Among the approaches we are seeing:

- *Differentiated BU models*, establishing regional BUs for customer industries that are more regionalized
- *Differentiated go-to-market models*, allowing a more flexible definition of the roles of the sales force, key account management, technical service, and industrial marketing, depending on the market and the buying behavior of its customer industries
- *Internal entrepreneurship*, providing further flexibility such as allowing internal ventures, creating autonomous BUs for small, high-margin businesses, and establishing independent “small country” organizations for promising markets that differ enough from others in their region to justify a customized approach

The differentiation these models provide is necessary for adjusting internal decision-making and business governance to the specific interaction and service needs of different customers and regions. Agility is a prerequisite for improving market foresight, unleashing new opportunities, and fostering entrepreneurial behavior. Quite simply, in a globalized, multipolar, and rapidly changing world, the agile global chemical company is far better positioned to create superior performance.

- *Differentiated matrix models based on market maturity*, featuring a strong business-unit (BU) lead in mature economies, as well as local, country-based entrepreneurship in emerging markets

VALUE CREATION QUESTIONS FOR CHEMICAL COMPANY EXECUTIVES

WE OFFER A SET of 12 questions to help chemical company executives assess the effectiveness of their value-creation plans.

- Does our portfolio have sufficient exposure to the customer industries that are likely to continue fueling growth in the chemical industry, such as the food and nutrition industries and industries that stand to benefit from resource-constrained growth?
- Is our revenue base robust enough to shield us from an overreliance on government-subsidized sectors—a customer base that is vulnerable to erosion in the current debt-crisis environment?
- Do we hold competitive advantage in raw-material procurement?
- Do we have advantaged access to mining feedstock and low-cost hydrocarbons relative to our competitors?
- Do we have superior processes to support and sustain our price advantage and margin dynamics?
- Is our portfolio strategy aligned with the value creation potential of each of our businesses?
- Do our funding policies match the individual businesses and the role they play in our portfolio?
- Is our resource spending aligned with the regional shifts of customer industries and talent availability?
- Do we have strong internal M&A and postmerger integration capabilities—strong enough to maintain an ongoing M&A program?
- Is our R&D strategy oriented toward the long term and fluid enough to adapt to external industry dynamics?
- Is our governance model flexible enough to adapt to the different approaches needed in various regions: Emerging versus mature markets? Large versus small countries? Free-market versus state-controlled economies?
- Does our governance model allow us to nurture small high-margin businesses instead of letting them become orphans of the larger business units?

NOTE TO THE READER

About the Authors

Jan Friese is a partner and managing director in the Frankfurt office of The Boston Consulting Group. **Sarah Gehrlein** is a consultant in the firm's Frankfurt office. **Andreas Gocke** is a senior partner and managing director in BCG's Munich office and the global sector leader for chemicals. **Frank Plaschke** is a partner and managing director in the firm's Munich office and the leader for value creation strategy in Europe. **Hubert Schoenberger** is a knowledge expert and team leader in BCG's Munich office. **Yves-Pierre Willers** is a senior partner and managing director in the firm's Shanghai office.

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For Further Contact

This report was sponsored by the Industrial Goods practice. BCG works with its clients to deliver solutions to the challenges discussed in this report. These clients include some of the world's largest and most successful chemical companies, in both

developed and emerging economies. If you would like to discuss the insights contained within this report or learn more about the firm's capabilities in the chemical industry, you may contact one of the authors.

Jan Friese

Partner and Managing Director
BCG Frankfurt
+49 69 9150 2351
friese.jan@bcg.com

Sarah Gehrlein

Consultant
BCG Frankfurt
+49 69 9150 2228
gehrlein.sarah@bcg.com

Andreas Gocke

Senior Partner and Managing Director
Global Sector Leader Chemicals
BCG Munich
+49 89 2317 4582
gocke.andreas@bcg.com

Frank Plaschke

Partner
BCG Munich
+49 89 2317 4503
plaschke.frank@bcg.com

Hubert Schoenberger

Knowledge Expert, Team Manager
BCG Munich
+49 89 2317 4223
schoenberger.hubert@bcg.com

Yves-Pierre Willers

Senior Partner and Managing Director
BCG Shanghai
+86 21 2082 3388
willers.yves@bcg.com

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Fax: +1 617 850 3901, attention BCG/Permissions

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The Boston Consulting Group, Inc.

One Beacon Street

Boston, MA 02108

USA

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