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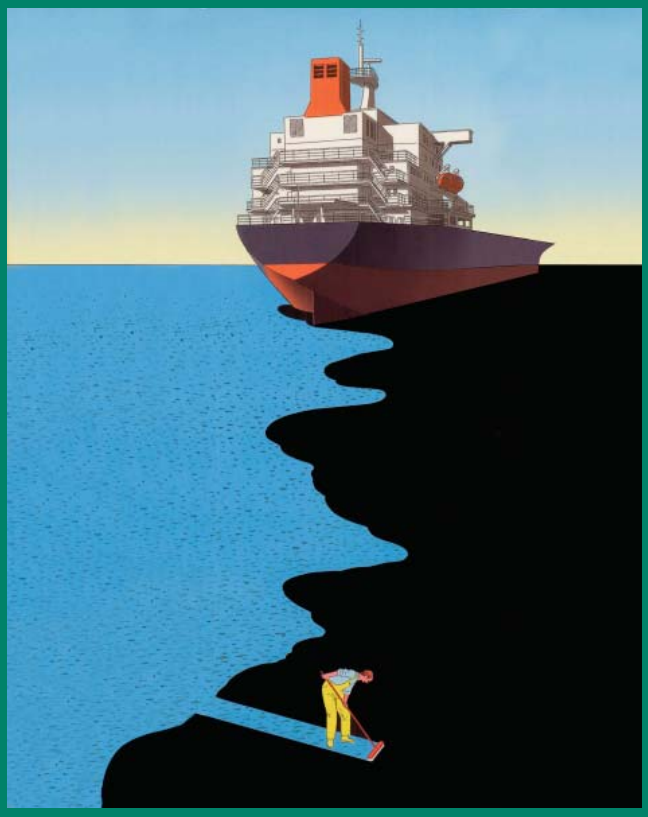
REPORT

Surviving the China Rip Tide

How to Profit from the Supply Chain Bottleneck



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George Stalk Jr.

Kevin Waddell

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E-mail: bcg-info@bcg.com
Fax: +1 617 973 1339, attention BCG/Permissions
Mail: BCG/Permissions
The Boston Consulting Group, Inc.
Exchange Place
Boston, MA 02109
USA

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Note to the Reader

This report is a joint product of the Consumer practice and the Operations practice of The Boston Consulting Group. It began as a working paper in 2006 and has now been updated. The authors welcome your questions and feedback.

For Further Contact

George Stalk Jr.
Senior Vice President and Director
BCG Toronto
+1 416 955 4200
stalk.george@bcg.com

Kevin Waddell
Vice President and Director
BCG Warsaw
+48 22 820 36 00
waddell.kevin@bcg.com

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Preface

Companies that rush overseas in search of low unit-production costs may be walking into a strategic trap. Over the past few years, gridlock has hit the major ports of the world. Hundreds of cargo ships float at anchor, cooling their keels and waiting to be unloaded—a process that is taking up to twice as long as usual. As a result of these dock jams, companies are ordering earlier, carrying more inventory, extending their planning horizons, and shipping priority products and components by air freight.

Unit production cost is only one part of a very complex picture to consider in outsourcing. As supply chains lengthen, they incur hidden direct and indirect costs. It's easy to underestimate the hidden costs in long supply chains and their impact on profitability. In this report, in order to illustrate the significance of those costs, we compare the economics of a typical domestic supply chain anchored in North America with one based in China. For Europe, we simulate three different supply chains: one anchored in Western Europe, one in China, and one in Central and Eastern Europe (CEE). The effects on operating margins of hidden costs that surface in the China-based chains should concentrate the attention of any manager sourcing in China today or considering such a move.

Advantage will go to companies that best their competitors in squeezing time out of long-distance supply chains. That will require reassessing their operations and processes and analyzing costs, revenues, and lost margins. Above all, companies should beware of the system effects of investing in one part of the supply chain while detracting from the performance of another.

Retailers know that in order to survive, they must have the products their customers want when they want them. The companies that supply the products are in the same boat. Fast, effective, and efficient supply chains are what float that boat.

The China Rip Tide

Causes, Effects, and Options

Surface freight from Asia to the west coast of North America and to Europe is growing at a rapid—by historical standards, an explosive—rate, whereas port and surface-transport capacities are not. North American ports and rail systems are beginning to choke, and delays and uncertainties are increasing. Freight demand on the North American west coast has been growing at a rate equivalent to one Port of Vancouver per year, and a rapid expansion of port and rail capacity will be difficult given political pressures and resistance from environmentalists. Although the problem is not as acute in Europe, plans are ostensibly in place to add significant port capacity over the next five to seven years. Nevertheless, the conditions we describe in this report will get far worse before they start getting better.

The ports and rail systems of the North American west coast are implementing changes, but these changes are unlikely to meet the growing demand, for many reasons. The most significant is that each of the North American participants in the China-anchored supply chains has a narrow view of its role and a limited notion of the end-to-end potential for improvement. The changes being made or contemplated reflect this narrow focus. They are incremental, and their effects will be swept aside by the bigger forces of the *China rip tide.*

In Western Europe, capacity utilization in the major ports continues to run between 90 and 95 percent, which allows little margin to absorb the variability inherent in overseas shipping. During the summer of 2004, a spike in demand caught operators off-guard and resulted in long delays for unloading container ships. Some ships were even turned away from ports such as Antwerp. Operators dealt with the problem by adding equipment, hiring dockworkers, and improving scheduling, but such measures only buy time in the near term.

A repeat of the delays that occurred in 2004 has been avoided so far, but the two-day strike at Europe Container Terminals in November 2006 occasioned a brief déjà vu. Shippers had to rapidly divert vessels from Rotterdam to Amsterdam, Antwerp, and Hamburg to keep goods moving. Although planned increases in capacity are significant, it would take only one or two expansions to come online late or not at all for European ports to be unable to support the surge from Asia. A study by Drewry Shipping Consultants showed that actual capacity added is usually about one-third of what is proposed, and it typically becomes available at least four years later than originally planned.

In North America, the supply chain bottleneck is beginning to affect the performance of manufacturing and retailing companies that rely on surface logistics to get their goods from Asia to the heartland. But few executives at retail or durable-goods companies understand the magnitude of the challenge being forced on them. Even fewer are investing against the phenomenon to reduce

costs, improve profitability, and create competitive advantage. However, a number of big importers have come together to form the Waterfront Coalition, an organization set up to lobby for more funding and political support for infrastructure improvements.

Economic Versus Accounting Profits

We believe strongly that a firm focus on reducing time and variability in the China-anchored supply chains serving North America and Europe can help companies dramatically reduce their costs, improve their margins, and build competitive advantage. We believe that such performance improvements will dwarf the more conventional profit-improvement efforts now under way at most of the companies we are familiar with. We also believe that companies should be looking closer to home (North American companies to Mexico, Central America, and South America and Western European companies to CEE), where the cost-of-labor penalty (relative to labor rates in China) is more than compensated for by superior supply-chain performance that is significantly less variable and virtually unaffected by port and surface-capacity constraints.

Retailers live or die by a very simple creed: stock products that sell; don't stock products that don't. As North American and Western European companies source more of their goods from China, the risk of getting this wrong increases dramatically. The effects show more in the economic profits than in the accounting profits. Accounting profits capture Generally Accepted Accounting Principles (GAAP) costs, revenues, and losses. Economic profits capture the hidden costs of lengthening supply chains: increased inventories, overproduction and underproduction, write-downs of excess inventories, and, most important, lost margins from stockouts. In reality, accounting profits may be positive while economic profits are not. Economic profits can be the source of insight for creating competitive advantage.

Some executives may be tempted to stop reading here and pass this report on to their logistics people. That would be a huge mistake. The actions required to turn the threat of the China rip tide into an opportunity are cross-functional, come together at the very top of the company, and require strategic choices, investments, and initiatives.

The Choices Ahead

So what can companies do, aside from nothing? They can retreat by bringing manufacturing home. They can adapt by building land-side capability in ports not yet congested in order to sidestep the problem. Or they can be still more creative and competitive by doing one of the following:

- They can aggressively manage their China-based supply chain, squeezing time from it in ways competitors haven't identified or exploited.

- They can explore alternatives that will minimize adverse supply-chain effects, including options—such as increased use of air freight—that may appear costly but may actually lower overall expenditures by reducing hidden costs.

- They can invest in premiums and capabilities. Premiums are extra payments for substantially enhanced performance by means of preferred treatment from suppliers such as ground, sea, and air shippers and port services. Investments in capabilities that enable companies to be better than competitors at managing their business in spite of crowded ports include cross-docking, facilitated portside handling, and "track and trace" capabilities to keep boxes moving.

- They can diversify supply with multiple suppliers and supply points or produce critical components and products domestically, accepting higher production costs as a tradeoff for lower stockouts and supply-chain costs.

Companies that make creative investments like these will benefit enormously, change the dynamics of their industry, and open a competitive gap that

will complement and enhance advantages founded on merchandising and store management. The China rip tide presents a major strategic challenge that many companies are not dealing with explicitly because they underestimate the importance of fast, effective supply chains. Most know that supply chain management is important, but they underestimate the magnitude—and the impact on profitability—of the hidden costs of longer supply chains, reduced flexibility, and lost gross margin from missed sales and write-downs. And rarely do executives think of supply chain investments as an outright source of competitive advantage.

In their rush to source from China, many companies are blindly walking into a strategic trap. The trap is thinking that sourcing from China will result in lower product costs, when in reality the supply chain dynamics will, in many cases, drive up overall costs and reduce profitability, thereby creating an opening for a competitor. The only hope for these companies is that all their competitors will make the same mistake. But competitors that do not source from China—or that do focus on supply chain speed—will be competing with a different set of economics. The first company to see and correct the strategic error of sourcing from China without an appropriate investment in supply chain dynamics to minimize costs will seal the fate of its competitors.

The Lure of China

China's emergence as one of the world's leading export nations is driven by a huge disparity in costs, caused primarily by hourly wages that are a small fraction of those in North America and Western Europe. This cost disparity is likely to expand rather than shrink, in part because the hourly wage gap will not close nearly as rapidly as many believe, and in part because other cost factors weigh in China's favor to a degree that most U.S. policymakers and Western executives haven't yet begun to comprehend or appreciate.

Typically, a U.S. or Western European factory worker costs an employer $15 to $30 per hour. A Chinese factory worker earns less than $1 per hour—a $14 to $29 gap. If, over the next five years, wages in China increase at a rate of 15 percent annually, while those in the United States increase at 3 to 4 percent annually (a very healthy growth rate), average hourly wages in 2012 will be $2 in China and $18 to $36 in the United States. So despite the disparity in growth rates, the gap will have widened to $16 to $34. Government-mandated labor costs such as workers' compensation will further widen this gap.

Of course, there is the exchange rate question. Our prediction that the gap will widen assumes that there will be no change in relative currency values. Predicting exchange rates, especially over the long term, is hazardous. But the experience of Japan may help set expectations. Largely as a result of Japan's success with industrial exports, the yen-dollar exchange rate went from a low of 360 in the early 1970s to about 100 today—an almost fourfold increase in the value of the yen relative to the dollar over about 30 years. If the yuan were to strengthen against the dollar at a similar rate over the next five years, the wage gap would narrow significantly. But wage rates in China would still be less than half those in the United States.

Wage rates are driven, first and foremost, by supply and demand. As China's industrial sector and middle class grow, wages and other labor costs will increase. But they will not increase enough to close the gap with the United States, France, Germany, or Japan and improve the competitive position of the labor force in those countries. The gap is too wide—and the Chinese labor pool too deep—for that to happen.

China still has 800 million people living in the countryside—nearly three times the entire U.S. population. Again, a comparison with Japan's experience can be illuminating. Even during the early stages of Japan's emergence as a global exporting power, the rural population supplying labor to Japan's industrial engine was less than half the size of North America's total population. Yet Japan's successful stint as a low-cost manufacturing site, based on low wages relative to those in the West, ran for almost 30 years.

We envision a similarly solid run for China. The migration of China's rural labor force to manufacturing jobs will mitigate any steep rise in wages for low-skilled workers in this decade. And although better-skilled workers will demand higher wages, the supply of candidates for skilled positions is also great and increasing, with almost half a million engineers graduating from Chinese universities every year, compared with 150,000 in the United States and 60,000 in Germany.

Wage rates are just one factor driving costs. The productivity of the labor force is another. Productivity is gauged in many ways, including quality, output per unit of labor cost, and output per unit of capital-and-support costs, as well as annual improvements in all these measures.[1]

In short, corporate and political leaders should not bank on China's cost advantage going away—or even shrinking—anytime soon. In fact, our experience suggests that the gap will increase before it decreases. So sitting this one out won't work. The advantage is here to stay, and the disruption will be significant. We're convinced that as much as 15 to 20 percent of industrial products in the United States and Europe—together with their associated jobs—will migrate almost entirely to China and other rapidly developing economies in the foreseeable future. Another 20 to 30 percent of jobs are up for grabs, depending on the strategies of their producers. The longer Western management teams wait to sort out their China strategies, the greater the risks their companies face.

1. In quality, too, the Chinese are excelling. Once a Chinese plant's initial process problems are worked out and it has moved along its learning curve, it can often achieve quality equal to that of many leading plants in the West. For example, the Honda automotive plant in China has emerged as the quality leader among all of Honda's plants outside Japan, even surpassing the company's impressive North American operations.

Demand-Side Pressures in Shipping

The growing imbalance in supply and demand in Pacific container shipping can be captured in one statistic: over the next several years, close to 100 new container-loading berths will be built in China, each with a lift capacity of about half a million TEU per year. (TEU stands for twenty-foot equivalent units. Most of the containers used in North America and Europe are around 40 feet long, making them equal to two TEU.) Shanghai's Port of Yangshan, for example, will have a capacity of 25 million TEU when it is complete. Yet over the next several years, no more than five new berths are planned for the west coast of North America.

On the demand side, most of the top importers into North America have been increasing the amount of goods they bring in by a significant percentage—many of them more than doubling their imports in the past couple of years. Imports from China to North America are growing at 18 percent per year in value and at 12 percent per year in number of containers. Current forecasts predict that the demand for port services will exceed capacity nationwide by 2010.

The Threat of Gridlock

It is hard to imagine anything short of a global catastrophe altering this trend. In the run-up to Christmas of 2004, gridlock hit the Los Angeles-Long Beach ports, the entry point for almost half the goods coming into the United States. Nearly 100 cargo ships floated at anchor waiting to be unloaded—a process that took up to twice as long as normal.

The results of the 2004 dock jam were serious and far-reaching. Some retailers blamed at least part of their third-quarter 2004 losses on reduced inventory from port congestion. In 2005 the shipping companies "rebalanced" their networks, moving containers to other ports on the west and east coasts. Retailers and manufacturers began ordering sooner, carrying more inventories, extending their planning horizons, and resorting to air freight for critical products and components. To avoid bottlenecks in the future, a number of Canadian department-store retailers opted to ship through the Panama Canal to the Port of Halifax, at a cost of about 37 days, just to be sure their goods were in Canada for the selling season. But most of these adjustments merely postpone the inevitable. Shipping times will increase. Business performance will suffer.

Many business leaders worry that a similar crisis will occur again. Doug Tilden, chief executive of Marine Terminals, a port operator, was quoted in the *Financial Times* last year, claiming, "Every aspect of the supply chain is stretched. It's not a question of whether [a congestion crisis] is going to happen. It's a question of when." In fact, if all the projects currently planned for Mexico, the United

States, and Canada become available over the coming years, they will barely be able to handle the growth that will have occurred. Just this past January, at the annual meeting of the Transportation Research Board, Kurt Nagle, president and CEO of the American Association of Port Authorities, said, "We must improve the efficiency and capacity of the domestic and international freight transportation system to avoid congestion that threatens to swamp our ability to move goods seamlessly and could wreak havoc on our economy."

It's much the same story in Europe. Most of the largest ports are increasingly plagued by congestion, labor shortages, and strained networks, as utilization has consistently averaged around 90 to 95 percent over the past four to five years. Although Far Eastern ports in Asia have been able to expand quickly enough to handle more shipments, such European destination ports as Southampton and Felixstowe in the United Kingdom and Rotterdam and Antwerp in the Low Countries are constrained by stringent environmental and planning rules that allow for only modest expansion at best and concentrate on better utilization of existing areas and facilities.

Many of these European ports plan significant capacity additions over the next five to eight years, from 37 million TEU in 2006 to 54 million TEU in 2010, a capacity increase of approximately 10 percent annually. (See Exhibit 1.) Demand, however, is expected to grow almost 10 percent per year as well and, given past experience, could exceed even this robust projection. Assuming *all* the planned capacity additions come online as expected, European port utilization will still be at almost 90 percent by 2010. And this estimate does not take into account the practical implications of the planning process (such as delays and reductions in capacity), which to date have added more than four years to the time it takes to bring new port capacity online.

Exhibit 1: European Ports Hope to Increase Capacity by 2010

Port	Current area (hectares)	Development area planned (hectares)	2006 throughput (million TEU)	Planned 2010 throughput (million TEU)	Total throughput increase (%)	Main investments and comments
Rotterdam	10,500	2,000	9.7	10.9	12	New Massvlakte 2 terminal, due in 2012–2014, should allow for doubling of current capacity
Hamburg	6,480	2,590	9.0	11.3	26	Improved layout of existing surface areas and use of modern handling technology are expected to raise handling capacities to 11.3 million TEU by 2010
Antwerp	11,599	1,440	7.0	11.7	67	Current overcapacity is about 2 million TEU, and work on expansion of port capacity continues; the port plans to increase trade with Asia
Bremerhaven	4,783	NA	4.2	7.0	67	New terminal should become operational in 2010
Felixstowe	284	ND	3.0	5.2	73	Proposed expansion would increase the quay length available for container handling by close to 1,000 meters, giving a total quay length of 1,350 meters accompanied by expansion of the port's Trinity Terminal
Le Havre	5,000	ND	2.2	4.5	105	Six new berths are planned by 2008; six additional berths will be built later on, according to traffic requirements
Southampton	283	NA	2.0	3.7	85	Plans to develop Dibden Bay were stopped for environmental and economic reasons; new plans include redevelopment of existing berths and reorganization of container stacks
Total	**38,929**	**6,030**	**37.1**	**54.3**	**46**	

Sources: Port authorities; European Sea Ports Organisation; BCG analysis.
Notes: 1 hectare = 2.471 acres; TEU = twenty-foot eqivalent units (containers); NA = not applicable; ND = data not available.

The Outlook for Increased Port Capacity

Sometime soon, the ports on the west coast of North America are expected to reach their combined container-unloading capacity. Many have plans for expansion that could raise their productivity to levels approaching those of Asian ports. (See Exhibit 2.) The expansion would come either from an increase in dockside footprint at current levels of container lift capacity, as indicated in the ports' master plans, or from significantly improved lift productivities.

The footprint expansion is doubtful. Local communities consider container ports to be polluters, noisy contributors to road and rail congestion, and just plain ugly. Less threatening business expansions have been stymied by complaints like these. Productivity improvements would require a breakthrough in labor-management relations—unlikely in an environment defined by a long history of discord.

Either a footprint expansion or a dramatic increase in productivity would push off the day of reckoning for three to five years. If some miraculous combination of modern management techniques, good labor relations, and political astuteness were to achieve both the footprint expansion and the productivity improvements, the day of reckoning would be postponed for eight to nine years at current container-import growth rates and volumes—a miracle that is very unlikely to occur. And even in the most optimistic scenario, surplus capacity would support only limited growth in demand. (See Exhibit 3, page 14.)

But the problem is bigger than the ports. The existing rail infrastructure for dispersing the flood of goods from China throughout the United States is also being strained, with freight shipping out of Los Angeles and Long Beach already very near capacity and freight shipping out of Oakland, Seattle, and Tacoma expected to reach capacity in the next couple of years. No major rail-infrastructure projects are being discussed to alleviate this looming capacity problem.

Exhibit 2: West Coast Ports Operate at Less Than Full Potential, and Many Plan to Expand

Low productivity and incomplete use of master plan land are key constraints

Port	Current area (1,000 acres)	Master plan area (1,000 acres)	2005 throughput (TEU)	2005 productivity (TEU per acre)	Capacity at 2005 productivity (TEU per year)			BCG's assessment of political and environmental barriers
					Current land	Master plan land	Difference	
Los Angeles	1,477	1,941	7,484,624	5,067	7,484,624	9,835,921	2,351,297	Very high
Long Beach	1,262	1,885	6,709,818	5,317	6,709,818	10,022,192	3,312,374	Very high
Oakland	674	764	2,272,525	3,372	2,272,525	2,575,978	303,453	Very high
Seattle	464	464	2,087,929	4,500	2,087,929	2,087,929	0	Medium
Tacoma	456	828	2,066,447	4,532	2,066,447	3,752,233	1,685,786	Medium
Vancouver	325	710	1,767,379	5,438	1,767,379	3,861,043	2,093,664	Very high
Portland	200	200	160,479	802	160,479	160,479	0	Medium
Total	4,858	6,792	22,549,201	4,642[a]	22,549,201	32,295,775	9,746,574	

Asian port productivity: about 6,000 TEU per acre

Gap between available land and used land

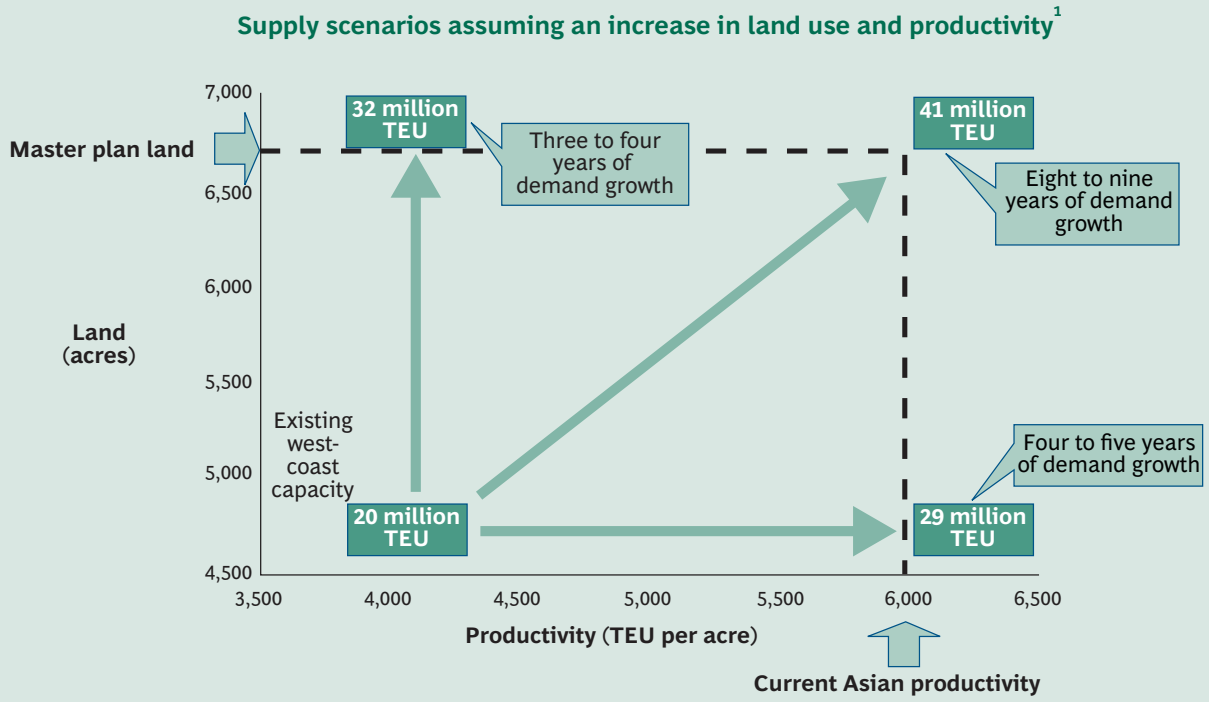
Sources: Moffatt & Nichol; BCG analysis.
[a] Weighted average based on number of acres.

New Port Development

Two potential solutions exist for North America—one for the medium term and one for the longer term. The medium-term answer is the development of a port in British Columbia. This alternative requires a smaller capital investment than the longer-term solution and could happen more quickly. The Port of Prince Rupert (PPR) is just south of the Alaska-Canada border. It is the northernmost deep-water port in North America that does not freeze, and it is 1,000 miles closer to Shanghai than Los Angeles-Long Beach. At present a bulk port, PPR is underutilized, and so is the rail line serving it. Moreover, the rail line runs eastward, away from all the west coast congestion, and eventually reaches into the U.S. Midwest. Under the right circumstances, PPR could become a major container facility, handling roughly 5 million TEU per year before the rail line reaches capacity. In the meantime, it plans to convert to a 2-million-TEU container port, with additional capacity of 500,000 TEU expected to become available by October 2007.

Unfortunately, PPR will take a long time to develop. The portside facilities do not exist and need to be built. Government approval at all levels will be slow to materialize because of the claims of native peoples, an absence of priority in the permitting process, and a lack of vision. Even if these hurdles can be overcome, PPR has several additional drawbacks that make it unlikely to succeed as a popular alternative to existing ports. For one thing, customers with cargoes for U.S. destinations will be reluctant to endure the double customs delays from importing first into Canada and then into the United States. For another, PPR will never be a major market in its own right, so every container arriving there will have to be shipped onward. Finally, shippers will always want to offload

Exhibit 3: Surplus Capacity at West Coast Ports Can Support Only Limited Growth in Demand



Source: BCG analysis is based on supply analysis by Moffatt & Nichol; the analysis assumes a current demand on west coast ports of 20 million TEU and annual growth in demand of 8 to 10 percent, according to U.S. trade data.
[1]In the interest of simplicity, we assume no shift to east coast ports.

prioritized cargo at Los Angeles-Long Beach, Oakland, or Seattle—or all three—before taking the time to visit a port where extensive transshipment will produce considerable delays even in the best of cases. This drawback will effectively eliminate PPR's 1,000-mile geographic advantage.

If developed, PPR is likely to remain a backup port for Vancouver for the foreseeable future. The situation will probably not improve until the double customs handling is reduced to a single handling and until customers interested in faster movement of containers demand that the shipping companies build a preferred spot for PPR into their schedules.

The longer-term solution is in Mexico. A number of sites exist that could be developed into large-scale deep-water ports. Roads and rail lines into Arizona or Texas would need to be built, and the entire project, optimistically, would take about ten years and $10 billion. Although more expensive to develop than PPR, a new Mexican port is a very realistic possibility, if only because something must be done, because Canada is unlikely to get organized to pick up its PPR option, and because the Chinese are growing impatient. In fact, plans are already under way to build a new port—Punta Colonet—on the Baja California coast. It is expected to add a million TEU by 2011, the year that Los Angeles and Long Beach are expected to reach their saturation point.

Neither port nor rail expansion is likely to happen soon, however. Companies are going to have to fend for themselves in the meantime.

The Hidden Costs in Supply Chains

Companies that source manufactured goods in China do so because of the attractive production costs. And over time, as larger container vessels with lower operating costs have come on-stream, shipping costs incurred when sourcing from Asia have also declined. With world-scale container ships exceeding 10,000 TEU in capacity, there are very few ocean-shipping costs remaining to be squeezed out. When the outsourced goods reach their final retail destinations, ocean-shipping costs amount to only about 1 percent of the retail shelf price. (See Exhibit 4.)

But unit production cost (UPC) and ocean-shipping costs are only two parts of a very complex picture to consider in outsourcing. As supply chains lengthen, they incur direct, indirect, and hidden costs. Direct and indirect costs include shipping, nesting and de-nesting of containers at both ends of the ocean pipeline, inventory storage, handling, procurement, insurance, and overall financing. These costs, which are not captured in the exhibit, can eventually add up to as much as 4 to 8 percent of retail shelf costs.

However, the largest costs by far of lengthening supply chains are hidden, and they come from the gross margins that are lost when the product isn't there for the consumer to purchase. The gross margins of the products in Exhibit 4 can range from 40 to 60 percent of the shelf price. Furthermore, the cost of excess inventory write-downs from having an oversupply of products that consumers don't want can amount to 10 to 20 percent of sales. These hidden costs, which are difficult to identify and quantify, arise from the dynamics of the supply chain. Here's how it works.

System Dynamics in Supply Chains

As supply chains lengthen, they also add time. The longer it takes to move a product from point A to point B, the more difficult it is to manage the chain without fluctuations, which create costs. Fluctuations arise as a change in demand at point B ripples back through the chain. Moreover, the flow of information about demand is delayed as it moves back through the chain and, as a result, distortions arise and build. Typically, a very small but unanticipated change in demand at point B can produce a change in demand at point A that is three to five times greater. This phenomenon is explained by system dynamics.[2]

At most companies, management thinks of these system-dynamics effects as forecasting errors, and the greater the forecasting error, the further into the future managers seek to predict demand. But because forecasting errors increase with the

2. For an introduction to the topic of supply chain dynamics, see Jay W. Forrester, "Industrial Dynamics," *Harvard Business Review,* July-August 1958.

magnitude of the delay, these efforts merely aggravate the system effects still further. Forecasting errors create and drive all types of hidden costs.

For one thing, variations in production loads from widely fluctuating demand cause factories to be overloaded and underloaded, resulting in inflated variable costs from overtime premiums and expedited material handling, as well as in fixed costs that are not absorbed. For another, additional inventory must be carried through the supply chain to facilitate fulfillment and cope with slack demand. What's more, that additional inventory must sometimes be discounted, with a resulting loss of margin. Then there is the lost gross margin from inventory that could have been sold had it been available when customers wanted it. Finally, we have observed that even if you are *not* overstocked in categories with lengthened supply chains, chances are someone else will be—so categorywide pricing pressure eats into everyone's margins.

Another hidden cost is the expense of flushing defective inventory from the supply chain. Time is lost identifying the cause of a quality problem, correcting it, and resetting production. Moreover, defective goods are still being fed into the chain during this period. Costs must be incurred not only to remove the defective inventory but also to produce additional goods to meet back orders and current demand—further straining factories—and to physically replace the marred goods with new inventory throughout the chain.

As containers take longer to move through ports, further hidden costs are created, including the overtime costs that frequently arise from idled ships, unreliable portside loading and unloading, and overburdened rail-transport services. There are also the costs of rerouting shipments to other ports—in the case of the North American west coast, to the east coast and the Gulf of Mexico.

Simulation of a North American Versus a China-Based Chain

How significant can these costs be? One way to get a handle on them is to compare the economics of a typical North American supply chain with those of one based in China. Such a comparison or simulation can become very complex very quickly. To simplify it, we have assumed

- a domestic unit price of $10
- a domestic UPC of $4, for a gross margin of $6
- a Chinese UPC of $3, for a gross margin of $7
- an operating margin of $4 for the domestic producer and $5 for the outsourcer to China, after a steady-state supply-chain cost of $2 per unit for both the domestic and China-based chains (a conservative estimate for the China-based chain, since its shipping-related costs will be higher than those of the domestic chain)
- a steady-state demand of 1,000 units per week on average
- a variable and fixed cost per unit at steady-state demand

Cost Assumptions. We start with a set of assumptions about manufacturing and logistics costs. (See Exhibit 5, page 18.) These costs are composed of those that are fixed at a steady volume of 1,000 units per week and those that are purely variable by unit.

For the supply chains themselves, we assume some basic, fairly average operating

Exhibit 4: Ocean-Shipping Costs Are Only a Small Portion of Shelf Price

	Typical shelf price ($)	Ocean-shipping costs ($)
TV set	700.00	10.00
DVD/CD player	150.00	1.50
Vacuum cleaner	150.00	1.00
Scotch whisky (bottle)	50.00	.15
Coffee (1 kilogram)	15.00	.15
Biscuits (tin)	3.00	.05
Beer (can)	1.00	.01

Sources: BCG analysis; ISL *Shipping Statistics Yearbook*.

parameters. (See Exhibit 6.) For example, the domestic and nonintegrated supply chain has

- manufacturing and sales in the United States
- an end-to-end cycle time of six weeks
- manufacturing time of three weeks
- plant inventory targets of two weeks
- transit time from factory to distribution center of two weeks
- a distribution center inventory target of two weeks
- transit time from distribution center to retail outlets of one week
- retail inventory targets of half a week

The transit times may seem long at first glance, but we are trying to capture typical order-to-delivery times for these segments of the supply chain, which are always longer than shipping times themselves.

Inventory Assumptions. Inventory targets are set in supply chains to trigger orders and the markdowns needed to relieve excess inventories when they occur. In this simulation, when inventories exceed targets, the price of the excess inventory is slashed 20 percent and sales are assumed to be immediate. There are key omissions in this simulation that have a seriously negative effect on the economics. These omissions are all real-world phenomena and include

- a network of manufacturing plants for subassemblies and the transit times between them (for instance, manufacturing partly in Puerto Rico for tax reasons or sourcing a key electronic part from the United States for assembly in Malaysia)
- cross-shipping between distribution centers and retailers
- possible variations in transit times
- the use of Mexico, or of CEE, as a supply base, which, compared with China, costs more but takes less time

Demand Assumptions. Demand is never a steady state—it always varies—but for the purposes of the simulation, we assume an average demand of 1,000 units per week with a variation about the mean of 300 units. We assume no growth or decline over time. Here again, we have left out some

Exhibit 5: Our Assumptions Account for Fixed and Variable Manufacturing and Logistics Costs for a North American Producer

	$ per unit
Selling price	10.00
Manufacturing costs	4.00
Logistics costs	2.00
Accounting operating margin	4.00

	Fixed cost per unit ($)	Variable cost per unit ($)	Total cost per unit ($)
Manufacturing costs	2.40	1.60	4.00
Logistics costs	1.32	.68	2.00
• Plant	.48	.12	
• Transit	.04	.36	
• Distribution center	.64	.16	
• Retail	.16	.04	

Source: BCG analysis.

key factors that could have a seriously negative impact on the economics of this simulation:

- The ramping up of new products and the ramping down of old ones
- Seasonal and promotional sales variations
- Growth or decline in demand
- A shift in mix, since we assume a single stock-keeping unit

We would need to construct a much more complicated simulation to capture the effects of these omissions. Experience tells us that including them would only increase the problems that are described below.

Degree of Sophistication. Our simulation also assumes four states of supply chain sophistication. (See Exhibit 7, page 20.) These states depend on how information on customer demand flows:

- In a *nonintegrated* supply chain, each upstream step gets its information on demand from its customer on the next step down the chain
- In a *semi-integrated* supply chain, each step gets its information on customer demand from its customer two steps down
- In an *integrated* supply chain, each step has a full view of final customer demand

For analytical purposes, we also consider the results of having a perfect forecast.

Exhibit 6: Our Supply-Chain Assumptions Take into Account Varying Product Flows

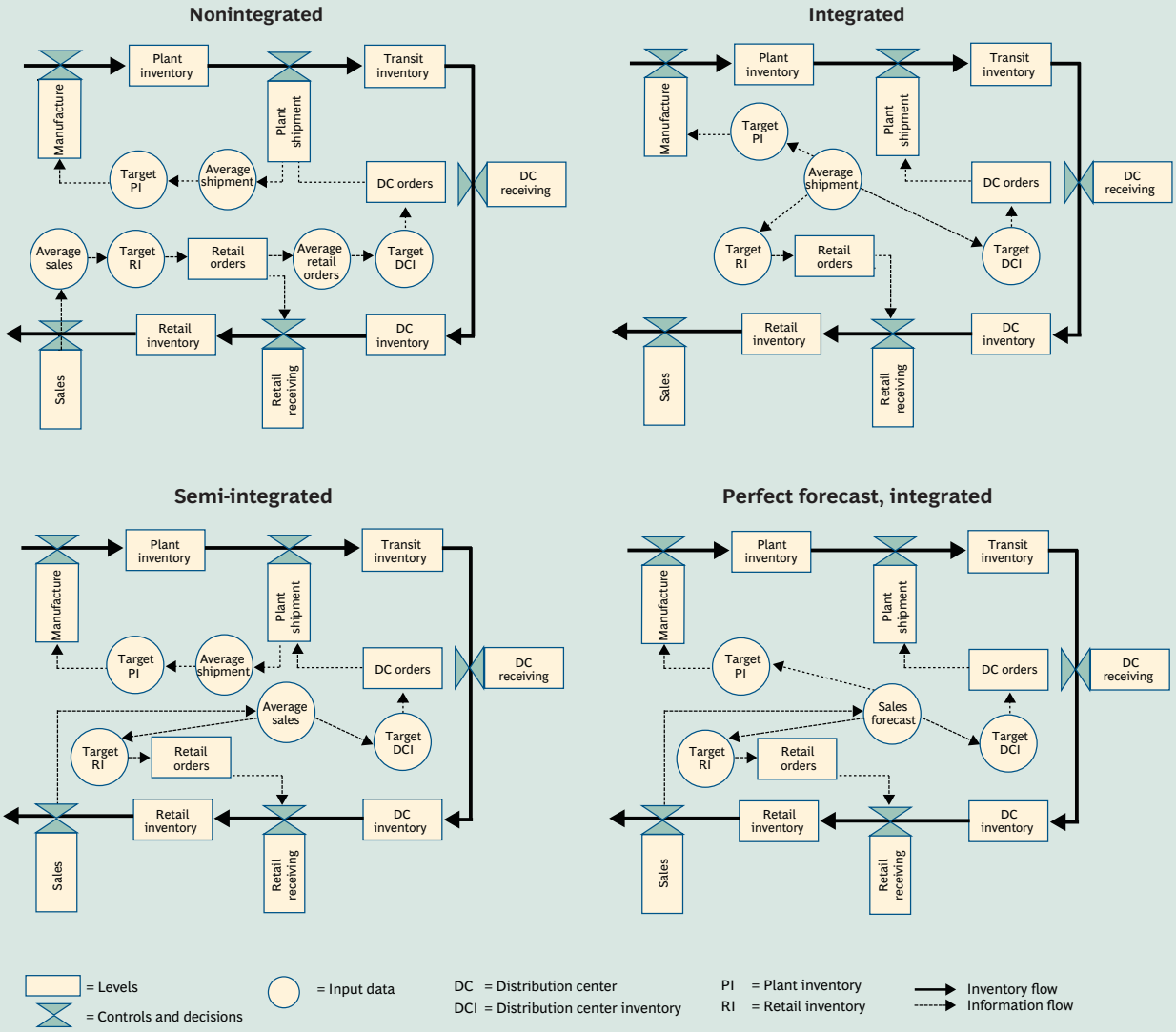
Product Flow		Nonintegrated			Semi-integrated					Integrated		
	Sourcing site	United States		China	United States		China			United States		China
	Cycle times (weeks)	3	6	11	3	6	11	18	18[a] normally distributed	3	6	11
Manufacturing	Lead-time	1 week	3 weeks	6 weeks	1 week	3 weeks	6 weeks	6 weeks	6 weeks	1 week	3 weeks	6 weeks
Plant inventory	Target based on	2 weeks of average distribution-center orders[1]			2 weeks of average distribution-center orders[1]					2 weeks of average outside sales[1]		
Transit from plant inventory to distribution center		1 week	2 weeks	4 weeks	1 week	2 weeks	4 weeks	11 weeks	6–17 weeks	1 week	2 weeks	4 weeks
Distribution center inventory	Target based on	2 weeks of average retail orders[1]			2 weeks of average outside sales[1]					2 weeks of average outside sales[1]		
Transit from distribution center to retail		1 week	1 week	1 week	1 week	1 week	1 week	1 week	1 week	1 week	1 week	1 week
Retail inventory	Target based on	.5 week of average outside sales[1]										
Outside sales												

Source: BCG analysis.
Note: Other product-flow assumptions: weekly ordering cycle and information delay of one week.
[1]Four-week rolling average.
[a]Plus or minus six weeks.

Supply Chain Simulation Models. The simulation is demanding. (See Exhibit 8.) There are four supply-chain models, five minimum-order-quantity scenarios, and four cycle-time scenarios, resulting in 80 supply-chain models. They are subjected to normal random demand and are run over 3,000 weeks to escape the effects of initial conditions in which everything—inventories, production loads, sales, and stock balances—is by necessity in a steady state.

In the first set of simulations, the three levels of information management sophistication are applied to a wholly domestic supply chain and to a chain with China at one end and, say, Chicago at the other. In our first comparison, the domestic chain has an overall cycle time of six weeks and sets its production run at one month of average demand. The China-based chain has an overall cycle time of 11 weeks and also sets its production run at one month of average demand.

Exhibit 7: Our Supply-Chain Simulations Track Four Levels of Sophistication in Information Flows



Source: BCG analysis.

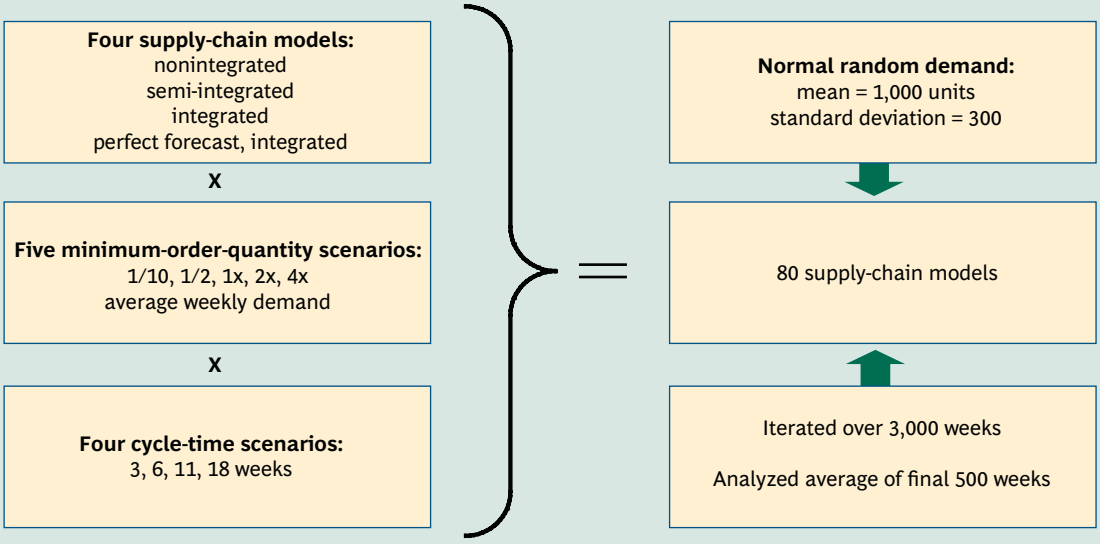
Information flows for both chains are nonintegrated, and weekly demand is allowed to randomly fluctuate more or less than average weekly demand.

When the two supply chains are subjected to this demand profile, retail inventory fluctuates between being overstocked and out of stock. An example of the system response to these demands is shown for illustrative purposes in Exhibit 9, on page 22. The exhibit depicts how the four China-anchored supply-chain models, from the nonintegrated to the perfect forecast, respond to random demand (the solid line) and to the resulting sales (demand minus stockouts plus discounted sales—the dotted line).[3] When inventory is overstocked, we discount the excess in order to move it. When understocked, we count as a cost of doing business the lost opportunity of not obtaining the gross margin from the goods that weren't available. The margin realized from sales revenues minus supply chain costs is shown in green. The margin lost owing to stockouts is in yellow.

The results: the domestic chain experiences volatility, which adds supply chain costs. The operating margin averages $.77, as opposed to our assumed steady-state operating margin of $4. The China-based chain experiences even greater volatility because of its longer cycle times and nonintegrated information flows. It ends up with an operating margin of $1.02, as opposed to the assumed steady-state operating margin of $5. Because of its lower UPC, the China-based chain still has the advantage.

3. In the perfect forecast, sales forecasts are perfectly forecast, *forward*-looking four-week averages and are available to all participants in the supply chain. In contrast, sales forecasts for the nonintegrated, semi-integrated, and integrated supply chains are based on historical averages of sales and product demand at various steps in the supply chain, depending on the degree of integration. The perfect forecast provides a benchmark measure of profitability for the supply chains, if they could have access to perfect knowledge of future demand. The data generated by the perfect forecast are used for internal analyses only and are not material to this discussion.

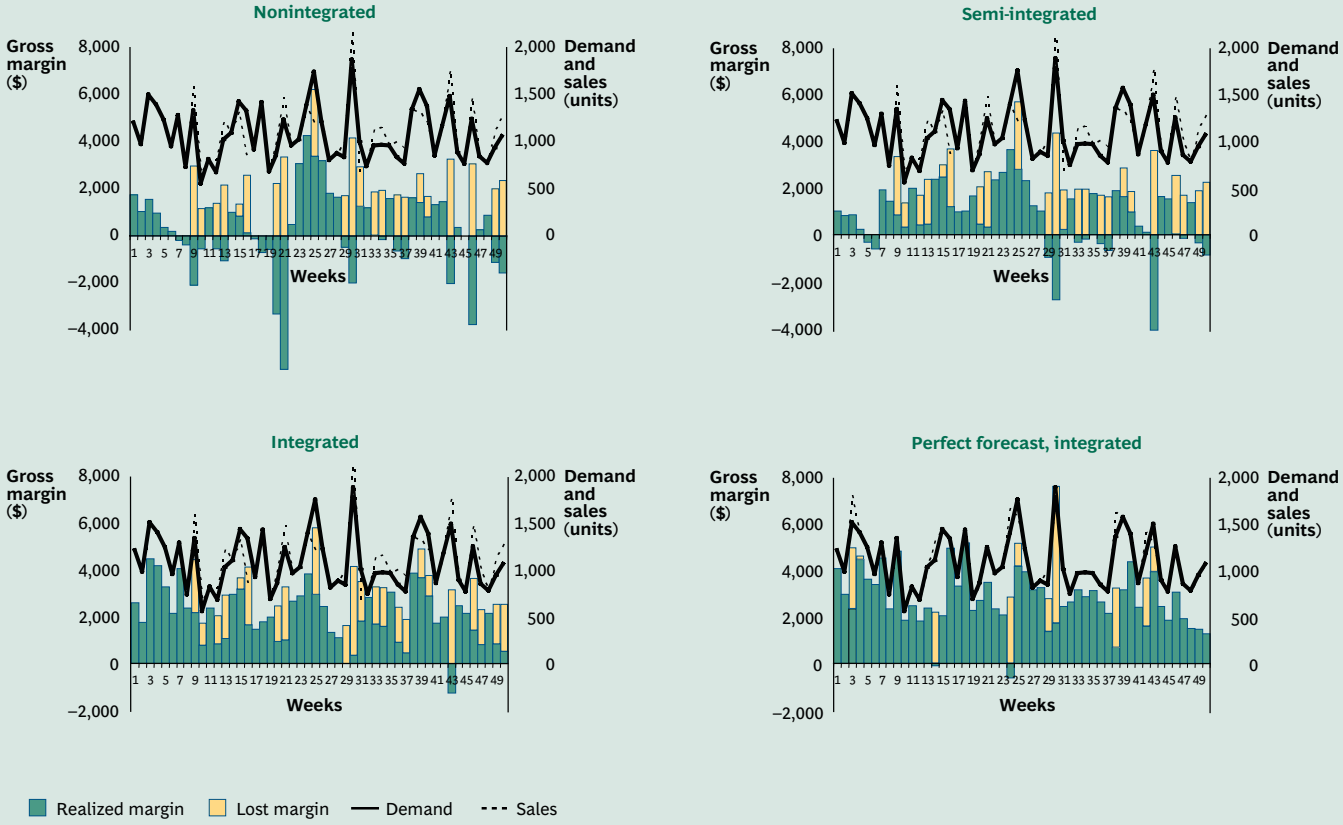
Exhibit 8: Our Analysis Produced 80 Supply-Chain Models



Source: BCG analysis.

Exhibit 9: Longer Cycle Times and Nonintegrated Information Flows Produce Greater Volatility and Lower Operating Margins

China-anchored supply-chain models: cycle time = 11 weeks; minimum order = 4x demand



Source: BCG analysis.
Note: Other product-flow assumptions: weekly ordering cycle and information delay of one week.

The Dangers of Lengthening Supply Chains

Exhibit 10, on page 24, shows a series of scenarios comparing a China-anchored supply chain with a wholly North American chain. The China-based chain is likely to move quickly to a semi-integrated state of sophistication as the difficulties of managing the nonintegrated chain become apparent. In doing so, it improves its operating margin to $1.21 per unit. At that point, the management of the China-based chain is likely to cut price—by, say, $1 per unit—to gain share from the domestic chain. It believes that the move will reduce its gross margin from $7 to $6 and its steady-state operating margin from $5 to $4.

If the North American supply chain matches the price cut to hold share, it will see its operating margin turn into a loss of $.16 per unit, whereas the China-based chain's margin will decline to $.28 but still be profitable. The reality is likely to be somewhere in between, but the China-based chain will still have the advantage through a combination of low UPC and semi-integrated information flows.

But now our scenario takes an interesting turn. The domestic supply chain can neutralize the China-based supply chain's advantage if it integrates its information flows and cuts end-to-end cycle times by half (still a big *if* for many companies). With that enhanced responsiveness, the domestic chain will see its operating margin increase from a loss of $.16 per unit to a profit of $2.19 per unit. Now *it* has the advantage. However, the competitive dynamic might continue, with the China-based chain becoming integrated and also cutting its cycle time in half. In that case, the advantage returns to the China-based chain because of its lower UPC.

The domestic supply chain should become time based with or without the threat of a China-anchored supply chain. The potential improvements to its competitiveness and profitability are too great for companies to ignore, although they still do.

For European competitors, the issues and implications of a China-anchored supply chain are very similar, since transit times from China to Europe are comparable to those from China to the United States, and Western Europe also faces similar issues with port capacity. However, from a Western European perspective, there is an important third option to consider: CEE. Sourcing from CEE allows companies to capture a significant portion of the savings available in China while paying only a fraction of the penalty in lengthening supply chains. Furthermore, as almost all the goods manufactured in CEE arrive in Western Europe by truck or train, the risk of port congestion is avoided as well.

In rough figures, fully loaded labor costs are $25 to $30 per hour in Western Europe, $2 to $5 per hour in CEE, and about $1 per hour in China. Transit times from CEE to Western Europe are measured in days (four to five days from western Russia and two days from the Czech Republic, Hungary, Po-

land, Romania, and Slovakia). Simply put, sourcing from CEE provides 80 to 90 percent of the benefit of sourcing from China while incurring only 10 to 20 percent of the supply chain penalty (again, avoiding increasingly congested European ports).

European Supply-Chain Simulations

To understand the implications of these differences, we simulated three different supply chains: domestic Western Europe, China anchored, and CEE anchored. The assumptions for Europe were the same as for the United States (as labor costs and domestic lead-times are comparable). Since transit times from China to Europe are the same as from China to the United States, the assumptions for China also remained unchanged. For the CEE-anchored supply chain, we made the following conservative assumptions:

- Manufacturing costs of $3.20 per unit (versus $4 in Western Europe and $3 in China)
- An additional week of manufacturing lead-time compared with the Western European chain
- An additional week for transit from plant inventory to distribution center compared with the Western European chain

The net effect is that the simulated CEE supply chain is two weeks longer than the domestic Western European supply chain. That's probably the case if sourcing is from central or eastern Russia but unlikely if sourcing is from countries in the region of the Czech Republic, Hungary, Poland, Romania, and Slovakia.

Despite the conservatism built into the simulation, the CEE-anchored supply chain is systematically advantaged compared with the Western Europe- and China-anchored supply chains. Exhibit 11 shows a summary of the simulations.

Exhibit 10: In the Competitive Dynamic Between China-Anchored and North American Supply Chains, Advantage Can Go Back and Forth

	Domestic manufacturing only	Entry of Chinese competitor		Chinese competitor integrates		Price reduction		North American manufacturing optimizes supply chain		Bottlenecks in Asian supply chain		Bottlenecks plus uncertain transit time	
Critical supply-chain factors	**North America**	**North America**	**China**	**North America**	**China**	**North America**	**China**	**North America**	**China**	**North America**	**China**	**North America**	**China**
Integration	Nonintegrated	Non-integrated	Non-integrated	Non-integrated	Semi-integrated	Non-integrated	Semi-integrated	Integrated	Semi-integrated	Integrated	Semi-integrated	Integrated	Semi-integrated
Cycle time (weeks)	6	6	11	6	11	6	11	3	11	3	18	3	18[a]
Minimum order quantity	4x	4x	4x	4x	4x	4x	4x	1x	4x	1x	4x	1x	4x
Retail price ($ per unit)	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Manufacturing cost ($ per unit)	4.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00	3.00
Theoretical operating profit ($ per unit)	4.00	4.00	5.00	4.00	5.00	3.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00
Actual operating profit ($ per unit)	.77	.77	1.02	.77	1.21	–.16	.28	2.19	.28	2.19	–.70	2.19	–1.43
China-sourcing cost advantage or disadvantage (%)			3		5		3		–31		–42		–53

Source: BCG analysis.
[a]Plus or minus six weeks.

The Central and Eastern European–Based Supply Chain Beats the China-Based Chain

Only when the Western European competitor fully integrates its supply chain, reducing cycle times to three weeks and minimum order quantities to 1x, does it outperform the CEE-anchored supply chain. The CEE-anchored supply chain outperforms the China-anchored supply chain in all instances, as one would expect.

All of this assumes that the CEE-based competitor does not integrate. Given the proximity of CEE to Western Europe and the increasingly free movement of people, capital, and technology, there is little to prevent the CEE-anchored competitor from fully integrating, as the competitor anchored in Western Europe does in the last scenario in Exhibit 11. The exhibit also shows the results of varying levels of such integration. If the CEE competitor reduces minimum order quantity (MOQ) from 4x to 2x without shortening the supply chain, its disadvantage falls to 26 percent. If, simultaneously, the cycle time is reduced from eight to five weeks, the disadvantage falls to a negligible 3 percent. And if the MOQ is further reduced to 1x (the same as the Western European competitor), the CEE-anchored competitor again gains a significant advantage of 30 percent (while still incurring the conservative two-week cycle-time penalty).

Exhibit 11: Supply Chains Based in Central and Eastern Europe Outperform Those Based in China

	Integration	Cycle time (weeks)	Minimum order quantity	Retail price ($)	Manufacturing costs ($)	Theoretical operating profit ($)	Actual operating profit ($)	CEE- and China-sourcing cost relative to Western Europe, indexed (%)
Domestic manufacturing only								
• Western Europe	None	6	4x	10.00	4.00	4.00	.77	100
Entry of foreign competitor								
• Western Europe	None	6	4x	10.00	4.00	4.00	.77	100
• CEE	None	8	4x	10.00	3.20	4.80	1.51	92
• China	None	11	4x	10.00	3.00	5.00	1.02	96
Foreign competitor integrates								
• Western Europe	None	6	4x	10.00	4.00	4.00	.77	100
• CEE	Semi	8	4x	10.00	3.20	4.80	1.68	90
• China	Semi	11	4x	10.00	3.00	5.00	1.21	95
Price reduction								
• Western Europe	None	6	4x	9.00	4.00	3.00	– .16	100
• CEE	Semi	8	4x	9.00	3.20	3.80	.75	90
• China	Semi	11	4x	9.00	3.00	4.00	.28	95
Domestic manufacturing optimizes								
• Western Europe	Full	3	1x	9.00	4.00	3.00	2.19	100
• CEE	Semi	8	4x	9.00	3.20	3.80	.75	121
• China	Semi	11	4x	9.00	3.00	4.00	.28	128
Foreign competitor optimizes								
• Western Europe	Full	3	1x	9.00	4.00	3.00	2.19	100
• CEE	Semi	8	2x	9.00	3.20	3.80	1.61	109
• CEE	Semi	5	2x	9.00	3.00	4.00	2.13	101
• CEE	Full	5	1x	9.00	3.00	4.00	2.84	90

Source: BCG analysis.

Back to the Real World

Unfortunately, the world we live in isn't evolving in a way that would help the China-based chain—and it wouldn't be evolving that way even if the various adjustments presented in Exhibit 11 were made. As noted, the surface-freight situation in North America and Europe is seriously challenged. Utilization at ports and on railroads is approaching all-time highs right now. With freight volumes increasing faster than the ports can handle them, the situation will only worsen. Options are limited. Some Asian ships are too big to go through the Panama Canal to less busy ports on the Atlantic coast. Even some of those that can fit through the canal must offload and reload containers to meet the canal's pilot-visibility rules. The offloaded containers are sent by rail across the isthmus to be reloaded on the other side, adding even more transit time. And while shifting to east coast ports might improve the predictability of shipping times, it certainly won't shorten them.

Because of the problems on the North American west coast and in Europe, cycle times of the China-based supply chains are going up, not down. If they increased from 11 weeks to 18 weeks, as they are today for some retailers and manufacturers of durable goods, the China-based chains would suffer a decline in operating margin to a $.70 *loss* per unit, while the enhanced domestic chains would still be realizing a profit of $2.19 per unit.

But that's not all. The cycle times of surface shipments (from China to Chicago, for example) are not only increasing—they are also becoming more variable. About 50 percent of the containers at one shipping company are offloaded within two weeks of their scheduled dates, and these are considered to be on time. The other 50 percent are even less predictable.

If the surface time of 18 weeks can randomly vary 6 weeks either way, the semi-integrated China-based chain will lose $1.43 of operating margin. So a domestic North American or Western European supply chain with integrated information flows and fast cycle times can outperform a China-based chain, despite China's low UPC.

Turning Threats into Opportunities

Everyone rushing to source from China can't be wrong. However, some North American companies are having second thoughts about their China-sourcing strategies and are reworking their domestic logistics networks or even retreating from China. Most companies are doing the obvious. A leading discount retailer is building distribution centers near the ports of Savannah and Houston in anticipation of the need to redirect its containers from the congested west-coast ports. Some Japa-

nese automotive OEMs are building onshore facilities in Mexico for the same reason. Kodiak Boots has brought some of its production back to North America to escape the challenges of a supply chain anchored in Asia.

So what can companies do? They need to be very aggressive in managing their China-based supply chains, looking for ways to squeeze time from them in ways competitors haven't identified. And how can they do that? By assessing all their operations and processes anew and by adopting many of the recommendations we offer below for newcomers.

For companies that haven't yet sourced from China, we recommend the following steps:

- Reduce minimum-production-order quantities and reduce cycle times as quickly and as much as possible
- Refrain from sourcing or manufacturing in China until management fully understands the dynamics of the supply chains
- Create an integrated or a semi-integrated information flow within the company's existing supply chain
- Conduct in-depth examinations of buying practices and management of supplier relationships at all levels of the supply chain in order to identify areas where hidden costs could arise and prevent their occurrence
- Segment the demand chain on the basis of order predictability and demand volatility so that components with the highest gross margins and the most volatile demand get the fastest handling
- For European companies, carefully evaluate the unique opportunity to source from CEE, where labor savings are almost as significant as in China and the supply chain penalty is relatively small

If a company does decide to source from or manufacture in China, it should explore alternatives that will minimize adverse supply-chain effects, including options that might appear costly at first but may result in overall lower costs.

- Use air freight for products with the highest margins and volatility.
- Insist on point-to-point ocean shipping. To reduce costs, companies build larger and larger container carriers, which must be scheduled to call on multiple ports. Shipping products on a vessel with your destination as its last port of call can add weeks—and variability—to transit times.
- Develop better relationships with transportation providers. This could mean identifying and paying shippers for preferential treatment. In *hot hatching,* for example, you offer a premium to a shipper that will load your goods onto its vessel last and unload them first. Another option is to work with the few shipping companies able to offload containers directly onto rail cars that head east on an express basis—cutting days and sometimes weeks out of the supply chain.

All these initiatives require investment in one of two forms: premiums or capabilities. As noted above, premiums are the extra payments required to get substantially enhanced performance and preferred treatment from suppliers such as ground, sea, and air shippers and port services. We have talked with many of these companies, and they do not know what to offer at what price. Companies can get results by forcing suppliers to compete on service in return for premiums.

Investments in capabilities, which tend to be a good deal harder to discern and carry out, include

- accelerating the flow and interpretation of data
- developing designs that enable final assembly to take place close to the point of final demand, thereby minimizing the time and cost effects of long supply chains
- learning to source, manufacture, launch, and withdraw products more effectively
- exploiting new concepts for fast freight

Identifying these investment opportunities requires exhaustive investigation and analysis of costs, revenues, and lost margins in today's end-to-end supply chains. Companies need to ask What if? And they need to explore their answers thoroughly for each and every white space before deciding that no additional investment in premiums and capabilities is likely to produce further improvement. They need to be especially alert to the subtle but important system effects of investing at one part of the chain to affect performance at another.

Next Steps

Information is power, and companies need to invest in it. Here are six information-related steps that managers can take to improve a company's supply chain:

- Estimate the size of the prize and make sure you seriously consider all viable options (including CEE for Western Europe). How will the ideas discussed here work in these different environments? What are their special situations: High volatility? Fast fashion cycles? Customization? Distributed manufacturing?

- Walk the line. Figure out what is actually happening and why, step by step.

- Focus on dramatically improving the responsiveness and reliability of key participants in the supply chain. Sometimes simple procedural changes can have huge implications.

- Identify and vet the changes necessary within the organization and across the supply chain to realize opportunities. Companies are seldom organized to make the cross-functional changes required to materially impact the performance of a supply chain. One company's purchasing group sourced the parts for a particular design from suppliers in three countries solely on the basis of UPC, disregarding the system impact of the decision. The result was frequent assembly shortages and emergency air-freight charges.

- Get information to the top of the company. Push efforts onto the A list of priorities of the company's leadership—or else abandon the effort altogether. Dramatically improved supply-chain performance can't happen without a mandate from leadership. Otherwise, the near-term and narrowly focused performance parameters of the organization will bring all sustained effort to a halt.

- Build improvement efforts into operating plans and budgets throughout the company. Some organizations simply build in stretch-performance goals and let their business units rush to find solutions. This method is scary to watch, but it can be very effective.

In general—and of utmost importance—strategy must match supply chain. If a company decides not to source goods in China while its competitor does, the rival's direct cost advantage can sometimes be overridden by increasing its logistical disadvantage. For example, what if the company with the domestic supply chain is able to increase the degree of customization its customers want or to raise the fashion quotient—more variety or more frequent selling seasons—in some category of its business? In that case, the demand volatility for certain products will be increased and the China-anchored competitor, with its long lead-times, could find its logistical problems aggravated.

Companies with time-advantaged supply chains might also consider consignment pricing, requiring their wholesale customers to pay only when they sell the company's products. To match this appealing offer to customers, competitors with a much longer supply chain will have to incur much higher costs for carrying greater inventory.

Some Closing Observations

The current problems of sourcing in China represent a giant nontariff trade barrier. In fact, the best strategy for U.S. protectionists may lie not in quotas or tariffs but in the active backing of environmentalists' efforts to hinder port expansion.

And the situation is likely to get worse before it gets better. Politicians will dither and debate until the options for alleviating the port bottlenecks have vanished.

Companies will do what they can—we have suggested a number of competitive tactics—but a single company can do little to solve the broader problem. An increasingly frustrated China, which has the most to lose from this de facto trade barrier, may undertake a major initiative, such as developing a new port on the west coast of Mexico. Any such effort would take years to have an effect, but the possibility is real.

Whether your company is operating and selling from Europe or North America, it will not be easy to get your own situation right. Winning will require creativity and insight into customer behavior, as well as segmented options, detailed cost analysis, and the kind of management that will strike many executive teams as an out-of-body experience. Yet the problem is severe enough that *someone* out there is undoubtedly trying to do something about it. That someone had better be you.

For Further Reading

The Boston Consulting Group and its authors have published a range of materials on global sourcing and related topics that may be of interest to senior executives in the consumer industry and related areas. Examples include:

"Sourcing in Central and Eastern Europe: An Overlooked Opportunity"
Opportunities for Action in Consumer Markets, September 2006

The New Economics of Global Advantage
A report by The Boston Consulting Group, July 2005

"Avoiding China's Rip Tide: Navigating Volatile Supply Chains"
Opportunities for Action in Consumer Markets, March 2005

Navigating the Five Currents of Globalization
A report by The Boston Consulting Group, February 2005

Competing Against Time: How Time-Based Competition Is Reshaping Global Markets
George Stalk Jr. and Thomas M. Hout (New York: Free Press, 1990; paperback edition, 2003)

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