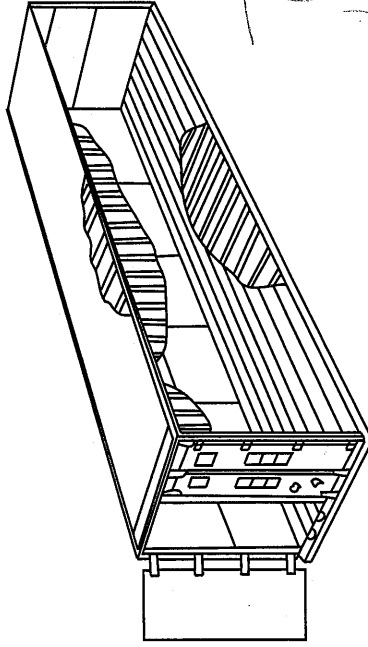


The Box

How the Shipping Container
Made the World Smaller and the
World Economy Bigger /



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the late 1970s and as the rapid exchange of cargo from one transportation carrier to another became routine, manufacturers discovered that they no longer needed to do everything themselves. They could contract with other companies for raw materials and components, locking in supplies, and then sign transportation contracts to assure that their inputs would arrive when needed. Integrated production yielded to disintegrated production. Each supplier, specializing in a narrow range of products, could take advantage of the latest technological developments in its industry and gain economies of scale in its particular product lines. Low transport costs helped make it economically sensible for a factory in China to produce Barbie dolls with Japanese hair, Taiwanese plastics, and American colorants, and ship them off to eager girls all over the world.

These possibilities first drew notice in the early 1980s, when the world discovered just-in-time manufacturing. Just-in-time, a concept originated by Toyota Motor Company in Japan, involves raising quality and efficiency by eliminating large inventories. Rather than making most of its own components, as competitors did, Toyota signed long-term contracts with outside suppliers. The suppliers were intimately involved with Toyota, helping design its products and knowing the details of its production plans. They were required to adopt strict quality standards, with very low rates of error, so that Toyota would not need to test the components before using them. The suppliers agreed to make their goods in small batches, as required for Toyota's assembly lines, and to deliver them within very narrow time windows for immediate use—hence the name, just-in-time. Keeping inventory to a minimum brought discipline to the entire manufacturing process. With few components in stock, there was little margin for error, forcing every firm in the supply chain to perform as required.²

The wonders of just-in-time were unmentioned outside Japan before 1981. In 1984, as Toyota agreed to assemble cars at a General Motors plant in California, U.S. business publications ran thirty-four articles on just-in-time. In 1986, there were eighty-one, and companies around the world were seeking to emulate Toyota's high-profile success. In the United States, two-fifths of the Fortune 500

Chapter 14

Just in Time

Barbie was conceived as the all-American girl. In truth, she never was: at her inception, in 1959, Mattel Corp. arranged to make her at a factory in Japan. A few years later it added a plant in Taiwan, along with a large cadre of Taiwanese women who sewed Barbie's clothes in their homes. By the middle of the 1990s, Barbie's citizenship had become even less distinct. Workers in China produced her statuesque figure, using molds from the United States and other machines from Japan and Europe. Her nylon hair was Japanese, the plastic in her body from Taiwan, the pigments American, the cotton clothing from China. Barbie, simple girl though she is, had developed her very own global supply chain.¹

Supply chains like Barbie's are a direct result of the changes wrought by the rise of container shipping. They were unheard-of back in 1956, when Malcom McLean placed his first containers on board the *Ideal-X*, and in 1976, when high oil prices brought sky-high freight costs that stifled the flow of world trade. Until then, vertical integration was the norm in manufacturing: a company would obtain raw materials, sometimes from its own mines or oil wells; move them to its factories, sometimes with its own trucks or ships or railroad; and put them through a series of processes to turn them into finished products. As freight costs plummeted starting in

manufacturers had started just-in-time programs by 1987. Overwhelmingly, these companies found that just-in-time required them to deal with transportation in a very different way. No more would manufacturers offer a load or two to some truck line's hungry salesman. Now, they wanted large-scale relationships with a much smaller number of carriers able to meet stringent requirements for on-time delivery. Customers demanded written contracts that imposed penalties for delays. Even shipments from another continent were expected to arrive on schedule. Railroads, ship lines, and truck lines with large route networks and sophisticated cargo-tracking systems had the edge.³

Before the 1980s, logistics was a military term. By 1985, logistics management—the task of scheduling production, storage, transportation, and delivery—had become a routine business function, and not just for manufacturers. Retailers discovered that they could manage their own supply chains, cutting out the wholesalers that had stood between manufacturers and consumers. With modern communications and container shipping, the retailer could design its own shirts and transmit the designs to a factory in Thailand, which used local labor to combine Chinese fabric made from American cotton, Malaysian buttons made from Taiwanese plastics, Japanese zippers, and decorations embroidered in Indonesia. The finished order, loaded into a 40-foot container, would be delivered in less than a month to a distribution center in Tennessee or a *hyper-marché* in France. Global supply chains became so routine that in September 2001, when U.S. customs authorities stepped up border inspections following the terrorist attack that destroyed the World Trade Center in New York, auto plants in Michigan began shutting down within three days for lack of imported parts.

The improvement in logistics shows up statistically in reduced inventory levels. Inventories are a cost: whoever owns them has had to pay for them but has yet to receive money from selling them. Better, more reliable transport has permitted companies to obtain goods closer to the time they need them, instead of weeks or months in advance, tying up less money in goods sitting uselessly on warehouse shelves. In the United States, inventories began falling in the

mid-1980s, as the concepts of just-in-time manufacturing took root. Manufacturers such as Dell and retailers such as Wal-Mart Stores have taken the concept to extremes, designing their entire business strategies around moving goods from factory floor to customer with minimal time in between. In 2004, nonfarm inventories in the United States were about \$1 trillion lower than they would have been had they stayed at the level of the 1980s, relative to sales. Assume that the money needed to finance those inventories would have to be borrowed at 8 or 9 percent, and inventory reductions are saving U.S. businesses \$80–\$90 billion per year.⁴

This precision performance would have been unattainable without containerization. So long as cargo was handled one item at a time, with long delays at the docks and complicated interchanges between trucks, trains, planes, and ships, freight transportation was too unpredictable for manufacturers to take the risk that supplies from faraway places would arrive right on time. They needed to hold large stocks of components to ensure that their production lines would keep moving. The container, combined with the computer, sharply reduced that risk, opening the way to globalization. Companies can make each component, and each retail product, at the cheapest location, taking wage rates, taxes, subsidies, energy costs, and import tariffs into account, along with considerations such as transit times and security. The cost of transportation is still a factor in the cost equation, but in many cases it is no longer a large one.

Globalization, historians and economists have hastened to point out, is not a new phenomenon. The world economy became highly integrated in the nineteenth century. The decline of tariffs and other trade barriers in the years following the Napoleonic Wars led international trade to increase after decades of stagnation, and the introduction of the oceangoing steamship in the 1840s sharply reduced transport costs. Ocean freight rates fell 70 percent between 1840 and 1910, encouraging increased shipment of commodities and manufactured goods around the world, while the telegraph—the nineteenth-century counterpart of the Internet—gave people in one

location current information about prices in another. Prices of grain, meat, textiles, and other commodities converged across borders, as traders found it easy to increase imports whenever domestic prices rose or domestic wages got out of hand.⁵

The globalization of the late twentieth century took on quite a different character. International trade is no longer dominated by essential raw materials or finished products. Fewer than one-third of the containers imported through southern California in 1998 contained consumer goods. Most of the rest were links in global supply chains, carrying what economists call “intermediate goods,” factory inputs that have been partially processed in one place and will be processed further someplace else. The majority of the metal boxes moving around the world hold not televisions and dresses, but industrial products such as synthetic resins, engine parts, washer, screws, and, yes, Barbie’s hair.⁶

In international production-sharing arrangements of this sort, the manufacturer or retailer at the top of the chain will find the most economical place for each part of the process. This used to be impossible: high transportation costs acted as a trade barrier, very similar in effect to high tariffs on imports, sheltering the jobs of production workers from foreign competition but imposing higher prices on consumers. As the container made international transportation cheaper and more dependable, it lowered that barrier, decimating manufacturing employment in North America, Western Europe, and Japan, by making it much easier for manufacturers to go overseas in search of low-cost inputs. The labor-intensive assembly will be done in a low-wage country—but there are many low-wage countries. The various components and raw materials will come from whichever location can supply them most cheaply—but costs in different locations often are quite similar. Even small changes in transport costs can be decisive in determining where each stage of the process will occur.⁷

The economics of containerization have shaped these global supply chains in peculiar ways. Distance matters, but not hugely so. A doubling of the distance cargo is shipped—from Hong Kong to Los Angeles, for example, rather than Tokyo to Los Angeles—raises the

shipping cost only 18 percent. Places far from the end market can still be part of an international supply chain, so long as they have well-run ports and a lot of volume.⁸

Container shipping thrives on volume: the more containers moving through a port or traveling on a ship or train, the lower the cost per box. Places with lower demand or poorer infrastructure will face higher transport costs and will be far less attractive manufacturing sites for the global market. In the 1970s and 1980s, when many U.S. industrial centers were dying, Los Angeles thrived as a factory location because it was home to the nation’s busiest containerport, and Los Angeles thrived as a port because it was well located to handle import volume from Asia, not just for California, but for the entire United States. The Pacific Rim became the world’s workshop for consumer goods, in good part, because large ports for containers gave it some of the world’s lowest shipping costs. Antwerp spent a stunning \$4 billion on port expansion between 1987 and 1997, including expropriation of 4,500 acres (2,000 hectares) of land, just to keep itself in the game. Conversely, African countries with inefficient ports and little container service are at such a transport-cost disadvantage that even rock-bottom labor costs will not attract investment in manufacturing.⁹

Shippers in places with busy ports and good land-transport infrastructure not only enjoy lower freight rates, but they also benefit from the shortest shipping times. Before the container, when breakbulk vessels like the *Warrior* carried most of the world’s trade, cargo typically left the factory weeks before the ship departed, sailed at a glacial 16 knots, and spent an unproductive week in the hold each time the vessel called at an additional port. In the container age, a machine manufactured on Monday can be dropped at Port Newark on Tuesday and delivered in Stuttgart, Germany, in less time than it once would have taken to be loaded aboard a ship such as the *Warrior*. Yet time still matters. By one estimate, each day seaborne goods spend under way raises the exporter’s costs by 0.8 percent, which means that a typical 13-day voyage from China to the United States has the same effect as a 10 percent tariff. The time savings represent a huge competitive advantage to shippers located

near a major port. Those served by smaller ports may have to endure longer wait times between ships or shuttle links to a larger port, adding time, and hence costs, to every shipment. Air freight all but eliminates the costs of time, but it is too expensive for most goods that are made in poor countries precisely because little value is added in their production.¹⁰

"Any change in technology," the economist Joel Mokyr observed, "leads almost inevitably to an improvement in the welfare of some and to a deterioration in that of others." That was as true of the container as of other technologies, but on an international scale. Containerization did not create geographical disadvantage, but it has arguably made it a more serious problem.¹¹

Before the container, shipping was expensive for everyone. The most expensive part of international freight transportation, loading cargo aboard ship, affected all shippers equally. Containerization has reduced international transport costs for some much more than for others. Landlocked countries, inland places in countries with poor infrastructure, and countries without enough economic activity to generate high demand for container shipping may have a tougher competitive situation now than they did in breakbulk days. Being landlocked, one study calculated, raises a country's average shipping costs by half. Another study found that it cost \$2,500 to ship a container from Baltimore, on the U.S. Atlantic coast, to Durban, in South Africa—and \$7,500 more to haul it by road the 215 miles from Durban to Maseru, in Lesotho. Within China, the World Bank reported in 2002, transporting a container from a central city to a port cost three times as much as shipping it from the port to America.¹²

And if high shipping costs, high port costs, and long waiting times do not leave a country at an economic disadvantage, a cargo imbalance might. Relatively few routes, it turns out, have an evenly balanced flow of maritime exports and imports. When the flow is out of balance, shippers in the more heavily trafficked direction have to pick up the cost of sending empty containers back in the other direction. In 1998, nearly three-quarters of the containers sent northbound from Caribbean islands to the United States were empty, re-

sulting in much higher shipping costs for the southbound imports of food and consumer goods on which these island-states depend.¹³

The revolutionary days of container shipping were over by the early 1980s. Yet the aftereffects of the container revolution continued to reverberate. Over the next two decades, as container shipping began to drive international freight costs down, the volume of sea freight shipped in containers rose four times over. Hamburg, Germany's largest port, handled 11 million tons of general cargo in 1960; in 1996, more than 40 million tons of general cargo crossed the Hamburg docks, 88 percent of it in containers, and more than half of it from Asia. The prices of electronics, clothing, and other consumer goods tumbled as imports displaced domestic products from store shelves in Europe, Japan, and North America. Low-cost products that would not be viable to trade without container shipping diffused quickly around the world. Declining goods prices in the late 1990s, thanks largely to imports, helped bring three decades of inflation to an end.¹⁴

Container shipping, it is clear, has helped some cities and countries become part of the new global supply chains, while leaving others to the side. It has assisted the rapid economic growth of Korea while offering precious little to Paraguay. Yet the trade patterns that containerization has helped to create are not immutable. In the 1980s, ship lines' commitments assured the success of several late entrants to containerization, such as Busan, in Korea; Charleston, South Carolina; and Le Havre, in France. In the 1990s, they repeated the trick on a much larger scale in Asia.

By the end of the twentieth century, the container shipping industry was dominated by a handful of alliances of global scope. These companies' megaships may have sailed between two ports, but the cargo they carried was increasingly unlikely to have been produced in or to be destined for the end points of the voyage. By deciding where to employ their vessels, the big ship lines had the power to determine which ports succeeded and which struggled. In some cases, that choice was made for unavoidable reasons; not all ports had the depths required to handle the biggest ships. In other cases,