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The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger, Princeton, NJ: Princeton University Press,
M@n@gement, 9: 2, 73-79.
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Marc Levinson 2006
*The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger*

Reviewed by
Benoît Demil and Xavier Lecocq
IAE, Université de Lille
benoit.demil@iae.univ-lille1.fr; xavier.lecocq@iae.univ-lille1.fr

THE TIN CAN THAT CHANGED THE WORLD:
THE INSTITUTIONALIZATION OF CONTAINERIZATION

April 26, 1956: 58 containers are loaded in Newark onto an aging tanker ship, the Ideal-X, and sailed into Houston five days later where 58 trucks are waiting to haul the boxes to their destination. This is the beginning of the fascinating story of containerization written by Marc Levinson. As he notes, the container has «all the romance of a tin can» (p. 1). However, behind this unglamorous object which has remained unnoticed for so long¹, a revolution in the international trade was taking place. The effects of such a revolution are striking today in ports, roads or railroad stations where 300 millions containers are making their way across the world. Levinson tells us from a historical perspective the process of containerization and its various consequences at the micro and macro levels, far beyond the single decrease of transportation costs.

The author is an economist in New York and has written previously three books about finance and markets. He was also formerly finance and economics editor of the *Economist*, a writer at *Newsweek*, and editorial director of the *Journal of Commerce*. The Box is his first book dedicated to this topic.

THE CONSEQUENCES OF A SILENT REVOLUTION

A way to make people want to read *The Box* is to begin by underlining the changes that have occurred since 1956 in the world at the economic, social, and urban levels. Before the advent of the container, the shipping industry was a highly labor intensive sector because it was time-consuming to load and unload freight on ships, trains or trucks. Consequently, transportation took a long time and was very costly as long as “break bulk” cargo prevailed (break bulk cargo consists of discrete items that had to be loaded and unloaded on pallets). Under

¹. Another book dedicated to containerization, although more focused on containerships, has been released recently: Brian J. Cudahy (2006), *Box Boats: How Container Ships Changed the World*, Bronx, NY: Fordham University Press.
these conditions, improvements in efficiency consisted of traditional calls to increase longshoremen productivity and eliminating inefficient work rules. But despite these calls, business remained frequently unprofitable.

What containerization did was to disrupt the old technology in transportation and to replace it by an efficient tool that favored the globalization of trade and production worldwide. Indeed, the direct effect of containers was to cut drastically the costs of transportation by decreasing the time required to load and unload ships in each port thanks to specifically designed cranes. It thus reduced the time of immobilization for each ship in ports. Since this innovation, an operator controls a trolley from which hangs a spreader, a steel frame designed to lock onto all four top corners of a 40-ton box. This operation is repeated every two minutes. Moreover, each time the crane places an incoming container on a truck, it picks up an outbound container from another, simultaneously emptying and filling the ship. Containerization also rationalized the loading of ships by replacing the preceding break bulk lines and, consequently, increasing the volume transported on each vessel. These advantages made containerization a very low cost technology that reduced the rates of each ton of freight transported. Moreover, containerization favored rapid connections with other transportation modes such as trucks and trains, enabling rapid transportation from port to port but also from port to every point in a country.

The diffusion of this technology rapidly produced huge macro-economic effects even if, as the author admits, they are difficult to isolate from the global economic boom following the second worldwide war. Firstly, it spurred international trade. For instance, in the 60’s, exports grew twice as much as production. Secondly, it connected fragmented markets of products as did the railroad for national markets in the nineteenth century (Chandler, 1977). Thus, for the customers, containerization increased considerably the variety and quantity of final products. Thirdly, it favored an international division of labor by enlarging the potential number of supply sources and increased the mobility of production factors. The emergence of Asian countries since the 70’s can be connected to this revolution. Finally, containerization also impacted the exchange balance of countries and allowed mastering inflation in the 90’s by importing low-cost goods in Western economies. Globalization is not a new phenomenon, though. However, with containerization, international trade was no longer essentially dominated by raw materials or finished products. Today, most containers are carrying around the world intermediate goods that have been partially processed in one country and will be further processed in another one.

At a more micro-level, containerization also changed directly several sectors of the economy. Specifically, it modified the configuration of the main commercial ports and their distribution around the world. Ports now require fewer employees because of the automation of the different operations of loading, checking, and unloading containers. Despite tough opposition from unions in a first period, the work of longshoremen was increasingly replaced by cranes on rails placed along the
ships. Thanks to the possibility of coupling containers on trains or trucks with ships, a lot of factories are now localized far from the ports. This point is important in towns where place was scarce as in New York’s port. Another consequence of containerization was to concentrate the commercial activity of each country in a few ports. For instance, Rotterdam rapidly became a logistic platform for all Europe. Three or four ports emerged as nodal points in the United States on the East and West coasts. Indeed, this new technology requires specific, huge investments in port’s infrastructures that make it inefficient to disseminate ports in a country. This phenomenon of concentration based on scale economies operated also for the ship transportation sector. More and more, this sector became capital intensive and required to invest in giant vessels to stay on the competitive curve. On board, the container also required smaller crew. As Levinson describes, “A ship carrying 3,000 40-foot containers, filled with 100,000 tons of shoes and clothes and electronics, may make the three-week transit from Honk Kong around the Cape of Good Hope to Germany with only twenty people on board.” (p. 4).

Finally, at the level of each company, containerization also had important consequences as the cost of commercial exchanges with other partners decreased. It also eased the internationalization of the firm and increased international competition in many sectors that were protected in the past. It made other managerial innovations like the just-in-time system reliable and efficient. Finally, these different trends have lead to a disintegration of firms, allowing processing a product in several countries whereas production used to be localized in one fully integrated plant. Consequently, containerization has spurred the advent of some crucial new functions in companies like logistics.

THE INNOVATION PROCESS

How did this new technology appear and impose a mass production approach for shipping transportation? The Box convincingly details the emergence of this revolution through several chapters dedicated to the role of entrepreneurs, the process of standardization or the multiple innovations that supported containerization.

From a retrospective view, the success of containerization was straightforward. The technology was rapidly improved by modifications in one or another part of this systemic innovation. After the first travel of the Ideal-X, several cost-saving innovations took place to decrease the time of loading and unloading, modify the design of containers to increase the size of the stacks on a deck or increase the size of the ships themselves (as earlier as 1960, new “jumboized” vessels could carry eight times as many containers as the Ideal-X). Other innovations like the computer and logistics also improved the efficiency of containerization. Indeed, all the operations of filling and emptying were choreographed by a computer long before a ship arrived in the port. All these innovations contributed to the drastic reduction in the cost of loading or unloading (from $5.83 per ton in 1956 to 15.8 cents a few years later).
However, as the literature on innovation would suggest, the development and implementation of containerization were not a straightforward process. The intrinsic advantages of containerization were not sufficient in the 50's to impose the technology against break bulk cargos. Indeed, the innovation described in the book is less the container itself—which had been in use for years and years—than the systemic innovation of containerization (the evolution of all the intricate elements participating in this technology). Among these elements were, of course the containers themselves, but also the ports, the vessels and their owners, government representatives, longshoremen and their unions, the cranes, port infrastructures, storage facilities, trains, trucks, the rules of competition between the different transportation modes, the set of standards for maritime insurers, or technical standards. Considered together, these elements rendered the task of imposing containerization less obvious and imposed important hurdles for the innovation process. Moreover, containerization brought along a radically different view of the shipping industry and more generally of transportation. And in fact, like a lot of radical innovations, experts misjudged completely the potential impacts and developments of this new technology. It was envisaged only as an adjunct to the traditional break bulk business. At the beginning, containers did not appear as a revolution but only as a niche technology, impractical for international trade. Several companies hesitated to bet millions of dollars on a technology that was not mature. Containerization also attracted little attention from unions despite its future devastating impact on professions such as longshoremen’s.

In this big picture of the innovation process, one particular actor—an institutional entrepreneur—played a crucial role to develop and implement containerization efficiently. Although he was not the inventor of the container, Malcom McLean was the first to succeed in this new business after the failure of several experiments before WWII. He built an empire in shipping transportation. Starting from a trucking company founded in 1934, this outsider and business maverick entered the sector in 1956 after buying a few ships built for WWII. The story of McLean and the way he interested other actors and resolved numerous difficulties constitute the meat of the book. Even if the book devotes much space to this individual story, containerization is above all a collective story. Indeed, a lot of negotiations were required to persuade longshoremen with their strong culture of solidarity who were suspicious mechanization would eliminate jobs. Moreover, the standardization process, crucial to reap benefits from this new technology, lasted several years. It was not until 1967 that standardized sizes of containers were established among several other factors. In this brand new industry, market forces (embodied in McLean’s company Sea-Land Service and its main competitor, Matson Navigation) and de facto standards imposed by ISO committee intervened. The question was then to avoid a lock-in of companies in inefficient standards but at the same time to favor the burgeoning of the industry. The complexity of debates was reinforced by several other factors. Firstly, standards in Europe were different than in the United
States. Secondly, the importance of different transportation modes varies across countries. For instance, railroads were systematically disadvantaged in the United States. Thirdly, shipping, railroad or truck companies had different interests concerning the supported standard. Finally, among direct competitors, there was no unique standard and each company defended its solutions according to its traffic and previous investments.

With the end of the long process of standardization in 1967, the shipping sector entered a phase of concentration in the 70’s, as more and more capital was required to operate in the industry. Indeed, a race to bigger and bigger vessels had been fuelling industry development since its inception. Yet, each new ship represented a huge investment and each new generation represented a bet on the trade-off between capacity and speed. The bigger a vessel, the slower, and the more oil it consumed. The highly unpredictable characteristics of the sector lied in difficult to predict macro-economic trends like fuel prices and the general economic climate, coupled with huge time lags between the decision to build a new vessel and its eventual use. (For instance, there is nowadays a 5-year lag between planning and operations for some ships.) Consequently, when a ship eventually becomes operational, it may be ill-adapted to prevailing economic conditions in terms of payload, fuel prices or speed. The collapse of numerous pioneers in this industry illustrates the difficulty to anticipate economic trends and current leaders (Danish Maersk and Swiss Mediterranean Shipping Company) are both late entrants.

SOME DISCUSSION POINTS

Despite its intrinsic interest, the book does not defend any particular thesis apart from the revolution case of containerization. However, it sheds light on several interesting questions related to the emergence and change process of a new sector. We would like to underline three questions in particular.

The first point concerns the public/private relationships and the way public actors intervened all along the emergence phase of this industry. The private sector alone would have had great difficulties to impose containerization. Indeed, infrastructure requirements for each port —and a network of ports are indeed needed to render this technology efficient— were above the investment capacity of a company, even the most important ones, as McLean’s. Moreover, American shipping companies received huge amount of subsidies for buying old war vessels and for constructing new vessels adapted to this new industry. These subsidies helped the administration subtly influence technical standards prevailing in the sector. Competition from other modes of transportation was also contained during several years through strictly regulated rates. The U.S. government called on private companies to help with the logistics in Vietnam (at the end of the war). Agencies in charge of ports invested massively —and for several of them, with negative returns— in cranes, rails (to insure multi modal loading and unloading), deepwater offshore, storage warehouses… Although in retrospect this
support proved crucial in a nascent sector with so high investments, it turned differently in the 70’s. Governments (like in Japan) then massively subsidized this new technology and rapidly planned the production of dozens of new ships. This mimetic movement by several governments created overcapacity with too many ships for the available freight (moreover, the tendency was to design bigger and bigger ships). In addition, the oil shock occurring in the early 70’s laminated the margins of most ships lines, and a consolidation took place among several European and American companies. Many countries also began investing in one or several giant ports able to receive the new ships. But in several cases, these investments proved useless because private companies preferred limiting the number of ports a vessel visited. Thus, in the 70’s, what previously constituted an advantage (i.e., regulation of sail routes and rates, subsidies for construction of ships in the home country) began to be a roadblock. Government investments that had appeared crucial in the developmental phase of the new sector rapidly created overcapacity in the industry. However, such massive intervention by public actors explains why this new systemic innovation was implemented quite rapidly (from 1956 to the end of the 60’s) compared to other radical innovations. The Box thus details an interesting case of the dual nature of public interventions in a private sector. The second interesting question posed by containerization is this: Why did actors seem to have misjudged the importance of the process and its potential consequences for world trade and business in general? Levinson suggests that governments around the world have seen the interest of containers for transportation but not, at least for a long time, for national competitiveness. Yet, the few governments that rapidly understood that containerization was a wonderful mean to increase their national competitive advantage have really drawn benefits from the innovation. In particular, the rise of Japan and several years later of the Asian Dragons is probably in part due to the efforts these countries put to become international platforms for trade with important ports for containerships. Even economists have been misled concerning the consequences of containerization. As Levinson argues, only a few of them considered containerization as a revolution for transportation. For instance, Benjamin Chinitz from Harvard studied the role of freight in the New York region during the 1950’s. He predicted that containerization would favour New York’s industry by offering local plants a mean to ship to Southern United States more cheaply than factories from the Midwest or New England. However, the full consequences of lower shipping costs at the world scale were not envisaged. The fact that containerization and the following decline in shipping costs would decimate much of U.S. and Europe manufacturing base by making it practical to import almost everything from Asia did not strike Chinitz or his colleagues. Moreover, as noted above, containerization also drastically changed worldwide business by permitting an economic restructuring of the value chains that was not envisioned by experts at the beginning of the containerization process. The Box, published only fifty years after the Ideal X odyssey, reminds the researcher that the eco-
nomic revolutions are not always visible and should encourage academics to look for the objects or process that are currently creating the ferment of new eras.

The third question that comes to mind in reading *The Box* concerns the accuracy of the author’s story. Has he perhaps given a biased account of the process of containerization? At the heart of Levinson’s book lies the crucial role played by Malcolm McLean in the emergence of the container as a standard for international trade. Thus, the story of the book begins in 1956 when McLean’s ship Ideal X sailed from Newark to Houston. According to Levinson, this is the founding act of the revolution of containerization. Even if the author evokes several attempts to use containers for transportation during the 20’s, he considers that the containerization process began in 1956 because McLean envisioned the possibility to make the container a device for multimodal transportation. However, containers had been used for thirty years by shipping companies or railroad companies in the United States, Australia, England, France or Canada. For instance, Pennsylvania Railroad, the largest American railroad company, had been using and supporting containers from the 20’s. The U.S. army began to use small steel containers in the late 1940s. Levinson notes that a 1955 census (one year before McLean’s Ideal X loaded its 58 containers) found that 155,000 containers were in use in non-communist Europe alone. McLean contributed and propelled containerization worldwide, but he did not create the container, and the full story of the box really begins in the 1920s. Beyond his foresight, McLean benefited from the U.S. government subsidies in the post WWII context and from its efforts to standardize the size of containers, facilitating multimodal transportation. Thus, the containerization process is far longer than what first seems (1920-1967 rather than 1956-1967) and the heroic figure of McLean (the institutional entrepreneur to consider an in vogue terminology) is neither the inventor nor a precursor of the container. His role was probably less important than it appears in the book. From a theoretical point of view, the case of *The Box* demonstrates the difficulty to qualify the role of an institutional entrepreneur. This should warn us against the currently often observed temptation to reduce almost completely the impetus and process of change at a macro-level (industry, country, worldwide trade…) to a single man’s action. Indeed, it would have been particularly interesting to contrast McLean’s success with the failure of the container pioneers. From a methodological viewpoint, this illustrates the need for researchers to treat change as a multilevel process with various intertwined actors (entrepreneur, government, unions, international organizations…), in a coevolutionary approach. Such a research design would have shown why container technology only imposed itself during the 1960’ and not earlier.

**Acknowledgment.** We are grateful to Johann Peter Murmann for his comments on an earlier draft of this book review.