



Logistics Clusters: The Feedback Loop Leading to Economic Growth and Jobs

By Yossi Sheffi

Governments around the world are investing in logistics clusters to encourage economic growth and create jobs. While the advantages of high-technology, knowledge-based clusters have been analyzed extensively, logistics cluster have not. A new book: *Logistics Clusters: Delivering Value and Driving Growth* (MIT Press, Cambridge MA, September 2012) fills the gap. This article looks at some of the factors motivating public sector investments in logistics clusters. It explains the mechanisms leading to their growth and some of the types of jobs created around such clusters.

Consider Silicon Valley technology, Florentine Renaissance art, Hollywood movies, Burgundy wine, Detroit automobiles, Paris fashion, Swiss watches, Taiwan semiconductors, or Madison Avenue advertising. Throughout history and into the modern era, certain regions rise to become world-renowned centers for a particular industry or skill. These regional economic booms attract workers, entrepreneurs, investment, companies, political interest, and intellectual capital. These regional economic booms also occur in logistics. Recently, governments around the world have been investing in the creation and development of clusters dedicated to logistics activities.

The fact that agglomerations of firms can draw economic advantages

from their geographic proximity to others in the same industry or stage of value addition was originally observed and advanced by the British economist Alfred Marshall in his classic work, *Principles of Economics* (1920). Marshall hypothesized that the development of industrial complexes implies the existence of positive externalities of co-location. He attributed such externalities to three main forces: (i) knowledge sharing and spillover among the co-located firms; (ii) development of a specialized and efficient supplier base, and (iii)

development of local labor pools with specialized skills.

In the 1990s, Michael Porter of Harvard Business School expanded on this hypothesis, suggesting that clusters affect competition by (i) increasing the productivity of the co-located companies, (ii) increasing the pace of innovation, and (iii) stimulating the formation of new businesses. In his words, “a cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally – without requiring it to sacrifice its flexibility.”

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Silicon Valley may be the “poster child” of clusters, but many regions have grown and prospered by becoming clusters of various industries. One of these industries, which has gotten scant attention in the literature, is logistics. The advantages of developing a logistics clusters, however, did not escape the attention of many regional and national governments. The last decade has witnessed an increased investment in the building of new logistics clusters and the further development of existing ones.

Many governments have followed a cluster strategy, in part, because of the phenomenal success of the well-known clusters like Silicon Valley, Hollywood, and Wall Street. As some economists have argued, it also gives policymakers a strategy and rationale for economic interventions and the implementation of industrial policy. In addition, the cluster model lures many governments with the belief that they only have to “kick-start” the “flywheel” and then a positive feedback loop of early companies getting economic advantages will draw more and more companies. This, in turn makes the cluster even more attractive, leading to even more companies joining, and leading to continuous economic growth and jobs.

Logistics Clusters

Logistics intensive clusters are agglomerations of several types of firms and operations: (i) firms providing logistics services, such as third-party-logistics providers (3PLs), transportation, warehousing and forwarders, (ii) the logistics operations of industrial firms, such as the distribution operations of retailers, manufacturers (in many cases after-market parts) and distributors and (iii) the operations of companies for whom logistics is a large part of their business. Such logistics clusters also include firms that service logistics companies, such as truck maintenance operations, software providers, specialized law firms, international financial services providers, and so forth.

Logistics clusters exhibit many of the same economic advantages that general industrial clusters do: an increase in productivity due to shared resources and availability of suppliers; improved human networks, including knowledge sharing; tacit communications and understanding; high trust level among companies in the cluster; availability of specialized labor pools as well as educational and training facilities; and the availability of knowledge creation and dissemination centers, such as universities, consulting firms, and think tanks. These factors grow and become more pronounced as the cluster grows, leading to a self-reinforcing positive feedback loop which feeds the continued growth of the cluster.

Leading logistics clusters around the world include Singapore, Shenzhen, Rotterdam, Duisburg, Sao Paulo, Dubai, Los Angeles, Memphis, Chicago, Los Angeles, and many others. While many of the advantages of industrial clusters can be found in logistics clusters, logistics clusters have several unique characteristics which reinforce the cluster’s formation and its advantages. These can be classified into two categories: (i) operational advantages related to transportation,

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and (ii) advantages related to sharing of assets among companies. Both types of advantages add significantly to the reciprocal reinforcing feedback mechanism which makes the cluster more attractive as it grows, leading to further growth.

Transportation Advantages of Logistics Clusters

The transportation advantages of logistics parks include economics of scope, scale, density and frequency of transportation services into and out of a logistics cluster.

Economies of Scope

Freight flows are not symmetric. For example, there is more maritime freight from China to Europe than the other way around, and more trucking freight from the US industrial Midwest than back. Consequently, after every delivery, equipment has to be repositioned to be ready for the next load. Naturally, transportation companies collect revenue only for loaded moves; consequently, movements into areas where little freight originates will be expensive, because the carrier has to take into account its next empty repositioning move.

Due to the significant flow of freight in and out of logistics clusters, carriers – be they truck lines, railroads, airlines, or ocean carriers – will charge lower rates for carrying freight into and out of a logistics cluster. The reason is that because they are not likely to move empty out of there once delivering a load, and are not likely to move empty into a logistics park in the first place in order to carry a load out of there. As more companies locate in the park, carriers are more likely to find follow-on loads, leading to lower transportation costs, making the cluster even more attractive to logistics operators.

Economies of Scale

As the volume of freight in and out of the cluster grows, transportation carriers can start using larger and larger conveyances. The cost of operating a transportation conveyance does not grow linearly with the size of the vehicle; it costs less to operate a larger vehicle, on a per unit capacity basis, than a smaller vehicle. This is evident by ocean carriers’ move to larger and larger ships (resulting in the need to expand the Panama Canal); the use of double stacking and very long trains by railroads; the use of 53 feet trailers and double and triple combinations by motor carriers; and the use of large cargo planes by freight airlines. As the size of the logistics cluster grows, this phenomenon generates another positive feedback: when carriers can use larger conveyances, they can reduce their rates, which makes



the cluster more attractive to more companies, increasing the size of the cluster and making it even more attractive to carriers (the transportation assets operators) and shippers (the manufacturers, retailers, distributors or other entities who are the beneficial owners of the freight being moved).

Economies of Density

Transportation companies may consolidate a group of less-than-conveyance loads into a single conveyance load. In order to pick up or deliver from/to multiple shippers, transportation carriers have to operate tours. If these pickup/delivery tours occur within a logistics cluster, they become more efficient as companies join the cluster because the distances between pickup (or delivery) locations is likely to become shorter the larger the cluster. This increases the efficiency of the “first mile” and “last mile” portion of each trip, which is usually the most expensive portion, allowing motor carriers to charge less for serving logistics clusters, thereby attracting more companies to these clusters and increasing further the efficiency of the transportation service.

Economies of Frequency

One of the most important factors in providing service by transportation companies is the frequency of departures and arrivals. Such frequency will naturally increase with increased volumes going in and out of the cluster. This is especially important when filling ocean containers, because logistics companies will routinely park a container in the cluster and move it when enough freight is accumulated. The larger a cluster is, the less time is required to fill a container going to a particular destination.

In addition, many logistics clusters are built around transportation hubs. When a shipper does not have enough freight to send directly in a dedicated conveyance from an origin to a destination, the shipments typically undergo consolidation and de-consolidation in one or more hub terminals on the way. Such hubs, by virtue of managing freight that flows through them, in addition to that which is originated or destined there, enjoy particularly high frequency of departures and arrivals. Most travelers are painfully familiar with the hub-and-spoke system by which airlines consolidate and deconsolidate people, giving rise to the saying about the busiest airport in the world: “When I die, I don’t know if I’ll go to heaven or hell, but I know I’ll change planes in Atlanta.”

Operational Advantages of Resource Sharing

In addition to the transportation advantages, logistics clusters offer their members other advantages, most of which are rooted in the interchangeability of transportation and logistics assets. The basic logistics operations: storage, removal, transportation, tracking, delivery, etc are similar regardless of the item being handled. Consequently, transportation and logistics assets can handle packages containing a large variety of goods in a standard manner.

Furthermore, rail cars, containers, trailers, barges, and airplanes all come in standardized sizes and capacities, dictated by regulations, international standards, or prevailing conveyance designs. Thus capacities, reach, and velocities are similar regardless of the company logo on the tractor’s door, ocean shipping container side, or airplane tail. Both of these factors mean that companies in logistics clusters can share certain assets, allowing them to serve their customers better than firms not participating in a cluster and allowing them to better adjust to fluctuating business volume.

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Shared Assets

When UPS fills its daily flight out of Singapore to its Asia-Pacific hub in Shenzhen, the carrier does not turn away any overflow packages, ask the customers to wait 24 hours for the next flight, or charter another aircraft for those few extra packages. Instead, UPS utilizes common carrier airlift capacity (typically belly freight in passenger airliners) from Singapore to move a few overflow shipments—sometimes directly to their final destination. Thus, having a logistics cluster in Singapore’s Air Logistics Park of Singapore (ALPS) helps all companies in Singapore.

Similarly, warehouse capacity can be used for short periods when one company is running temporarily out of space and another has space to lease. As more and more logistics providers join a logistics cluster, these opportunities rise, making the cluster even more valuable to more logistics-intensive operations.

Expansion Capability

In addition to changes in demand caused by seasonal variations and economic conditions in various markets, the flows in a company’s logistics network might be subject to large fluctuations as a result of new product launches, mergers, acquisitions, spin-offs, and strategic realignments. Such fluctuations may require the acquisition of new assets or the divesting of existing distribution center space.

Large logistics clusters include many companies operating in different industries and subject to different economic forces. The constant changes in business volume mean some growing companies need to lease more distribution space, and others may be downsizing by moving to smaller spaces or subleasing portions of their space. Unlike other more specialized industrial infrastructure, such as manufacturing plants, warehouses can readily share equipment (e.g., floor space, shelves, conveyors, and forklifts) across industries, thus allowing the expansion or contraction

into or out of adjacent distribution space with relative ease.

When LEGO Systems Inc. needed to expand its distribution center in the AllianceTexas logistics park by about 50 percent, Hillwood Development Company, the park developer and operator, was able to move LEGO from its 402,500 square foot facility to a 596,000 square foot facility down the street. Such flexibility obviates the immediate need to move to a distant new geographical location, which may be costly because of the need to alter the logistics network. A new location may also require new procurement of transportation services and renegotiation of transportation service contracts, as well as potentially changing service commitments to customers and renegotiating supplier service agreements. In addition, it may require a new labor force, labor agreements, and potentially using a new logistics service provider. In clusters, the availability of larger and smaller nearby spaces enables the shipper or distributor to maintain a stable network even as volume grows or shrinks.

Shared Workforce

Although companies operating distribution centers may not always share resources directly, they do it through their 3PL or another external organization. Exel, for example, operates multiple customer distribution centers in and around the AllianceTexas logistics park north of Fort Worth, Texas. As customer needs fluctuate, Exel moves its trained warehouse workers from one facility to the next. Exel shares labor so often that it devised an online software tool to automate the process. The tool even tracks labor hours shared across the Exel network and, coupled with a networked payroll system, ensures that each customer pays only for the labor it used.

Serving Customers when Providers Change

Logistics is a global business, and the multinationals that operate logistics networks operate on a global scale and serve, in many cases, multinational customers. Such customers routinely move their business from one logistics provider to another, impacting the way their shipments are collected, routed, delivered, tracked and paid for, throughout the world.

When a company changes logistics providers, the new provider has to get up to speed very quickly on the shipper's processes, get familiar with their facilities, hours of operation, personnel, and various special requirements. When the logistics services providers are located next to each other, it is easier for them to share their knowledge and coordinate the changes and provide the customer with a smooth transition. The uninitiated may be surprised that the "losing" company will support the change. The reason is that it is understood among all concerned that such changes happen all the time and the "loser" may be the "winner" next time around. Thus, the logistics providers make sure that above all, the customer gets good service. Naturally, it is another reason for shippers to locate within the logistics cluster where the presence of multiple logistics providers eases transitions from one to another.

Economic Impact

In these times of recessions and economic crises, governments are interested more than ever in economic growth and particularly jobs. Logistics clusters offer one possibility for certain regions, depending on their geography, to create jobs and economic opportunities.

Jobs

Many local and national governments focus their cluster development efforts on high technology, knowledge-intensive industries such as information technology, nanotechnology, and biotechnology. Most of the jobs in these industries require engineering and science graduate degrees, a segment of the population for whom unemployment is not a problem. In contrast to high-tech clusters, logistics taps labor pools across a very wide range of skill levels. At the low-end of the spectrum, jobs such as truck driver, forklift operator, or warehouse worker require little formal education and modest levels of training or work experience. Yet logistics isn't all manual labor because the industry now makes heavy use of information and communications technology to interact with suppliers and customers around the globe, control product flows, cope with global risks, satisfy exacting customer service requirements, and cut costs at the same time.

The profile of skills employed in a logistics clusters expands further in three directions beyond those required to perform logistics and supply chain management activities. First, logistics clusters include many value-added activities. For example, Flextronics repairs laptop computers in the Memphis cluster, UPS dispenses medical supplies by pharmacists working in its Louisville Supply Chain Service campus in Louisville, and ATC performs returns management service for mobile phones, including testing and repairs, in the AllianceTexas logistics park. Such activities can be performed most efficiently in logistics clusters due to the low cost and high level of transportation service in and out of such clusters.

Second, many logistics clusters actively recruit companies to relocate their headquarters, not just their logistics, to the cluster. The need to be in the "center of the action" can motivate companies to locate their global, regional, or divisional headquarters to the same location that handles distribution of products to customers. Headquarters brings additional non-logistics jobs across a wide range of white-collar corporate functions such as marketing, IT, strategy, and executive management.

Third, logistics clusters also provide jobs for the creative class, because many design-intensive consumer goods companies (such as clothing, toys, and housewares) choose to co-locate headquarters and design centers near their major global distribution hubs. For example, designers for Tabletops Unlimited in Los Angeles work next to and even in the warehouse, ensuring a tight coupling between the designer's vision for housewares products and the supplier's delivery of goods coming in and going out of the distribution center.



Wages

Not only do logistics clusters bring jobs, but they also bring increased wages and productivity improvements relative to non-cluster regions. Based on quantitative analysis of all German clusters, the Wiesbaden Center for Cluster Competitiveness estimates that a one percent increase in cluster presence in a region was associated with a €302 per employee increase in the average wages and 44 eurocents per person per hour increase in regional productivity.

The result is that logistics clusters offer a decent average wage. Dr. John Husing studies the impact of the logistics industry in Southern California. His analysis of the Los Angeles Basin shows that three sectors offer median or average wages above \$20/hour for non-college educated workers: logistics, manufacturing, and construction. In the economic environment of 2011/2012 and looking ahead, only logistics promises long-term growth. Other growing, low-skill sectors such as retail, hotels, entertainment, and Indian gaming pay an average of under \$15/hour. Of the four sectors that added jobs in Southern California between 1990 and 2004, Husing found that logistics offers the highest average annual wages (\$45,987). These wages rivaled those of the manufacturing sector. A study by the Chicago Metropolitan Agency for Planning (CMAP) echoes these findings: transportation and logistics salaries in Northern Illinois were close to and in some cases higher than those in the so-called Chicago manufacturing “super cluster.”

Logistics clusters do more than just hire low-skill workers; they provide a conduit for social mobility. Most logistics service providers value operational experience and thus hire from within the industry and promote from within the company, fueling social mobility. For example, one of the basic values of UPS is a commitment to long-term employment relationships, which often starts with students working at UPS part time.

On Balance

Although not as injurious as heavy industry, logistics activities create heavy vehicle traffic, which degrades the environment with noise, pollution, and road congestion. Objections by residential and environmental groups can stymie development and hinder operations. For example, in April 2012 a German court upheld a ban on night flights in Frankfurt Airport. The ban affects mainly freight operations, with Lufthansa Cargo estimating its resulting losses at €40 million per year.

Logistics hubs are also a concentrated source of pollution. Furthermore, the clustering of transportation terminals and distribution centers implies more circuitous transportation routing and more miles traveled as compared to traveling directly from origin to destination. At first glance, it seems that less clustered freight transportation operations would be environmentally beneficial. The correct metric for energy consumption, however, is not the fuel consumed per conveyance movement but the fuel consumed per shipment moved.

Minimizing fuel per shipment requires consolidation to larger and more efficient conveyances, and this means clustering. Thus, although logistics clustering leads to greater concentration of pollutants, it also leads to less total pollution globally.

The concentration of logistics assets in a cluster means that logistics clusters can become hotbeds for green innovation in using renewable and clean energy for transportation and warehousing. The Southern California region sports the largest logistics cluster in the US anchored by the ports of Los Angeles and Long Beach. The ports are testing numerous alternative fuel vehicles, including an LNG yard hostler, CNG port drayage truck, and an LNG locomotive. As of 2012, the port of Los Angeles has some 900 alternative fuel vehicles in use. The result of this and other programs helped slash emissions from container-hauling trucks by 89 percent.

The ports, however, seek even more radical innovations that offer zero vehicle emissions, such as entirely new battery-powered, zero-emission heavy-duty trucks invented by a local company, Balqon Corporation. The port funded the development of the technology, a multiphase testing process in port drayage applications, and an initial purchase of five units. The results are three innovative commercial products – the Nautilus E20, Nautilus E30, and Mule M150 – for medium- and heavy duty hauling for ports, logistics clusters, and inner city applications. Not only do these trucks produce zero tailpipe emissions, but their total energy consumption is 70 percent less than that of a normal diesel-powered vehicle.

Final Word

Local and national governments all over the world are investing in the development of logistics clusters. It is one of the eight strategic thrusts of the Netherlands, amounting to over nine percent of its GDP; one of the four strategic thrusts of Panama in its 2010 national plan; and one of the ten strategic clusters funded for development in Germany. In the US, business logistics provide 8.5% of the GDP in 2011.

Logistics is thus a growing business due to globalization, outsourcing, and the emphasis most companies have to put on low cost and high customer service. Furthermore, it is a business that, by and large, has to be performed locally and thus is not subject to outsourcing. In addition, it serves multiple industries and therefore is less subject to the vagaries and business cycles of any one industry, thus offering some measure of long term stability.

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