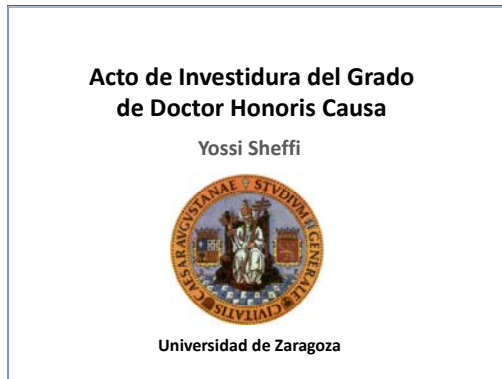


## Logistics Clusters and Economic Growth

Yossi Sheffi

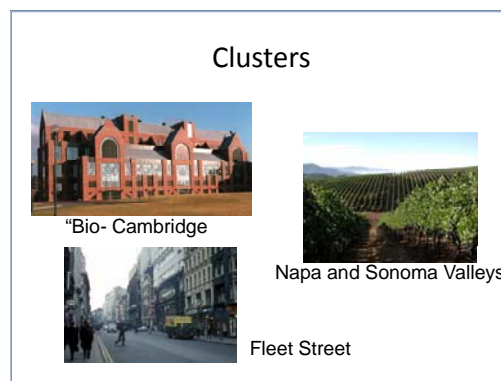
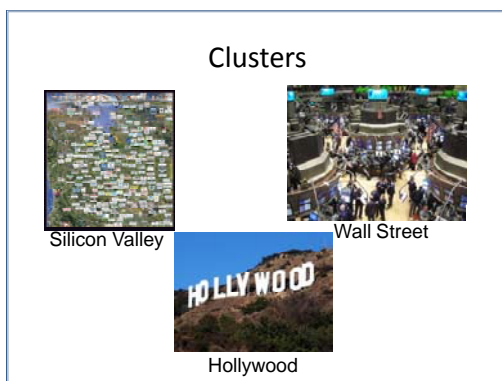


Rector of the University of Zaragoza,  
Senior faculty,  
Distinguished guests,  
Friends,

Thank you for the honor you are bestowing on me today. For the last eight years I have come to know and befriend many of you, so this honor is doubly significant for me. It cements the friendship and the shared destiny of the Aragon society with the Massachusetts Institute of Technology and me.

### Industrial Clusters


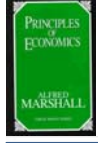

I have had the privilege to be part of the success of PLAZA and the Zaragoza Logistics Center. The success of PLAZA got me to try to understand why companies cluster and why logistics clusters in particular offer advantages. There are many examples of industrial clusters: Silicon Valley, Hollywood, Wall Street, Napa valley, and "Bio Cambridge:" there are 162 biotechnology companies within one mile of my office at MIT.



The economic literature has recognized long ago the advantages of firms co-locating next to each other. In 1920, the British economist Alfred Marshall commented on the “positive externalities of co-location” in his book “Principles of Economics”<sup>i</sup>. He mentioned knowledge sharing among the co-located firms, the availability of a specialized supply base and the availability of a specialized labor pool. Almost 80 years later, Michael Porter of the Harvard Business School published an article in the Harvard Business Review<sup>ii</sup> citing increased productivity, increased pace of innovation and a high rate of new business formation as the main advantages of industrial clusters. Many governments have adjusted their economic priorities and focused on industrial cluster development -- including the Government of Aragon.

### Literature

- Alfred Marshall, *Principles of Economics* (1920): “Positive externalities of co-location.”
  1. Knowledge sharing
  2. Supply base
  3. Labor pool
- Michael Porter, *Economics of Competition*, *Harvard Business review* (1998)
  1. Increased productivity
  2. Increased pace of innovation
  3. High pace of new business formation










When trying to understand the cluster phenomena, there are two questions that come to mind:

1. Why cluster? Isn't EDI, video-conferencing, visibility software, etc, enough for communications? (Remember Tom Friedman's “The World is Flat?”<sup>iii</sup>)
2. If this is not enough, why don't companies in a cluster acquire each other more than we see? (Remember Coase's transaction costs theory?<sup>iv</sup>)

### Economists are Asking:

1. Why cluster? Isn't EDI, video-conferencing, visibility software, etc, enough for communications? (remember Tom Friedman?)
 




2. If this is not enough, why don't companies in a cluster acquire each other more than we see? (remember Coase?)
 

The answer to the first question lies in the five advantages of clusters:

1. Trust. Clusters include, by and large, people with similar backgrounds, language, culture, religion and customs. Thus, it is easier to develop trust, among organizations and people, leading to lower transactions costs among firms whether they are trading partners or horizontal collaborators/competitors. In most cases this trust is based on relationships forged outside the work environment.
2. Tacit knowledge exchange. As systems and services become more complex, much of the knowledge associated with their development and operations cannot be codified in an email attachment sent to a supplier. Such tacit knowledge exchange supports discussions over specifications with a supplier; exchanging benchmarking information with a competitor; or supporting a customer – all made easier, faster, less expensive and more effective when conducted within a cluster – using face-to-face and chance meetings.
3. Collaboration. The concentration of firms in the same industry, with their similar needs and concerns, gives natural rise to joint activities. These include government lobbying, joint cluster development and joint activities such as procurement.

4. Research and education. The strength of engineering and computer science in Stanford University and of biotechnology and engineering at MIT mean that companies located in Silicon Valley and “Bio-Cambridge” have access to state of the art research and have a steady supply of highly educated employees, while faculty and students can work in their laboratories on real problems using actual data.
5. Supply base. As mentioned by Marshall almost 100 years ago, clusters attract suppliers who see advantages in locating next to their customers. Even in today’s environment, the opportunity for unstructured and chance interaction with customers, the opportunities to learn where their business is heading and the opportunities to forge strong, trusting and collaborative relationships with customers is very important when firms make location decisions.

The answer to the second question is that large companies have their own shortcomings: they are slow to make decisions, they are bureaucratic, and they are risk-averse. Consequently, a cluster may be an optimal organizational structure, balancing flexibility and fast decision making on the one hand with the reach and resource availability on the other. In Porter’s 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<sup>v</sup>.”

### Logistics clusters

The focus of this talk is on a particular type of cluster – a cluster of firms with logistics-intensive operations. This includes mainly three types of companies: (i) logistics services providers, (ii) companies with logistics-intensive operations, and (iii) the logistics operations of industrial firms.

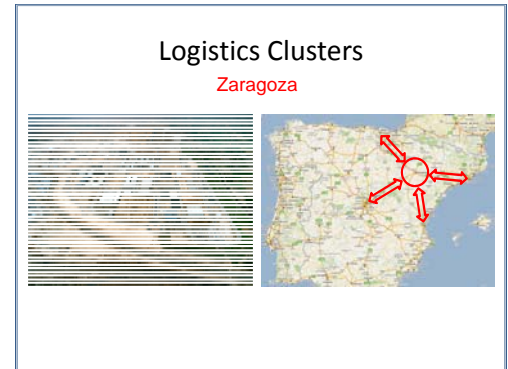
There are thousands of logistics clusters around the world. They are known as “Logistics Villages” in Germany, “Distribution Parks” in Japan, “Logistics Platforms” in Spain and various other names around the world. Here are six examples:

- Singapore – In 1965 Singapore was separated from Malaysia and lost its hinterland. In order to compete, Singapore redoubled its focus on trade and developed a re-export-oriented manufacturing economy, requiring efficient port operations, continuing Singapore’s role as *entrepôt* for Southeast Asia (about 85% of the containers that come to the Port of Singapore never enter the country and over half of the remaining material leaves Singapore as re-export). The Singaporean Port Authority (PSA) kept investing in automation, leading to continuous optimization of port services, reducing time and cost to its tenants. Today, Singapore is the world’s busiest container port<sup>vi</sup>
- Holland - Like Singapore, re-exports constitute a large fraction of total Dutch export – in this case close to 50%. Rotterdam is the largest container port in Europe but the entire Dutch logistics corridor stretching from Rotterdam, to Brabant, Breda and Fresh Park Venlo on the German border is actually a logistics cluster. Holland is also helped by a tradition



of trade going back to the East India Company, which was the 1<sup>st</sup> multinational company, operating hundreds of ships in worldwide trade.

- Zaragoza – PLAZA is the largest logistics park in Europe. You are all familiar with it. Geographically it is nearly equidistant from Madrid, Barcelona, Valencia and Bilbao, and it is an inland port between the Atlantic and the Mediterranean. The Aragón logistics cluster, however, is more extensive than just PLAZA. It includes facilities in Truel, Huesca, and Fraga, in addition to related private developments. As an aside, the development of PLAZA is also a great example of how leaders from all parts of society - community government, city government, opposition, labor, industry and academia can rise to tackle a common challenge.



- Memphis – FedEx’s move to Memphis has cemented the city’s role as a US logistics center. Memphis’ geography and climate are central to its role as the biggest cargo airport in the world. But Memphis is also a major railroad center: all five US Class I railroads have facilities there. And it is home to over 400 trucking companies and a river port on the Mississippi River. Thus, Memphis is a quadra-mode logistics cluster. The city was built based on a trading tradition mainly of cotton. The cotton trade tied Memphis to Northern industry so much so that many in Memphis did not want to secede from the Union at the beginning of the Civil War.



- Panama – The isthmus has been a trading route for many years, first by way of the Camino Real land route, which opened around 1530, then by the railroad, which opened in 1855, and then by the Panama Canal, which opened in 1914. Today, there are maritime terminals at both the Atlantic and the Pacific sides of the canal and the Panamanian investment program calls for the development of several logistics parks along the canal, transforming Panama into a hub of value-added logistics activities.



- Chicago – Chicago has developed into a trading hub thanks in large part to its location at the edge of the Great Lakes. The railroads were developed to connect the lakes’ shipping lanes to the West, thus connecting the US East Coast to the US hinterland. The Eastern railroads



then followed, making Chicago a railroad hub, an inland port and a huge logistics cluster. Today Chicago is still home to the commodities exchange and the largest inland port in the world.

As evident from these examples, in many cases logistics clusters grow around major transportation hubs: ports, airports, significant intersections and rail hubs. Transportation hubs are used for cargo transshipment – in many cases between transportation modes – as well as for consolidation activities. Anyone who has ever changed planes at a hub airport is familiar with the role of hubs in transportation network.

### Operational advantages of logistics clusters

Operational advantages of logistics clusters can be classified into two categories: transportation advantages and asset sharing advantages. The transportation advantages of logistics parks include economics of scope, scale, density and frequency of transportation services in and out of a logistics cluster.

- Economies of scope –logistics clusters present opportunities for balanced movements in and out of the cluster, avoiding equipment idle time and empty repositioning moves.
- Economies of scale – more logistics activities in the cluster create higher freight volumes in and out of the cluster. This allows transportation carriers to use larger conveyances, get higher utilization, leading to lower costs.
- Economies of density – as the density of companies in the park grows, pickup and delivery operations are becoming more efficient.
- Economies of frequency – as the volume of freight in and out of the cluster grows, companies can schedule higher frequency departures and arrivals, increasing the level of service enjoyed by the cluster's inhabitants.

All these phenomena create a positive feedback loop: the more companies that join the cluster, the lower the transportation costs and the better the level of service, attracting, in turn, more companies to the park, reducing costs and improving the transportation services even further.

Cluster participants also enjoy the ability to share resources, be they equipment or employees. The need for flexible resource sharing is rooted in the variability of product flows both in the short term and the long term. The opportunity for sharing is due to the fact that resources used in warehousing and transportation, be they equipment or labor, are not specific to each company's operations and can therefore be shared relatively easily by the companies in the cluster. As more companies join the cluster, sharing opportunities increase, making the cluster even more valuable to the companies in it.

### Value-added activities – the Memphis Example

Several companies in Memphis exemplify the value added activities made possible by a logistics cluster.

**Mallory Alexander International Logistics** processes orders for 1-800-FLOWERS and YouFlowers.com. Every night the company accepts shipments of flowers from hundreds of growers throughout Latin America. The flowers are then arranged into bouquets, as ordered on-line and on the telephone by customers. An evening order will reach the customer, anywhere in the US, the next morning.

**Flextronics** processes every night about 5,000 laptop computers in need of repair. A faulty laptop can be dropped off by 20:00 at a FedEx station anywhere in the US; by early the following morning it will be in the Flextronics facility where technicians will diagnose the problem and attempt to fix it. By the end of the day – about 18 hours later - most laptops will be repaired and sent back to be delivered the next morning to their owners, hardly 36 hours after being dropped off.



**Medtronic's** distribution center in Memphis keeps spinal kits, used by hospitals for spinal procedures. The kits can cost more than \$100,000 and hospitals cannot afford to stock them until needed. Furthermore, in any surgical procedure, only a small part of the kit is actually used. So when a doctor meets with his patient on Wednesday evening in Boston, she can schedule a surgery for Thursday noon. Medtronic will put a kit on the FedEx flight by midnight Wednesday. It will arrive at Boston Thursday morning and available to the surgeons immediately. After the surgery, the unused part of the kit is sent back to Memphis in order to be cleaned, refurbished, and ready for the next case. Furthermore, in case of an emergency operation (following, for example, following an accident), Medtronic uses a "Next Flight Out" (NFO) utilizing Delta Airlines, which has a hub in Memphis. In this case a Medtronic employee places the package with the crew of the next flight from Memphis to Boston (there are several flights a day), and a Boston hospital employee will pick up the package at the Delta counter in Boston, rushing it to the operating theatre. Naturally, using trucking services, Medtronic can send a kit overnight to any hospital within 600 miles of Memphis, a radius encompassing 152 metropolitan areas.

**Siemens Medical Systems** operates a central parts distribution center in Memphis for its Magnetic Resonance and Computed Tomography

Machines. This central warehouse supplies 17 regional warehouses throughout the country. The system enables Siemens to deliver an MRI or CT machine part within two to six hours of a customer call.



These are but a few examples of value-added operations that rely on the high level of service offered around logistics clusters, leading to value-added activities involving more employment and higher economic activity.

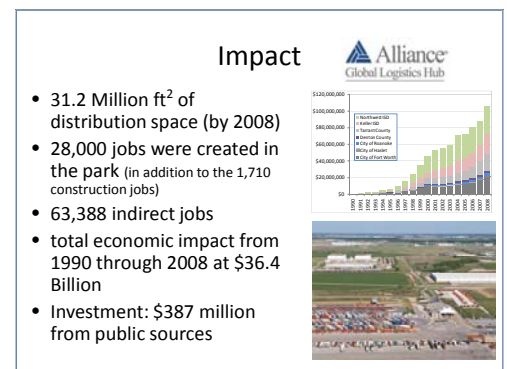
## Jobs

Many local governments chase knowledge-based industries. Many of these industries, however, create relatively small number of jobs, and often only for very skilled workers, who are also very mobile, creating long term vulnerability. Logistics clusters typically involve a large number of jobs for both skilled and unskilled labor. The traditional criticism that logistics jobs involve “moving boxes” at minimum wage is an outdated view of the industry which misses many of the benefits of logistics-related jobs. In addition to low-level manual jobs (sorting or hand-picking) the industry includes the following:

- Part time jobs, which give many employment seekers training for a future career. At UPS, which is the third largest employer in the US with over 400,000 employees, many of the part time jobs are filled by students. Consequently, UPS’ benefit package includes not only medical and retirement benefits but also tuition assistance.
- Professional jobs – many jobs in the industry involve the operations of machinery, ranging from trucks, to forklifts, as well as airplanes, trains, and ships, and sophisticated robotics equipment.
- Information technology jobs – the logistics industry is one of the largest users of sophisticated information and communications technology. The industry’s information technology sophistication comes from the need to control millions of moving items and thousands of conveyances, in real time, in order to achieve minimum cost and maximum service. For example, every year UPS spends four times as much on information technology annually as it does on buying trucks raising the question of whether UPS is really a trucking company or an information technology company.
- Executive jobs – As with any industry requiring the oversight of tens of thousands of employees, many managerial and executive jobs are associated with logistics operations.

## Economic Impact

One of the few logistics clusters that has kept meticulous accounting of the costs and benefits of the project is the Alliance Global Logistics Hub near Fort Worth, Texas. Alliance broke ground in 1990 and by 2008 had not only three million square meters of distribution space but also a privately built airport. The project has already generated 28,000 logistics jobs as well as 63,388 indirect jobs. Total economic impact has been estimated to be \$36.4 billion. The public investment of \$387 million generated an 11% return through 2008, based only on the taxes paid.



Following my current research, my next book will answer why logistics clusters contribute so much to economic growth and how can local governments encourage their formation and development.

Let me close by thanking, again, the University of Zaragoza for bestowing on me this honor, and thank you all for coming.

## References

---

<sup>i</sup> Alfred Marshall, **Principles of Economics**. London: Macmillan, 1920.

<sup>ii</sup> Michael Porter, *Clusters and the New Economics of Competition*. **Harvard Business Review**. Nov-Dec 1998

<sup>iii</sup> Tom Friedman, **The World is Flat: A Brief History of the Twenty-First Century**. New York: Farrar, Straus, and Giroux, 2005

<sup>iv</sup> Ronald Coase, "The Nature of the Firm, **Economica**, Vol. 4, Issue 16, pages 386–405, November 1937

<sup>v</sup> Michael Porter *Op. Cit*

<sup>vi</sup> American Association of Port Authorities, **World Port Rankings**, 2009.