

# The Geography of Global Supply Chains: Evidence from Third Party Logistics

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## **Abstract**

Global supply chains have a distinct geography that involves the dimensions of production, distribution, and consumption. This geography, at the heart of many sourcing strategies, is often neglected by supply chain managers, or at least scholars investigating supply chain management. Yet, this essay underlines that this geography reveals patterns that depict well the organization and structure of outsourcing with distribution systems supporting the dichotomy between the geography of production and consumption. Significant segments of supply chain management exist solely to support this spatial divergence. Global processes are also reflected in regional structures and the case of third party logistics providers is investigated. Depending on the gateway and the type of supply chain being serviced, North American 3PLs display a clustering that is particularly prevalent around airport terminals and crossborder ports of entry. Such firms are highly flexible and changes in the locational behavior are likely to reflect changes in outsourcing and supply chain management.

**Keywords:** *Freight transport, Supply Chains, Globalization, Third Party Logistics (3PL), Geography.*

## **Introduction**

The outsourcing process is well understood, particularly its rationale of lowering production costs and helping firms focus on core competencies (e.g. Rao and Young, 1994, Kholer, 2001). Its organizational outcome on global supply chains is less so as outsourcing is related to fragmented production systems and complex supply chains (Jones and Kierzkowski, 2005). In such a context, there is an emerging geography of freight distribution supporting global supply chains that rests on two interdependent concepts. First, the global economy is a system of locations where inequalities incite trade and their related flows. These inequalities can be related to basic natural endowments, standard production factors (land, labor, capital), technological and technical capabilities as well as income. What is relatively new is the capability to more effectively overcome the friction of distance

and to manage the complexity of fragmented production systems. This underlines the second geographical concept looking at global supply chains as a system of friction where the physical capabilities of transport mode, terminals and infrastructure play a fundamental role.

While the growth in international trade is a well-established trend, the geographical and functional integration of production, distribution and consumption with the emergence of global production networks remains to be better understood (Coe et al. 2004). Complex networks involving flows of information, commodities, parts and finished goods have been set, which in turn demands a high level of command of logistics and freight distribution. In such an environment, powerful actors such as maritime shipping companies, terminal operators and third party logistics providers have emerged. They are not directly involved in the function of production and retailing, but mainly take the responsibility of managing the web of flows.

Global supply chains are thus characterized by a growing level of integrated services, finance, retail, manufacturing and distribution. This integration is favored by improved transport and logistics, efficient exploitation of regional comparative advantages and a transactional environment supportive of the legal and financial complexities of global trade. This essay will look at the three interdependent geographies of global supply chains; the geography of production, distribution and consumption. Once these geographies are covered, the analysis will focus on the role of third party logistics providers and their propensity to cluster around terminal facilities.

## **The Three Geographies of Global Supply Chains**

### **Geography of Production**

Up to the 1970s, the three dominant factors of production, land, labor and capital, could not be effectively used at the global level. For instance, a corporation located in one country had difficulties taking advantage of cheaper labor and land in another country, notably because regulations would not permit full (and often dominant) ownership of a manufacturing facility by foreign interests. This limitation was gradually overtaken by economic integration and trade agreements (Walker, 2000). Facing integration processes and massive movements of capital coordinated by global financial centers, factors of production have achieved an extended mobility, which can be global in some instances. To reduce their production costs, especially labor costs, many firms have relocated segments (sometimes the entire process) of their industrial production systems to new locations; a process commonly known as offshoring. In the past quarter of a century, no other components of the global economy than China have more impacted the geography of production and particularly the location of manufacturing (Demurger et al., 2002).

Special economic zones (SEZ) played an instrumental role in the integration of China to the global economy and brought forward an entirely new geography of production. These areas aim at attracting foreign investment and technology, many through the setting of joint ventures, to provide employment, to utilize Chinese and imported resources, and to support capital formation (Ge, 1999). The bulk of the output is to be exported to foreign markets, underlining that SEZs are part of an export oriented strategy that has characterized many Asian economies since World War II. The following incentives were the most salient for foreign investors (World Bank, 2009):

- Labor. The ability to use the vast Chinese pool of low cost labor was a powerful incentive to locate in SEZs. Foreign firms have also the right to hire and fire labor, which was different from the then prevailing Chinese lifetime system of public or collective firms.
- Land use. SEZs were physically developed as planned entities with infrastructures and access to a container port complex so that parts and raw materials could easily be brought in for processing and shipped to foreign markets. A degree of protection of private property was also significant since until 2004, there was no constitutional protection of private property outside SEZs.
- Tax incentives. SEZs offered reduced corporate income tax rates, including income tax exemptions for foreign nationals working in SEZs. No custom duties are levied on imported materials and parts as long as they are for re-exports.

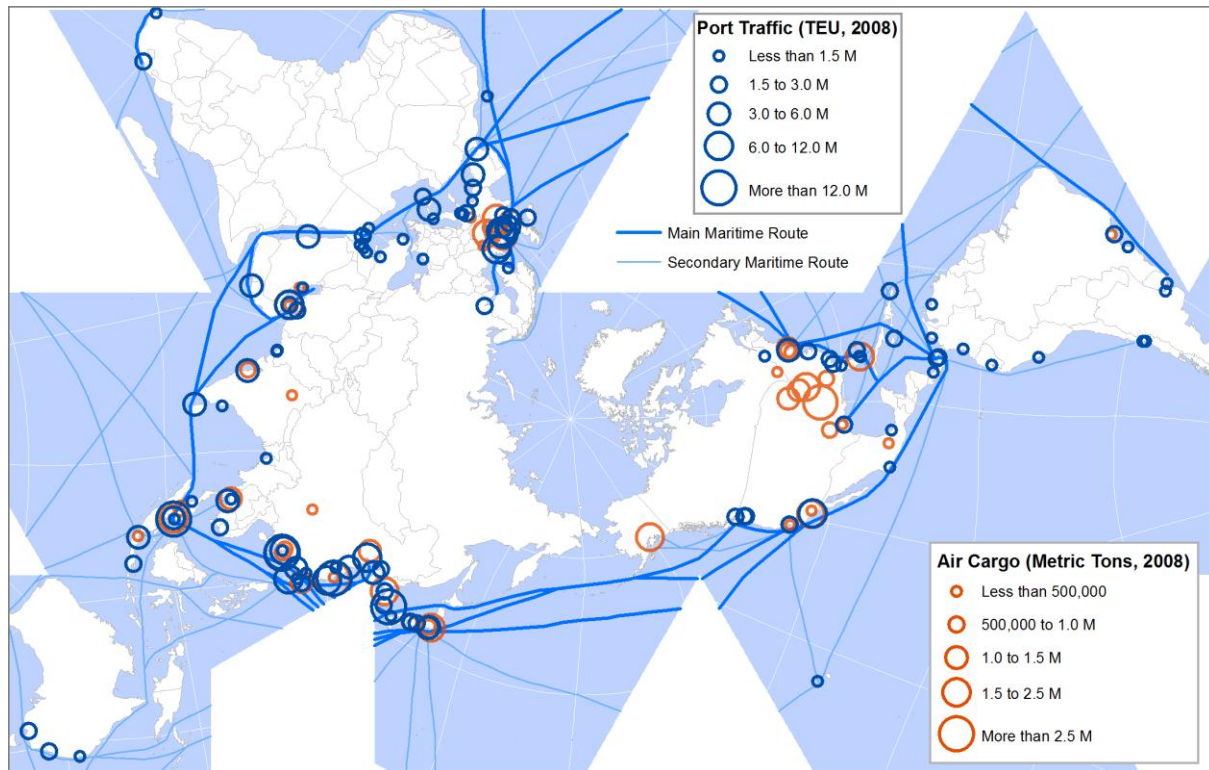
The development of SEZ went through several stages which were linked with the setting and expansion of major container port infrastructure. In 1980, the first four SEZs were established in proximity to Hong Kong (Shenzhen), Macau (Zhuhai) and Taiwan (Shantou and Xiamen). The success of SEZ's led to an interest in the planning of industrial clusters. In time, the Pearl River Delta (PRD) would become the world's most important manufacturing cluster. The development of manufacturing clusters was also accompanied by the development of port terminal clusters, implying that the PRD was becoming a port system. The resulting locational pattern of development can be seen in Figure 1, where additional ports were established inland to promote interior economic development. However, the continuing importance of the SEZ's reinforces the reality that China's geography of production is strongly coordinated by its proximity to coastal areas and their capabilities to access global markets through port and airport terminals. Comparatively, limited developments have taken place in interior and western Chinese provinces.



**Figure 1 - China's Special Economic Zones (Source: World Bank, 2009)**

### **Geography of Distribution / Transportation**

The setting of a global geography of production has been accompanied by a restructuring of global transportation and distribution networks. Transport terminals are unique bottlenecks in global freight distribution as they consume scarce land and have demanding site criteria. Yet, their location and characteristics provides opportunities for supply chain managers to adapt to the constraints they impose. Seaport and inland terminals are taking up a more active role in supply chains by increasingly confronting market players with operational considerations such as imposing berthing windows, dwell time charges, and truck slots. This increases throughput, optimizes terminal capacity and makes the best use of available land (Rodrigue and Notteboom, 2009).



**Figure 2 - World's Main Container Ports and Air Cargo Airports, 2008 (Sources: Containerization International & Airport Council International)**

Figure 2 reflects well the production pattern discussed in the previous section, where the current weight of coastal China is preponderant as shown by the concentration of production and port facilities along the Asian/Chinese coast. Containerization completely changed the world's commercial geography with the emergence of new port locations reflecting changes in the global geography of production and consumption. This geography indicates a high level of traffic concentration around large port facilities, notably for Pacific Asian ports along the Tokyo - Singapore corridor. As export oriented economic development strategies took shape, containers handled in Pacific Asian ports as well as ports linked with the Asia trade surged. There is also an emerging geography of container ports where there is a specialization between container ports acting as gateways and container ports acting as intermediate hubs. Gateway ports command the access of large manufacturing or market regions. Hong Kong, Los Angeles and Rotterdam are notable examples. Intermediate hub ports (or offshore hubs) act as intermediary locations where containers are transhipped between different segments of the global maritime transport system. Singapore and Dubai are among the most prominent.

Similarly, air freight activity differs from passenger activity, especially in the United States (Bowen, 2010). The Midwest being the economic centroid of the United States, many air freight forwarders have located their hubs at airports such as Memphis (Federal Express) and Louisville (UPS) that generate little passenger traffic. The importance of Pacific Asian airports is linked with the specific role of the region in the global economy, especially over electronics. Since these products tend to have a high value-to-weight ratio, air transport is particularly suitable for their shipping to North

American and Western European markets. Because long distance cargo planes have less range than passenger planes, two airports play a notable intermediate role, Anchorage (Pacific Asia - North America traffic) and Dubai (Pacific Asia - Western Europe traffic).

### Geography of Consumption

The global geography of consumption is highly important as it drives the structure that most supply chains are servicing. This geography is a complex web of essential and discretionary spending patterns that can mainly be represented as an urban system reflective of the intensity of material consumption since cities are locations of final consumption. This demand variable must be measured by a socioeconomic welfare factor reflective of the level of consumption on a per capita basis. The Human Development Index (HDI), which is a composite measure ranging from 0 (lowest) to 1 (highest) including life expectancy, literacy, education and gross national income per capita, is reflective of the material intensity of consumption since a society with a high HDI score has the material means to provide a range of social services while individuals have significant discretionary incomes. In spite of a wide diversity and cultural preferences, the materialization of consumption has been prevalent among the world's cities (Zukin, 1998). On Figure 3, acute differences are observed between the distribution of large cities of more than one million inhabitants, which increasingly concerns developing countries (e.g. China, India, Brazil), and the level of development where high HDI scores are related to what is known as the "triad"; North America, Western Europe and Japan (Japan / South Korea / Taiwan).

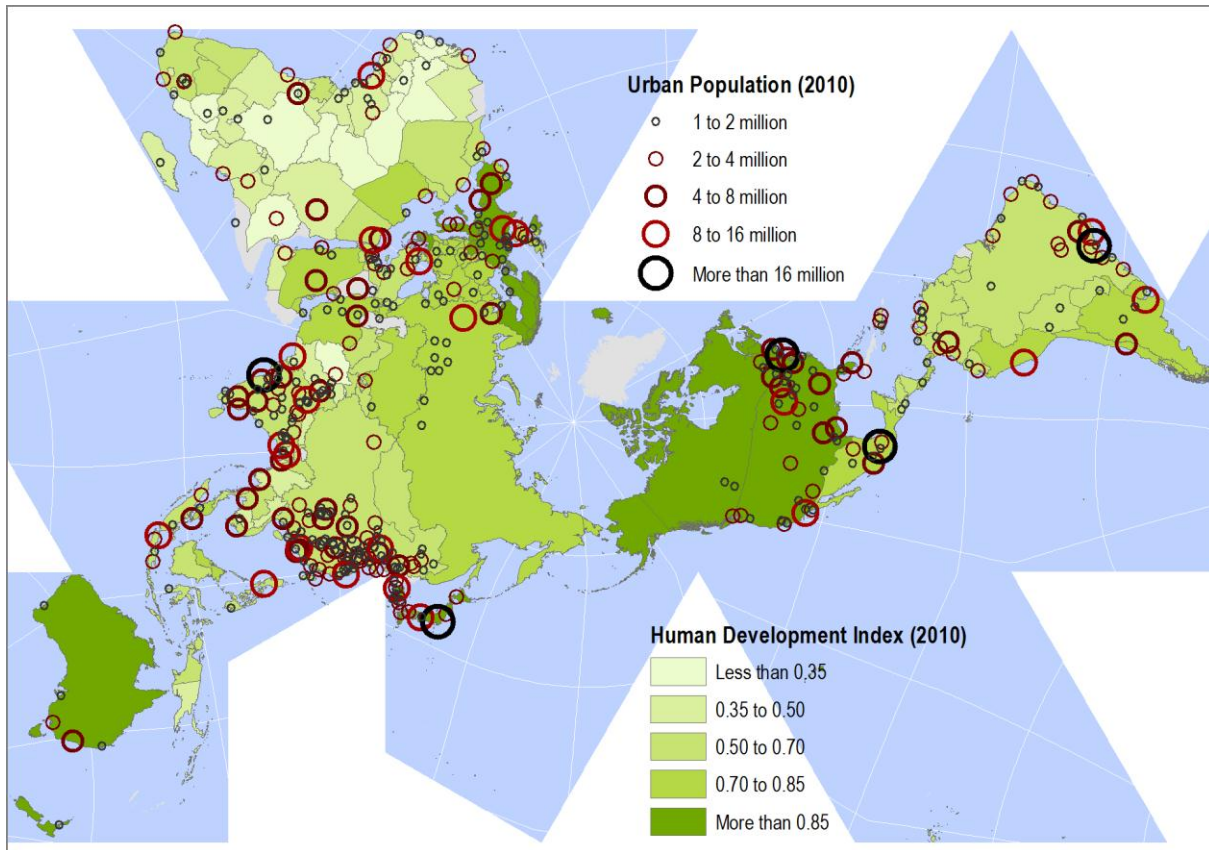


Figure 3 - World's Largest Cities and Human Development Index, 2010 (Source: UNEP, 2010)

The concentration of consumption around the triad was the main focus of export-oriented strategies (also known as the Asian development model) and the global supply chains they supported. The import-based and imbalanced logistics of North America and Europe, in which many supply chains are focusing on retail goods, is being challenged through a convergence of macroeconomic factors. A share of the North American and European consumption was based on debt and asset inflation (e.g. housing bubble) and was thus an artificial and temporary driver that played mostly between 2001 and 2008. The aging of the population and the growth of the share of the workforce in retirement are also significant economic forces that will impact the nature and the extent of the consumption in the developed world, particularly for Europe and Japan. While the current geography of consumption shows a significant division between production and consumption, a rebalancing towards a level of consumption more in line with location of production is to be expected. Growing buying power in developing economies and diffusion of consumption norms and patterns will involve the refocusing of supply chains to locations that were previously ill-served.

## **The Spatial Organization of Global Supply Chains: A 3PL Perspective/ Example**

### **Third Party Logistics Providers and Outsourcing**

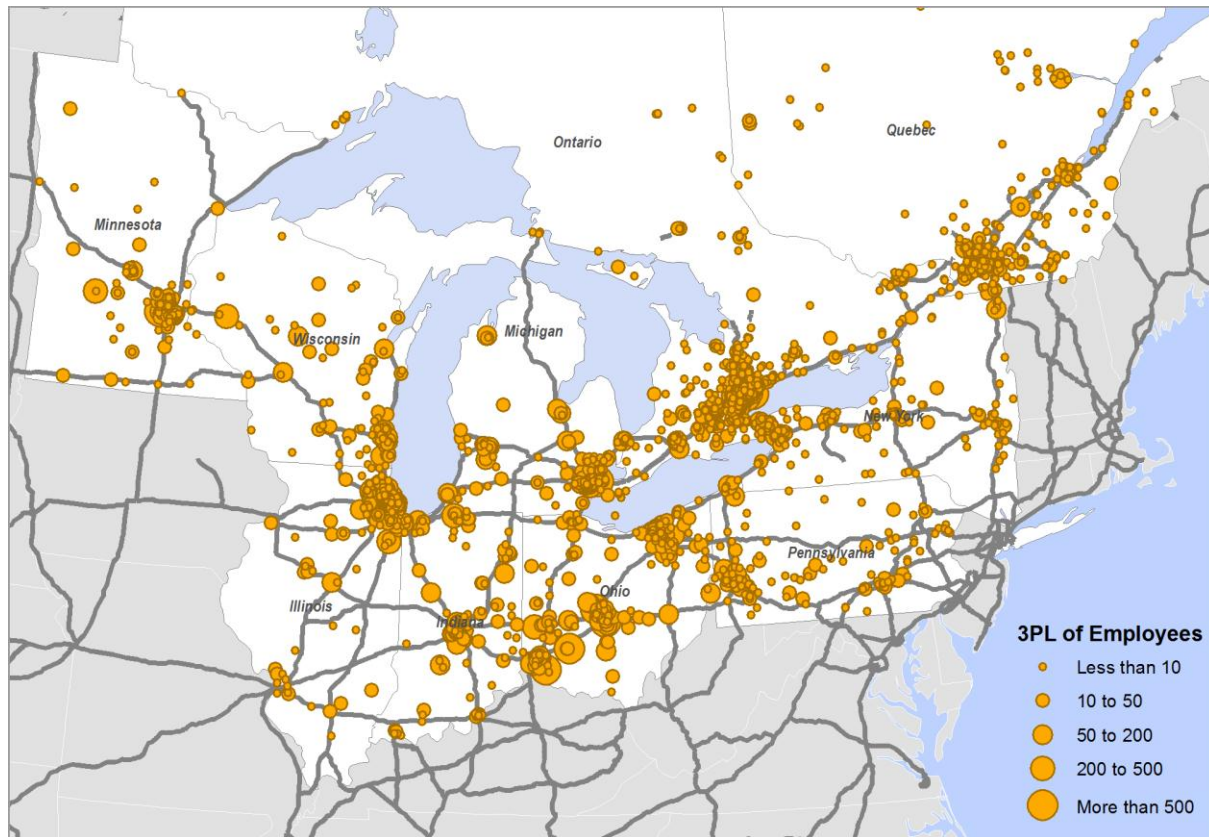
Globalization, offshoring and the growing complexity of supply chain management has incited the expansion of firms specializing in transport and logistics services (Kholer, 2001). Third party logistics providers (3PL) are firms other than the beneficial cargo owners and usually independent of the carriers and are involved in the setting and operations of supply chains on their customers' behalf. For many firms, supply chain management is not perceived as a core competency and consumes resources that could be better utilized otherwise, so some supply chain services can be subcontracted. The range of services provided by 3PLs can be narrow or wide, regional or global, sector or commodity specific (Maloni and Carter, 2006). The added value provided by 3PLs is supply chain specific rather than specific to the physical characteristics of the goods. It can for instance involve supply chain time or cost improvements or the increased reliability of goods movements. 3PLs can be asset-based, where they operate modes, terminals or distribution centers, or non-asset based where they can set or manage specific supply chains on behalf of their customers or assist in new sourcing strategies.

The main advantages which are expected from outsourcing logistics are commonly interdependent (Lieb and Bentz, 2005). The most salient relates to a reduction of input or operating costs, which mostly involves lower distribution costs through a better usage of transportation and warehousing assets. Improving customer service is also a common goal, mostly through a higher reliability of distribution, implying that demands are better met from a time and reliability standpoint. 3PLs tend to have better systems and procedures to deal with customer interactions. Supply chain management knowledge and expertise that can be accessed and that was previously not available internally is often mentioned as an explanation for why firms would contract a 3PL. For example, when offshoring takes place, a firm is commonly less familiar with the new market for inputs, including the management of the extended supply chain. This is again a reason why a 3PL can be used.

While 3PLs conventionally supplied third party, transportation, distribution and related logistics activities, many 3PLs are getting involved in new activities in order to capture additional income sources and provide a higher level of supply chain integration. Vertical (through an existing supply chain) and horizontal (through other supply chains) integration are common expansion strategies (Carbone and Stone, 2006). Also, 3PLs are offering consultant supply chain services, which have conventionally been offered by 4PLs (firms without assets solely offering supply chain services). They can also offer services, such as packaging and labeling, which were offered by beneficial cargo owners. A strategy is to try to offer a wide range of door-to-door services in order to bind their customers as effectively as possible and therefore reduce the risk of a customer departure. Other actors are also stepping into the logistics services sector. For instance, many maritime shipping companies have expanded the scope of their logistics services to include a variety of inland activities including terminal operations, trucking, warehousing, transloading, chassis management and even rail shuttles (in Europe). Their objective is to generate and retain traffic on their ocean networks while adding value to their customers supply chains. The point is that the nature and range of activities being pursued by 3PLs is increasingly blurred.

### **The Clustering of Third Party Logistics Providers**

The shifts observed in the 3PL industry are changing several components of the geography of supply chains, a trend which bears detailed investigation. In particular, the clustering of 3PL firms is apparent since many are assuming their locational strategies to maximize proximity to markets and transport terminals (Figure 4). While clustering is well understood in economic theory as a factor promoting transactional efficiency, the spatial and functional context of the clustering of logistics activities is not well understood (Meijboom and Rongen, 1995). As the map below shows, a clustering of 3PL firms in the Great Lakes region is already apparent, but is not necessarily related to demographic importance but to the function each location plays in the North American production and freight distribution system. This pattern is far from being static since supply chains are constantly evolving with changes in sourcing and distribution strategies as well as how distribution takes place.



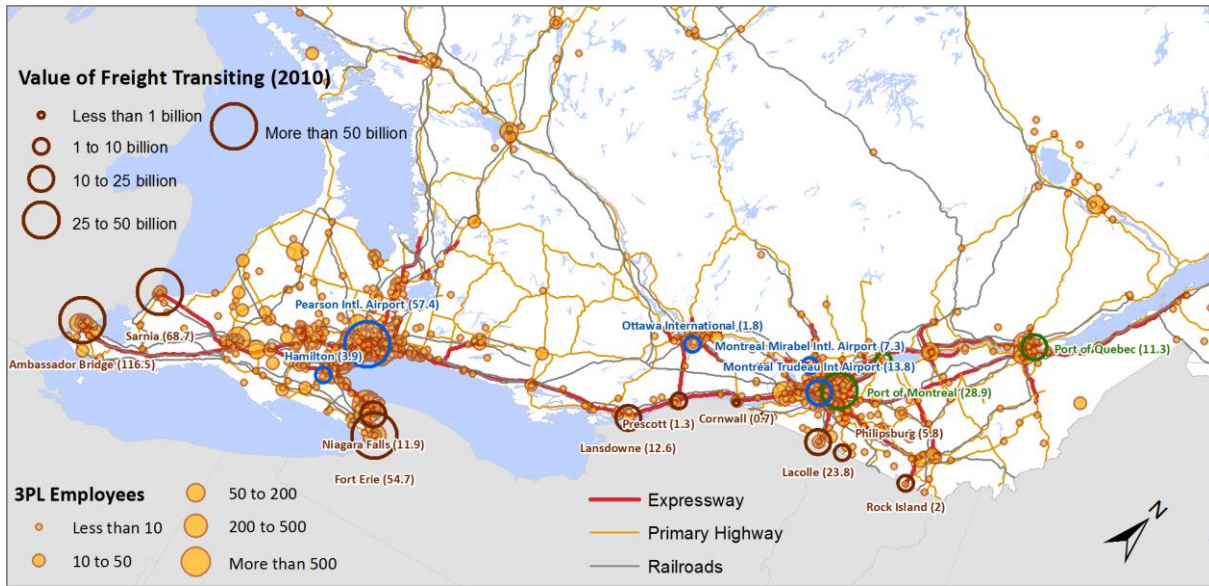
**Figure 4 - Location of 3PL Firms in the Great Lakes Region (Source: base data from Dun & Bradstreet, primary NAICS code 488510)**

The clustering effect above appears related to the respective transport time, or more specifically to the time dependence of the supply chain. For instance, for a 3PL, proximity to an airport is critical as air cargo tends to be time sensitive (measured in hours). Alternatively, proximity to a port terminal may not be judged essential for a 3PL since maritime shipping concerns transport legs measured in weeks. Since a port of entry is at the same time an intermodal and a transactional point, it is not surprising that 3PLs tend to locate in proximity. Therefore, looking at North American evidence, five clustering location patterns for 3PLs can be suggested:

- **Customer/transactional centric.** A location within a major central business district where close interactions with major customers, mostly corporate head offices, is fundamental. This is particularly the case for the retailing sector.
- **Airport centric.** A location in proximity to a major airport terminal enabling the 3PL to effectively deal with the time sensitivity of air cargo (e.g. custom clearance, delivery).
- **Market centric.** A location accessing and servicing main regional markets, particularly for the retail sector dealing with inbound logistics. They commonly involve intermediate logistics functions such as crossdocking and daily store restocking.
- **Border centric.** A location in proximity to a major cross-border gateway to assist customs-related procedures and take advantage of cargo consolidation / deconsolidation opportunities.

- **Port centric.** A location in proximity to port terminals where benefits are derived from intermodal activities such as transloading.

Figure 5 provides a greater level of detail of this clustering effect for the Quebec – Windsor corridor, which is remarkable, particularly if overlaid with the value of freight transited at major modal ports of entry (cross-border stations, airports and ports). This corridor accounts for 60% of Canada’s gross domestic product. The largest cluster in Canada is around Pearson International Airport (Toronto), which is the Canadian port of entry that accounted for the largest value of international trade (\$57.4 billion of transited freight in 2010). Other airports (e.g. Montreal) also have a clustering of 3PLs, but to a lesser extent, mostly because of lesser volumes.



**Figure 5 - Value of Freight Transiting at Main International Ports of Entry and Location of 3PL Employment along the Quebec – Windsor Corridor (Note: Brown = transborder freight, Blue = air freight, Green = maritime freight) (Source: base data from Dun & Bradstreet, primary NAICS code 488510, Statistics Canada International Trade Data.)**

The border centric clustering effect is also evident with the major NAFTA ports of entry each having 3PL firms in proximity with the Ambassador Bridge (between Detroit and Windsor) being the most important land gateway in North America in terms of value of traffic. This volume is bound to involve an array of customs related issues as well as consolidation and deconsolidation activities performed by 3PLs. In contrast, the port centric clustering observed along the Quebec – Windsor corridor tends to be coincidental with central business districts.

## Conclusions

Global supply chains have a distinct geography that involves the dimensions of production, distribution and consumption. This geography, at the hearth of many sourcing strategies, is often neglected by supply chain managers, or at least scholars investigating supply chain management. Yet, this geography reveals patterns that depict well the organization and structure of outsourcing with distribution systems supporting the dichotomy between the geography of production and

consumption. Indeed, a significant segment of supply chain management exists solely to support this spatial divergence.

Global processes are also reflected in regional structures as the case of third party logistics providers underlines. Depending of the gateway and the type of supply chain being serviced, North American 3PLs display a clustering that is particularly prevalent around airport terminals and crossborder ports of entry. Such firms are highly flexible and changes in the locational behavior are likely to reflect changes in outsourcing and supply chain management.

In light of the interrelated trends in the geographies of production, distribution, and consumption, the following research venues appear promising:

- The impacts of geography and the major global changes (economic, social, political) on new supply chain location decisions, particularly at the firm level. While location decisions outcomes are readily observed (e.g. the location of a distribution center), it is relevant to assess the decision-making process that has led to site selection. The straightforwardness of site characteristics is blurred by supply chain considerations, often global in scope.
- The changes in power relations and structure of global supply chains in light of the constant shift and rebalancing of sourcing and comparative advantages.
- The forms the clustering of logistics activities, such as 3PLs, takes over the competitive landscape of freight distribution. Several forms of relations are possible, ranging from standard competition, mergers and acquisitions, to forms of collaboration.

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