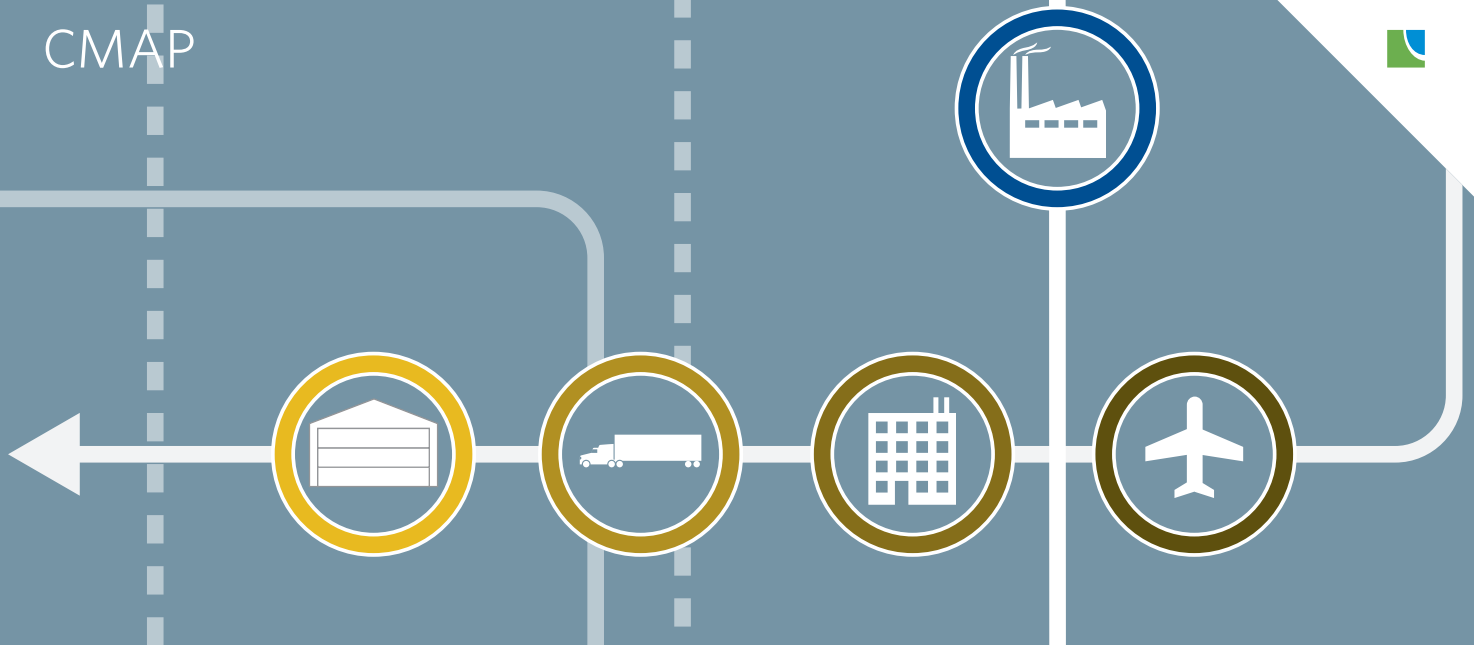
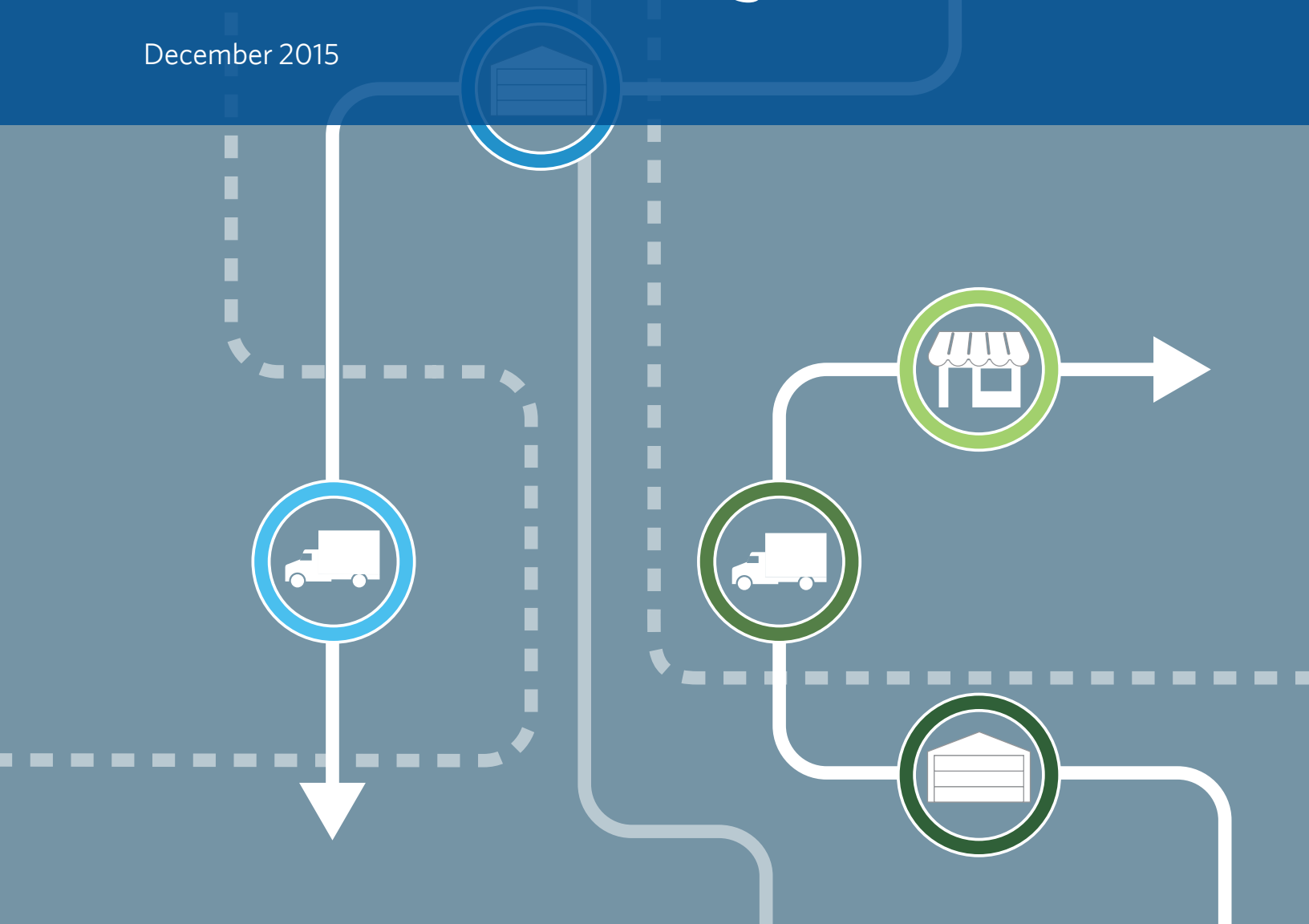


CMAP



Chicago Region Supply Chain Trends and Trading Partners

December 2015



CMAP is the region's official comprehensive planning organization. Its GO TO 2040 planning campaign is helping the region's seven counties and 284 communities to implement strategies that address transportation, housing, economic development, open space, the environment, and other quality of life issues. See www.cmap.illinois.gov for more information.

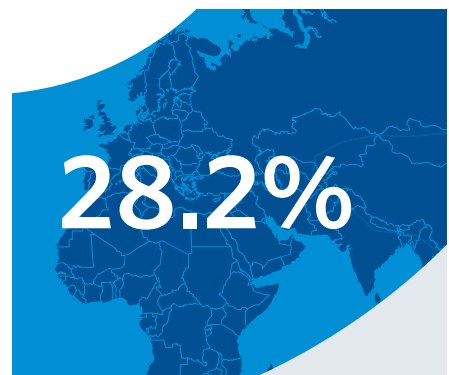
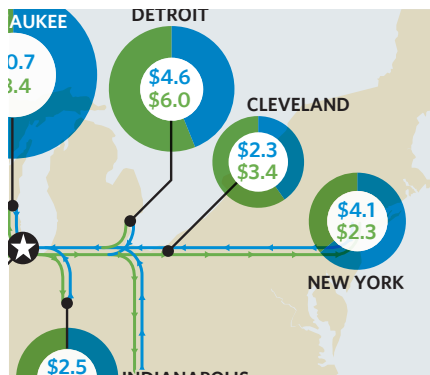
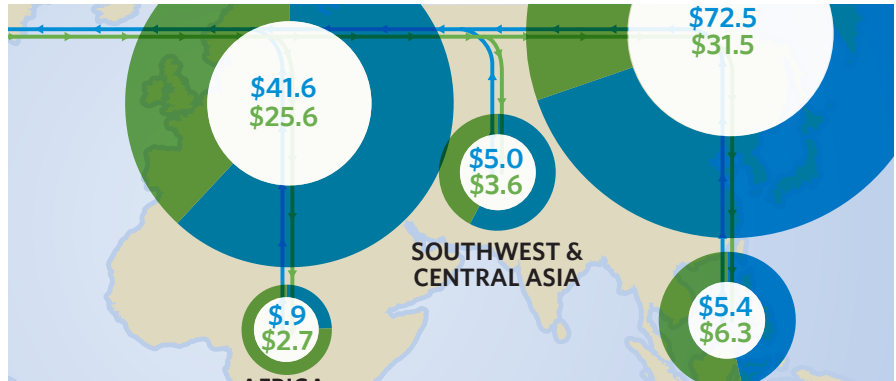
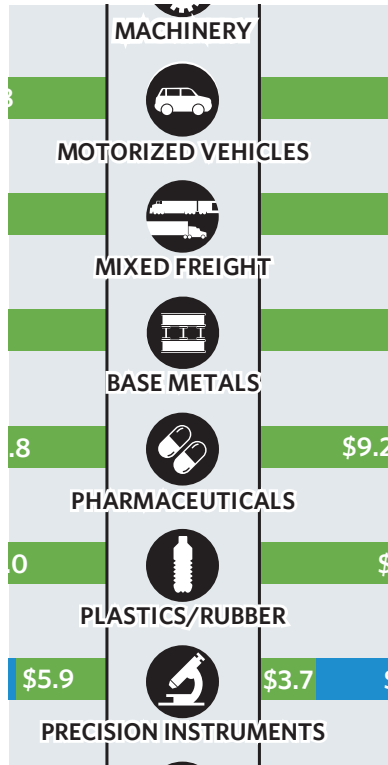
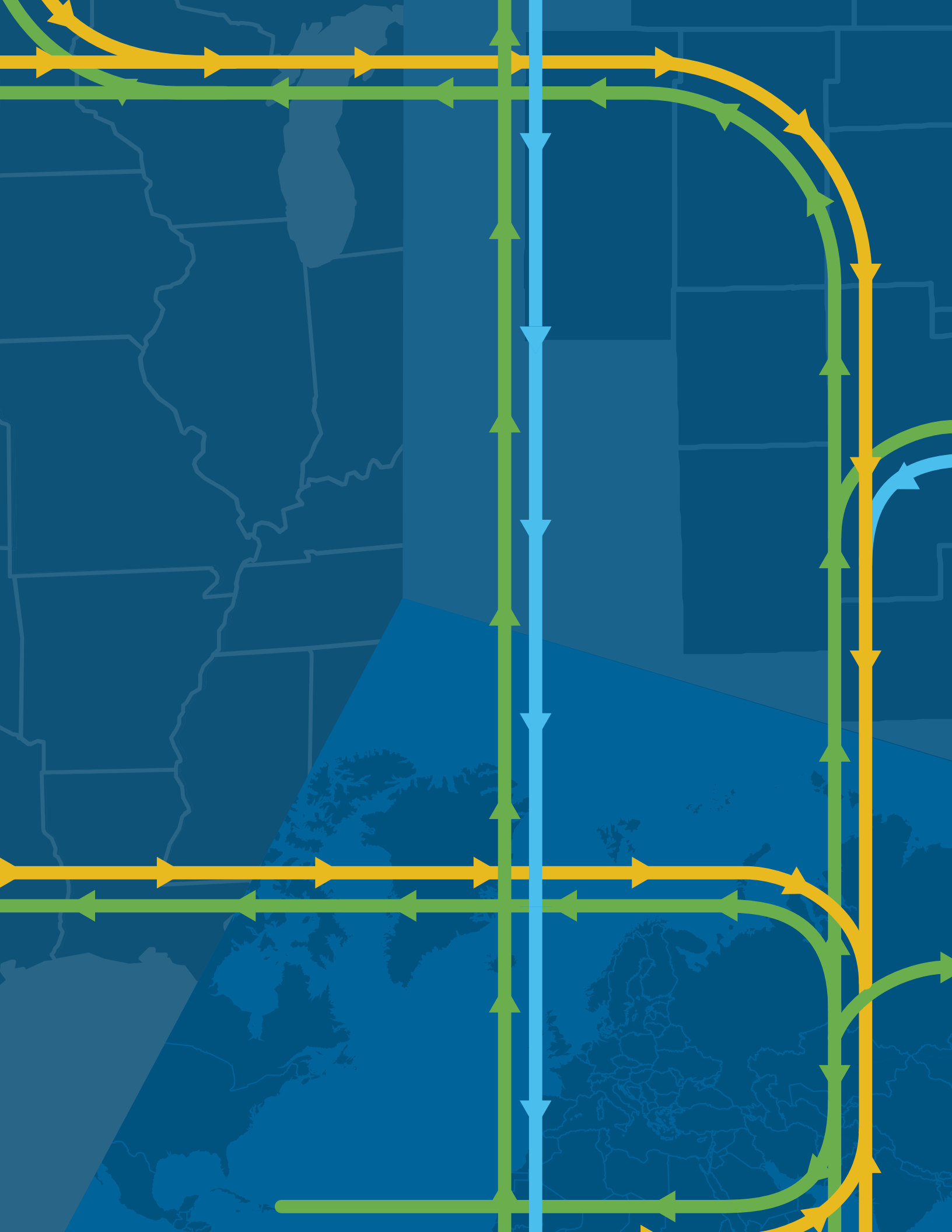


Table of Contents

Introduction	5	Modern supply chain production and logistics systems	17
Metropolitan Chicago's trading partners	7	Outsourcing logistics	17
Domestic and foreign trading partners	8	Freight transportation arrangement industry	18
Traded commodities	12	Multimodal transportation	20
Manufacturing and mode choice	15	Warehousing and distribution	22
		Opportunities and challenges	24
		Conclusion	26
		Endnotes	27

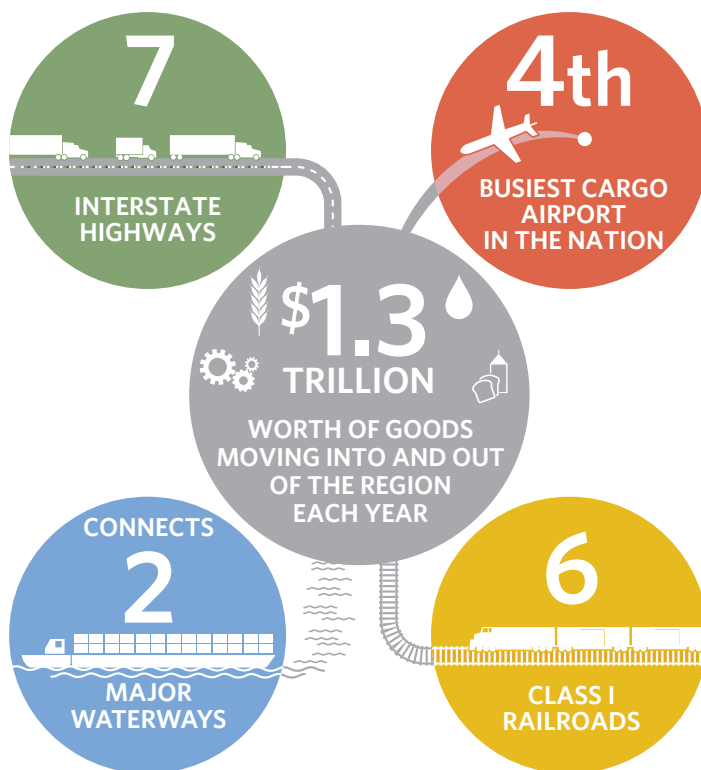


Introduction

Metropolitan Chicago is one of the nation's few global centers of commerce. According to the Bureau of Labor Statistics, the region produced over \$610 billion worth of goods and services in 2014, making it the third largest metropolitan economy in the U.S. after New York and Los Angeles. The region is a major origin, destination, and distribution point for primary, intermediate, and finished products.¹ Approximately \$1.3 trillion in goods moves into and out of metropolitan Chicago each year — an amount more than twice the region's GDP.²

Transportation infrastructure plays a key role in fueling the region's economy by connecting northeastern Illinois to the rest of the world. The region is home to one of the busiest cargo and passenger airports in the nation, houses more than one billion square feet of industrial space, enjoys connections to two major waterways, and is one of nation's largest container ports. Seven interstate highways and six major rail networks provide unparalleled access to major ports on the East and West Coasts. Trains leaving the region are able to reach eight of the ten busiest U.S. ports in under three days and all ten ports within five days.³

Figure 1. Metropolitan Chicago freight assets



Note: Total freight value includes all modes designated by the Freight Analysis Framework.

Source: Chicago Metropolitan Agency for Planning analysis of Federal Aviation Administration, Freight Analysis Framework data, 2012.

This prominence as a node for freight movement means that when the region's freight system works effectively, it supports local and national economic growth by opening up metropolitan Chicago to new markets and facilitating the free flow of freight to and from the East and West Coasts. When the system performs poorly or is disrupted, however, the economic repercussions are felt both locally and nationwide. Understanding and improving metropolitan Chicago's connections to the nation and world is critical to our long-term economic success.

Advances in freight and logistics are changing how goods are moved. Today's manufacturers interact with suppliers and customers across the globe, often forming complex supply chains in the process. As a result, manufacturers now increasingly outsource some or all of their logistics functions, which has given rise to a growing freight transportation arrangement industry in the Chicago region and nationwide. Information technology enables manufacturers and logistics providers to leverage the strengths of multiple freight modes to move goods while minimizing costs and maintaining or increasing reliability. The speed and complexity of goods movement is also shifting storage space demands increasingly toward the use of distribution centers, which provide a number of value-added services beyond what standard warehousing space provides. The changing nature of supply chains and freight movement presents a number of opportunities and challenges for the region.

Metropolitan Chicago's current comprehensive plan, GO TO 2040, highlights the importance of the region's infrastructure as an asset for economic success. Our region's infrastructure provides manufacturers with access to multiple freight options that provide timely and cost-effective shipping. Modernizing freight infrastructure can relieve congestion and enhance the reliability of freight modes that our region's manufacturers depend on. Planning for and investing in infrastructure that supports multimodal freight transportation, such as truck-rail intermodal, will also help foster the region's economic competitiveness. Road and rail traffic delays in the region are a common occurrence, both for passenger and freight carriers. These delays impose costs on the region's economy through lost time for workers and less reliable shipping for manufacturers. These delays can also affect the national economy because the region is a major hub for freight movement. Performance-based programming can help guide regional infrastructure investments in a way that increases the speed and dependability of freight movement in the region.

This report explores how goods flow into and out of metropolitan Chicago, the decisions that drive those movements, and the economic repercussions of changing freight flows. The first section of this report analyzes Freight Analysis Framework (FAF) data to identify the region's key trading partners, the types of commodities moved into and out of the region, and the freight modes by which these commodities are moved. The second section explores the changing decision points that drive freight and logistics choices for the region's manufacturers. The report concludes by highlighting the importance of modernizing our region's freight infrastructure and engaging in multimodal freight planning in order to foster economic

Metropolitan Chicago's trading partners

Businesses in the Chicago region trade goods with a number of partners on the national and international scales. This trade satisfies demand by consumers for products and by manufacturers for raw materials and intermediary inputs. It also allows the region's manufacturers to sell their output in other markets. This report analyzes the Federal Highway Administration's FAF data to understand these regional trade patterns.⁴ The following analysis includes goods moved by truck, rail, air, and water into and out of the Chicago region FAF zone, which includes the seven-county CMAP region of Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will Counties, along with neighboring DeKalb, Grundy, and Kankakee Counties.

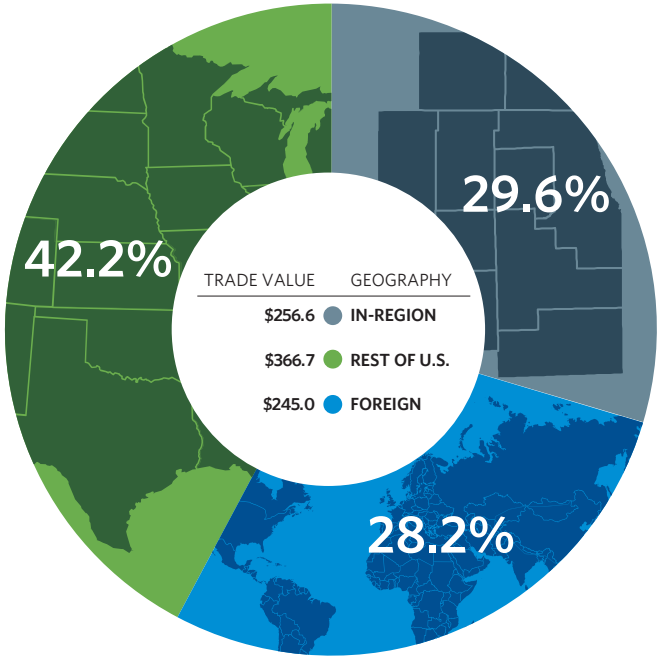
FAF data show the movement of 43 different commodities based on the Standard Classification of Transported Goods, a system designed to allow for easy comparison of freight flows around the world.⁵ The domestic portion of this analysis examines trade between the Chicago region and other metropolitan areas based on FAF zone geographies. By value, slightly less than half of domestic freight shipments into and out of the region originate from or terminate in non-urban FAF zones across the U.S., such as the remainder of Illinois and non-metropolitan portions of Wisconsin and Indiana. Because the focus of this analysis is supply chain trends among metropolitan regions, non-urban flows are not discussed in detail here.⁶

The FAF represents the most comprehensive regional freight data available, but the data are not without limitation. The FAF struggles to capture multimodal freight shipments, which are becoming increasingly popular as intermodal transportation evolves and freight infrastructure becomes more integrated between modes. The commodity classifications used in the FAF to identify the types of goods being moved are often vague, which makes it difficult in some instances to make concrete conclusions about the flow of goods into and out of the region. Despite these limitations, FAF data can still be used to develop a high-level understanding of the region's trade activity.

Domestic and foreign trading partners

At the broadest level, the region’s trade patterns can be split into three main categories: domestic, foreign, and in-region. Domestic trade includes trade between the region and metropolitan and non-metropolitan parts of U.S., accounting for 42 percent of all trade activity. Foreign trade includes the export and import of goods to and from Canada, Mexico, and other regions of the world, accounting for 28 percent of the region’s trade. Freight flows within the region — that is, freight shipments originating and terminating within the Chicago FAF zone — account for slightly less than 30 percent of all flows.

Figure 2. Chicago region total trade value by geography, 2012, in billions of dollars



Note: Freight modes include air, truck, rail, and water.
 Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.

Figure 3 depicts the Chicago region’s top U.S. metropolitan trading partner regions by total flow value.⁷ The region’s three largest domestic trading partners are Milwaukee, Los Angeles, and Detroit. Milwaukee’s proximity to Chicago and connections across numerous industries and supply chains make it Chicago’s largest trading partner. In 2012, the two regions traded approximately \$19 billion worth of goods, nearly all of which was moved via truck. The most common commodity traded between the regions is mixed freight, which predominantly flows from Milwaukee into Chicago and includes items such as groceries, restaurant supplies, hardware, and other consumer goods.

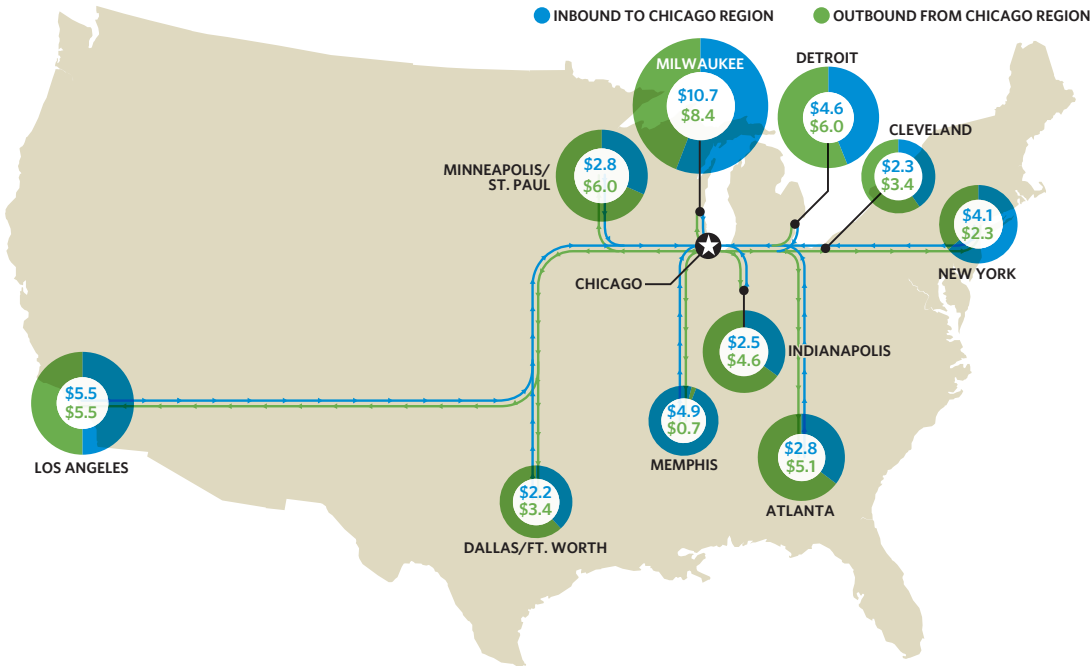
The region's second largest domestic trading partner is Los Angeles, which traded \$11 billion in goods with metropolitan Chicago in 2012. In addition to being one of Chicago's largest domestic trading partners, Los Angeles is also a critical hub for the region's exporters, who moved approximately \$13 billion of goods through Los Angeles ports in 2012.

By value, Los Angeles is Chicago's second largest export gateway after Alaska. Chicago exports that move through Los Angeles include heavy, lower value commodities, such as basic chemicals, agricultural products, or base plastics and rubber. Nearly all goods moved from Chicago to Los Angeles for export are loaded onto cargo ships to be moved to their final destination. Chicago exports moving through Alaska tend to be light weight, high-value commodities, such as pharmaceuticals, electronics, and precision instruments (which include a variety of items, such as eyewear, medical instruments, photocopy machines, and industrial gauges and meters). These exports are usually flown to their final foreign destinations.

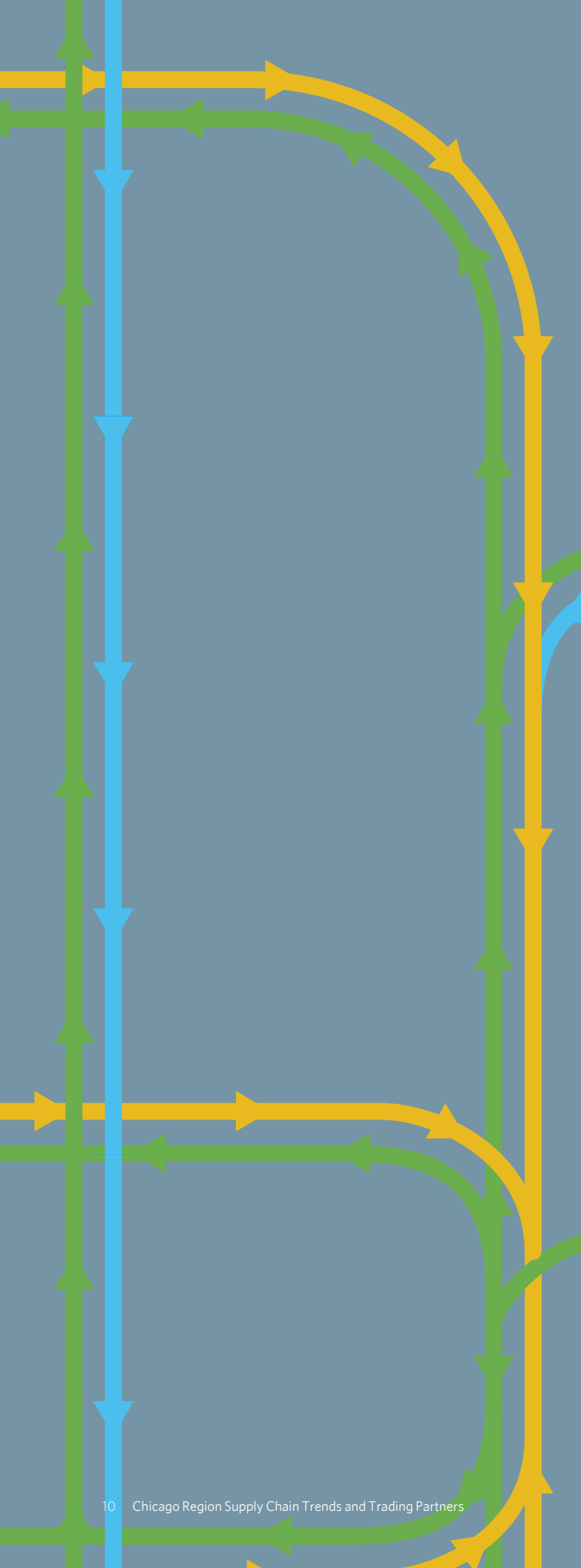
Because of its coastal location, Los Angeles is a key partner for the trade of intermodal containers. Intermodal containers are offloaded from international cargo ships at the ports of Los Angeles and Long Beach and then sent via train to the Chicago region. Once in Chicago, containers are transferred from train to truck and then hauled to their final destination. This process also works in the opposite direction, with the region's manufacturers filling intermodal containers with goods to send back to Los Angeles, either for domestic consumption or export. In 2013, over 1.7 million containers were moved between the Chicago and Los Angeles Bureau of Economic Analysis (BEA) regions.⁸

The region's third largest trading partner is Detroit, which traded approximately \$10.7 billion in goods with Chicago in 2012. The most common incoming commodity from Detroit is motorized vehicles. Common outbound commodities moving from the region to Detroit include mixed freight and electronics.

Figure 3. Top domestic trading partners by total value, 2012, in billions of dollars



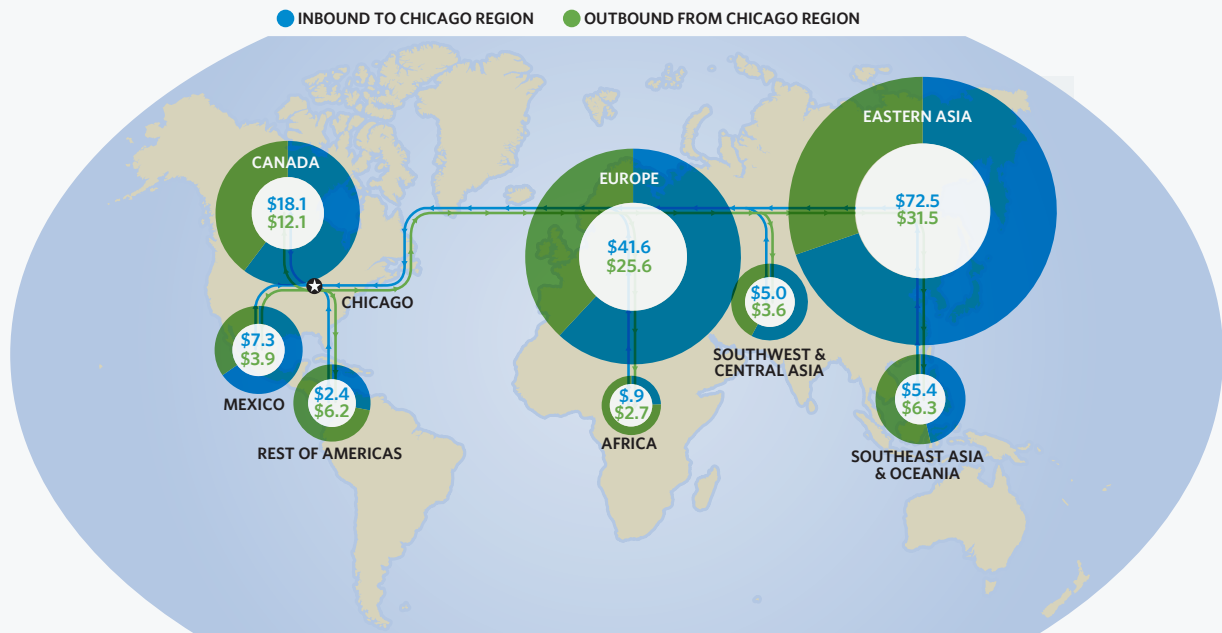
Note: Analysis includes only urban Freight Analysis Framework zones. Freight modes include air, truck, rail, and water.
 Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.



Foreign trade accounts for slightly more than one-quarter of freight flows into and out of the region and has seen significant growth in recent years. Between 1997-2012, for example, the estimated value of foreign freight flows into the state of Illinois grew by over 110 percent. In 2012, total imports into the region amounted to \$153 billion, while estimated exports were \$92 billion.

Figure 4 shows the Chicago's region top foreign trading partners by total trade value. Eastern Asia is by far the largest foreign trading partner of metropolitan Chicago, which imported nearly \$73 billion in goods from that region in 2012. The top commodities imported from Eastern Asia include electronics, machinery, and pharmaceuticals. Major exports to the region include machinery, precision instruments, and electronics. The lack of commodity specificity in the FAF data makes it difficult to draw conclusions about the nature of Chicago's trade with Eastern Asia because two of the most imported commodities — electronics and machinery — also appear to be two of the commodities most frequently exported from here to Eastern Asia.

Figure 4. Foreign trading partners total trade value, 2012, in billions of dollars



Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.

Traded commodities

In addition to identifying the geography of key trading partners, FAF data can also be used to analyze the region's total trade flows of various commodities. Figure 5 shows the top traded commodities by value, trade flow direction, and geographic origin and destination.

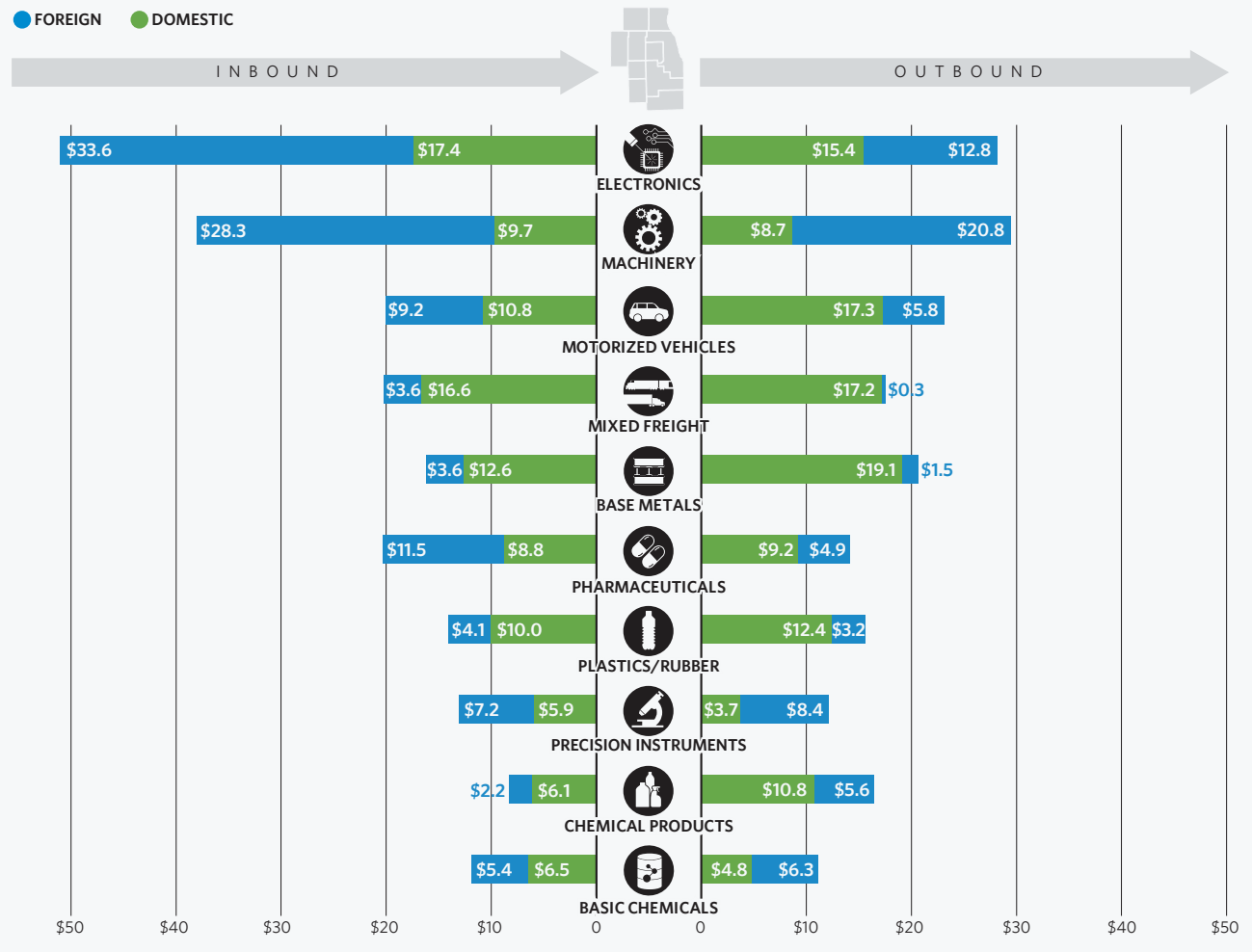
While FAF data do not provide the level of granularity necessary to discern the specific types of goods flowing into and out of the region, the data do highlight the relative importance of domestic and foreign trade in certain commodities. By value, over half of the region's outbound freight flows of machinery, precision instruments, and basic chemicals are exports, indicating that the industries associated with production of these commodities sell their products across the globe. Industries that export their products have access to a customer base that is substantially larger than non-exporting industries. Research shows that exporting industries are drivers of regional economic growth and innovation.⁹

In the Chicago region, machinery and chemicals manufacturing have long been areas of significant economic strength, with industry location quotients of 1.11 and 1.52 respectively, and could constitute areas for further export promotion.¹⁰

Some commodity groupings, such as base metals; plastics and rubber; and chemical products (ink, glue, soap), are mostly traded domestically. The lower value and high weight of base metals, which include unwrought iron, steel, aluminum, copper, lead, nickel, and zinc, make trade with distant partners difficult. Base metals, whether inbound or outbound from the region, are primarily traded with other partners here in the Midwest. Trade of these base commodities plays an important role in supporting the region's manufacturing industries. Metals, plastic products, and chemical products manufacturing are large, highly specialized industries in metropolitan Chicago that consume these raw inputs. Combined, these three industries account for over 120,000 jobs, with the region's fabricated metals, plastics, and chemical manufacturing industries having location quotients of 1.44, 1.43, and 1.52 respectively.¹¹

Figure 6 summarizes the trade characteristics for the region's four most traded commodities by value, all of which are produced by advanced manufacturers. It highlights the importance of international trade to the region, especially with Eastern Asia and Europe. Ensuring that the region's manufacturers can move goods to and from global markets facilitates the growth of advanced manufacturing industries, which create high-quality, high-paying jobs for the region.

Figure 5. Chicago region top commodities traded by value, 2012, in billions of dollars

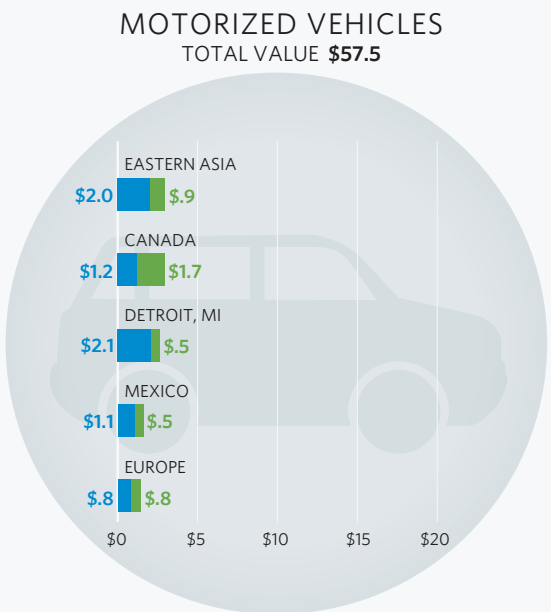
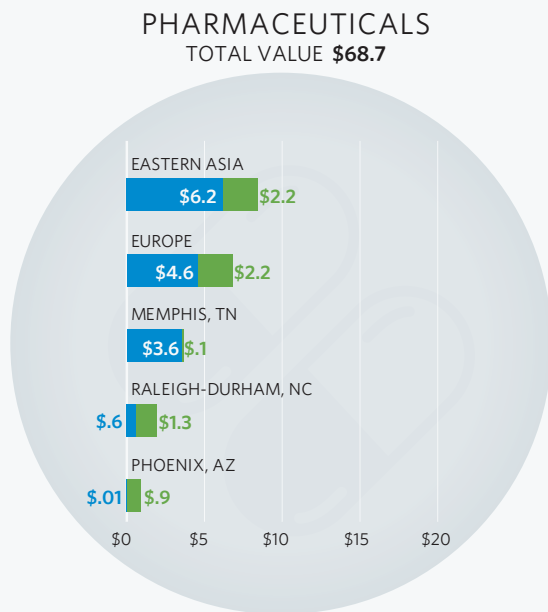
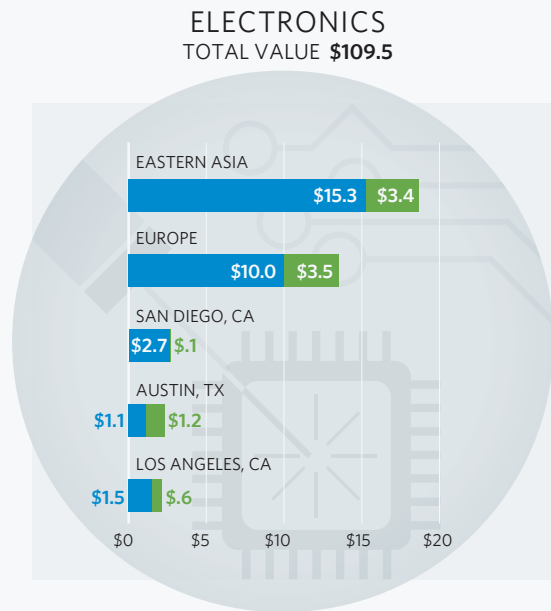
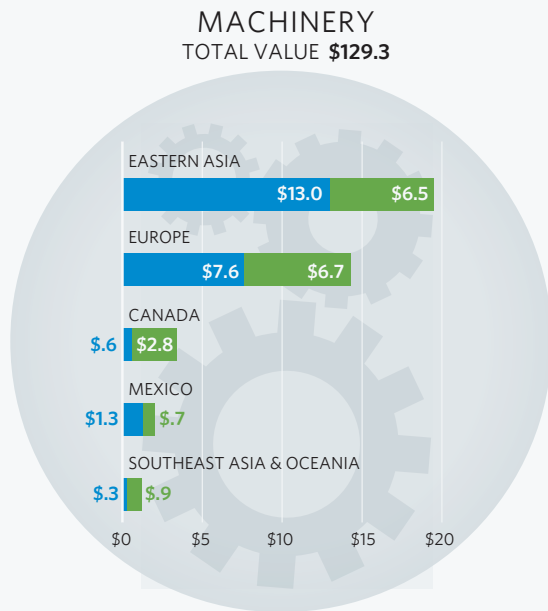


Note: Freight modes include air, truck, rail, and water.

Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.

Figure 6. Trade of major commodities, 2012, in billions of dollars

● INBOUND TO CHICAGO REGION ● OUTBOUND FROM CHICAGO REGION



Note: Analysis includes domestic urban Freight Analysis Framework zones and world regions. Freight modes include air, truck, rail, and water.
 Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.

Manufacturing and mode choice

Freight in modern supply chains is moved predominantly by air, truck, rail, water, or a combination of these modes. The mode by which goods are moved depends on a number of decisions that are driven by customer needs, product value, and weight. By value, the most popular freight mode used to move goods into and out of the region is truck, followed by air, rail, and water. These proportions change when movement is measured by weight. Although truck is still the single largest mode by weight, rail and water freight move a greater proportion of freight tonnage than air.

Table 1. Chicago FAF region inbound and outbound freight movements by value and weight

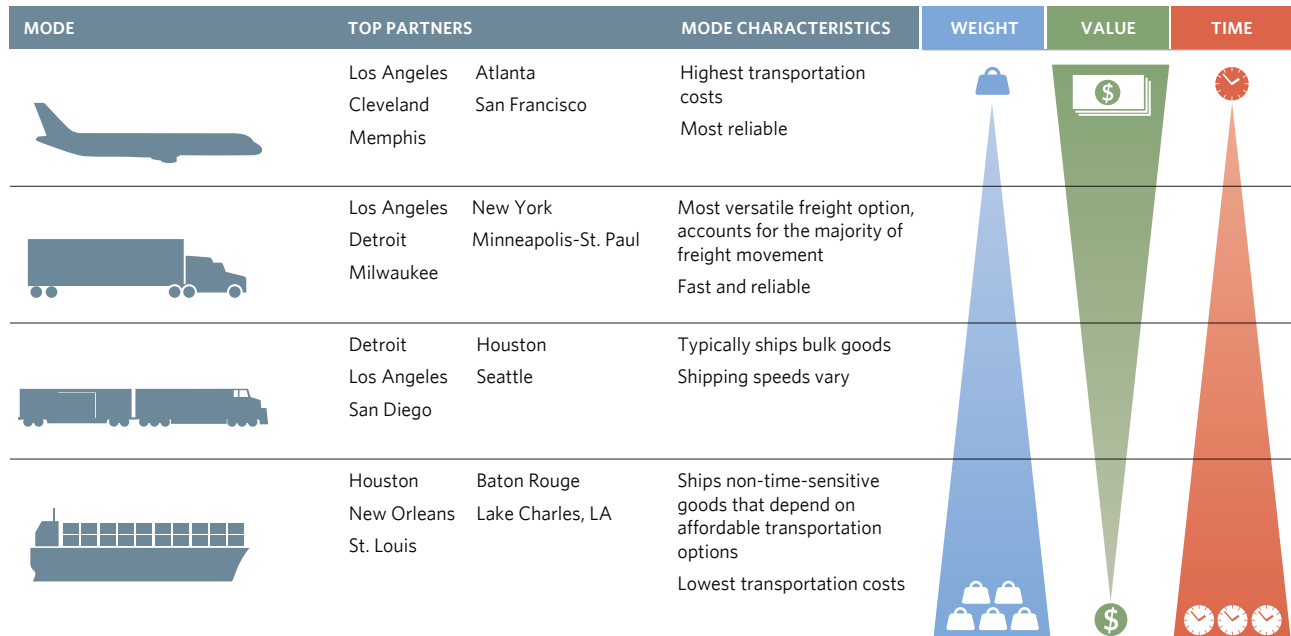
MODE	VALUE (MILLIONS)	TONNAGE (MILLIONS)
Truck	\$911,159	702.7
Air	\$55,344	0.7
Rail	\$35,981	67.5
Water	\$3,819	25.8

Source: Chicago Metropolitan Agency for Planning analysis of 2012 Freight Analysis Framework data.

Truck transportation is the most versatile of all freight modes. For most shippers, trucks provide the optimal combination of speed, reliability, and affordability. Trucks enjoy a much wider degree of geographic freedom than railcars and ships and cost significantly less than moving freight by air. Because of their versatility, trucks move a variety of commodities, from raw materials to intermediary and final goods.

Air, rail, and water freight are the second, third, and fourth most common freight mode by value. Due to its cost, air freight is generally used to transport goods that are lightweight or of high value, such as electronics, machinery, pharmaceuticals, or precision instruments. Three-quarters of the region's inbound and outbound air freight moves to or from Alaska, which is a major gateway for imports and exports from Eastern Asia. Rail and water freight operators specialize in serving industries that move heavy, low-value goods that depend on affordable transportation options, including basic chemicals, coal, and fertilizers. Rail freight moves to and from the Chicago region through a number of metropolitan areas, while the region's water freight trade is concentrated with metropolitan areas located along the Mississippi River.

Figure 7. Chicago region top trading partners by mode, 2012



Sources: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data; Wial et al., “Why Does Manufacturing Matter?” 2012.

Although local industries enjoy unrivaled access to the four major transportation modes, the condition of the region’s transportation infrastructure remains a significant concern. Road congestion slows the movement of trucks and decreases the dependability of manufacturing supply chains. Research shows that the Chicago region is the third most congested metropolitan area in the U.S., with congestion costing the region an estimated \$7.2 billion in lost time and wasted fuel in 2014.¹² Chicago is also home to nation’s second largest truck bottleneck — the Jane Byrne Interchange — where three of the interstate highways converge.¹³ The interchange is currently being reconstructed and should be completed in 2018. Upon completion, the project is expected to reduce some congestion issues.

Chicago is a key nexus for North American freight rail network, but the region is also a well-known chokepoint for rail congestion. Rail freight movements in the region are often hindered by old or inadequate rail infrastructure that struggles to accommodate today’s levels of train traffic. Trains leaving Los Angeles can reach Chicago within 72 hours of departure.¹⁴ Once in the region, however, it can take up to 30 hours to cross through Chicago.¹⁵ Because it is the nation’s largest rail hub, disruptions of rail traffic in this region are often felt nationwide.¹⁶

Efforts to modernize key chokepoints in the region’s rail infrastructure are ongoing through the Chicago Region Environmental and Transportation Efficiency (CREATE) program. CREATE is a public-private partnership between freight railroads, Metra, Amtrak, and federal and local government agencies. The program, which was launched in 2003, identified 70 priority rail infrastructure projects. To date, 23 projects have been completed and \$1.2 billion has been committed to the program. Securing the remaining \$2.6 billion needed to complete the remaining CREATE projects is critical for the region’s infrastructure.¹⁷

Modern supply chain production and logistics systems

Today’s manufacturers operate in a global marketplace in which firms source inputs from around the world and sell their products to a global customer base. The evolution of the Internet and modern information technology have led to enhanced methods that enable manufacturers to more accurately forecast product demand, which in turn has allowed manufacturers to carry less inventory on hand and demand smaller, more frequent shipments of inputs.¹⁸ Many of the benefits that consumers enjoy when shopping online — such as real-time stock status of items, frequent order status updates, and package tracking — are slowly permeating business-to-business shipping. A growing number of manufacturers are working to decrease lead times on products and provide increased logistics visibility to customers.¹⁹





As a result of these changes, the decisions that manufacturers make when sending and receiving goods are becoming increasingly complex. This complexity is leading a growing share of manufacturers to outsource some or all of their firm’s logistics functions, which is in turn driving the growth of the logistics industry nationwide and in the region. These changes are also affecting the way manufacturers and distributors use the region’s warehouse and distribution spaces, with the use of distribution spaces becoming increasingly popular because they provide a number of value-added services that allow manufacturers to carry less inventory on hand. Manufacturers focus their resources on developing expertise in production. The outsourcing of logistics functions to firms that focus solely on the efficiency of freight movement can generate significant savings for manufacturers.

Outsourcing logistics

Today, nearly all manufacturers outsource at least a portion of their logistics by contracting directly with freight carriers to move outbound shipments or by using a broker/forwarder to arrange shipments. Other manufacturers engage in more extensive outsourcing in which a third party logistics firm, known as a “3PL,” provides a suite of logistics services to manufacturers.

Carriers provide a discrete, necessary logistics service by physically moving goods from origin to destination. Brokers, forwarders, and 3PLs, on the other hand, create value for manufacturers through application of freight market knowledge and economies of scale in freight buying. Brokers and forwarders play an important role in helping manufacturers find carriers in a highly fragmented freight market. Nationwide, over 90 percent of truck carriers manage six or fewer trucks, making it difficult and time consuming for shippers to find the most competitive carrier rates.²⁰

Figure 8. Logistics firms roles and services

ENTITY	SERVICE PROVIDED
Carrier 	Handles the physical transport of goods from one location to another.
Broker 	Negotiates terms of freight movement agreements between shippers and carriers for a fee. Client base may consist of either carriers or shippers.
Forwarder 	Negotiates terms of freight movement agreements between shippers and carriers for a fee, typically with international shipments. May advise clients on export laws and regulations, as well as product packaging and carriage costs.
Third Party Logistics (3PL) 	Provides comprehensive logistics services. Services may include arranging transportation, warehousing, cross-docking, inventory management, packaging, and freight forwarding.

Sources: Council of Supply Chain Management Professionals Supply Chain Management Terms and Glossary, 2013; Export.gov.

Freight brokers often have well-established working relationships with carriers. These relationships help ensure that a manufacturer's products will be moved by an established, vetted carrier. Brokers often combine the shipments of multiple manufacturers under one account, which increases the broker's freight-buying power and allows the broker to negotiate discounted rates. Freight forwarders provide brokerage services on an international level, managing the movement of a shipment from the shipping dock of a manufacturer to its foreign destination. Forwarders track international shipments across multiple modes and ensure that shipments meet customs requirements and pass through the customs process quickly.

Third party logistics firms provide the greatest level of logistics services to shippers. In addition to providing brokerage services, 3PLs can provide advanced logistics services, such as repacking of goods, demand forecasting, inventory management, or warehousing and distribution services. Third party logistics firms use proprietary technology to find cost-effective, timely freight options for clients. Like brokers and forwarders, a 3PL's buying power often helps small and medium sized manufacturers secure lower freight rates. Some 3PLs also provide scalable warehousing and distribution services that might otherwise be unaffordable to smaller manufacturers.

Freight transportation arrangement industry

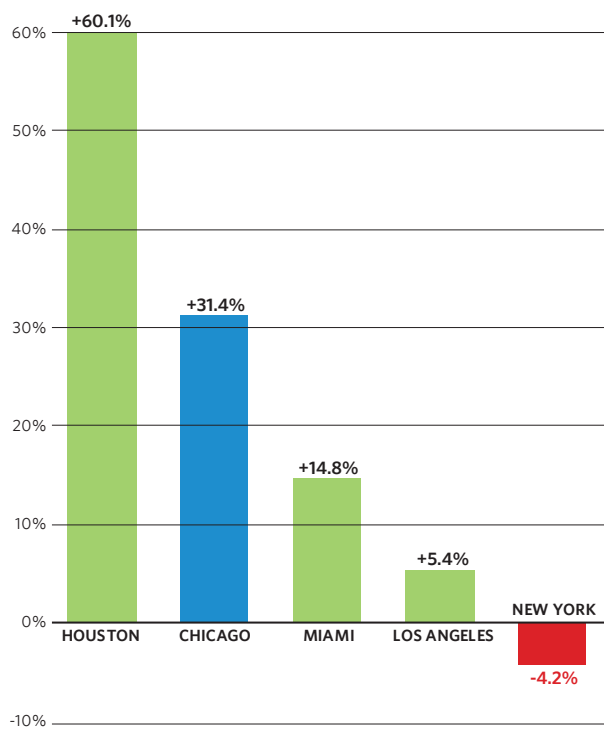
The growing popularity of outsourcing logistics to improve supply chain efficiency has led to logistics job growth in the Chicago region. Economists classify freight brokers, forwarders, and 3PLs as part of the freight transportation arrangement (FTA) industry. The Chicago metropolitan area is home to approximately 1,000 FTA establishments that produced \$3.1 billion in goods and services in 2014.²¹ The FTA industry contains 16,600 jobs in the seven-county region, making it the third largest metropolitan FTA industry in the U.S. behind New York and Los Angeles.²²

Although the nature of logistics work is becoming increasingly web-based, allowing individuals to work anywhere in the country, logistics jobs tend to concentrate in metropolitan areas that have historically specialized in moving freight. The Chicago region has been able to capitalize on this advantage and has developed a high level of specialization in freight transportation arrangement, with a regional industry location quotient of 2.76.²³

The Chicago region's FTA industry is also one of the fastest growing in the nation. The region's FTA industry grew by more than 30 percent between 2001-14, the second fastest growth rate among the five metropolitan areas with the largest FTA industries in the U.S. The number of FTA jobs in metropolitan Chicago has grown by 3,900 since 2001.²⁴ In the past ten years, the region has given rise to several large, fast growing 3PLs, such as Hub Group, Coyote Logistics, Echo Logistics, and Load Delivered, which have cemented the region's leadership in logistics. The rapid growth of the region's FTA industry has been facilitated in part by the influx of venture capital into 3PLs. Small 3PLs with innovative ideas are often able to attract venture capital funds that invest in information technology startups.²⁵ In recent years, the 3PL industry has begun to mature, which has led to the consolidation of smaller firms.

FTA industry growth presents a particularly strong workforce development opportunity for the region. The primary FTA industry occupation is cargo and freight agents. Cargo and freight agents expedite and route the movement of incoming and outgoing freight shipments among multiple modes. The occupation pays \$22 per hour on average, and employers do not necessarily require a postsecondary degree, making the job accessible to a larger portion of the region's workforce.²⁶ Cargo and freight agents often receive short-term, on-the-job training after being hired. Growth in these types of jobs leverages the region's built-in industry cluster strengths and infrastructure advantages.

Figure 9. Freight transportation arrangement industry employment change in select metropolitan areas, 2001-14



Source: Chicago Metropolitan Agency for Planning analysis of Economic Modeling Specialists International data.

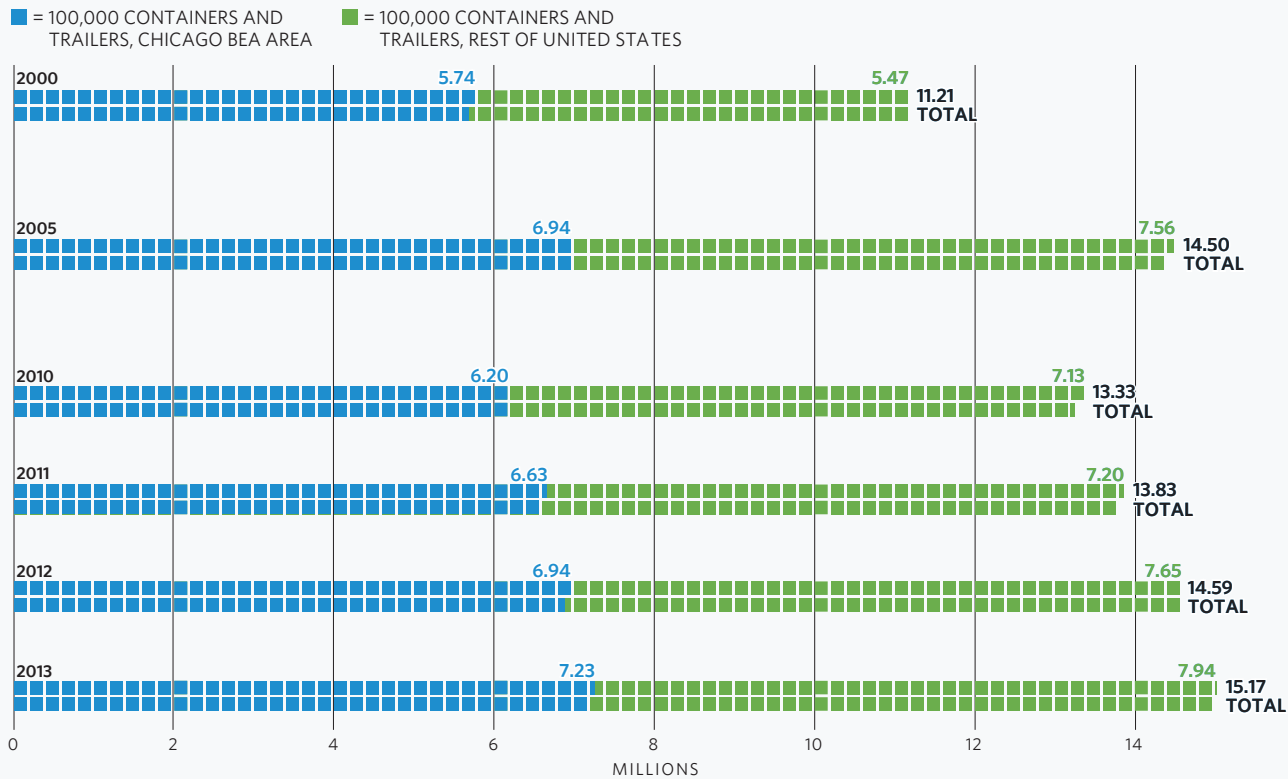
Multimodal transportation

Intermodal shipping moves freight at a significantly faster pace than traditional rail, providing solutions that meet the more timely demands of modern supply chains. The process involves shipping goods in standardized containers that can be quickly moved across multiple freight modes, such as from truck to train and vice-versa. Intermodalism combines the universal geographic access provided by trucks with the low long-distance hauling costs of rail transportation to provide cost-effective freight solutions when goods move over longer distances.²⁷ The timeliness and cost of intermodal shipping depends on a number of factors, such as traffic in and around intermodal facilities or drayage driver availability, making speed comparisons to truck freight difficult. Nevertheless, the cost savings of intermodalism have made it an increasingly popular mode choice.

The presence of six of the nation's seven Class I railroads and 20 active intermodal facilities in the region, as of 2015, has made metropolitan Chicago the largest national point of origin and termination for intermodal containers nationwide. Over seven million domestic intermodal container shipments originated or terminated in the Chicago BEA area in 2013.²⁸ The region accounts for nearly half of all national intermodal container traffic. The rapid growth of train-truck intermodal has led to increased truck traffic in and around the region's intermodal facilities. This congestion is a serious concern for businesses that receive intermodal shipments. In cases of severe congestion around intermodal facilities, drayage trucks might wait for an entire day to pick up a single intermodal container.²⁹

Although it represents only a small portion of all freight moves, intermodal traffic in the region has been growing steadily over the last three years and will continue to rise in popularity if fuel prices and congestion increase. The region is a prominent destination for incoming intermodal containers from the East and West Coasts, and generally receives more containers than it sends out. Thus, containers delivered to the region are often sent back to their origin empty. This portion of a trip, known as a "backhaul," provides an opportunity for the region's shippers to fill freight containers going back to the coasts, or to international trading partners, at discounted rates.

Figure 10. Intermodal rail movements in the U.S. and Chicago Bureau of Economic Analysis area, select years



Source: Chicago Metropolitan Agency for Planning analysis of 2013 Surface Transportation Board Carload Waybill Sample.

Warehousing and distribution

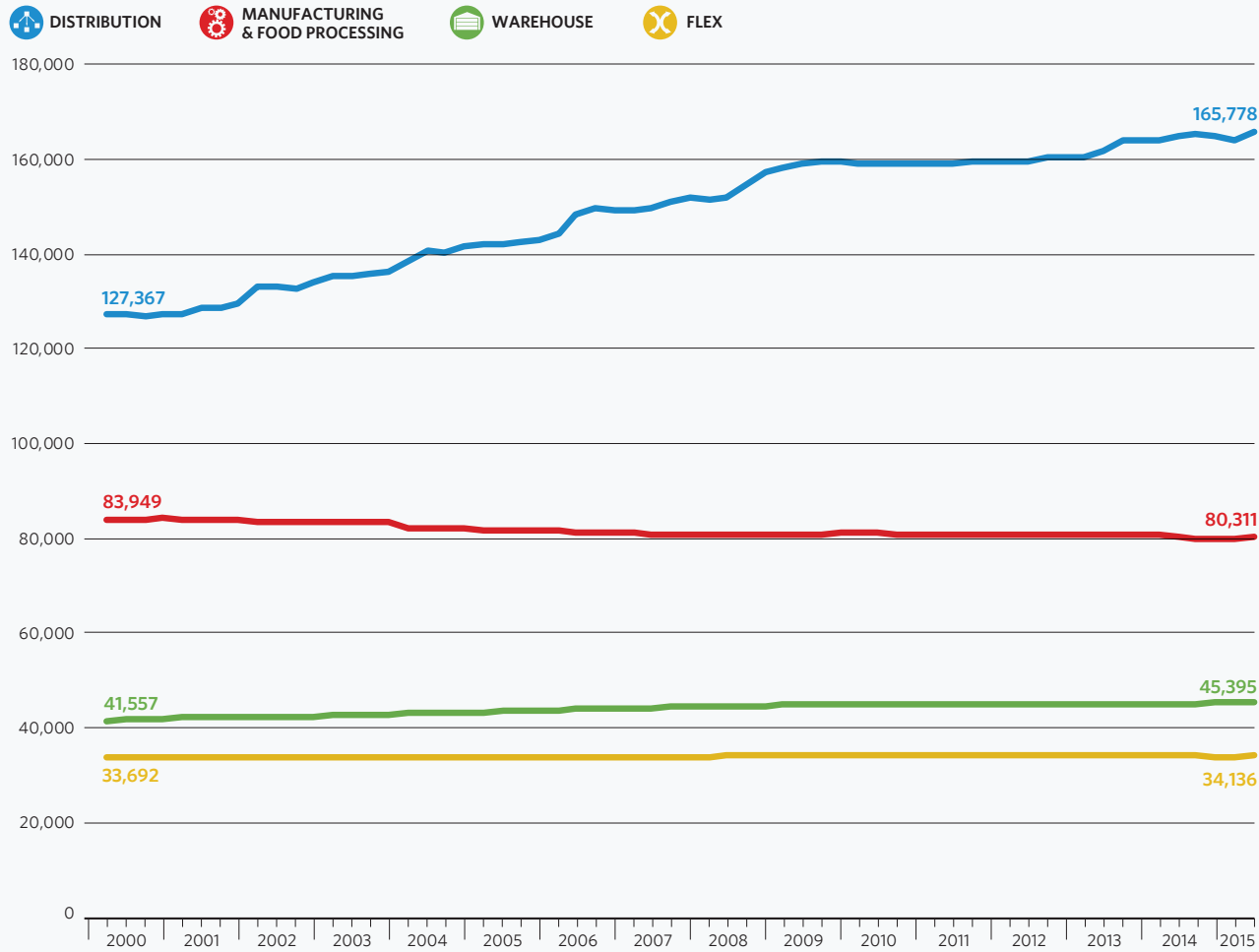
Manufacturers face three primary costs in managing their logistics processes: transportation, warehousing, and inventory carrying. Transportation costs generally account for the largest share of logistics expenses and have thus become a primary target for cost reduction in recent years. Some manufacturers are also implementing strategies to reduce inventory carrying and warehousing costs, which represent the second and third largest components of business logistics costs.³⁰ Holding less inventory decreases the amount of cash tied up in inventory, allowing businesses to use these resources elsewhere. Today, some manufacturers may carry as little as 6 to 12 hours of supplies on hand, making the timeliness of every shipment critical.³¹ This increased velocity of inventory movement is leading a shift in the way storage spaces are used, with a growing number of manufacturers relying on distribution center space rather than warehouse space.

Warehouse and distribution facilities each serve a distinct purpose. Warehouses typically store goods and focus on the most cost-effective methods for doing so. Distribution center spaces, on the other hand, focus on moving inventory in and out as quickly as possible and facilitate completion of a number of supply chain tasks, such as packing, labeling, or cross-docking. During a cross-dock, a product is dropped from an inbound truck and moved onto an outbound truck with minimal storage or handling. Distribution spaces generally feature larger building RBA (rentable building area), taller ceiling heights, and more loading docks to allow implementation of modern distribution techniques.³²

Both the demand for and the average size of distribution buildings has increased in recent years. Larger facilities can decrease logistics costs through economies of scale by providing lower management costs per employee, handling higher volumes of goods, and serving larger market areas than small distribution centers. The use of large distribution centers also allows businesses to estimate product demand at regional levels rather than having to estimate demand from multiple community-level centers.³³

As the size and number of distribution centers grow, their land use and transportation needs become increasingly challenging to meet. Modern distribution centers require large tracts of land that allow for the efficient movement of trucks and easy access to highways. These types of spaces are difficult to find near the urban core, and a growing number of distribution centers are being built on the edges of metropolitan areas.³⁴ Greenfield development of distribution space presents several challenges. Development on the edge of urbanized areas can require new construction and the use of existing infrastructure in ways that may differ from their original design, rather than using freight-supportive transportation infrastructure that already exists in established areas.

Figure 11. Chicago region average square feet of rentable building area per building, by type, 2000-15



Note: Industrial building types are aggregated from CoStar building categories in keeping with standard industry definitions.
 Source: Chicago Metropolitan Agency for Planning analysis of CoStar data.

Opportunities and challenges

GO TO 2040 underscores the need for a finer-grained understanding of the region's freight system. This report examines the flow of goods into and out of the region, and identifies how freight flows are changing. In today's economy, freight movements include the shipment of goods over longer distances, via multiple modes, and at higher frequencies. In order to meet these demands, the region's industries rely on public and private infrastructure. Investments in transportation infrastructure that consider both individual and industry benefits can help the region's economy grow. At the most fundamental level, reinvestment is needed to modernize the region's existing transportation infrastructure. There is also a growing need to plan for multimodal freight, which shippers increasingly rely on to move goods.

Invest in the modernization of existing infrastructure

A number of the region's industries are closely tied to Chicago's position as a transportation and logistics hub. Congestion threatens this competitive advantage by decreasing the reliability of freight movement. The region's road and rail networks contain some of the largest freight chokepoints in the U.S. Implementing performance-based metrics that recognize the relationship between infrastructure and our region's economy can help guide reinvestment in our transportation system in a way that addresses congestion issues and supports the needs of local industries.

Some inroads have already been made toward modernization. The CREATE program, for example, brings together local, state, and federal governments with the region's rail stakeholders. The program's projects focus on upgrading obsolete equipment, building road flyovers at critical rail crossings, and separating key intersections where rails cross over one another. These projects have benefits for both public and private stakeholders and freight, passenger rail, and roadways. Securing funding to complete remaining CREATE projects is a regional priority.

Engaging in freight planning can help the region identify transportation investments that provide the greatest economic benefits. This process requires collaboration among a number of stakeholders. CMAP has taken the lead in convening government and private sector stakeholders in developing a regional freight plan. Efforts are also being undertaken at the county level to improve the region's truck permitting process by encouraging collaboration between the region's county board chairs, CMAP, and private business represented by the Supply Chain Innovation Network of Chicago. At the municipal level, CMAP's Local Technical Assistance program is helping municipalities in the O'Hare subregion develop a truck routing plan that expands across municipal jurisdictions.

Address the needs of multimodal freight movement

The increasing complexity of logistics and shipping necessitates a new understanding of freight movement. A growing number of shipments use multiple modes of transportation between their origin and destination. Infrastructure investments that consider the multi-modal nature of freight can support these new types of movements.

Truck-rail intermodal activity is experiencing significant growth in the region. This growth has created strain on roadways located near intermodal facilities. Trucks often queue outside of intermodal facilities in anticipation of picking up containers, and any inefficiencies or unexpected hiccups in the intermodal process can result in significant traffic buildup on the nearby road network. As intermodal trains grow in size, and technology advances, more containers will pass through the region's intermodal facilities. Addressing infrastructure issues near intermodal facilities and planning for future intermodal growth will ensure that the region's industries have access to a valuable freight asset while also supporting community needs.

The evolution of a global freight transportation network has connected the region to suppliers and customers around the world. FAF data show that the region's advanced manufacturing industries, such as pharmaceuticals, chemicals, electronics, and machinery manufacturing, particularly benefit from strong connections to foreign trading partners. Jobs in these industries tend to pay high wages and require a skilled workforce.³⁵ Efforts to upgrade air and road infrastructure around O'Hare will help support global trade connections for our advanced manufacturing industries.

In 2013, work began on the construction of a new, 820,000-square-foot cargo facility at O'Hare. Upon completion, the project will expand the airport's cargo facility square footage by more than 50 percent.³⁶ Additionally, runways are being upgraded to accommodate larger cargo airplanes.

There are also capacity constraints and congestion issues around the O'Hare area that could be addressed to promote fluid freight movement in this subregion. The area is also home to a number of freight assets that provide access to major trade corridors, such as intermodal facilities, container yards, and several interstate highways. The level of freight access that the area provides makes it a desirable location for manufacturing and freight firms.³⁷ However, congestion is a significant problem limiting the mobility of freight.³⁸ Construction of the nearby Elgin O'Hare-Western Access project, identified as a regional priority in GO TO 2040, could facilitate the movement of freight in and around O'Hare by adding capacity to congested areas, facilitating the movement of truck-air cargo to and from the airport, and opening up access to its western side.³⁹



Conclusion

Metropolitan Chicago's transportation system is both a national and regional asset. On the national scale, the region is a transportation node in a number of North American supply chains. On a regional scale, transportation infrastructure supports the region's manufacturing cluster, which benefits from strong connections to international markets. The ways in which manufacturers source inputs and ship products are changing. Making investments in infrastructure that account for the changing needs of local industries will ensure that the region continues to capitalize on its transportation assets. This report lays a foundation for understanding the national and international flow of goods to and from the region and begins a high-level exploration of how our manufacturing industries use the region's infrastructure. Moving forward, CMAP will examine the freight and logistics aspects specific industry clusters to better understand their supply chains, unique needs, and opportunities to better support the drivers of the region's economy.

Endnotes

- ¹ Adie Tomer and Joseph Kane, "Mapping Freight: The Highly Concentrated Nature of Goods Trade in the United States," 2014. See http://www.brookings.edu/-/media/research/files/reports/2014/11/freight-networks/srvy_gcifreightnetworks_oct24.pdf.
- ² CMAP analysis of 2012 Freight Analysis Framework data.
- ³ Ports: CMAP analysis of American Association of Port Authorities, NAFTA Region Container Traffic 2013 Port Ranking by TEUs. Transit Times: CMAP analysis of Railroad Company schedules.
- ⁴ FAF data are updated every five years and are based primarily on the Census Bureau's Commodity Flow Survey, which reports data on the movement of goods in the U.S. by commodity type.
- ⁵ For a detailed description of items included in each commodity code groupings, refer to the Department of Commerce's 2012 Commodity Flow Survey SCTG Commodity Code book, http://www.census.gov/econ/cfs/2012/2012_manual.pdf.
- ⁶ The only non-urban FAF zone included in this analysis is the state of Alaska, which is a significant gateway for the region's air exports.
- ⁷ Domestic trade values exclude the trade of exported or imported items.
- ⁸ CMAP Policy Update, "Intermodalism — Metropolitan Chicago's Built-In Economic Advantage," http://www.cmap.illinois.gov/about/updates/-/asset_publisher/UIMfSLnFfMB6/content/intermodalism-metropolitan-chicago-s-built-in-economic-advantage.
- ⁹ Michael Porter, "The Economic Performance of Regions," 2003. See http://www.clustermapping.us/sites/default/files/files/resource/The_Economic_Performance_of_Regions.pdf.
- ¹⁰ CMAP analysis of Economic Modeling Specialists International data, 2015. Location quotients measure the region's proportion of jobs in an industry compared to the national proportion. A location quotient above 1.0 indicates that an industry has a higher employment concentration within the region than the national average.
- ¹¹ CMAP analysis of Economic Modeling Specialists International data, 2015.
- ¹² Texas A&M Transportation Institute Urban Mobility Scorecard. See <http://mobility.tamu.edu/ums/report/>.
- ¹³ American Transportation Research Institute Congestion Impact Analysis, 2014. See <http://atri-online.org/2014/12/17/congestionimpacts/>.
- ¹⁴ CMAP Policy Update, "Intermodalism, Metropolitan Chicago's Built-In Economic Advantage," May 2015. http://www.cmap.illinois.gov/about/updates/-/asset_publisher/UIMfSLnFfMB6/content/intermodalism-metropolitan-chicago-s-built-in-economic-advantage.
- ¹⁵ Amtrak Chicago Gateway Blue Ribbon Panel report, 2015. See <http://www.amtrak.com/ccurl/873/180/Chicago-Gateway-Amtrak-Blue-Ribbon-Panel-Final-Report.pdf>.
- ¹⁶ Ibid.
- ¹⁷ CMAP Policy Update, "Create Program Status Check," Feb. 2015. http://www.cmap.illinois.gov/about/updates/-/asset_publisher/UIMfSLnFfMB6/content/create-program-status-check.
- ¹⁸ Linda Taylor and Robert Martichenko, FedEx, "Lean Transportation: Fact or Fiction?" 2006. See <http://images.fedex.com/us/autodistrib/LeanTransportationFinal101606.pdf>.
- ¹⁹ Marc Wulfraat, "How the Amazon Effect is changing the American manufacturing industry forever," Supply Chain Digest, 2014. See http://www.scdigest.com/EXPERTS/WULFRAAT_14-03-26.PHP?cid=7936&ctype=content.
- ²⁰ Matthew Harding, "Using Freight Market Intelligence to Navigate the Transportation Market," Distribution Business Management Journal, 14 (2012). See <http://www.chainalytics.com/wp-content/uploads/2012/09/Using-Freight-Market-Intelligence-to-Navigate-the-Transportation-Market-M-Harding.pdf>.
- ²¹ CMAP analysis of Economic Modeling Specialist International, Moody's Analytics data, 2015.
- ²² CMAP analysis of Economic Modeling Specialist International data, 2015.
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ CMAP interviews with local distribution and logistics companies.
- ²⁶ CMAP analysis of Economic Modeling Specialist International data, 2015.
- ²⁷ Jean-Paul Rodrigue, The Geography of Transportation Systems. (New York: Routledge, 2013). See <http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/transcost.html>.
- ²⁸ CMAP analysis of Federal Surface Transportation Board data.
- ²⁹ CMAP interviews with local distribution and logistics companies.
- ³⁰ Establish Davis Logistics cost and service database 2011. See <http://www.establishinc.com/wp-content/uploads/2013/11/Establish-Davis-Logistics-Cost-and-Service-Presentation-2013a.pdf>.
- ³¹ U.S. Department of Transportation Federal Highway Administration, "Keeping the Global Supply Chain Moving." 6:06. August 2, 2013. See http://www.ops.fhwa.dot.gov/publications/fhwahop09035/captioned_video/ft_sc.wmv.
- ³² NAIOP Research Foundation, "NAIOP Terms and Definitions: North American Office and Industrial Market," 2012. See https://www.naiop.org/-/media/Research/Terms%20and%20Definitions/Terms%20and%20Definitions_080612.ashx.
- ³³ Derik Andreoli, Anne Goodchild, and Kate Vitasek, "The rise of mega distribution centers and the impact on logistical uncertainty," International Journal of Transportation Research, 2 (2012). See https://depts.washington.edu/pcls/documents/research/Goodchild_RiseOfMegaDCs.pdf.
- ³⁴ Clarence Woodsma, John Jensen, Pavlos Kanaroglou, and Hannah Maoh, "Logistics land use and the city: A spatial-temporal modeling approach," Transportation Research Part E: Logistics and Transportation Review, 44:2 (2008). See <http://www.sciencedirect.com/science/article/pii/S136654507000725>.
- ³⁵ CMAP report, "Metropolitan Chicago's Manufacturing Cluster: A Drill-Down Report on Innovation, Workforce, and Infrastructure," 2013. <http://cmap.is/mnftcluster>.
- ³⁶ CMAP Policy Update, "Air Freight Activity in the Chicago Metropolitan Region. 2015. http://www.cmap.illinois.gov/about/updates/policy/-/asset_publisher/U9jFxa68cnNA/content/air-freight-activity-in-the-chicago-metropolitan-region.
- ³⁷ CMAP report, "O'Hare Subregional Freight Manufacturing Drill-Down," 2014. <http://cmap.is/oharefreight>.
- ³⁸ "Elgin O'Hare - West Bypass Study: Tier One Final Environmental Impact Study," 2010. See http://www.idot.illinois.gov/Assets/uploads/IDOT-Projects/District-1/Elgin-Ohare-West-Bypass/files/EOWB_Report.pdf.
- ³⁹ For a detailed analysis of land use and transportation conditions in the O'Hare area, refer to CMAP's O'Hare Subregional Drill Down Report. See <http://cmap.is/oharefreight>.



Chicago Metropolitan
Agency for Planning

233 South Wacker Drive, Suite 800
Chicago, IL 60606

312-454-0400
info@cmap.illinois.gov

www.cmap.illinois.gov

