INTERNATIONAL
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2016 Top Markets Report
Cold Supply Chain

A Market Assessment Tool for U.S. Exporters

May 2016

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John Miller, I&A's Industry Specialist for Cold Chain and Distribution Services, served as the lead author for this report. Thank you to all cold chain industry representatives who have provided insight including: ITA's Strategic Partners of **The Global Cold Chain Alliance, APICS, FedEx, UPS, and the International Air Transport Association**.

Table of Contents

Executive Summary 3

Overview and Key Findings 5

Country Case Studies
- Australia 19
- Brazil 21
- China 25
- India 29
- Indonesia 33
- Japan 37
- Kenya 41
- Malaysia 45
- Mexico 49
- Singapore 53
- Vietnam 57

Addendum: Resources for U.S. Exporters 61

Appendices
- Appendix 1: Methodology 63
- Appendix 2: Scorecards 65
- Appendix 3: Citations 68

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Executive Summary

The 2016 Cold Chain Top Markets Report is being launched during a time of increased interest in international trade. The completion of negotiations in the Trans Pacific Partnership, and hopes for its quick ratification, has sparked expectations of improved opportunities to expand trade within partner countries.

The report also comes at a time when an increasing understanding of the global value chains that are the key drivers for the flow of trade in both goods and services is impacting the way that industries and government view trade in terms of investment and policy development. As a business function of distribution services, cold chain services are force multipliers that create a world of opportunities for related trade and exports of goods. A cold chain can most readily be defined as a series of warehousing and distribution activities that is designed to ensure ideal storage and transportation conditions for temperature-sensitive products. Cold chain services also have the added benefit of improving quality of life for billions of people around the world and are in high demand, especially in less developed economies that suffer from malnutrition, high rates of food spoilage and chronic disease.

This year's report uses World Economic Forum research as well as industry insight to assess 20 international markets for cold chain expansion. The case studies section of the report covers 11 countries that collectively represent more than $450 billion out of more than $1.8 trillion in total sales by U.S. majority owned foreign affiliates in distribution services. The countries also represent more than $800 billion in total U.S. goods and services exports. The expansion of foreign affiliates and their corresponding sales contributes to U.S. companies' bottom lines and does not detract from U.S. jobs but rather increases the need for U.S. workforce to support business operations here in the United States.

Ultimately, the report finds that cold chains grow in support of distribution services operation, primarily in the retail and franchise sectors. In developing markets, cold chains provide opportunities for small and medium-sized farmers and businesses to enter the supply chains of international markets, exporting their temperature-sensitive products to retailers around the world. In consumer markets, cold chains provide access to products previously unavailable locally, raising the quality of life through fresher, safer food, pharmaceuticals and biologics while increasing opportunities for retail and franchise sales growth.

The biggest barriers to cold chain growth remain government protectionist measures and non-tariff barriers, often in related distribution services industries. The difficulties and delays of clearing customs or transporting products across borders is also a major impediment for services.

Through policy development, commercial dialogues, participation in trade negotiations and managing Industry Advisory Committees, including the Advisory Committee on Supply Chain Competitiveness, the International Trade Administration (ITA) has been focused on reducing these barriers to trade and will continue to work with countries around the world to provide opportunities for distribution service providers to compete on a level playing field.

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Overview and Key Findings

Introduction

The development of cold chain systems is a force multiplier that can generate exports and open new markets over multiple sectors over an extended period, rather than a one-off export transaction that can be quantified simply as an export success. U.S. businesses understand the need for viable and efficient cold chain systems; they spend hundreds of millions of dollars each year to build and maintain both cold storage and transportation systems, which allow U.S. businesses to flourish. Export promotion and trade policy agencies should focus on the development of international cold chains through improved regulatory environments, increased skill level of workforce and encouragement of infrastructure investment, thereby promoting the benefits of U.S. services.

Cold chain systems are crucial to the growth of global trade in perishable products and to the worldwide availability of food and health supplies. Each year, billions of tons of fresh food products and millions of dollars' worth of U.S. exports are lost due to poor cold chain systems in developing markets. The World Economic Forum lists food crises as fourth on its top global risks of highest concern for the next 10 years.[1] Globally, billions of dollars are spent on improving agricultural processes to create higher food yields, but the fact that nearly half of all food never makes it to a consumer's plate is largely ignored.[2]

Global losses in the food industry total more than $750 billion annually.[3] These losses primarily result from lack of proper facilities, improper food safety handling procedures and insufficient training for those personnel working in the cold chain. Additionally, over $260 billion of annual biopharma sales are dependent on cold chain logistics to ensure the efficacy of their products.[4]

The concept and technology for controlling the temperature of sensitive products has been well-established for decades. The development of cold chain systems, especially in terms of government policy, however, is a fairly new concept. Cold chain systems can most aptly be viewed as a business function in a global value chain rather than as an industry. As a business function, they encompass activities and processes that span several industries and support the exports and sales of numerous other industries. The United States has a competitive advantage in cold chain systems derived from some of the most advanced technologies and logistics management services in the world.

Key Findings: Top Markets and Methdology

This report assesses the global market for U.S. manufacturers and service providers in refrigerated supply chains (cold chain). The focus is primarily for U.S. government (USG) decision makers to develop sound policy as well as to assist U.S. companies searching for market opportunities.

The report details the basis for understanding the market and developing industry and export promotion strategies. It is driven by developments in supply chain technology and its many linkages to other industry sectors and potential exports of services and manufactured goods for the cold chain area itself and for other sectors dependent on the systems.

The report assesses market opportunities in 20 countries, drawing from well-known World Economic Forum/World Bank rankings, business criteria for selecting locations for investment and private sector estimates of business potential. The methodology section sets out regional assessments of the markets for these indicators and then examines individual markets in more depth. Case studies were developed for 11 countries chosen based on interest expressed by government or private sector representatives to the ITA's Supply Chain Team.

Figure 1: Projected Cold Chain Export Markets (Bold indicates case studies included in report)

1. Singapore	**5. Japan**	**9. Australia**	**13. Mexico**	**17. Vietnam**
2. United Arab Emirates	6. Germany	**10. China**	**14. Thailand**	18. Colombia
3. United Kingdom	7. Canada	11. Poland	**15. India**	**19. Kenya**
4. Netherlands	**8. Malaysia**	12. South Africa	**16. Indonesia**	**20. Brazil**

Ultimately, the report finds that there are significant opportunities for growth of U.S. cold chain services in key markets. These opportunities may not be quick or easy to achieve, but they represent a potentially strong long-term payoff for U.S. business.

U.S. businesses engaged in international cold chain activity assess markets against specific criteria when selecting locations for expansion. The four primary criteria, according to industry sources, include the governmental regulatory environment, whether there is a trainable skilled labor force, the infrastructure environment and the potential demand within the country or region.

Government/Regulatory

The first aspect that U.S. industries consider when looking at a new market is the regulatory environment of the country. In particular, U.S. industry looks for a stable government with transparent policymaking plus technical regulations, standards and procedures for assessment of conformity that are non-discriminatory and based on relevant internationally recognized best practices. Legal frameworks that allow companies to resolve legal disputes and challenge regulations are essential when identifying potential export markets.

Labor Force

Another important aspect for market decision-making is the quality and skill level of the potential work force in the market. Industry must have the capacity to train and develop the talent and the management required to run an efficient supply chain operation.

Infrastructure

The infrastructure within a country is another key aspect in a company's selection of export markets. Electricity and IT infrastructure must be sufficient to support logistics operations. Transportation infrastructure must be capable of supporting the reliable distribution of a product within the country or region without excessive delays. The International Association of Refrigerated Warehouses has noted a strong correlation of cold storage capacity to a country's transportation score in the World Economic Forum's Transport Index.[5]

Demand

Finally, the demand within a country must be considered. The potential size of the market will depend on consumer needs, the number of consumers in the country, products produced and demanded by the market, as well as the level of development within the market.

When determining which global markets policy-makers should target for export promotion and trade policy activities, it is important to account for the primary decision-making criteria of U.S. businesses engaged in the cold chain market. In this report and the case studies that follow, the criteria for evaluating markets was based on the four specific aspects of *Government/Regulations*, *Labor Force*, *Infrastructure* and *Demand*. These are reflected in the report's scorecard and country case studies.

The scorecard for this report is derived from the Global Competitiveness Index 2015-2016 created by the World Economic Forum for their Global Competitiveness Report.[6] By using this competitiveness index, a cross-country analysis based on these market evaluation criteria is possible. Particular aspects of the index were used to represent the primary criteria that industry indicated as a priority in market selection.

The scorecard assigns a numeric value to each of the criteria on a scale of 1 to 7, with 7 being the highest score in a particular category. The scorecard is color-coded using red, yellow and green to indicate comparative values of countries in the same income level. It is important to note that the colors yellow and red do not necessarily represent a poor environment but rather represent the lower 40 percent of scores in the given income level.

New for 2016, a separate category has been added to assess industry's interest in each of the countries. The Global Cold China Alliance, which represents all major industries engaged in temperature controlled logistics, provided ratings on a scale of 1 to 7, with 7 being the highest score based on their members expressed interest. This industry interest category effectively contributes 20 percent of the total country score.

The case studies in this report analyze selected potential markets and assess important competitiveness factors. These case studies are intended to aid ITA in promoting the development of efficient international cold chains to improve U.S. export opportunities. Inclusion of countries in the case study section does not necessarily indicate that these are higher ranked countries of opportunity but rather that government or private sector representatives have expressed interest in learning more about these markets to ITA's Supply Chain Team.

Industry Overview and Competitiveness

The series of warehousing and distribution activities that comprise a cold chain system are designed to ensure ideal storage and transportation conditions for temperature-sensitive products. Dozens of U.S. export industries depend on the vital links that cold chain systems provide. U.S. businesses invest hundreds of millions of dollars in their cold chain operations to create efficiency and reliability because an end-to-end cold chain is only as efficient and secure as the weakest link in the system. Each link in the cold chain must maintain the same level of integrity for the customer to receive a satisfactory product. A single breakdown in the chain can result in catastrophic losses of product.

Figure 2: Refrigerated Warehouse Capacity Growth by Country	CAGR 2008-2014 (Percent)
India	43
China	35
Mexico	27
Brazil	26
United States	9

Global Cold Chain Alliance

Cold chain services that support perishable food distribution globally are estimated to be valued at nearly $250 billion.[7] Experts also estimate that cold chain logistics spending in support of biopharma industry is more than $10 billion and is expected to grow to $13 billion by 2019. Asia alone contributes to $1.2 billion in growth.[8] The compound annual growth rate (CAGR) of cold chain markets is anticipated to reach nearly 16 percent into 2019.[9]

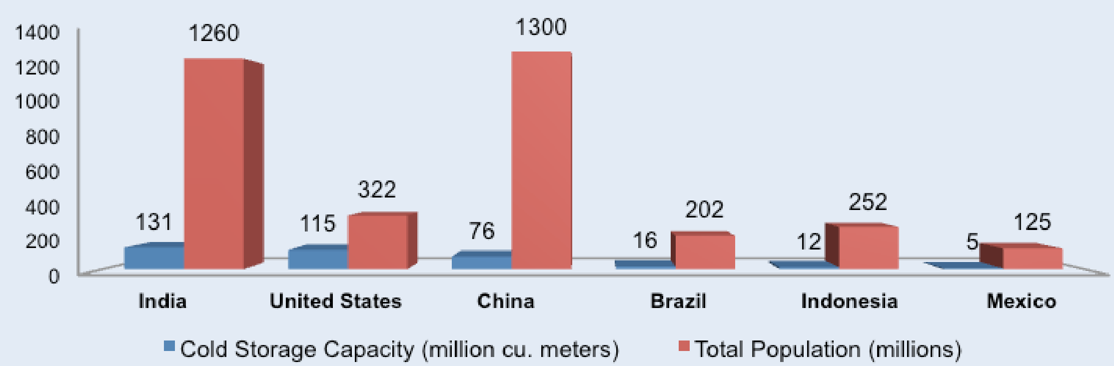
The United States is a world leader in developing the technology and processes necessary to develop and manage cold chain systems efficiently; therefore, the U.S. is well positioned to capture a large share of the global market for cold chain development. According to the Global Cold Chain Alliance, an industry association comprised of the many industries that make up cold chain services, global refrigerated warehouse capacity increased by 20 percent from 2012 to 2014, and three of the top five refrigerated warehouse operators by total volume are U.S. companies.[10]

Operators providing value-adding activities, such as harvesting and food processing, pass off their products to cold chain service providers for storage, transportation and delivery. While the majority of cold chain services are utilized in the fresh food market, cold chain operators typically transport and distribute both processed and fresh foods, especially in the U.S.

Fresh foods, like fruits, vegetables, meat, poultry and dairy, require an uninterrupted cold chain due to their perishable nature. By controlling parameters of temperature, humidity and atmospheric composition, along with utilizing proper handling procedures, cold chain service providers can increase the product life of fresh foods for days, weeks or even months. These services allow fresh products to hold their value longer, increasing their transportability and providing opportunities that expand their market reach.

Cold chain systems for processed foods have a slightly different flow. The activities involved in processing are usually transformative in nature and involve adding ingredients or preservatives or altering the natural characteristics of the food product. These alterations can extend the life of the resulting product by months

Figure 3: Cold Storage vs Total Population



or even years. In some cases, processing may delink the product from the cold chain system if the resulting product is no longer susceptible to temperature shifts.

The nature of processing also allows the use of lower grade food products that are not suitable quality for the fresh food market. Thus, processing can be considered as an option to maximize food harvesting and to optimize the utilization of available cold chains and various grades of harvested food.

The exact structure of each cold chain varies significantly depending on product and customer requirements; however, the goal of a properly designed cold chain system is to safely move temperature-sensitive products in a way that reduces waste, maintains the quality and integrity of the product and limits opportunities for bacterial contamination. A complete cold chain system may include post-harvest pre-cooling or freezing, processing, temperature controlled warehouse or storage, retail or distribution and refrigerated transport between locations.

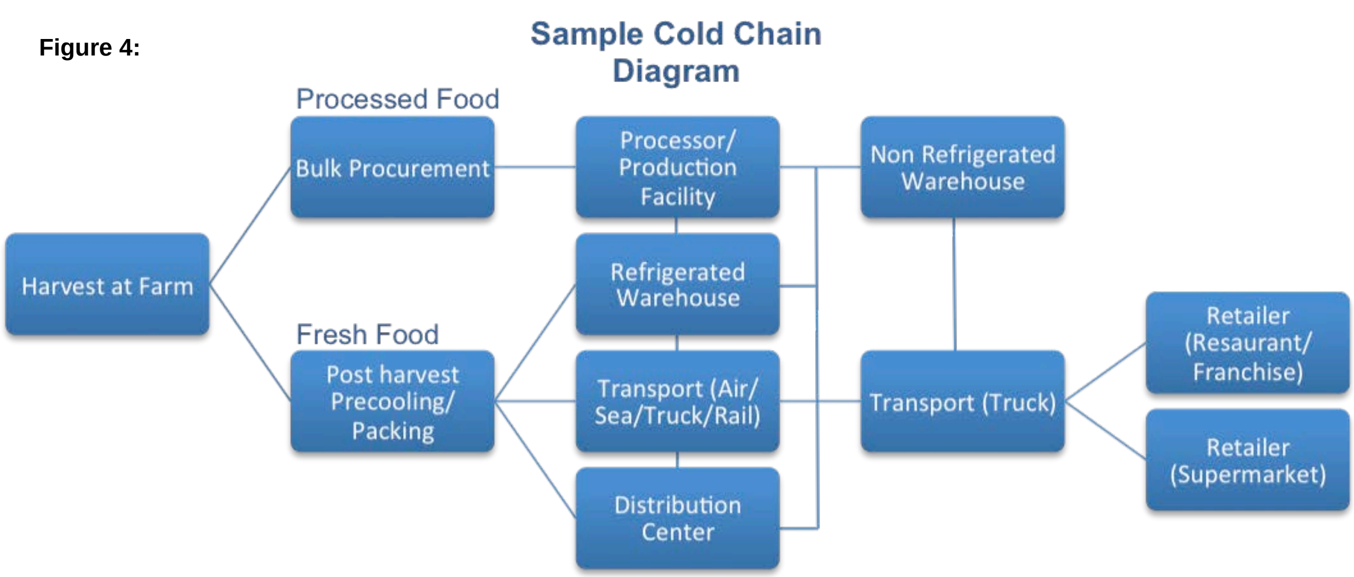
Requirements for cold chain facilities vary based on the size, type and amount of product, along with the particular requirements of the customer. Fruits and vegetables often require cool facilities and are stored around 55°F. Most dairy products require temperatures just above freezing around 35°F. Meat and poultry products are typically stored just below freezing at approximately 28°F. Ice cream and other frozen products may require deep freezing at temperatures that can range from -10°F to -150°F.

The Global Cold Chain Alliance (GCCA), through its core partner, the World Food Logistics Organization (WFLO), maintains information and research on the safe harvesting, storage, handling and transporting of different commodities and temperature-sensitive products. ITA has a strong partnership with GCCA to help expand and grow cold chain systems around the world based on international best practices.

Each cold chain varies by region, location and temperature requirements; however, ensuring a cold chain for agricultural products begins at the farm. Produce often goes through precooling at the harvest location and is then loaded onto a truck or other transportation unit designed to keep the produce protected from the sun and held within a desirable temperature range, as it travels to a processor facility or a temperature controlled warehouse. In less-developed locations, transportation may be carried out on covered trucks or smaller carts; in more developed locations, these transportation solutions can include insulated reefer trucks.

Depending on the type of product and its ultimate destination, a product may proceed to one of several types of facilities. A cool dry storage facility protects the product and keeps it from high temperature fluctuations and humidity. A cold storage facility may be appropriate for products that require a lower temperature to remain fresh. This reduces the chance for bacterial introduction. A super cold facility is designed for products that may need to be kept frozen. Sometimes these temperatures may be 100° or more

Figure 4:



below zero. At each of these facilities, the product is kept at the ideal temperature until it is loaded onto an appropriate vehicle and shipped to a distribution center or its final destination, such as a retailer or restaurant.

At the retailer or restaurant, a product must be stored at the appropriate temperature in a refrigerator or freezer, as it awaits its final user, typically a home use customer or restaurant customer.

Cold chain systems are critical to the operations of U.S. franchisors and retail service providers. Modern retail sales have been growing at a rate of 10 to 15 percent globally and have reached 50 percent of market share in most large emerging markets.[11] U.S. franchise brands for food concepts are known for quality and safety around the world. In order to maintain their reputations, franchisors must have reliable and safe means to transport products to their retail operations.

Cold chain services typically have a deep vertical co-ordination with the retail and franchise customers that receive their services, allowing those customers to ensure the quality and the safety upon which they have built their reputations. The level of co-ordination often extends beyond just how products are stored and transported, to the local farmers, and allows for control of how food is grown and harvested.[12]

In some less-developed economies that lack cold chain services, retailers and franchisors have had to invest large sums of money in developing their own cold chain logistics systems. While companies like Wal-Mart, McDonalds and YUM! have the necessary capital to establish cold chain systems for their operations, the lack of cold chain development more broadly in many countries represents a significant limitation for many U.S. companies. This is especially true for small and medium size enterprises (SMEs) attempting to expand into international markets.

Transportation costs are often the most challenging obstacles to suppliers in developing countries.[13] In countries with well-developed cold chains, most retail and franchise service providers outsource their supply chain operations to third party logistics providers (3PLs) and to other cold chain service providers that meet their requirements based on their products and business strategies.

A recent global trend in cold chain is the rise of E-commerce for fresh food and grocery sales, as well as prepared food delivery. In the U.S. and China, there are a growing number of delivery services that offer fast food and dining beyond the traditional pizza delivery experience. A third party, rather than a vertically integrated part of a retail franchise, often provides these services to the restaurant operator or directly to the consumer, much like a 3PL would offer delivery and transportation for products.

Figure 5:

Sample Storage Temperatures

$>65^0$ F	• Processed Foods (pickled, dried, cooked) • Cooking oils • Onions
50^0-65^0 F	• Sub Tropical Fruits and Seeds • Chocolate
32^0-50^0 F	• Fresh Fruits and Vegetables • Milk and Dairy Products • Flowers and Eggs
$<0^0$ F	• Meat, Fish and Poultry • Frozen Fruits and Vegetables • Ice Cream

Grocery delivery, including fresh and frozen foods, is a rapidly growing service that is being utilized around the world. In the U.K., as much as 27 percent of shoppers utilize e-commerce for their monthly grocery shopping and have their food delivered directly to their home. This industry is expected to reach $23 billion by 2020. U.S. web retailer and supply chain specialist, Amazon, recently struck a deal with a major U.K. grocer to expand same day delivery of groceries in the country.[14] The complexities of warehousing and delivering fresh products directly to consumers are beyond the specialty of most retailers, and these services are mostly contracted to cold chain service providers.

Among Asian economies and developing markets, e-commerce is having an outsized impact on the delivery of retail products, including fresh and prepared foods. ITA anticipates that many of these economies will skip cycles of normal development, bypassing the standard transition from wet market to brick and mortar supermarkets and organized retail. Instead, many large metropolitan markets will see the largest growth in direct to consumer e-commerce and m-commerce (commerce conducted through mobile devices) sales of temperature-sensitive products. Thus, a rapidly advancing model of distribution that will more heavily utilize cold chain services is expected. Smaller cold storage facilities located closer to urban environments are likely to grow quickly.

While food and beverage products are the most commonly associated commodities that utilize cold chains, they are not the only ones. Many pharmaceuticals, vaccines, bioengineered drugs and biologics that are derived from living cells must remain within a limited range of temperatures to maintain their viability. To meet these requirements, U.S. express delivery service providers, such as FedEx and UPS along with foreign companies such as DHL, have made huge investments to develop complete logistics systems throughout the world. These systems maintain the integrity of the vaccines and other healthcare products that they transport for various manufacturers and healthcare providers. Their cold chain systems include warehouses, specialized aviation and ground transportation equipment, advanced software management systems and extensive personnel training.

Developing cold chain systems provides export opportunities across the services and manufacturing spectrum. Cold chain-related design and engineering, maintenance, logistics and software, and IT development amount to billions of dollars of U.S. services exports each year. Likewise, manufactured products, such as industrial racking systems, forklifts, trucks and commercial HVAC systems contribute to billions of direct U.S. goods exports. Global expansion of cold chain systems also helps U.S. agricultural producers expand their market opportunities overseas.

The markets opened through efficient internationally developed cold chain systems allow U.S. franchisors and retailers to continue to expand the services trade surplus that the United States has held for more than four decades. Services exports, however, can be notoriously difficult to quantify. The Bureau of Economic Analysis (BEA), the U.S. government entity responsible for recording trade data, defines “cross border trade” as occurring when suppliers in one country provide goods or services to consumers in another country, with people, information or money crossing national borders. Therefore, sales of services provided by U.S. companies physically operating in another country are often recorded not as exports but as U.S. owned foreign affiliate sales.

According to BEA, services exports in 2013 totaled $662 billion. Distribution services accounted for $46.6 billion of these exports, with logistics services functions (including cold chain services) representing 51 percent or $23.9 billion.

By contrast, services supplied by U.S. owned foreign affiliates amount to more than $1.3 trillion, and distribution services accounted for $399 billion in 2012, the latest numbers on record. These foreign affiliates in distribution services had total sales of over $1.8 trillion in 2013.[15]

In the realm of services, there is growing evidence that the focus of exports as a primary indicator of economic activity is outdated. As more businesses operate on a global level and reallocate their resources on the specific business functions in which they have a comparative advantage, distribution, logistics and cold chain services will continue to facilitate an ever-growing international market of innovation, efficiency and competition. From 2008 to 2012, sales by logistics services affiliates rose on average 21 percent, suggesting that cold chain and logistics service providers are responding to an international demand for value-added services.[16]

Global Industry Landscape

In the United States, cold chain systems are well-developed through many years of investment and provide high quality of life benefits to U.S. consumers. In fact, in 2008, the World Health Organization attributed refrigeration as a major factor in the reduction of stomach cancer by nearly 90 percent in the United States since 1930.[17]

Cold chains in the United States are designed to meet high demands from businesses, consumers and regulators. Businesses require products that meet the level of quality of their business structure; consumers demand the highest quality available based on the price they are willing to pay; and regulators, such as the U.S. Department of Agriculture (USDA) and U.S. Food and Drug Administration (FDA), set requirements and minimum safety standards for the handling of many consumer foods and temperature-sensitive products. These market demands have resulted in a competitive

U.S. industry, with standards that lead the world in terms of safety and integrity.

U.S. cold chains have reshaped the consumer market over several decades. Product seasonality issues rarely exist in the United States today, as retailers are able to source from countries with alternate climates. Global trade in perishable products has continued to grow year after year.

Flowers are an example of a product that utilizes and depends on cold chain storage. Cold storage permits flowers of all varieties to be purchased year round, by sourcing them from South America and keeping them fresh through the extensive U.S. cold chain. The United States imports more than 5 billion fresh cut flowers each year. Exports of temperature-sensitive products from the U.S. to many of these same sourcing countries are still limited, however, due to inadequate distribution cold chains outside of the United States.

Figure 6: Fresh Cut Flowers Imports: 2014 Valentines Season By Country of Export (cbp.gov)	Jan 1-Feb 14 2014 (millions)
Colombia	505.9
Ecuador	184.2
Mexico	43.1
Netherlands	21.3
Costa Rica	9.5
Kenya	8.3
Thailand	7.6
Guatemala	7.1
Peru	1.7
India	1.7

Customs and Border Protection

Improving technologies in cold transportation has created a shift in transporat modes; flowers are increasingly being transported to the U.S. via ocean going vessels, rather than the traditional, more expensive air transportation option. In fact, global shipments of all perishable products by ocean carriers has increased rapidly over the last 35 years.[18] Reasons for the shift include greater availability of refrigerated containers, improved facilites at ports and better technology options for monitoring shipments in route.[19]

Air transporation is still a heavily relied on mode of cold transportation for many high value items, such as biologics and bioengineered drugs which can cost as much as $100,000 or more. The amount of biotechnology products that require cold chain has risen drastically around the world. Nearly half of the top 50 global drug products in 2013 required cold chain services. These drug sales amounted to $104 billion, and the overall cold chain biopharma industry is expected to grow to $350 billion by 2019.[20]

Cargo challenges in air transportation have led to some pharmaceuticals shifting to sea modes in recent years. The International Air Transport Association (IATA) found that temperature excursions (a product temperature that has deviated beyond its acceptable range) are one of the primary reasons shippers are shifting away from air transportation. Further, the organization found that more than half of all temperature excursions occur when packages are with airline cargo handlers or in airports. As a result, IATA created a global pharmaceutical logistics certification program through their Center of Excellence of Independent Validator (CEIV). The certification program trains stakeholders on regulations and standards, compliance and accountability, and audits for adequately equipped facilities. The program allows stakeholders to easily search and identify cold chain service providers that meet certification standards.[21]

IATA has also been heavily engaged in the development of industry best practices and standards for perishable air cargo and has produced the “Perishable Cargo Regulations” manual to improve and standardize the practices among its 280 airline and air cargo handling members.[22]

Due to cold chain service’s multiple industrial components, including logistics, transportation, distribution, and equipment and technology industries, it is difficult to describe the industrial nature of the global cold chain sector in general or structural terms. Rather, using a global value chain view of cold chains as a business function is a more effective way to view the various activities and businesses involved in the service. The following is a snapshot of the cold chain service’s warehousing, third-party logistics, express delivery, industrial transportation equipment and personal protective equipment activities.

<u>Warehousing</u>

Americold Logistics, based in Atlanta, GA, is by far the largest firm in the cold storage and 3PL logistics sector. The company operates 1.1 billion cubic ft. of refrigerated storage, with more than 230 facilities, and has almost $2.5 billion in annual sales. Outside the

United States, the company has operations in Argentina, Australia, China and New Zealand. Americold supplies more than 3,000 customers, including Tysons, Heinz, Con-Agra and General Mills, with more than 90,000 freight shipments each year.[23]

Figure 7: Cold Storage By Volume	Storage (mil. ft^3)	Sales Revenue (millions)
Americold (U.S.)	992	$2,430
Lineage Logistics (U.S.)	600	$206
Swire Group (U.K.)	335	N/A
Preferred Freezer (U.S)	258	$441
Nichirei Logistics (Japan)	152	$188
Kloosterboer (NLD)	124	N/A
VersaCold Logistics (Can)	119	$419
Partner Logistics (U.S.)	101	N/A
Interstate Warehousing (U.S.)	83	N/A
AGRO Merchants (U.S.)	80	$76
Nordic Logistics (U.S.)	70	$100
Cloverleaf Cold Storage (U.S)	65	$39
Burris Logistics (U.S.)	72	$2,630

Global Cold Chain Alliance and Hoovers.com

Other major refrigerated warehousing providers include Lineage Logistics, Swire Cold Chain Logistics, Preferred Freezer, Nichirei Logistics and Burris Logistics. Lineage, based in California, primarily operates in the U.S. with 600 million cubic feet of storage. Lineage had earnings of $206.4 million in 2014. Swire Group is held by holding company John Swire & Sons and includes numerous cold chain service companies, including Swire, Finlay and U.S. Cold Storage. The collective companies operate in Australia, China, Sri Lanka, the United States and Vietnam; they have 335 million cubic ft. of storage. Preferred Freezer, based in New Jersey, has 260 million cubic ft. of cold storage, mostly near freight hubs in the United States, China and Vietnam where it also provides cross docking and transshipping services. Nichirei Logistics, with 152 million cu ft., is the logistics subsidiary of Nichirei Corporation in Japan, a food processor with nearly $5 billion in annual sales. Burris Logistics, based in Delaware, has 15 facilities with 72 million cubic feet and has estimated sales of $2.63 billion.

Third Party Logistics

Third party logistics operators (3PLs) provide integrated warehousing and transportation services to businesses on an outsourced basis. The availability of 3PL services allows businesses to focus on their core competencies while having 3PL's specialized systems handle most or all of their logistics requirements. These services can often be customized for individual clients based on the client's specific needs and can include air, rail, maritime and truck freight; brokerage and customs services; warehousing; and distribution and in-bound and out-bound freight consolidation.

Shipments via 3PLs rose 7.2 percent in the second quarter of 2014, according to the Transportation Intermediaries Association.[24] The role of 3PLs to manage fulfillment in the cold chain sector is likely to continue to grow for the foreseeable future due to the increasing role of omnichannel retailing, especially in the fast growing ASEAN region.

According to the Journal of Commerce, revenue from the top 50 logistics companies was $248 billion in 2014, an increase of almost 5 percent.[25] C.H. Robinson Worldwide led U.S. logistics companies with $11.9 billion of sales revenue. With few physical assets of its own, C.H. Robinson contracts with more than 66,000 carriers around the world to manage 14.3 million shipments to more than 46,000 customers.[26] C.H Robinson buys, sells and transports food and agriculture products around the world.

Figure 8: Top 10 Global 3PL's	Sales Revenue (millions)
DHL Logistics (GER)	$37.5
Kuehne + Nagel (SZ)	$23.4
DB Schenker Logistics (GER)	$19.0
C.H. Robinson (US)	$11.9
DSV (DEN)	$8.7
CEVA Logistics (NE)	$7.9
Panalpina (SZ)	$7.3
Dachser (GER)	$7.1
Expeditors International (US)	$6.6
SNCF Geodis (FRA)	$5.8

Journal of Commerce

Express Delivery Services

United Parcel Services' (UPS) subsidiary, UPS Supply Chain Solutions, is one of the top 3PL service providers, though UPS' primary focus is as an express delivery service provider that transports more than 17 million packages per day to over 220 countries. The company operates more than 106,000 vehicles, over 600 aircraft and exceeded $58 billion in sales in 2014.[27] UPS has developed Temperature True, a packaging and transportation system that provides services to more than 500 healthcare companies. UPS has developed 49 facilities dedicated to the temperature-sensitive healthcare industry with cryogenic freezing to -150°F.

Figure 9: Express Delivery Services	Sales Revenue
Deutsche Post (Ger)	$68.83B
UPS (U.S.)	$58.23B
FedEx (U.S.)	$47.43B
LA POSTE (FRA)	$14.56B

Hoovers.com

Another major U.S. service provider is FedEx, which delivers more than 3.5 million packages per day to more than 220 countries. With more than 56,000 vehicles and over 650 aircraft, FedEx generated more than $47 billion in sales in 2015.[28] FedEx has also rapidly developed logistics hubs throughout the world catering to temperature-sensitive transportation and uses a system called SenseAware that can monitor product vitals of humidity, barometric pressure, location, light exposure, at temperatures as low as -238°F.

Within the United States, both companies have established customs clearing processes and host U.S. Customs and Border Protection (CBP) offices within their facilities to allow international deliveries to proceed smoothly, without delays that could potentially expose sensitive products to risk.

Figure 10: Refrigerated Transportation Manufacturers	Sales Revenue (millions)
Wabash National	$1,860
Utility Trailer Manufacturing	$1,020
J.B. Poindexter	$708
Thermo King	$548
Great Dane	$466

Hoovers.com

Industrial Transportation Equipment

One of the largest U.S. manufacturers of reefers, or refrigerated trailers, is Utility Trailer Manufacturing based in California. The family-owned company has more than 140 brands, and has estimated annual sales of over $1 billion and also builds specialized refrigerated vans and delivery trucks.[29] Other manufacturers of refrigerated trailers and commercial trucks and vans include: Wabash National with a variety of manufactured products; J.B. Poindexter which focuses on specialized trucks and vans; and Great Dane Trailers with a variety of dry bed, flatbed and refrigerated sales. Companies like Thermo King, a division of Ingersoll Rand, provide temperature control systems for trucks, trailers, rail cars and shipping containers. Thermo King has annual sales estimated at $548 million.

Cold chain spending in the biopharma industry on insulated boxes, blankets, phase change materials, temperature controlled shipping containers, sensors and recorders, and other tertiary packing and instrumentation is estimated at $3.1 billion.[30]

Personal Protective Equipment

There are also a number of SMEs in the U.S. cold chain sector. For example, Georgia based Refrigiwear provides Personal Protective Equipment for workers operating in the cold environments of warehouses. The 55-year old company employs 142 workers and earns $38 million in sales revenue from their 150,000 square foot facility.

Challenges and Barriers

While it can be challenging to operate a business in any international environment, one of the greatest challenges to cold chain expansion in a developing market is the lack of infrastructure necessary to sustain cold chains. Transportation systems in many of these economies can make reliably transporting refrigerated products in a timely manner difficult to near impossible. In addition, lack of reliable power for cold warehouses, power hookups for reefer trailers at ports and transportation hubs, and adequate facilities at the final customer locations add further costs and complications.

Over many years numerous aid agencies and organizations, both government and private, have been driven by the humanitarian benefits of cold chain to address many of these infrastructure issues in markets that suffer from massive food wastage and malnutrition, with varying degrees of success. Ultimately however, many of these groups fail to reach their goals of widespread cold chain development, largely because they view cold chain as an industry of its own rather than a business function of a global value chain. Thus, they fail to address the second and perhaps most pertinent challenge to the growth of cold chain: finding ways to make a reasonable return on investment.

Cold chain service providers operate as a business function in the distribution services market and meet the needs of retailers and franchises. Due to the enormous investment costs, cold chain operators need a significant amount of volume to become profitable within an ideal time frame of 2-3 years. These volumes typically are met predominantly through large, organized retailers and franchises. For these reasons, the growth of cold chain services often coincides with the growth of the international retail and franchise markets. It is ultimately the retailers and the branded marketers that control the production and flow of products through cold chains to the consumers.

By their nature, most services, like retailers, provide sales to foreign countries that require a physical presence in that country. Service providers therefore establish branches or foreign affiliates to provide these international services. It is critical that, in order for services in a country to grow, there must be in place business friendly government policies that are open to foreign direct investment (FDI). Protectionist measures by foreign governments, often seen in lower and middle-income economies, tend to restrict foreign services activities, especially in the area of distribution services like retail. In doing so, these economies inadvertently restrict the opportunities to expand and grow the business function of cold chain services.

While the prime markets for cold chain are often consumer driven, developed economies and, in some cases, emerging economies can pose opportunities for cold chain operators to service exports that are primarily headed to foreign consumer markets. These prime developing markets need to have policies that are open to FDI and facilitate ease of trade to allow businesses to see clear paths to a return on the investments they will need to make.

In developing, lower income markets, the most likely initial opportunities include design and engineering of warehouses, the operation of third party logistics and technologies that can efficiently overcome shortfalls in infrastructure development, for example: developing economies with unreliable electricity may require unique solutions or alternative energy sources to properly maintain warehouse temperature; a lack of adequate roads may also mean new transportation options or versatile refrigerated containers need to be developed.

As these solutions are developed and introduced, they provide new access to international markets and opportunities for small businesses and farmers where previously there were none. The highest quality products from these small farms are mostly exported to other regions since consumers are often unable or unwilling to pay for the higher quality products locally, and without economies of scale, local retailers are unable to support the investments necessary to maintain the quality of products.

The economic activity sparked by these international transactions increases the income of engaged locals and spurs investment by international retailers and franchisors. As the economy develops into a higher income consumer market and the retail industry becomes more organized, cold chain services will shift more product from exports to the retail and franchises that begin to operate locally.

In many of these developing economies, smaller “mom and pop” retail establishments can often be the greatest recipients of benefits from this situation, since these local establishments are often able to utilize economies of scale from the same supply chains as the large companies without the large footprint.

It cannot be overstressed that this model of the development of an economy through cold chain only works in those economies with business friendly trade policies. In fact, according to the World Bank, gravity model studies have shown that important drivers for FDI include the growth potential for a market, the labor environment and the distance and ease of reaching important markets, which includes the openness of an economy to trade. Further, the World Bank has highlighted that a 1-percentage point difference in the regulatory indicator portion on the *Ease of Doing Business* report correlates to FDI inflows of $250 to $500 million annually.[31]

In developed, higher income economies, competition from numerous cold chain service providers can pose a challenge. The most likely opportunities for U.S. cold chain providers, therefore, will be in the consolidation of existing fragmented systems into higher efficiency systems that provide increased reliability and higher quality options that allow retailers to cater to particular consumer tastes. New technologies that address particular aspects of each market, such as cultural preferences and omnichannel retail shopping, may also be a significant long-term growth opportunity.

Opportunities

Cold chain systems require industrial designers and engineers to develop efficient warehousing and storage systems, as well as refrigeration units for transportation vehicles and networks. Engineers and industrial design teams take into account what type of product will be stored in a warehouse facility, how much processing will be done within the facility, the quantity of items to be stored and the product's specific handling requirements. Many facilities hold varying types of product sizes and handling requirements, and the design of these warehouses will often take into account the need for flexibility in cooling and handling conditions. A cold warehouse and storage system may cost several million dollars to design and build. These sales and services help contribute to the $4 billion in U.S. industrial engineering exports and $12.3 billion in architecture and engineering services in 2014[32] and $184 billion dollars in industrial equipment exports in 2012.[33]

Once these systems are in place, cold chain warehouses require maintenance and repair services. Freon-based systems are an affordable option for small-scale chiller systems; however, ammonia-based refrigeration systems have long been the industry standard for large industrial refrigeration. U.S. companies have also developed new technologies for small charge ammonia systems that use up to 98 percent less ammonia and can replace older, inefficient systems.[34] All of these systems will require regular maintenance performed by skilled professionals. Due to ammonia's hazardous qualities, safety and administrative controls must be implemented for equipment maintenance and service. The United States exported $22.3 billion worth of maintenance and repair services in 2014[35] – a number that ITA expects to increase, as additional cold chain development takes place in emerging markets.

In a cold warehouse, forklifts and trucks are needed to move and store pallets of products. These trucks vary significantly based on the type and design of a cold chain facility. Additionally, refrigerated transportation equipment, such as refrigerated trucks, will be required to transport products to retailers, franchisors or end users.

Modern refrigerated trucks, known as reefers, are designed to be very versatile and can be configured in minutes to carry a wide variety of cold products. Many trucks can carry products of varying refrigerated temperatures by adjusting internal compartments to meet specific product temperature needs. Often modern trucks are fitted with GPS monitoring systems that can provide data on location and can help operators maintain the temperature in individual compartments. Individual trucks can cost between $30,000 to well over $150,000. Warehousing vehicles and reefer trucks helped contribute to $4.5 billion worth of trucks, buses and special purpose vehicles exported by the United States. in 2014,[36] and U.S. owned foreign affiliates in transportation equipment sold more than $3 billion in 2013.[37]

Managing cold warehousing and delivering products is often contracted out to third party logistics operators (3PLs), which provide important service export opportunities. 3PLs offer outsourced logistics services scaled and customized based on the needs of the customers they serve. Their expertise in management and transportation logistics and economies of scale often provide services at a lower cost than customers can provide for themselves. In 2013, U.S.-owned foreign affiliates in transportation and warehousing had sales of more than $63 billion.[38]

In addition, express delivery service providers also have cold chain logistics services that are expanding internationally. Express delivery service providers can deliver high-value temperature-sensitive products, primarily vaccines, medical and biotech products, by air to facilities around the world. These transportation services contribute to the $90 billion of U.S. exports seen in transport services in 2014.[39]

Managing and coordinating the warehouse and transportation services that are necessary to maintain proper product temperatures is aided through advanced logistics and warehouse IT and managing software. While some logistics service providers develop their own proprietary software, many rely on IT and software service provided by technology companies. U.S. exports of computer software, telecommunications and information services totaled $75.3 billion in 2014,[40] and services from U.S. foreign affiliates sold more than $6 billion in 2013.[41]

Once in place, cold chain systems make it possible for U.S. exporters to reliably ship meat, poultry, fruit and vegetables. Various forms of frozen and fresh food, wine and other beverages can also be exported through these advanced systems. In 2014, nearly $145 billion worth of food products were exported.[42] U.S. foreign affiliates in agriculture sold $547 million, and food services sales amounted to nearly $39 billion in 2013.[43]

Cold chain systems also allow U.S. pharmaceuticals, biotech materials and some sensitive electronic equipment to be exported safely.

Country Case Studies

The following pages include country case studies that summarize export opportunities in selected markets. The overviews outline ITA's analysis of the U.S. export potential in each market and represent a range of countries to illustrate a variety of points. The markets included in the case studies are representative of certain regions and are not listed in any priority ranking order.

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Australia

Australia's established cold chain may benefit from the ratification of TPP, as agriculture and other products exported from the country to TPP partners may see significant increases. The current market may also see improvements in efficiency through consolidation.

Overall Rank	High-Income Category Ranking
9	8

Australia has an estimated GDP of $1.46 trillion. U.S. exports of goods and services are around $46 billion, making it the United States' 15th largest export market. U.S. majority owned foreign affiliate sales in Australia were $184 billion, and distribution services accounted for $41 billion in 2013.[44]

The population of Australia is considered high income, with a per capita income of about $42,760 (PPP) per year. Unemployment has increased over several years to reach 6 percent in 2014.[45]

Modern supermarkets make up approximately 35 percent of the Australian food retail market,[46] and food spending is expected to grow to $74 billion by 2020.[47]

The Australian franchise industry is well-established with more than 1,000 franchisors and 65,000 franchise units. Australian franchise concepts make up 92 percent of the market, with the U.S. share at around 3 percent. Nearly 18 percent of franchisors are in the food and beverage sector. With potential growth in the healthy alternative side of food and beverage, opportunities may exist for cold chain operations that service this aspect of the market.

E-commerce in Australia has been estimated to be over $17 billion in 2015, according to National Australia Bank, with over 12 million Internet subscribers and 20 million cell phone subscribers, indicating potential for growth in e-commerce for refrigerated products.

The pharmaceutical industry has seen sales of $10.5 billion in 2015, and sales are expected to remain flat through 2020.

Figure 11:

Competitiveness Index	Score
Government/Regulatory	4.5
Labor Force	4.9
Infrastructure	5.6
Demand	4.7
Industry Interest	4.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	24 Million
Cold Storage Capacity	5.08 M/m^3
Pharmaceutical Sales	$10.5 Billion
Food Spending	$67 Billion
Food Spending per Capita	$2,793
Agribusiness Market	$44 Billion
Agriculture Imports	N/A
Agriculture Exports	$80 Billion

BMI and Global Cold Chain Alliance

Agriculture production is over $50 billion more than half of which is exported primarily to its neighbors in the Asia Pacific region. With the newly negotiated Trans-Pacific Partnership (TPP), as well as negotiations with Asian economies for more trade agreements, farm output is expected to expand providing opportunities for U.S. cold chain service providers to support the industry. The full agribusiness economy, including supporting functions is over $150 billion, more than 12 percent of the Australian economy.

Australia ranks 13th out of 140 on the World Bank's Ease of Doing Business 2016 Rankings.[48] Since 2013 the Australian government has focused on improving the business environment and its openness to investment by reviewing and reforming labor markets and taxation and reducing regulatory barriers.

Australia is ranked 13th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 37 and a labor participation rate of 65.2 percent. More than 50 percent of the workforce is tertiary educated, yet only slightly more than 30 percent of the workforce is engaged in high skilled employment, indicating an educated workforce that is underemployed for its skill level.[49]

Figure 12: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Australia	13	$43,929
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Transport infrastructure has seen a downward trend since 2011, suggesting that Australia may not be keeping up with growth, especially in ports and rail. The country's quality of transport infrastructure overall, however, is ranked 16th out of 140 countries in the World Economic Forum Global Competitiveness index.[50] In recent years, with the decline of the commodities markets, Australia has been selling off much of its government owned infrastructure to private industry, such as ports that service western commodities industries.

Australia ranked 16th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. While Customs has shown improvement, the Ease of International Shipments has declined significantly.[51] The ratification of TPP may reverse this decline.

The U.S. has a free trade agreement with Australia that has virtually eliminated tariffs on U.S. exports. Australia is a signatory to the recently negotiated TPP. Upon ratification, U.S. businesses may find increased potential for growth and more opportunities to participate in trade. The agreement will eliminate tariffs, lower service barriers and increase transparency while also increasing competitiveness by supporting strong intellectual property rights protection and enforceable labor and environmental obligations.

The TPP will promote fairness by ensuring non-discriminatory treatment of U.S. goods and services, establishing rules for fair competition with State-owned enterprises and providing the same rights and protections for U.S. investors that foreign investors currently enjoy in the United States while protecting the inherent right of governments to regulate.

Resources:

U.S. Commercial Service:
http://export.gov/Australia/

Australia Country Commercial Guide:
http://export.gov/ccg/australia090720.asp

Industry's Take:
Australia is a market dominated by several large players and is reaping the benefits of a trade agreement with China. That, however, does not mean there is an opportunity for growth, as the domestic market is relatively small in comparison to other regions around the world. Thus, we see a round of consolidation that might occur in the future.
Richard Tracy, Global Cold Chain Alliance

Brazil

Brazil's culture, proximity to the United States and level of development make it a prime location for cold chain export growth; however, systemic government structural problems and the effect of the regulatory environment on business development and trade make any short to medium-term growth diminutive.

Overall Rank 20

Upper-Middle Category Ranking 6

With a GDP of $2.3 trillion, Brazil is the seventh largest economy in the world and is the United States' ninth largest export market for goods. Exports to Brazil account for 3 percent of total U.S. exports of goods and services or around $71 billion. U.S. majority owned foreign affiliate sales in Brazil were $207 billion in 2013, and while retail sales numbers are not available, distribution services contributed more than $18 billion.[52]

Figure 13:

Competitiveness Index	Score
Government/Regulatory	3.0
Labor Force	3.6
Infrastructure	4.2
Demand/Business Factors	5.0
Industry Interest	4.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	208 Million
Cold Storage Capacity	16.0 M/m^3
Pharmaceutical Sales	$26.3 Billion
Food Spending	$200 Billion
Food Spending per Capita	$963
Agribusiness Market	$222 Billion
Agriculture Imports	$2.5 Billion
Agriculture Exports	$7.3 Billion

BMI and Global Cold Chain Alliance

More than half of Brazil's population is considered middle class, earning between $11,500 and $29,000 per year. Unemployment has been increasing, and inflation has recently been as high as 8.5 percent.

The Brazilian retail market is heavily saturated. Modern supermarkets have a market share of 50.7 percent and have seen slow growth of about 1.3 percent over 2008 through 2013. The large metropolitan cities have limited opportunity for growth overall; however, fresh food providers and franchise and restaurant service providers should continue to see growth opportunities.

The franchise sector in Brazil is one of the main growth engines and has consistently grown faster than the stagnating economy. Many common U.S. franchise restaurants have been expanding throughout Brazil's urban regions. Despite these trends, growth in franchising is likely to slow as the sector begins to suffer the effects of an economy on the verge of depression.

E-commerce and m-commerce are rising in popularity, with as much as $14 billion in sales. Online sales of refrigerated products, however, have not accounted for any significant amount. The largest geographical area of electronic sales is São Paulo, with 34 percent of total purchases.

The pharmaceutical industry in Brazil has reached approximately $28 billion and has grown by 36 percent since 2010. Taxes on medicines are approximately 34 percent, but the government expects these to be reduced over time.

Express delivery companies face particular challenges shipping into to the country. All goods processed through the Simplified Custom Clearance, the process used for express delivery, face a flat 60 percent duty. Express delivery providers bringing in refrigerated items are also often charged a duty on the refrigerated container, or unit load device, which is used to ship temperature-sensitive products.

Agriculture is one of the largest sectors of the Brazilian economy, comprising 22.8 percent, and large portions of the country are still available to be cultivated. The infrastructure of the country, however, creates extreme challenges in connecting farmland to the global economy. Opportunities may exist for 3PLs and services that can provide vital cold chain links to these far flung Brazilian prairie regions.

In October 2014, the Brazilian government published dietary guidelines that recommended the use of fresh foods over processed foods. The guidance suggests that improved cold chain development will be needed to meet the needs for fresh food.

Brazil ranked 116th in the World Bank's 2016 Ease of Doing Business, a downgrade of 5 places since 2015, when the survey was recalculated. Of particular note were low rankings in the categories of Paying Taxes, Dealing with Construction Permits, Trading Across Borders and Registering Property.[53]
Brazil's economy has been in a downward spiral for nearly two years. In February 2016, Moody's Investor Service cut Brazil's sovereign fund rating to junk, citing political turmoil and the country's gross debt, which has increased to two-thirds the value of its economy. Moody's downgrade was the last of the three major ratings firms to downgrade the country's investment grade and with a negative outlook, with most analysts believing that more downgrades are coming.[54]

Figure 14: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Customs issues, taxes and fees can limit opportunities for U.S. businesses and inefficient rules and regulations hamper growth opportunities for businesses engaged in cold chain operations. According to the World Bank, on average businesses pay taxes totaling 69.2 percent of profits.[55] Corruption and high levels of crime also plague the business-operating environment.

Brazil has one of the lowest levels of market penetration for refrigerated warehouses at .09 cubic meters per urban resident, though the market has been growing at a rate of 26.5 percent from 2008 to 2014.[56]

Refrigerated warehouse service providers face numerous challenges in the Brazilian market. Lack of understanding about the cold chain within the Brazilian government has led to inefficient rules and regulations. For example, a cool storage facility that distributes prepackaged goods may be required to abide by the same workplace guidelines as a meat processing facility. As a result, employees are required to don full protective suits and scrub their boots and hands before entering or exiting the facility despite the fact that warehouse employees will never come in direct contact with any food or food products.

Most warehouse facilities in Brazil lack sufficient fire suppression systems because regulations do not exist that require their use. Fire suppression systems, often developed and sold by U.S. companies, can be prohibitively expensive due to customs and importation taxes and fees. Technologies in cold chain management, such as computer-based and GPS tracking systems, are likewise expensive to acquire and use in Brazil, thereby limiting the speed of growth in the Brazilian market.

Brazil is ranked 78th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 29 and a labor participation rate of 69.8 percent. Approximately 8 percent of the population is tertiary educated, and the country is ranked 108th in ease of finding skilled employees.[57]

With a lower educated work force than other countries in the region, it is important for cold chain operators to perform a significant amount of on-the-job training.

Transportation infrastructure in Brazil is a mixed bag of success and failures. Brazil's quality of transport infrastructure is ranked 77th out of 140 countries in the World Economic Forum Global Competitiveness index. Of particular note are low rankings in areas of Quality of Overall Infrastructure, Quality of Roads and Quality of Port Infrastructure[58]

Road transportation within and around major cities is often highly developed, though traffic congestion is a major concern throughout most of the day. Distribution of products during off hours can be limited due to cultural aspects surrounding business practices and crime concerns.

Brazil ranked 65th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Virtually every category in the index declined from the previous studies of 2010 and 2012. Brazil's customs are ranked 94th in the survey,[59] reflecting Brazil's heavily bureaucratic processes which focus on using customs clearance as a profit center.

Logistics in Brazil are some of the most costly in the world. Distribution makes up about 32 percent of logistics costs, suggesting that there are considerable opportunities for 3PLs and service providers that can implement improvements in warehousing, inventory management and transportation management.

While rail is considered to be about 30 percent cheaper than road transportation, rail infrastructure is poorly developed and regulations surrounding management of rail lines make travel by rail a means of last resort for temperature-sensitive products.

Improvements to Brazil's government regulatory environment through trade facilitation can play a role in identifying where improvements can be made within the cold chain system. Brazil recently ratified the World Trade Organization Trade Facilitation Agreement, which may indicate a willingness to focus on this area.

The ITA is working with the Brazilian government through the U.S – Brazil Commercial Dialogue to map the cold chain and identify trade bottlenecks and barriers. The identification of these barriers will help guide policy efforts to reduce and remove these impediments to trade for distribution services industries.

Resources:

Brazil Country Commercial Guide:
http://export.gov/ccg/brazil090732.asp

USTR National Trade Estimate Report:
https://ustr.gov/sites/default/files/files/reports/2015/NTE/2015%20NTE%20Brazil.pdf

U.S. Mission to Brazil - Intellectual Property Protection:
http://brazil.usembassy.gov/intelprop.html

U.S. Commercial Service:
http://export.gov/Brazil/

Brazil Chamber of Electronic Commerce:
www.camara-e.net

Brazilian Association of Credit Card and Service Companies:
www.abecs.org.br

E-bit - *Certificação de Consumidores*:
www.ebit.com.br

Foreign Investment and International Trade Promotion Agency (APEX Brasil):
http://www2.apexbrasil.com.br/en

Industrial Property Institute (INPI):
http://www.inpi.gov.br/

Trade and Investment Guide (Brazil Export):
http://www.brasilexport.gov.br/

Securities Exchange Commission (CVM):
http://www.cvm.gov.br/subportal_ingles/index.html

Superintendence of Private Insurance (SUSEP):
http://www.susep.gov.br/english-susep/index

Associação Brasileira da Indústria de Armazenagem Frigorificada:
http://www.abiaf.org.br/

Brazil Agency for Industrial Development (ABDI):
http://www.abdi.com.br/

Brazil Bank Federation (Febraban):
http://www.febraban.org.br/

Brazil Franchise Association (ABF):
http://www.portaldofranchising.com.br

Industry's Take:
The devaluation of the Real is negatively affecting the Brazilian business climate. If the political situation could become more stable, the economy would improve.

Richard Tracy, Global Cold Chain Alliance

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China

With a large, rapidly growing demand and well-established infrastructure in large urban populations, China is a top market for cold chain development.

Overall Rank	Upper-Middle Category Ranking
10	2

With a GDP of more than $11 trillion, China is the largest economy in our Top Market Report. Exports of goods and services to China reached $167.2 billion in 2014, a growth of 4.4 percent, and accounted for 7.1 percent of all U.S. exports. U.S. majority owned foreign affiliate sales in China were $260 billion, and distribution services accounted for more than $40 billion in 2013.[60]

Figure 15:

Competitiveness Index	Score
Government/Regulatory	4.1
Labor Force	4.4
Infrastructure	4.7
Demand/Business Factors	4.8
Industry Interest	5.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	1.376 Billion
Cold Storage Capacity	76 M/m^3
Pharmaceutical Sales	$108 Billion
Food Spending	$1.2 Trillion
Food Spending per Capita	$875
Agribusiness Market	$1.36 Trillion
Agriculture Imports	$65.7 Billion
Agriculture Exports	$10.5 Billion

BMI and Global Cold Chain Alliance

The population of China is considered upper middle income, with a per capita income of about $13,170 (PPP) per year. Unemployment has held steady at 4.7 percent, and inflation was less than 1 percent in 2014.[61]

China is currently undergoing a rapid transition from a manufacturing and construction led economy to a consumer led economy. The rapidly growing middle class offers huge opportunities for retailers, franchisors and restaurant service providers to expand and grow. At 5.34 percent, the market share of modern grocery retailers is at the low end of the spectrum for all countries; however, this market share has increased at a rate of 64.9 percent from 2008 to 2013.[62]

Many consumers outside of first tier cities still purchase agriculture and food products from a traditional wet market, limiting the full utilization of cold chains. On the other hand, major cities like Beijing and Shanghai have seen a dramatic increase in the demand for and utilization of cold chain warehouse and transportation systems, especially as western businesses and cultural influences become more popular and consumers become more educated and aware of food safety issues.

Franchising is still a relatively new concept in China, though U.S. franchisors and retailers have seen considerable growth. There are more than 4,500 franchises, and total stores from the top 100 franchises amount to over 120,000. Nearly 40 percent of franchise operations are engaged in food and beverage and retail. Per-capita grocery sales at these establishments have increased at an annual growth rate of 7.6 percent from 2008 to 2014.[63]

U.S. businesses must be mindful of the challenge to find reliable suppliers that use proper practices and training; in 2013 a supplier sold KFC and McDonalds expired meat. This food safety scare hurt the brand reputation of McDonalds and KFC and led to a significant plunge in sales.

The Chinese population has more than 632 million Internet users, and more than 400 million participate in online shopping. According to China government's National Bureau of Statistics, e-commerce sales increased by nearly 50 percent from 2013 to 2014 to reach $449 billion. Sales are expected to reach as high as $1 trillion by 2019.

As in many Asian markets, e-commerce is giving rise to a new trend among shoppers who purchase groceries and meals online to be delivered to their residence or business, bypassing typical retail establishments. Food products purchased online are often deemed to be safer and of better quality than those purchased at local markets. This alters the standard model of cold chain services and opens a new opportunity for U.S. cold chain service providers. 3PLs who have been able to develop new, efficient ways to deliver temperature-sensitive products directly to consumers have seen massive growth that will likely continue for the foreseeable future. With continued improvement of the cold chain sector, U.S. SMEs are also expected to find better opportunities to enter the Chinese market.

Pharmaceutical sales in China are expected to hit $115 billion in 2016 and reach nearly $200 billion within seven years.[64] A major driver of cold chain biopharma expansion in China is likely to be insulin. Currently, 25 percent of the world diabetic population lives in China, yet China only consumes about 6 percent of the world's insulin.[65] Transportation and storage of vaccines and pharmaceuticals by ill-equipped or untrained service providers has been a big problem in China. Experts have expressed to ITA that many of the vaccines administered in the country have been rendered ineffective due to temperature fluctuations.

U.S. express delivery companies have made significant investments in China to meet the many opportunities and challenges the market holds. These investments include establishing aviation hub operations to link China with global markets, establishing delivery services throughout China and buying Chinese logistics firms to expand. In China, express delivery services (EDS) have become a thriving industry, but industry still faces several problems.

Burdensome and often conflicting regulatory requirements are imposed by different Chinese government agencies, not only at the national level but also at the provincial and municipal levels. This skews competition and adds to operators' costs. A key industry regulator also owns a key state-owned competitor. Licensing, customs and transportation inefficiencies all must be addressed.
China accounts for 17 percent of U.S. agriculture exports, making it the largest agriculture export market for the United States. At nearly $1.4 trillion, agriculture comprises more than 10 percent of the Chinese economy. The expansive size of the country and the lack of infrastructure in the lesser-populated farm regions, combined with the fact that most farms are small and do not have the economy of scale to invest in cold chain transportation, make farm to fork cold chain development difficult. These challenges, however, also provide opportunities for 3PLs and cold chain service providers to develop unique solutions that can link these farmlands to the global economy.

China ranked 84th in the World Bank's 2016 Ease of Doing Business, a slide of 1 place since 2015, when the survey was recalculated. Of particular note were low rankings in the categories of Dealing with Construction Permits, Starting a Business, Protecting Minority Investors and Paying Taxes.[66]

China is ranked 64th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 35, and a labor participation rate of 71.3 percent. Less than 6 percent of the population is tertiary educated, and the country is ranked 27th in ease of finding skilled employees.[67]

Figure 16: World Bank Ease of Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Refrigerated warehouse capacity has seen CAGR of 34 percent, and investments increased by $16 billion in 2013.[68] The need for cold chain service providers, refrigerated warehouses, 3 PL's and EDS will continue to expand at a rapid pace. The country is expected to become the largest 3PL market in the world by the end of 2016, and there is a large opportunity for U.S. service providers to gain market share.[69]

Cold chain capacity may increase by as much as 20 times current capacity over the next decade. It is important that the emerging cold chain industry utilizes international best practices that U.S. businesses have come to expect; otherwise, U.S. export expansion opportunities may be limited.

To help increase the use of international best practices in cold chain operations, ITA created the American Cold Chain Working Group, comprised of industry representatives and government officials that periodically meet in Shanghai to discuss the timing and implementation of applying international best practices in the cold chain sector.

China ranked 28th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. The country has shown overall improvement in every category of the Index since 2007, though the category of Customs has slightly declined since 2012 to the rank of 38,th due largely to the cumbersome process and significant amounts of paperwork.[70]

A lack of knowledge of internationally recognized best practices, clear concise regulations and enforcement in transportation and cold chain logistics means smaller logistics providers in China often cut corners to save costs. This has led to inconsistencies in quality and mistrust between businesses and consumers and acts as a barrier for any company entering the market that utilizes proper practices and equipment.[71]

Lack of trained labor specific to the logistics industry has made business expansion difficult for many U.S. companies. APICS (formerly the American Society of Transportation and Logistics) has developed training and certification in logistics management and is working on similar programs for the cold chain industry in China.

While China seems to have no shortage of available labor, the struggle of logistics companies to reduce costs often means lower levels of training for employees. Cold chain operators may find a limited amount of trained labor available for operations and should, therefore, anticipate providing extensive amounts of training for all aspects of logistics and cold chain operation. Further work is necessary to improve logistics management and reduce barriers to entry for U.S. companies.

China's quality of transport infrastructure is ranked 51st out of 140 countries in the World Economic Forum Global Competitiveness index and has consistently improved in the category since 2011.[72] The infrastructure is well-established in most urban locations. While congestion can be a major source of frustration, many logistics providers have developed solutions, such as delivery by mopeds and scooters. Electricity in urban environments is generally stable, allowing cold chain providers the means to power the facilities necessary for operations. Due to the massive size of the country, infrastructure outside of the major cities, including transportation and electricity can sometimes be a challenge.

Resources:

U.S. Commercial Service:
http://www.export.gov/china/

China Country Commercial Guide:
http://export.gov/ccg/china

Agricultural Affairs Office: AgBeijing@usda.gov

The Chinese Central Government's Official Web Portal
http://english.gov.cn/

Guide to Investment in China (site of China's Ministry of Commerce)
http://fdi.gov.cn/

The American Chamber of Commerce in Shanghai China Business Report 2013-2014
http://www.amcham-shanghai.org/ftpuploadfiles/Website/CBR/2013-2014-China-Business-Report.pdf

China Council for the Promotion of International Trade
http://www.bizchinanow.com

Events:

APICS 2016 SHANGHAI Shanghai, China | 14-15 April 2016

Industry's Take:
The devaluation of the Real is negatively affecting the Brazilian business climate. If the political situation could become more stable, the economy would improve.
Richard Tracy, Global Cold Chain Alliance

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India

India's potential market size should make it near the top of the Top Market countries; however, constantly shifting regulatory barriers and complex tax schemes limit the large scale investments necessary to fully realize the country's potential.

Overall Rank 15

Lower-Middle Category Ranking 1

With an estimated GDP of $2 trillion, India is expected to see growth of nearly 7.5 percent. Exports of goods and services from the U.S. amounted to $38.9 billion or 1.8 percent of all U.S. exports in 2015. U.S. majority owned foreign affiliate sales in India were $70.8 billion and distribution services accounted for more than $13 billion in 2013.[73]
The population of India is considered lower middle income, with a per capita income of about $5,630 (PPP) per year. Unemployment has held steady at 3.6 percent, and inflation was 3.0 percent in 2014.[74]

Figure 17:

Competitiveness Index	Score
Government/Regulatory	4.1
Labor Force	4.1
Infrastructure	3.8
Demand	4.5
Industry Interest	4.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	1.31 Billion
Cold Storage Capacity	131 M/m^3
Pharmaceutical Sales	$16.3 Billion
Food Spending	$282 Billion
Food Spending per Capita	$215
Agribusiness Market	$263 Billion
Agriculture Imports	$6.4 Billion
Agriculture Exports	$8.1 Billion

BMI and Global Cold Chain Alliance

The $500 billion dollar retail industry is serviced by over 12 million mostly family-owned businesses. Such a fragmented industry can make it difficult for cold chain operators to see sufficient returns on the large investment that is required to set up efficient operations. It is estimated that the highly fragmented cold chain sector that has sprouted up includes more than 3,500 mostly unorganized participants.[75]

India is currently undergoing a rapid transition to a consumer led economy. With over 250 million middle-income consumers, huge opportunities should exist for retailers to expand and grow. Protectionist policies of the Indian government, however, have prevented many Western retailers from entering the market and have kept the share of modern supermarkets in India down to an abysmal .05 percent, lower than virtually all other countries in the developed or developing world. With a growth rate at 4.3 percent,[76] it is unlikely much will change in the near future.

The franchise sector in India is rapidly expanding. Currently valued at around $14 billion, the sector is anticipated to reach more than $50 billion in the next two years. U.S. fast food, casual restaurants and the food and beverage segments are anticipated to reach $1.2 billion.

E-commerce has averaged 34 percent growth over the last several years to reach about $22 billion. Internet use in India has grown significantly to 250 million people. Unfortunately, the Government of India forbids foreign direct investment in business-to-consumer e-commerce, and as of yet, sales of groceries and temperature-sensitive products have not taken off like in other Asian economies. In February 2016, *The Economic Times* reported that the Indian government may be looking into changes to e-commerce regulations that would allow for 100 percent FDI in marketplace models of e-commerce, potentially creating opportunities for U.S. investment.[77]

Express delivery companies are helping to increase the investment into air cargo infrastructure in India. The country currently handles around 2.5 million tons of air cargo.

Even though India is the largest producer of fruit and the second largest producer of vegetables in the world, it represents only 1 percent of world exports, and childhood malnutrition in the country is as high as 45 percent. India is also the largest producer of milk, and 30,000 refrigerated trucks in the country primarily serve the dairy market.

India is one of the largest consumers of food in the world and is the third largest producer of agriculture. Huge opportunities may exist for U.S. cold chain providers that can efficiently consolidate the 3,500 companies currently engaged in cold chain operations. The food service industry is estimated to be nearly $50 billion and is anticipated to grow at 10 percent annually for the next several years.

The Global Cold Chain Alliance estimates that the cold storage market in India has been growing at a rate of 25 percent per year to reach $8 billion in 2014.[78] Despite the growth, India sees nearly 40 percent of its produce go to waste annually due to inadequate cold chain infrastructure; one-third of its losses occur during storage and transit.[79].

Experts have estimated that India has less than half the cold chain capacity necessary to meet its current needs and will require as much as $100 billion of infrastructure investment over many years. While some optimistic estimates expect the cold chain sector to grow to $12 to $15 billion over the next five years, many large retailers and large cold chain service providers will likely continue to hold off investing the amount of large scale capital necessary to efficiently serve the country until the retail market is more organized, restrictions are lowered and there are greater opportunities for return on investment.

In recent years, the Indian government has made attempts to improve investment in cold chain, including exempting customs duties on refrigeration units and equipment, setting up Mega Food Parks, providing tax benefits on investments and even creating a National Centre for Cold Chain Development. These have been welcome changes and have added to the cold storage growth rate; however, most large potential investors still remain on the sidelines, awaiting improvements to the retail environment, especially since cold chain operations in India can cost more than double that of many other countries.

India has been a disappointment for many service industries over the last several years, as high expectations for greater export opportunities have not been realized. India was ranked 130th out of 189 countries in the World Bank's Doing Business rankings in 2016, an increase from 134th in 2015, yet it is still the lowest rated of the "BRIC" economies.[80] Companies entering the market can expect varying business and economic conditions across all of India's 29 states and 7 union territories, due largely to the decentralized nature of India's political system.

In 2014 India Prime Minister Narendra Modi stated that his government's goal was to bring India into the Top 50 of the World Bank's Doing Business ranking by increasing transparency and simplifying rules.

Despite some positive developments, including the Government of India's reduction of certain foreign direct investment (FDI) restrictions, businesses often remain reluctant to invest in the market due to a variety of problems that make it difficult to operate, including poor infrastructure, a complex tariff regime with some of the highest tariffs in the world, protectionist policies, bureaucratic inefficiencies and intellectual property theft.

India is ranked 100th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 25 and a labor participation rate of 54.2 percent. Approximately 6 percent of the population is tertiary educated, and the country is ranked 40th in ease of finding skilled employees.[81]

Figure 18: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

The Government of India has taken a lot of steps to reduce restrictions on FDI; however, much of the leading government party's constituents are small shop owners, and thus, it is still very protective of the multi-brand retail sector and limits opportunities for outside competitors to enter the market.

Currently, multi-brand retailers may own up to 51 percent of a business in India with the following restrictions:

- Must seek state government approval
- Only permitted to open in cities with a population greater than 1 million residents

- Must commit 50 percent of the first $100 million investment into developing backend infrastructure
- Must source a minimum of 30 percent of the total value of goods from Indian SMEs

According to the World Economic Forum, the small-scale and fragmented retail market that the government protects in India prevents the scale of capital investment necessary to create a modern logistics system.[82] A refrigerated transportation study performed by Ernst & Young for the Indian Ministry of Agriculture's National Centre for Cold Chain Development (NCCD) recommended the government promote more organized retailing to encourage investment in the cold chain sector.[83]

Further, the WTO reported in 2015 that India's trade policy is used to regulate domestic supply and policies frequently change, causing disruptions and unpredictability for business. Import and export taxes and duties, as well as minimum export prices, are used ad hoc and prevent significant long-term strategic development across industries.[84]

In June 2015, the WTO ruled that the restrictions India put in place on U.S. agriculture products, including poultry, eggs and live pigs, citing concerns about avian influenza violated the WTO Sanitary and Phytosanitary (SPS) Agreement. Afterward, according to the U.S. International Trade Commission, the Indian Ministry of Commerce examined ways to scientifically justify protecting India's poultry farmers from U.S. imports.[85]

India ranked 54th out of 160 countries in World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has remained virtually unchanged in almost every category of the Index since 2007, though the category of Logistics Competence has significantly declined.[86]

India's current tax scheme has encouraged logistics companies to create small stocking facilities located throughout India's 30 states. The complexities of taxation and the subsidization rules of India's national government prevent large logistics companies from creating economies of scale through efficient hub-and-spoke type distribution systems.
India's quality of transport infrastructure is ranked 32nd out of 140 countries in the World Economic Forum Global Competitiveness index. The quality of roads has been increasing since 2001; however, there is a downward trend in quality of railroad and air transport infrastructure.[87]

Sixty percent of freight moves on a road network with less than 5 percent of those roads national highways. The average truck speed across the country is around 13 M.P.H. Often, retail stores may not be able to meet demands due to delays in shipment caused by transportation infrastructure.

A low level of organized 3PLs means that as much as 75 percent of truck owners have a fleet of less than 5 vehicles. Most of these trucks are more poorly maintained and are more than a decade old.

The Indian government has plans to upgrade the 13 major ports to accommodate the nearly 200 percent increase in cargo expected over the next seven years. Currently, the ports suffer from outdated and insufficient cargo handling equipment and terminals. This anticipated investment may provide opportunities for U.S. companies to develop cold chain facilities that can help India meet current and future demand.

Despite having the fourth largest rail system in the world, most shippers avoid rail. The national rail system is underinvested, but the Indian government is developing a dedicated freight corridor plan that will span 2,000 miles across the eastern and western sides of the country. In February 2016, the Indian government announced that it would budget $17.6 billion on rail development for the fiscal year starting in April, a 21 percent increase from the previous year.

Opportunities may exist for cold chain operators that can create or utilize technologies that reduce dependence on the electricity grid. Energy infrastructure is extremely lacking and serves as a huge impediment to integrating cold chain capabilities across the supply chain.

The World Economic Forum ranked India 98th out of 140 in quality of electricity supply[88]. Energy can contribute to 30 percent or more of cold chain operations costs in India, and many farmers do not have access to electricity. As recently as 2012, India had a multi-day blackout, which affected over 620 million people. Companies involved with cold storage must anticipate and adapt to the infrastructure by investing in costly generators or risk losing their products in the event of electricity failure.

Resources:

U.S. Commercial Service:
http://www.export.gov/india/

Country Commercial Guide:
http://www.export.gov/ccg/india090814.asp

Global Cold Chain Alliance:
http://www.gcca.org/contact/india/

American Chamber of Commerce, India:
http://www.amchamindia.com/

U.S. India Business Council:
http://www.usibc.com/

Confederation of Indian Industry:
http://www.cii.in/

Events:

India Cold Chain Expo:
Madhya Pradesh, December 16-17, 2016
www.gcca.org

Industry's Take:
India is a huge market that is being eyed, from a distance, by major logistics players. Equipment suppliers are already there in full force; however, they are facing issues of price sensitivity. Many customers make major purchasing decisions based solely on price as opposed to quality. Finally, the vast majority of consumers in India are still not demanding the use of cold chain.
Richard Tracy, Global Cold Chain Alliance

Indonesia

Indonesia ranks high in opportunities as a potentially large market primed for infrastructure investment. Numerous challenges, however, limit the interests of cold chain providers. It is the fourth most populous nation, and its booming economy is experiencing rapidly rising incomes.

Overall Rank	Lower-Middle Category Ranking
16	2

With a GDP of nearly $862 billion, Indonesia is the 16th largest economy in the world. Goods and services exports to Indonesia accounted for $10.7 billion in 2015. U.S. majority owned foreign affiliate sales in Indonesia were $31 billion in 2013, and while retail sales are not available, distribution services contributed more than $2 billion.[89]

Figure 19:

Competitiveness Index	Score
Government/Regulatory	4.0
Labor Force	4.2
Infrastructure	4.4
Demand	4.5
Industry Interest	3.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	258 Million
Cold Storage Capacity	12.3 M/m^3
Pharmaceutical Sales	$5.8 Billion
Food Spending	$179 Billion
Food Spending per Capita	$697
Agribusiness Market	$141 Billion
Agriculture Imports	$4.7 Billion
Agriculture Exports	$11.4 Billion

BMI and Global Cold Chain Alliance

The population of Indonesia is considered lower middle income, with a per capita income of about $10,190 (PPP) per year. Unemployment has been stable around 6.2 percent, and inflation was 6.4 percent in 2014.[90] Household spending per capita is $6,810 and is expected to reach $9,098 by 2020 (PPP).[91]

The consumer economy in Indonesia is booming, and the country has abundant natural resources. Infrastructure development in the country, however, has not kept up, providing both opportunities and challenges for cold chain operators.

Small traditional shops dominate Indonesia's retail landscape with little variety or few options available to consumers. Furthermore, shelf space is limited, which serves as a barrier to entry for many food producers wishing to sell products in the market. Significant opportunities, however, do exist for food retailers to find ways to better serve these markets.

Within the larger metropolitan areas, wealthier consumer groups often prefer fresh produce. Given the rise in consumer income, ITA expects a commensurate increase in demand for temperature-sensitive products sold by modern retailers.

Despite a growth in supermarkets, protectionist activities of Indonesia's government have interfered with expansion of large retail markets. Deregulation has helped remove some barriers, but new local content requirements are becoming burdensome to business, and government corruption is a large concern.

The franchise sector in Indonesia is strong, with over 1,100 franchises and growth rates of 8 to 14 percent expected to continue for the foreseeable future. Food and beverage, quick serve and fine dining are all expected to expand in the country, as there is a strong demand for U.S. restaurants and bars, especially in the major cities.

E-commerce and m-commerce are rising in popularity across Indonesia, with 4.6 million online shoppers spending as much as $3.5 billion 2015. The industry is expected to grow to 8.7 million customers this year and 135 million by 2023. Across Asian nations, there has been a trend toward purchasing groceries and food products online. With Indonesia's young, tech savvy population this may be a great opportunity for cold chain service providers.

The pharmaceutical industry in Indonesia has reached nearly $6 billion in 2015. Indonesia is in the process of implementing a national health insurance plan that will cover the entire country's population by 2019, and pharmaceutical sales are expected to rise to $9.7 billion by 2020.

Indonesia's agriculture market is expected to grow to nearly $200 billion by 2020. Poultry, beef and veal production are anticipated to increase 3 to 5 percent annually through 2020, while consumption is expected to rise 4 to 6 percent annually.[92] Indonesia has a significant fishery sector that is also in need of cold chain services.

A swiftly growing domestic market was cited by Agility in ranking Indonesia fourth in their 2015 Emerging Markets Logistics Index.[93] The index highlights markets that are primed for logistics investment.

Indonesia ranked 109th in the World Bank's 2016 Ease of Doing Business Rankings, an increase of 11 places since 2015, when the survey was recalculated. Of particular note were low rankings in the categories of Starting a Business, Enforcing Contracts and Paying Taxes.[94]

Indonesia is ranked 69th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 27 and a labor participation rate of 67.7 percent. Less than 5 percent of the population is tertiary educated, and the country is ranked 37th in ease of finding skilled employees.[95]

Figure 20: World Bank Ease of Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Indonesia	109	$10,517
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Indonesia's quality of transport infrastructure is ranked 39th out of 140 countries in the World Economic Forum Global Competitiveness index. Every category of transportation receded in quality since 2013, indicating that Indonesia is not keeping up with the rest of the world in transportation development. Quality of port infrastructure was the lowest rated category of transport infrastructure.[96] Due to traffic, poor infrastructure and pervasive corruption, many choose to utilize warehousing in Singapore rather than central warehousing in Indonesia.

Indonesia's ports are under strict government oversight, limiting the expertise and investment that foreign port operators and investors can provide. A report from Maersk Line cited a lack of equipment, low port efficiency and poor road access causing congestion and sub-optimal port-efficiency, making it difficult to keep produce fresh.[97]

Indonesia ranked 53rd out of 160 countries in World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has shown slight improvements in most categories since 2007, but the categories of Tracking and Tracing and Ease of International Shipments have shown downward trends.[98]

Indonesia has been described as a complicated market for foreign producers and distributors to maintain an advantage in, due to geography and lack of infrastructure capabilities. There are 6,000 inhabited islands in Indonesia spanning 5,000 km from east to west, making it difficult to efficiently and quickly transport, store and distribute temperature-sensitive products. Even consumers on the island of Java, which is home to the majority of the Indonesian population, are difficult to reach because shoppers are spread out across the archipelago.[99]

A majority of Indonesia's remote sites lack available electrical power, which poses a significant constraint on cold chain development. The Government of Indonesia is striving to address these infrastructure deficiencies by building seven maritime clusters that will be powered by renewable energy and plans to open up the cold storage sector to 100 percent foreign investment.

Halal logistics, which is prevalent in Malaysia (see Malaysia case study), is becoming increasingly prevalent in Indonesia and is a trend to monitor. U.S. firms that are unaware of the certification requirements and the special requirements involved in transporting, storing and distributing temperature-sensitive halal products may be at a competitive disadvantage.

Resources:

U.S. Commercial Service:
http://www.export.gov/indonesia/

Country Commercial Guide:
http://export.gov/ccg/indonesia090815.asp

Ministry of Trade:
www.kemendag.go.id

Industry's Take:
Indonesia is on the list of low index cold storage markets. There are abundant natural resources; however, the infrastructure is too poor to exploit them efficiently. Another challenge is how to service a growing population that is spread over an island nation.

Richard Tracy, Global Cold Chain Alliance

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Japan

Japan's cold chain system is well-established. Cold chain suppliers will be watching for new opportunities that may develop through the ratification of TPP and resulting expected increases in international trade.

Overall Rank
5

High-Income Category Ranking
5

Japan has an estimated GDP of $4.6 trillion, making it the third largest economy in the world. Exports of goods and services from the U.S. amounted to $114.7 billion in 2015. U.S. majority owned foreign affiliate sales in Japan were $235.9 billion, and distribution services accounted for more than $65 billion in 2013.[100]

The population of Japan is considered high income, with a per capita income of about $37,920 (PPP) per year. Unemployment has steadily decreased for several years to 3.7 percent in 2014, and inflation was 1.6 percent in 2014[101]

Japan's food and agriculture market is estimated at nearly $1 trillion, spurred on by the importance of food in the Japanese culture. Japanese spend, on average, 23 percent of disposable income on food. Food spending is expected to reach nearly $354 billion by 2020.[102]

Consumers in the Japanese market tend to be obsessed with the quality and the taste of food over the quantity, but recent trends have shown that the importance placed on food value is increasing. Branding is important to consumers as is the appearance of food products, increasing the importance of high quality cold chain operations.

Japan has a highly developed consumer driven economy based on a large and very broad middle class with a high per capita income. Therefore, catering to consumer preferences, rather than competing on price alone, presents an opportunity for U.S. exporters. U.S. brands in particular have an advantage due to their reputation for safe, high value products.

With more than 1,300 chains, the franchise sector in Japan is well-developed and growing. Sales from the more than 250,000 stores in the franchise industry amounted to over $208 billion. The largest category of franchise establishments was in convenience stores at 41 percent followed by food service chains at 17.2 percent.

Figure 21:

Competitiveness Index	Score
Government/Regulatory	5.1
Labor Force	4.7
Infrastructure	6.0
Demand	5.6
Industry Interest	4.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	127 Million
Cold Storage Capacity	32.6 M/m^3
Pharmaceutical Sales	$95 Billion
Food Spending	$311 Billion
Food Spending per Capita	$2,455
Agribusiness Market	$68 Billion
Agriculture Imports	$64 Billion
Agriculture Exports	N/A

BMI and Global Cold Chain Alliance

Japan's 90 percent Internet penetration and a culture that prides itself on technology have led to outstanding growth in e-commerce. According to the Ministry of Economy, Trade and Industry (METI), e-commerce sales to consumers have increased at double digits annually since 2012, when the industry saw growth of over 110 percent. Japan has more active cell phones than citizens at 120 percent, according to the World Bank; therefore, it should be no surprise that m-commerce is the fastest growing segment of e-commerce, with more than 50 percent growth in the first quarter of 2015. Food and beverage sales currently account for around 12 percent of the $107 billion consumer e-commerce industry.[103]

Japan spends more on health per capita than any other country in the world. Pharmaceutical sales in Japan are estimated at $95 billion in 2015 and are anticipated to increase to $108 billion by 2020, due in part to Japan's aging population.[104] Imports account for 31 percent of the market, and U.S. market share is around 20 percent when accounting for licensed compounds to Japanese manufacturers. Japan represents an attractive opportunity for refrigerated logistics service providers to serve the growing pharmaceutical industry.

Japan imports more food products than any other country in the world at $64 billion. The United States is the largest single supplier of food to the country with $13.9 billion in exports. Consumer ready foods account for $6.5 billion, which makes Japan the largest destination for these U.S. exports.

Japan is ranked fifth out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 45 and a labor participation rate of 59.2 percent. More than 29 percent of the population is tertiary educated, and the country is ranked 23rd in ease of finding skilled employees.[105]

Japan has a physical infrastructure that is very well-developed and extends across the country. Japan's quality of transport infrastructure is ranked fifth out of 140 countries in the World Economic Forum Global Competitiveness index. Port and air infrastructure are the only categories that are not in the top 10 in the world, but these have improved since 2011.[106] Upgrading aging infrastructure has been a fiscal stimulus priority for the government since 2012.

Supply chains in Japan have experienced a lot of consolidation, though there is still much room for further streamlining. U.S. cold chain service providers may find great opportunities in further consolidation and incorporation of new management and operation practices.

Japan ranked 10th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has shown slight declines in most categories since 2007.[107]

Japan has a well-established rule of law and is a large player in international trade with strong protection for property rights, including intellectual property rights. Despite this, Japan ranks 34th on the World Bank's Ease of Doing Business Ranking for 2016. Primary challenges include paying taxes, getting credit and starting a business.[108] In addition, the United States continues to call on the Japanese government to improve its regulatory environment, which can often be overly burdensome toward business. Tariffs are low but complex, and the country has numerous restrictions, including a bureaucracy that limits openness to foreign participation.

Figure 22: World Bank Ease of Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Japan	34	$36,426
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Japan is a party to the recently negotiated Trans-Pacific Partnership (TPP). Upon ratification, U.S. businesses may find increased potential for growth and more opportunities to participate in trade. The agreement will eliminate tariffs, lower service barriers and increase transparency, while also increasing competitiveness by supporting strong intellectual property rights protection and establishing enforceable labor and environmental obligations.

The TPP will promote fairness by ensuring non-discriminatory treatment of U.S. goods and services, establishing rules for fair competition with State-owned enterprises and providing the same rights and protections for U.S. investors that foreign investors currently enjoy in the United States while protecting the inherent right of governments to regulate.

Resources:

U.S. Commercial Service:
http://export.gov/Japan/

Japan Country Commercial Guide:
http://export.gov/ccg/japan090820.asp

Japan External Trade Organization (JETRO):
http://www.jetro.go.jp/en/invest/setting_up

Foreign Agricultural Service (FAS), U.S. Embassy, Tokyo
http://www.usdajapan.org

Events:

Event: INTERPHEX JAPAN
Date: June 29-Jul 1, 2016
Venue: Tokyo Big Sight
Web: www.interphex.jp/en/Home/

Event: BioJapan 2015
Date: October 14 - 16, 2015
Venue: Pacifico Yokohama
Web: http://www.ics-expo.jp/biojapan/index.html

Event: Medical Japan 2016
Date: February 24 – 26, 2016
Venue: Intex Osaka
Web: http://www.interphex-osaka.jp/en/

Event: CPhI Japan 2016
Date: April 20 – 22, 2016
Venue: Tokyo Big Sight
Web: http://www.cphi.com/japan/home/

Industry's Take:
Japan is a mature market with little to no growth in the cold chain industry. It has been dominated by a number of domestic players for years, and since the economy is flat, this market is not high on the list of countries in which to invest.
Global Cold Chain Alliance Industry Member

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Kenya

Kenya and the other members of the East African Community (Tanzania, Rwanda, Uganda and Burundi) are making progress in improving their regulatory environment and may have great long term potential. The massive amount of infrastructure investments necessary, combined with the risk of government change and the limited retail market size, however, currently put Kenya in the lower half of our top market survey.

Overall Rank 19

Lower-Middle Category Ranking 4

The following case study highlights and is primarily sourced from a Kenya Cold Chain Assessment performed by the Global Cold Chain Alliance in partnership with the International Trade Administration. The full assessment report is available at: http://www.gcca.org/resources/publications/white-papers-reports/keeping-it-cool-assessing-cold-chain-in-kenya/

Kenya has an estimated GDP of $61 billion, and exports of goods from the U.S. amounted to $936 million in 2015. U.S. majority owned foreign affiliate sales in Kenya were $966 million in 2013, an increase of 33 percent from 2012, though distribution services data is not available for the country.[109]

The population of Kenya is considered lower middle income, with a per capita income of about $2,940 (PPP) per year. Unemployment has held steady at 9.2 percent, but it should be noted that some unofficial estimates range as high as 40 percent. Inflation was 7.5 percent in 2014.[110]

Food spending is expected to grow 10 percent annually to reach $17.6 billion by 2020, boosted by rising incomes and awareness of the health benefits of fresh foods.

Franchising in Kenya is most common in the hospitality sector with about a dozen world-renowned firms. Food and beverage franchises have seen the most growth despite the challenges in supply chains.

Internet use in Kenya is low by many measures with less than 25 million users. Due to the expansion of wireless cell phone service, however, the country is seeing a rapid growth in users. E-commerce is limited to only a few industries, including airline hospitality, banking and courier services. Opportunities may exist for 3PLs that can harness the power of the growing cell phone market to schedule pickups and deliveries from the thousands of small farms spread across the country, which currently have virtually no access to global trade markets.

Pharmaceutical sales in Kenya are estimated at $797 million in 2015 and are anticipated to increase at a compound annual growth of 9.5 percent to reach around $1.2 billion by 2020.[111]

Figure 23:

Competitiveness Index	Score
Government/Regulatory	3.8
Labor Force	4.4
Infrastructure	3.8
Demand	4.3
Industry Interest	3.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	204 Million
Cold Storage Capacity	N/A
Pharmaceutical Sales	$742 Million
Food Spending	$10.9 Billion
Food Spending per Capita	$236
Agribusiness Market	$8.9 Billion
Agriculture Imports	$234 Million
Agriculture Exports	$643 Million

BMI and Global Cold Chain Alliance

Kenya's agri-business is estimated at $8.9 billion in 2015 and is expected to rise $10.6 billion by 2020.[112] Approximately 30 percent of Kenya's economy is based on agriculture despite a virtual lack of options for most farmers to reach global markets.

Opportunities may exist for 3PLs and logistics providers that can navigate the complicated challenges of linking farms to the global market.

Kenya ranked 108th in the World Bank's 2016 Ease of Doing Business, an improvement of 21 places since 2015, when the survey was recalculated. The country was one of the survey's largest movers, with improvements in Getting Credit, Getting Electricity and Registering Property.[113]

Kenya is ranked 101st out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 19 and a labor participation rate of 67.3 percent. Less than 6 percent of the population is tertiary educated, and the country is ranked 14th in ease of finding skilled employees.[114]

Figure 24: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Kenya	108	$2,954
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

In Sub-Saharan Africa, nearly 94 percent of all wasted food is a direct result of insufficient supply chains.[115] As such, the Middle East and Africa is a significant long-term expansion goal for many food franchises. To date, investment has been centered in the Middle East, North Africa and South Africa. In the past few years, however, franchises have begun to look at underdeveloped markets, such as Kenya, as an expansion opportunity. While franchises such as YUM Brands already have locations in several Sub-Saharan markets, the area remains largely underdeveloped.

Kenya is the largest and most dynamic economy in the East African Community. It has a highly entrepreneurial population that serves as the logistics and financial hub for the region. The quality of transport infrastructure is ranked 69th out of 140 countries in the World Economic Forum Global Competitiveness index,[116] but Kenya has increasingly become an important player in global food markets with a thriving vegetable export industry. This is largely due to Kenya's location near many shipping routes and increasing capabilities of food processers and producers. Kenya is one of only two EAC countries with seaports that serve as gateways to its landlocked neighbors.

Kenya's 45 million people are classified as lower-middle income, which puts it in the same classification as Egypt, Indonesia, Morocco, Nigeria, Senegal and Ukraine. The country prioritizes academic education, but it lacks vocational training, which has led to a skills gap in the labor market. The country also has some of the highest minimum wages in the East African region.

Agriculture represents 30 percent of Kenya's GDP, and the majority of the production occurs on small farms that are engaged primarily in subsistence farming. These farms have neither the means nor incentive to invest in cold storage and lack the knowledge or capacity to apply proper packaging or handling techniques. Furthermore, a lack of access to adequate transportation infrastructure virtually cuts these farmers off from all but the most local, informal consumer markets. Many agriculture products can be seen transported along motorways in wheelbarrows or on motorbikes, oxcarts or small vehicles, and many markets are supplied by pushcart.

Current return on investment for cold chain in Kenya is estimated to take eight to ten years, far longer than the three year ROI that is expected by most foreign direct investors. High startup costs, long bureaucratic delays and confusing rules and regulations combined with numerous legal and illegal fees throughout the business process make entering the market a daunting task, especially for a capital intensive industry like cold chain.

Most warehouses in Kenya are established for the export market, and many are created expressly for air shipment. The flower industry is one area that is well-established and follows best international practices for exporting. Kenya is a large exporter of fresh cut flowers and accounts for 38 percent of flower imports into the European Union.

On the domestic side, there are a few small firms within the major metropolitan areas that have cold facilities, though most are not designed and built for higher volume or efficiency befitting retail distribution networks. Manual labor is often substituted for use of proper equipment and design, which leads to inconsistencies, product damage and breaks in the cold chain.

Retailers and quick service restaurants face significant constraints in Kenya and East Africa, including the lack of cold storage facilities, poor infrastructure and the seasonality of supplies. Despite this, many have committed to expanding operations, and quick service restaurants are becoming a major driver in the growth of cold chains. Most franchises have strict sourcing controls and requirements that prevent the use of lower standard produce, thus having well-established cold chain systems in place are necessary for their growth. Despite the challenges, some franchisees have reported that demand is out-pacing growth in the region.

Kenya ranks 145th out of 175 on Transparency International's Corruption Perception Index, and many businesses consider any interaction with government as having a negative impact on business. Kenya operates a tax on the movement of agriculture products called a "cess". The rate of the cess and the application process seem to be arbitrary and up to the discretion of the local authority, allowing opportunities for illegal tariffs and fees. There are suggestions that illegal government "fees" or payoffs may cost as much as 10 to 15 percent of revenue. Businesses that do not pay these fees may see delays in shipments.

The lack of clarity in food safety regulations and enforcement is a major concern for cold chain operators. Across Africa, cold chain providers are often hesitant to invest in the market due to a lack of transparency in government regulations that sometimes can generate an appearance of corruption.

Kenya ranked 74th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has shown slight improvements since 2007, though the category of Customs has declined significantly to rank 151st out of 160 in 2014.[117]

3PLs in Kenya are virtually non-existent, forcing most cold chains in Kenya to be vertically integrated and designed to meet the specific needs of individual businesses. These businesses invest in vertical integration, primarily to export commodities; as a result, food-handling practices for exported products follow international best practices, including Hazard Analysis and Critical Control Points (HACCP) and BRC Global Standards. More than 80 percent of the local food market in Kenya is informal, and these products suffer from a fundamental lack of understanding or consumer demand for best practices in handling and transportation.

Rural distribution for food products is often based on informal networks where firms, such as Coca-Cola and Unilever, employ locals to take goods to consumers. While these distribution networks are somewhat functional, they are often not efficient. Exporters that can make large investments in distribution networks to supply the mass market may therefore develop a competitive advantage.[118]

Approximately 18 percent of households in Kenya are connected to a power grid, and the lack of access to electricity makes building a cold storage facility outside of the main metropolitan zones very difficult. Even within metropolitan areas, weekly or even daily outages are common, necessitating backup systems. Power surges and fluctuations are also common, adding to wear and tear on compressors and other equipment. Sourcing repair parts and services can also be a major challenge for operators in the region.

There is significant opportunity for Kenya to increase the competiveness of its exports through investment in ports. Refrigerated storage at the Port of Mombasa does not exist, congestion is sometimes an issue and most shippers of perishable products spend a premium on airfreight to avoid these issues. Uganda has also complained of theft of transit cargo at the Port of Mombasa.

Kenya has a generally well-educated and mobile workforce with an entrepreneurial spirit. A lack of vocational training, however, will need to be taken into account for businesses entering into the market. Also, a fundamental lack of basic food safety knowledge and best practices by food handlers within the country's local supply chain mean that cold chain operators must be diligent in establishing procedures, training and guidelines for food safety and handling.

Unemployment in Kenya ranges from 10 to 20 percent, and the majority of Kenya's workforce is engaged in the informal economy. In fact, USAID estimates that a little more than 10 percent of employed youth are engaged in the formal economy.

Most Kenyans make purchases through local markets or directly from farmers. These markets tend to sell lower quality products that have never been refrigerated. Consumers generally cannot afford the higher quality products that would come from an established cold chain system.

A growing middle class that has seen significant wage raises indicates that there is potential for demand to increase over the long term, and recent growth in quick service restaurant franchises in the Kenya market demonstrates a positive development.

Resources:

U.S. Commercial Service:
http://www.export.gov/kenya/

Country Commercial Guide:
http://export.gov/ccg/kenya

African Growth and Opportunity Act (AGOA):
www.agoa.gov

Kenya Customs Department:
www.kra.go.ke

East African Community:
www.eac.int

Industry's Take:
A recent study of the cold chain sector in Kenya showed the need is great, but consumer demand currently does not allow for sustainable growth in the near future. The challenge is how to match the domestic growth in the cold chain to complement what is being done for exports.
Global Cold Chain Alliance Industry Member

Malaysia

Malaysia's Competitiveness Index puts the country near the top in all categories. Concerns over transparency and protectionist measures may cast a shadow on its future growth potential.

Overall Rank	Upper-Middle Category Ranking
8	1

Malaysia has an estimated GDP of $338 billion. Exports of goods from the U.S. amounted to $13 billion, but U.S. services export data is unavailable. U.S. majority owned foreign affiliate sales in Malaysia were $51.1 billion, and distribution services accounted for more than $4.6 billion in 2013, though retail data is unavailable.[119] All trade figures are down from their peak in 2011, but Malaysia is the United States 19th largest trading partner.

The population of Malaysia is considered upper middle income, with a per capita income of about $24,770 (PPP) per year. Unemployment has dropped to 2 percent, and inflation was 3.1 percent in 2014.[120]

The organized food retail sector accounts for less than half of grocery sales in Malaysia. Food spending is expected to grow more than 8 percent annually to reach $45.6 billion by 2020,[121] boosted by rising incomes and awareness of the health benefits of fresh foods.

The franchise sector in Malaysia is seeing steady growth. U.S. franchisors are 39 percent of all foreign operating franchise establishments in Malaysia. The food and beverage sector is the largest single sector of the franchise industry in Malaysia, comprising 36 percent of all approved franchises.

E-commerce in Malaysia has grown substantially. Nearly 70 percent of the population, or more than 21 million people, have adopted e-commerce. It is anticipated that this growth will continue through at least 2020 due in part to the government's push to promote the use of the Internet to connect to global economies. Across Asian nations, there has been a trend toward purchasing groceries and food products online. Although these grocery sales are primarily non-refrigerated products now, this may represent a great opportunity for cold chain service providers in the long-term, as the emergence of online shopping for groceries should create additional demand for refrigerated trucks and warehouses near major population centers.

Figure 25:

Competitiveness Index	Score
Government/Regulatory	5.2
Labor Force	5.4
Infrastructure	5.5
Demand	5.3
Industry Interest	3.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	30.3 Million
Cold Storage Capacity	N/A
Pharmaceutical Sales	$2 Billion
Food Spending	$29.5 Billion
Food Spending per Capita	$974
Agribusiness Market	$28 Billion
Agriculture Imports	$1.3 Billion
Agriculture Exports	$4.4 Billion

BMI and Global Cold Chain Alliance

Pharmaceutical sales in Malaysia are estimated at $2 billion in 2015 and are anticipated to increase at a compound annual growth of 9.5 percent to reach around 3.2 billion by 2020. Malaysia represents an attractive opportunity for refrigerated logistics service providers to serve the growing pharmaceutical industry. The Government of Malaysia has announced that it will invest in the biotech sector to boost production capabilities.[122]

Malaysia's agri-business is estimated at $28 billion and is expected to rise to $38 billion by 2020.[123] In 2013, the United States exported $181 million of dairy products to Malaysia, comprising 16 percent of imports. Fresh fruits amounted to $77 million, increasing at a rate of 10 percent annually.

Malaysia ranked 18th in the World Bank's 2016 Ease of Doing Business Rankings, a drop of one place since 2015, when the survey was recalculated. Prior to the methodology changes, Malaysia ranked as high as sixth place in 2014.

Figure 26: World Bank Doing Business Ranking		
Country	**Ranking (2016)**	**GDP Per Capita (PPP, 2014)**
Malaysia	18	$13,956
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Malaysia is ranked 52nd out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 26 and a labor participation rate of 57.5 percent. More than 13 percent of the population is tertiary educated, and the country is ranked fourth in ease of finding skilled employees.[124]

Malaysia has a high potential for cold chain sector growth in the ASEAN region. Quality products and the potential for trade within the ASEAN region make Malaysia an attractive market for U.S. service providers. Cold chain logistics companies currently in the market include CCN, IGLO, Kotena National, Integrated Cold Chain, MAFC, Haisan, MISC, IMC, Gerimis, Gold Coin, Vesco, NCB, Bifrost, LTS and Actionpack. The expected annual increases of 7 percent in consumer spending and a growing middle class over the next several years represent a good opportunity for retail growth and imports from the United States.

More than 60 percent of Malaysia's population is Muslim, and Malaysia is a forerunner in the halal food production industry. This can represent an opportunity for refrigerated logistics services. Given the demand for halal food products in Malaysia, cold chain logistics providers interested in entering this market should consider getting certified to appeal to all consumer segments.

The Malaysian government expects the country to become a global hub for halal products with its extensive product lines, halal distribution centers and government promoted certification process for halal production, processing and distribution.[125]

MS1500:2400 is Malaysia's proprietary halal standard. The certification process is stricter than that of other countries, including Saudi Arabia. The Department of Islamic Development, or JAKIM, is Malaysia's halal certifying authority.

The additional requirements necessary for certification can often increase the cost of production for U.S. companies and producers. While many consumers support halal logistics it requires the entire supply chain to adhere to certain principles; if one partner in a supply chain does not adhere to these principles, the product cannot be labeled as halal. In the case of Malaysia, a partner in the supply chain that has been certified halal by a different authority (such as Saudi Arabia) will not automatically receive certification by Malaysia's halal standards. Several U.S. producers that have been approved by Saudi halal authorities have not been approved by Malaysia.

Malaysia's quality of transport infrastructure is ranked 10th out of 140 countries in the World Economic Forum Global Competitiveness index. With the exception of air transport, all categories of transportation have improved since 2011.[126] It is worth noting that the Government of Malaysia has been a strong supporter of port development. The Malaysian government has been proactive in promoting infrastructure, and opportunity exists for cold chain services to conduct business in this region.

Researchers have found that lack of regulatory forms to facilitate the logistics industry and lack of information sharing with regard to expansion and development of the logistics industry are constraints for industry.[127] Companies intending to undertake cold chain logistics and related services are required to:

- Incorporate a company under the Companies Act of 1965
- Obtain the appropriate licenses, e.g., for operating public/private bonded warehouses and commercial vehicles and haulage (Class A license).

Malaysia ranked 25th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has remained virtually unchanged in almost every category of the Index from 2007, though the category of Ease of International Shipments has shown marked improvement.[128]

In late 2015, Malaysia launched a Logistics Masterplan outlining the following:

- Strengthening the institutional and regulatory framework;
- Improving trade facilitation mechanisms;
- Developing infrastructure and freight demand;
- Strengthening technological and human resource development; and
- Internationalization of logistics services.

The objective of the masterplan is to strengthen the position of Malaysia as the preferred logistics gateway to Asia.

Malaysia currently has labor regulations that can be very challenging to comply with, especially for SMEs. The regulations make it difficult to hire expatriate employees and instead promote hiring ethnic Malay groups as opposed to other ethnic groups.

Malaysia is a party to the recently negotiated Trans-Pacific Partnership (TPP). Upon ratification, U.S. businesses may find increased potential for growth and more opportunities to participate in trade. The agreement will eliminate tariffs, lower service barriers and increase transparency while also increasing competitiveness by instituting stronger intellectual property rights protection and establishing enforceable labor and environmental obligations.

The TPP will promote fairness by ensuring non-discriminatory treatment of U.S. goods and services, establishing rules for fair competition with State-owned enterprises and providing the same rights and protections for U.S. investors that foreign investors currently enjoy in the United States while protecting the inherent right of governments to regulate.

Resources:

U.S. Commercial Service:
http://www.export.gov/malaysia

Country Commercial Guide:
http://export.gov/ccg/malaysia

Halal certification information:
http://www.halal.gov.my/index.php

Industry's Take:
Malaysia is a very attractive market because of economic growth, quality of products and the potential for trade in the ASEAN region. There is a need to gather more specific information about the cold chain industry that is currently lacking.

Richard Tracy, Global Cold Chain Alliance

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Mexico

Mexico's national economic growth rate and proximity to the United States make it a key market for export growth. Improvement in government regulation and streamlined border and customs programs would accelerate cold chain growth in Mexico.

Overall Rank **13**

Upper-Middle Category Ranking **3**

Mexico has an estimated GDP of $1.3 trillion. Exports of goods and services from the U.S. amounted to $270 billion, or 11.6 percent of all U.S. exports. U.S. majority owned foreign affiliate sales in Mexico were $235 billion, and distribution services accounted for more than $70 billion in 2013.[129]

The population of Mexico is considered upper middle class, with a per capita income of about $16,640 (PPP) per year. Unemployment has held steady at 4.9 percent, and inflation was 4.7 percent in 2014.[130]

Mexico has a great capacity for growth in the cold chain industry in the near future. Retailers and franchisors in the food sector are focused on continuing the nearly 7 percent annual growth in food sales that they have experienced for several years.

While market share of modern supermarkets is low at 3.4 percent, Mexico has seen a growth rate of 54 percent from 2008 to 2013 and per-capita sales growth of 4.6 percent.[131] Mexican demand for value-added food imports has grown rapidly in recent years, as the introduction of supermarket food distribution systems has become more prominent.[132]

Growth in consumer income will lead to increased demand for food products; franchisors and other food retailers have significant opportunity to utilize a collaborative model when establishing cold chain infrastructure with Mexican farmers.

The franchise sector in Mexico is the fifth largest market in the world and is expanding rapidly, estimated to have grown 11 percent in 2015. U.S. fast food and casual restaurants are common, and the food and beverage segment is estimated to be nearly one-third of the total franchise market.

E-commerce faces numerous challenges in Mexico. The rate of broadband penetration and digital literacy ranks at the bottom of OECD countries. Over 50 percent of the country's 51.2 million Internet users are in Mexico City, Guadalajara and Monterrey. There is a cultural distrust of the largely ineffective postal and online payment systems; in fact, only 64 percent of e-commerce payments are made by credit card. Despite these issues, e-commerce has grown by 42 percent to reach $9.2 billion in 2013.

Figure 27:

Competitiveness Index	Score
Government/Regulatory	3.4
Labor Force	4.0
Infrastructure	4.4
Demand/Business Factors	4.5
Industry Interest	5.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	127 Million
Cold Storage Capacity	5.0 M/m^3
Pharmaceutical Sales	$11.2 Billion
Food Spending	$58.5 Billion
Food Spending per Capita	$460
Agribusiness Market	$52 Billion
Agriculture Imports	$4.8 Billion
Agriculture Exports	$1.4 Billion

BMI and Global Cold Chain Alliance

Pharmaceutical sales are expected to reach $14 billion in Mexico by 2020.[133] Cargo theft is a frequent concern and a huge entry barrier to the Mexican market, especially with high value products like pharmaceuticals. In the United States, pharmaceutical distributors typically operate on low margins, and thus cargo theft may jeopardize the financial health of a distributor and cause distributors to charge higher prices to account for the risk.

Mexico has burdensome customs procedures for express delivery services, and couriers are 100 percent liable for all of the contents of their shipments.

Mexico's $52 billion agri-business is highly dependent on trade with the United States. Most agricultural products in Mexico travel by truck, and the United States is a large consumer of Mexican produce. There may be significant opportunity to expand cold storage facilities in regions that produce agricultural products exported to the United States.[134]

Figure 28: World Bank Doing Business Ranking		
Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Mexico	38	$17,107
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Mexico is the eighth largest food producer in the world at over $140 billion and comprises some of the largest international producers. As the Mexican economy continues to develop, demand for food products will continue to increase. Furthermore, given the U.S.-Mexico relationship, demand on the U.S side has a large impact in Mexico. Geographic proximity has made the United States and Mexico strategic partners in the food industry. Mexico is the United States' second largest food supplier, totaling $17.7 billion in exports in 2013.

Mexico ranked 38th in the World Bank's 2016 Ease of Doing Business, an improvement of four places since 2015, when the survey was recalculated. Of particular note were low rankings in the categories of Registering Property and Paying Taxes.[135]

Corruption and crime are large concerns for businesses in Mexico. The country has one of the highest homicide rates in the world, and government institutions are extremely inefficient. Mexico is very open to trade and, through the NAFTA agreement, has relatively simple processes for importing and exporting, with low tariff rates on most U.S. products.

Mexico is ranked 58th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 26 and a labor participation rate of 61.6 percent. More than 8 percent of the population is tertiary educated, and the country is ranked 61st in ease of finding skilled employees.[136]

Infrastructure is one area that has historically limited Mexican cold chain capabilities. While Mexico has a modern highway system that connects main industrial areas, transportation infrastructure beyond major cities is often lacking. Mexico's quality of transport infrastructure is ranked 36th out of 140 countries in the World Economic Forum Global Competitiveness index, with Quality of Railroad Infrastructure the lowest scoring category.[137]

The government is focused on capitalizing on the 44 international trade agreements it has signed by modernizing roads and transportation infrastructure to turn the country into a well-connected, global logistics center. Current projects include modernizing and expanding ports and multimodal corridors. Estimates attribute as much as 15 percent of total product costs to transportation and logistics.

Mexico ranked 50th out of 160 countries in the World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. The country has shown overall improvement trends in every category of the Index since 2007, though the categories of Tracking and Tracing and Timeliness have declined since 2010.[138]

Cold chain service providers are investing and growing throughout the country. The cold chain industry will likely continue to see growth of nearly 30 percent as Mexico upgrades its infrastructure. Maintaining a stable government and electricity supply, as well as improving transportation, will be essential to sustain growth in the industry.

Resources:

U.S. Commercial Service – Mexico
http://www.export.gov/mexico/index.asp

Mexican Embassy in the U.S.
http://www.embassyofmexico.org

Mexican Office of the President
www.presidencia.gob.mx

Secretariat of Economy (SE)
http://www.economia.gob.mx

American Chamber of Commerce in Mexico, A.C.
http://www.amcham.com.mx

U.S.-Mexico Chamber of Commerce
http://usmcoc.org

Events:

Expo Carga – June 28-30, 2016
http://www.expo-carga.com

Industry's Take:
Mexico is experiencing a high growth rate with regard to exports and domestic consumers purchasing ready-to-eat meals from the organized retail sector. There is one major 3PL in Mexico; more and more players, however, are entering the market. It will only be a matter of time before the global players make their move.
Richard Tracy, Global Cold Chain Alliance

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Singapore

Singapore's well-established infrastructure, favorable business climate and high per capita income make it a top market for cold chain. Its strategic location is ideal for cross docking and distribution networks to service the ASEAN region.

Overall Rank	High-Income Category Ranking
1	1

Singapore has an estimated GDP of $308 billion, and U.S. exports to Singapore amounted to nearly $43 billion in 2015. U.S. majority owned foreign affiliate sales were $405 billion in the country, and distribution services accounted for more than $202 billion in 2013.[139]

The population of Singapore is considered high income, with a per capita income of about $80,270 (PPP) per year. Unemployment has held steady around 3 percent, and inflation was low, around .2 percent, in 2014.[140]

Singapore's retail food sector is one of the most advanced in the world. Food spending is expected to reach nearly $9 billion by 2020.[141] The mature nature of Singapore's mass grocery retail sector is evidenced by intense competition, which ensures that retailers must be highly innovative to compete.

Singapore has one of the highest per capita incomes in the world, and more than 72 percent of the population earns over $50,000 annually, presenting a high level of consumer purchasing power. Therefore, catering to consumer preferences, rather than competing on price alone, presents an opportunity for U.S. exporters.

Singaporean customers often value the ease of shopping in convenience stores or online. Packaged foods are an industry that appeals to this consumer segment, as these products are easier and less time-consuming to cook. In the face of rising obesity rates, government initiatives and consumer choices to eat healthier have created demand for healthy processed foods.

There is also strong demand for fresh products in Singapore; even busy professionals who cannot make treks to the markets frequently will buy fresh produce and freeze it themselves to consume later. Therefore, significant opportunity exists for firms to sell food items that are both fresh and readymade or easy to prepare.

Figure 29:

Competitiveness Index	Score
Government/Regulatory	6.0
Labor Force	5.8
Infrastructure	6.3
Demand	5.1
Industry Interest	5.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	5.6 Million
Cold Storage Capacity	N/A
Pharmaceutical Sales	$793 Million
Food Spending	$6.8 Billion
Food Spending per Capita	$1,205
Agribusiness Market	N/A
Agriculture Imports	$1.2 Billion
Agriculture Exports	$1.1 Billion

BMI and Global Cold Chain Alliance

Wet markets still represent a major point of sale for fresh grocery products. Wet markets are reminiscent of traditional markets and serve as destinations that sell fresh produce, meat and fish products. Older consumers tend to prefer shopping in these outlets.

The franchise sector in Singapore is well-developed and growing. There are more than 30,000 franchises in the country, and U.S. concepts are very well received. Many businesses use Singapore as a distribution center and a showcase for concepts to the Asia region. With more than 15 million visitors each year, it is common for visitors to inquire into bringing a concept seen in Singapore to their home country. Singapore's well-developed infrastructure and strategic location provide convenient access to the Asia region.

E-commerce in Singapore is estimated at $3.3 billion in 2015 and is expected to reach as high as $33 billion by 2020. The e-commerce site EBay estimates that e-commerce accounts for as much as 5 percent of all retail sales in Singapore.

E-commerce and direct to consumer deliveries of temperature-sensitive products will find excellent opportunities in this market due to relatively lower overhead and real estate costs of operation and the ability to cater to consumers that do not have time tso shop at a retail store. This may also represent a great opportunity for cold chain service providers, as the growth of online shopping for food and groceries should create additional demand for refrigerated deliveries and warehouses near major population centers.

Pharmaceutical sales in Singapore are estimated at $800 million and are anticipated to increase to around $1 billion by 2020. Singapore represents an attractive opportunity for refrigerated logistics service providers to serve the growing pharmaceutical industry.

Singapore's quality of transport infrastructure is ranked third out of 140 countries in the World Economic Forum Global Competitiveness index. All aspects of the infrastructure from road to rail, ports and air are all consistently rated in the top ten in the world.[142]

Singapore ranked 5th out of 160 countries in World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. While the categories of Infrastructure and Customs have shown slight improvements since 2007, almost every other category has declined.[143]

Singapore has a highly developed and sophisticated cold chain distribution system. Cold chain operators are looking at further developing their Singapore facilities to create a cross-docking location to more efficiently move product throughout the ASEAN region, which would help U.S. cold chain firms improve their operating efficiency and market prospects in the region.

Singapore is becoming a hub for perishable products moving from one part of the world to another. At Coolport@Changi, a $16 million 8,000 sq. meter building is the transit point for 90 percent of the perishable goods that pass through the airport. The facility has 18 temperature zones that range from -28° C to 18° C.[144] A recent 1,400 square meter facility run by dnata expanded the total airport capacity to 75,000 tons annually.[145]

Express delivery is greatly aided by the advanced supply chain infrastructure in Singapore. Changi Airport is served by more than 100 airlines with flights to 80 countries and nearly 300 weekly freighter flights. The airport sets some of the highest standards for cargo and has goals of clearing 90 percent of cargo shipments through customs within 13 minutes.

Due to land constraints, as much as 90 percent of food consumed must be imported. Recent trends have shown Singaporean retailers sourcing more agriculture products beyond the region to meet the 5.5 percent annual increase demand of the local markets. Products range from generic to high-end organic foods. It is estimated that, this year, Singapore's dairy market will be around $1 billion. The beef market will be $415 million, and the fresh fruits and vegetables market is anticipated to be about $1billion.

The Agro-Food and Veterinary Authority of Singapore (AVA) worked with the food industry and SPRING Singapore to launch a new Singapore Standard (SS) for the cold chain management of vegetables in 2013. Named SS 585: 2013, the new standard covers major supply links starting from the farm to the packing house, transportation, distribution, wholesale center and retail. SPRING Singapore is now promoting international recognition and adoption of these standards from the International Standards Organization (ISO).[146]

About 15 percent of Singapore's resident population is Muslim, and as such, there is a relatively strong demand for halal food products in Singapore. Cold chain logistics providers interested in entering this market may want to consider halal certification to appeal to all consumer segments.

Singapore has consistently ranked at the top of business friendly markets and is ranked first in the World Bank's 2016 Ease of Doing Business Rankings. One risk, however, that should be monitored arises when purchasing property. Because land is so scarce in Singapore, numerous bidders often drive the price of land to above its real value, making it costly to develop sites and facilities needed for cold chain operations.

Singapore also has one of the most expensive labor markets in the world. This may be a barrier to entry for SMEs looking to expand into this market.

Singapore is ranked 24th out of 124 countries in the World Economic Forum's Human Capital Index 2015. The population has a median age of 37 and a labor participation rate of 67.8 percent. More than 21 percent of the population is tertiary educated, and the country is ranked 20th in ease of finding skilled employees.[147]

Figure 30: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Singapore	1	$82,763
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

The United States has a free trade agreement with Singapore that has brought tariffs on most products down to zero. Singapore is also a party to the recently negotiated Trans-Pacific Partnership (TPP). Upon ratification, U.S. businesses may find increased potential for growth and more opportunities to participate in trade. The agreement will eliminate tariffs, lower service barriers and increase transparency while also increasing competitiveness by instituting stronger intellectual property rights protection and establishing enforceable labor and environmental obligations.

The TPP will promote fairness by ensuring non-discriminatory treatment of U.S. goods and services, establishing rules for fair competition with State-owned enterprises and providing the same rights and protections for U.S. investors that foreign investors currently enjoy in the United States while protecting the inherent right of governments to regulate.

Singaporeans also pride themselves on being a 'foodie' country, and 60 percent of Singaporeans eat out at least four times a week, according to the 2010 National Nutrition Survey. "Eating out" includes hawker centers, food courts, coffee shop stalls, restaurants, coffee houses and workplace canteens as usual meal venues. A recent MasterCard survey on consumer dining habits showed Singaporeans to be one of the top spenders for dining out across the wider Asia Pacific. There is also a recognizable shift toward fine dining, new cuisines and differentiated dining experiences among Singaporeans, creating increased demands for new perishable food items.

Resources:

U.S. Commercial Service:
http://www.export.gov/singapore/

Country Commercial Guide:
http://export.gov/ccg/singapore090882.asp

Restaurant Association of Singapore (RAS)
www.ras.org.sg

Singapore Hotel Association (SHA)
www.sha.org.sg

Industry's Take:
Singapore is a highly developed country with at sophisticated distribution system. There is opportunity to make Singapore a staging station for cross-docking facilities to move product more efficiently.
Richard Tracy, Global Cold Chain Alliance

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Vietnam

Strong foreign infrastructure and logistics activity signal that Vietnam should be a growth market, though government regulatory concerns keep it on the lower end of this year's *Top Markets* rankings.

Overall Rank	Lower-Middle Category Ranking
17	3

Vietnam has an estimated GDP of $186 billion, and exports of goods from the U.S. amounted to $5.7 billion in 2015. U.S. majority owned foreign affiliate sales in Vietnam were $3.2 billion in 2013, an increase of 6.8 percent, but distribution services data is not available for the country.[148]

The population of Vietnam is considered lower middle income, with a per capita income of about $5,350 (PPP) per year. Unemployment is approximately 2.3 percent, and inflation was 3.7 percent in 2014.[149]

Vietnam's organized retail sector is at the beginning stages of growth, and most retailers and cold chain operators are continuing to monitor the development of the market. Food spending is expected to increase on average by 10.5 percent annually to reach over $31 billion by 2020.[150] There is a traditional preference to eat fresh products, leaving the frozen food segment fragmented. The entry of major retailers with supermarket models combined with increasing exports of farming and seafood products are expected to drive demand for cold chain services.

The estimated $46 billion franchise sector in Vietnam is very popular and well suited for the developing economy. American food and beverage franchise brands have become big players in the market, as Vietnamese consumers associate western brands with quality and lifestyle.

With internet penetration at more than 45 percent, e-commerce in Vietnam has grown substantially over the last five years to reach nearly $4.2 billion in 2015 and accounts for 2.1 percent of all retail sales, according to the Vietnam E-Commerce and

Information Technology Agency. The average shopper spent $165 online.[151]

Across Asian nations, there has been a trend toward purchasing groceries and food products online. This may represent a great opportunity for cold chain service providers, as the emergence of online shopping for groceries should create additional demand for refrigerated delivery and warehouses near major population centers.

Figure 31:

Competitiveness Index	Score
Government/Regulatory	3.8
Labor Force	3.9
Infrastructure	3.9
Demand	4.2
Industry Interest	4.0

World Economic Forum and Global Cold Chain Alliance

Economic Statistics	
Population	93.4 Million
Cold Storage Capacity	N/A
Pharmaceutical Sales	$4.2 Billion
Food Spending	$19.1 Billion
Food Spending per Capita	$204
Agribusiness Market	$43.3 Billion
Agriculture Imports	$5.0 Billion
Agriculture Exports	$5.2 Billion

BMI and Global Cold Chain Alliance

Pharmaceutical sales in Vietnam are estimated at $4.2 billion and are anticipated to increase at a compound annual growth rate of over 12.5 percent to reach around $7.6 billion by 2020.[152] Vietnam represents an attractive opportunity for refrigerated logistics service providers to serve the growing pharmaceutical industry.

Trade routes through Vietnam have increased airfreight imports from the United States by an average of 19.2 percent since 2005,[153] providing opportunities for express delivery services within the country.
Vietnam's agribusiness market is expected to grow to $51 billion by 2020.[154] It is estimated that this

year, Singapore's dairy imports from the United States will be around $1 billion, though most of that will be in dry powder form, which does not require refrigeration. The poultry market sources its imports primarily from Brazil and the United States and expects to import 75 metric tons of U.S. poultry this year. The Vietnamese market will import 20,000 metric tons of beef and 3,000 metric tons of pork from the United States this year.

Vietnam ranked 90th in the World Bank's 2016 Ease of Doing Business, improving by three places since 2015, when the survey was recalculated.[155]

Figure 32: World Bank Doing Business Ranking

Country	Ranking (2016)	GDP Per Capita (PPP, 2014)
Vietnam	90	$5,629
Russia	51	$25,635
China	84	$13,206
Brazil	116	$15,838
India	130	$5,701

Vietnam still remains a relatively risky place to do business, as laws and regulations are not always transparent. Furthermore, there are restrictions on forms of foreign direct investment that deter some retailers from entering this market.

Vietnam is a party to the recently negotiated Trans-Pacific Partnership (TPP). Upon ratification, U.S. businesses may find increased potential for growth and more opportunities to participate in trade. The agreement will eliminate tariffs, lower service barriers and increase transparency while also increasing competitiveness by instituting stronger intellectual property rights protection and establishing enforceable labor and environmental obligations.

The TPP will promote fairness by ensuring non-discriminatory treatment of U.S. goods and services, establishing rules for fair competition with State-owned enterprises and providing the same rights and protections for U.S. investors that foreign investors currently enjoy in the United States while protecting the inherent right of governments to regulate.

Vietnam is ranked 59th out of 124 countries in the World Economic Forum's Human Capital index 2015. The population has a median age of 29 and a labor participation rate of 77.5 percent. Less than 9 percent of the population is tertiary educated, and the country is ranked 99th in ease of finding skilled employees.[156]

The labor market can be challenging in Vietnam. Managers often have a lack of incentive to improve company processes. This has led to a productivity challenge in Vietnam. Companies wishing to expand to Vietnam should invest resources in training quality management that can identify areas for improvement and take action.

With over 54.5 million people, Vietnam has a large, literate labor force. The minimum wage ranges from $110 to $160 a month with urban districts subject to higher wages.

The Vietnamese government has taken a proactive step to promote cold chain infrastructure by introducing financial incentives to attract foreign investment. Vietnam's government has also made it a policy initiative to promote the rapid growth of infrastructure and attract many of the world's largest infrastructure companies; as a result, many 3PLs have benefited.[157]

Vietnam ranked 48th out of 160 countries in World Bank's 2014 Logistics Performance Index (LPI). The LPI is an indicator of key dimensions of a country's logistics performance, including Customs, Infrastructure, International Shipments, Competence, Tracking and Tracing, and Timeliness. Overall, the country has shown improvement in almost every category of the Index since 2007, though the category of Customs has slightly declined.[158]

Foreign logistics firms have a strong presence in Vietnam, capturing 80 percent of market share worth $48 billion. While ocean shipping services are dominated by joint ventures, domestic firms mostly handle road-shipping services. Cold chain has been identified as one of the key growth opportunities for foreign investors in Vietnam, an area where there has been significant international investment.

Vietnam's quality of transport infrastructure is ranked 67th out of 140 countries in the World Economic Forum Global Competitiveness index.

Every category of transportation infrastructure has improved since 2011, though the quality of roads and the overall quality of the transport infrastructure is very low.[159]

The refrigerated products and services industry would be wise to monitor the state of bulk rail shipping in Vietnam to determine the market opportunity for both refrigerated rail cars and refrigerated warehouses at intermodal links and trans-shipment hubs. Furthermore, according to *Business Monitor International*, the poor state of domestic infrastructure capabilities provides strong demand for foreign construction companies.[160]

While retailers have expanded to Vietnam in recent years, distribution networks remain underdeveloped. Vietnam has had traditionally low investment in the rail industry, leaving cost-effective bulk rail freight underutilized. There have been several plans to expand rail capacity, and increased Chinese investment may promote Vietnam's rail sector. Reduced transport costs can further promote Vietnam's agricultural and seafood exports, creating additional demand for refrigerated services.

Preferred Freezer, a U.S.-based refrigerated warehousing firm, operates a large cold storage facility in Vietnam that is one of the most modern refrigerated warehouses in the country and utilizes state of the art automation technology as well as advanced inventory tracking methods.

Resources:

U.S. Commercial Service:
http://www.export.gov/vietnam/

Country Commercial Guide:
http://export.gov/ccg/vietnam090915.asp

American Chamber of Commerce (AmCham) HCMC:
http://www.amchamvietnam.com/

American Chamber of Commerce- Hanoi:
http://www.amchamhanoi.com

Industry's Take:
The cold storage market in Vietnam is over-built for current operations. The organized retail sector is just starting to take off, and thus, most players are keeping an eye on the situation. There is potential for companies with a longer-term approach.

Richard Tracy, Global Cold Chain Alliance

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Addendum: Resources for U.S. Exporters

The U.S. government has numerous resources available to help U.S. exporters: from additional market research to guides to export financing, to overseas trade missions, to staff around the country and the world. A few key resources are highlighted below. For additional information about services from the International Trade Administration (ITA), please visit www.export.gov.

Country Commercial Guides
http://export.gov/ccg/
Written by U.S. Embassy trade experts worldwide, the Country Commercial Guides provide an excellent starting point for what you need to know about exporting and doing business in a foreign market. The reports include sections addressing: market overview, challenges, opportunities and entry strategies; political environment; selling U.S. products and services; trade regulations, customs and standards; and much more.

Basic Guide to Exporting
http://export.gov/basicguide/
A Basic Guide to Exporting addresses virtually every issue a company looking to export might face. Numerous sections, charts, lists and definitions throughout the book's 19 chapters provide in-depth information and solid advice about the key activities and issues relevant to any prospective exporter.

Trade Finance Guide: A Quick Reference for U.S. Exporters
http://www.export.gov/tradefinanceguide/index.asp
Trade Finance Guide: A Quick Reference for U.S. Exporters is designed to help U.S. companies, especially small and medium-sized enterprises, learn the basics of trade finance so that they can turn their export opportunities into actual sales and achieve the ultimate goal of getting paid—especially on time—for those sales. Concise, two-page chapters offer the basics of numerous financing techniques from open accounts to forfaiting, to government assisted foreign-buyer financing.

Trade Missions
http://www.export.gov/trademissions/
Department of Commerce trade missions are overseas programs for U.S. firms that wish to explore and pursue export opportunities by meeting directly with potential clients in their markets.

Trade missions include among other activities: one-on-one meetings with foreign industry executives and government officials that are pre-screened to match specific business objectives.

Certified Trade Fairs
http://www.export.gov/eac/show_short_trade_events.asp?CountryName=null&StateName=null&IndustryName=null&TypeName=International%20Trade%20Fair&StartDate=null&EndDate=null
The Department of Commerce's trade fair certification program endorses overseas trade shows that are reliable venues and good markets for U.S. firms to sell their products and services abroad. These shows serve as a vital access vehicle for U.S. firms to enter and expand to foreign markets. The certified show/U.S. pavilion ensures a high-quality, multi-faceted opportunity for American companies to successfully market overseas. Among other benefits, certified trade fairs provide U.S. exhibitors with help facilitating contacts, market information, counseling and other services to enhance their marketing efforts.

International Buyer Program
http://export.gov/ibp/
The International Buyer Program (IBP) brings thousands of international buyers to the United States for business-to-business matchmaking with U.S. firms exhibiting at major industry trade shows. Every year, the International Buyer Program results in millions of dollars in new business for U.S. companies by bringing pre-screened international buyers, representatives and distributors to selected shows. U.S. country and industry experts are on site at IBP shows to provide hands-on export counseling, market analysis and matchmaking services. Each IBP show also has an International Business Center, where U.S. companies can meet privately with prospective international buyers, prospective sales representatives and business partners and obtain assistance from experienced ITA staff.

The Advocacy Center
http://www.export.gov/advocacy/
The Advocacy Center coordinates U.S. government interagency advocacy efforts on behalf of U.S. exporters bidding on public-sector contracts with overseas governments and government agencies. The Advocacy Center helps to ensure that sales of U.S. products and services have the best possible chance competing abroad. Advocacy assistance is wide and varied but often involves companies that want the U.S. government to communicate a message to foreign governments or government-owned corporations on behalf of their commercial interest, typically in a competitive bid contest.

U.S. Commercial Service
http://www.export.gov/usoffices/index.asp
With offices throughout the United States and in U.S. Embassies and consulates in nearly 80 countries, the U.S. Commercial Service utilizes its global network of trade professionals to connect U.S. companies with international buyers worldwide. Whether looking to make their first export sale or expand to additional international markets, companies will find the expertise they need to tap into lucrative opportunities and increase their bottom line. This includes trade counseling, actionable market intelligence, business matchmaking, and commercial diplomacy.

Appendix 1: Methodology

Key Market Assessment Requirements

U.S. businesses engaged in international cold chain activity assess markets against specific criteria when selecting locations for expansion. The four primary criteria, according to industry sources, are the governmental regulatory environment, whether there is a trainable skilled labor force, the infrastructure environment and the potential demand within the country or region.

Government/Regulatory

The first aspect that U.S. industries consider when looking at a new market is the regulatory environment of the country. In particular, U.S. industry looks for a stable government with transparent policymaking plus technical regulations, standards and procedures for assessment of conformity that are non-discriminatory and based on relevant, internationally recognized best practices. Legal frameworks that allow companies to resolve legal disputes and challenge regulations are essential when identifying potential export markets.

Labor Force

Another important aspect for market decision-making is the quality and skill level of the potential work force in the market. Industry must have the capacity to train and develop the talent and the management required to run an efficient supply chain operation.

Infrastructure

The infrastructure within a country is another key aspect in a company's selection of export markets. Electricity and IT infrastructure must be sufficient to support logistics operations. Transportation infrastructure must be capable of supporting the reliable distribution of a product within the country or region without excessive delays. The International Association of Refrigerated Warehouses has noted a strong correlation of cold storage capacity to a country's transportation score in the World Economic Forum's Transport Index.[161]

Demand

Finally, the demand within a country must be considered. The potential size of the market will depend on consumer needs, the number of consumers in the country, products produced and demanded by the market as well as the level of development within the market.

Methodology

When determining which global markets policy-makers should target for export promotion and trade policy activities, it is important to account for the primary decision-making criteria of U.S. businesses engaged in the cold chain market. In this report and the case studies that follow, the criteria for evaluating markets was based on the four specific aspects of *Government/Regulations*, *Labor Force*, *Infrastructure* and *Demand*. These are reflected in the report's scorecard and country case studies.

The scorecard for this report is derived from the Global Competitiveness Index 2015-2016 created by the World Economic Forum for their Global Competitiveness Report.[162] By using this competitiveness index, a cross-country analysis based on these market evaluation criteria is possible. Particular aspects of the index were used to represent the primary criteria that industry indicated as a priority in market selection.

The scorecard assigns a numeric value to each of the criteria on a scale of 1 to 7, with 7 being the highest score in a particular category. The scorecard is color-coded, using red, yellow and green to indicate comparative values of countries in the same income level. It is important to note that the colors yellow and red do not necessarily represent a poor environment but rather represent the lower 40 percent of scores in the given income level.

New for 2016, a separate category has been added to assess industry's interest in each of the countries. The Global Cold China Alliance, which represents all major industries engaged in temperature-controlled logistics, provided ratings on a scale of 1 to 7, with 7 being the highest score based on their members expressed interest. This industry interest category effectively contributes 20 percent to the total country score.

The case studies in this report analyze selected potential markets and assess important competitiveness factors. These case studies are intended to aid ITA in promoting the development of efficient international cold chains to improve U.S. export opportunities. Inclusion or omission of countries in the case study section does not necessarily indicate that these are higher or lower ranked countries of opportunity but rather that government or private sector representatives have expressed interest in learning more about these markets to ITA's Supply Chain Team.

Appendix 2: Scorecards

Cold Chain Competitiveness Scorecard: High Income Economies[163]

Criteria (1 - 7 Best)	U.S.	Australia	Canada	Germany	Japan	Netherlands	Poland	Singapore	UAE	U.K.
Government/Regulatory	4.8	4.9	5.1	5.1	5.1	5.4	3.9	6.0	5.6	5.3
Ethics and corruption	4.5	5.3	5.3	5.1	5.5	5.7	3.7	6.2	6.2	5.4
Intellectual Property Protection	5.8	5.8	5.8	5.7	6.1	6.0	4.0	6.2	5.5	6.0
Legal framework- settling disputes	4.9	4.9	5.2	5.3	5.4	5.5	3.7	6.2	5.2	5.7
Legal framework- challenging regulations	4.8	4.7	5.0	5.2	4.6	5.5	3.1	5.2	4.7	5.3
Transparency of government policymaking	5.0	4.9	5.3	5.1	5.5	5.5	3.6	6.2	5.4	5.5
Foreign competition	4.5	4.8	4.9	5.0	4.6	5.8	5.0	6.4	5.9	5.3
Security	4.9	5.7	5.6	5.3	5.5	5.6	5.1	6.2	6.5	5.4
Burden of government regulation	3.6	3.3	3.8	3.9	3.6	3.9	2.8	5.4	5.2	3.9
Labor Force	5.6	4.5	5.2	4.6	4.7	4.8	3.9	5.8	5.6	5.5
Flexibility	5.4	4.2	5.2	4.2	5.2	4.7	4.3	6.1	6.0	5.4
Flexibility of wage determination	5.7	4.1	5.4	3.6	6.0	3.7	5.6	6.0	6.1	5.8
Hiring and firing practices	5.0	2.9	4.5	3.4	3.0	3.6	3.5	5.4	5.1	4.8
Country capacity to attract talent	5.8	4.8	5.3	4.7	3.3	5.0	2.4	6.0	5.9	5.9
Country capacity to retain talent	5.7	4.5	4.9	4.9	4.2	5.1	2.7	5.4	5.5	5.3
Reliance on professional management	5.9	5.8	5.9	5.7	5.6	6.1	4.3	6.1	5.5	5.9
On-the-job training	5.4	5.2	5.1	5.5	5.4	5.7	4.4	5.6	5.2	5.3
Infrastructure	5.8	5.6	5.7	6.0	6.0	6.1	4.4	6.3	6.2	5.9
Electricity and telephony infrastructure	5.8	6.2	5.9	6.3	6.3	6.3	5.1	6.5	5.9	6.4
Transport infrastructure	5.9	5.2	5.6	6.0	6.1	6.3	3.5	6.5	6.6	5.6
Technological adoption	5.8	5.4	5.5	5.6	5.7	5.7	4.5	6.0	6.1	5.8
Demand / Business Factors	5.4	4.7	5.0	5.4	5.6	5.3	4.5	5.1	5.4	5.3
Domestic market size	7.0	5.1	5.3	5.9	6.1	4.8	5.0	4.4	4.6	5.7
Domestic competition	5.2	4.9	5.3	5.0	5.0	5.5	4.7	5.8	5.8	5.3
Foreign competition	4.5	4.8	4.9	5.0	4.6	5.8	5.0	6.4	5.9	5.3
Control of international distribution	5.3	4.1	4.6	5.5	5.5	5.0	3.6	4.4	5.3	5.0
Local supplier quantity	5.4	4.7	5.1	5.8	6.2	5.2	5.1	4.5	5.4	5.6
Local supplier quality	5.5	5.3	5.4	6.0	6.2	5.6	4.9	5.1	5.3	5.4
State of cluster development	5.5	4.1	4.5	5.5	5.3	5.2	3.6	5.1	5.5	5.3
Quality of Demand Conditions	5.0	4.6	4.9	4.7	5.7	4.9	4.1	5.2	5.1	5.0
Industry Interest	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0
Total Score	5.1	4.7	5.0	5.0	5.1	5.1	4.3	5.6	5.6	5.4

High-income economies tend to have well-developed distribution services, including cold chain systems. These systems serve retail and franchise markets that are equally well-developed. Most opportunities for cold chain service providers in these markets will be in acquisitions and consolidation of the services to improve efficiency in the systems. U.S. cold chain providers and 3PLs that utilize the latest technologies and management practices to solve unique challenges in specific markets are the most likely candidates to expand in these markets.

Cold Chain Competiveness Scorecard: Upper Middle Income Economies[164]

Criteria (1 - 7 Best)	Brazil	China	Colombia	Malaysia	Mexico	S. Africa	Thailand
Government/Regulatory	3.0	4.1	3.2	5.2	3.4	4.4	3.7
Ethics and corruption	2.1	4.0	2.5	4.8	2.5	3.2	2.9
Intellectual Property Protection	3.7	4.0	3.7	5.4	3.8	5.4	3.2
Legal framework - settling disputes	2.8	4.0	3.1	5.3	3.1	5.3	3.9
Legal framework - challenging regulations	2.9	3.5	3.0	5.0	3.0	5.0	3.7
Transparency of government policymaking	3.1	4.5	3.9	5.3	4.1	4.5	3.8
Foreign competition	3.2	3.9	3.9	5.5	4.4	4.5	4.8
Security	4.2	4.7	3.1	5.2	3.2	4.1	3.8
Burden of government regulation	1.7	4.0	2.6	5.0	2.8	2.9	3.3
Labor Force	3.6	4.4	4.0	5.4	4.0	3.7	4.2
Flexibility	3.6	4.4	4.5	5.2	4.3	3.7	4.1
Flexibility of wage determination	4.0	5.0	5.3	5.5	5.1	2.7	4.3
Hiring and firing practices	2.3	4.6	3.6	5.3	3.5	2.2	4.5
Country capacity to attract talent	3.0	4.2	3.2	5.3	3.4	3.8	3.8
Country capacity to retain talent	3.7	4.2	3.3	5.3	3.5	3.6	4.0
Reliance on professional management	4.4	4.4	4.3	5.7	4.2	5.4	4.5
On-the-job training	3.9	4.2	3.8	5.5	4.1	4.7	4.2
Infrastructure	4.2	4.7	4.0	5.5	4.4	4.4	4.7
Electricity and telephony infrastructure	4.4	4.4	4.3	5.2	3.9	3.5	4.7
Transport infrastructure	3.5	5.1	3.2	5.8	4.5	4.7	4.6
Technological adoption	4.6	4.5	4.5	5.6	4.9	5.1	4.8
Demand / Business Factors	4.2	4.8	4.2	5.3	4.5	4.5	4.6
Domestic market size	5.8	7.0	4.7	4.8	5.5	4.8	5.0
Domestic competition	3.7	4.5	3.9	5.5	4.2	4.9	4.6
Foreign competition	3.2	3.9	3.9	5.5	4.4	4.5	4.8
Control of international distribution	3.8	4.3	3.8	5.2	4.0	4.3	4.1
Local supplier quantity	4.7	5.2	4.9	5.4	4.6	4.6	4.8
Local supplier quality	4.3	4.3	4.7	5.3	4.7	4.8	4.4
State of cluster development	4.2	4.5	3.7	5.3	4.2	4.2	4.1
Quality of Demand Conditions	3.9	4.4	4.1	5.3	4.1	4.2	4.8
Industry Interest	4.0	5.0	3.0	3.0	5.0	4.0	4.0
Total Score	3.8	4.6	3.7	4.9	4.3	4.2	4.2

Upper middle-income markets tend to be prime for cold chain expansion and often have some established retail and franchise industries that already utilize cols chain systems. These systems may vary from rudimentary to advanced. There are likely many opportunities for a variety of cold chain service providers to enter and expand in these markets, though the government/regulatory environment may hinder growth opportunities in many countries.

Cold Chain Competiveness Scorecard: Lower Middle Income Economies[165]

Criteria (1 - 7 Best)	India	Indonesia	Kenya	Vietnam
Government/Regulatory	4.1	4.0	3.7	3.8
Ethics and corruption	4.1	3.7	3.0	3.1
Intellectual Property Protection	4.2	4.3	3.7	3.6
Legal framework - settling disputes	4.2	3.9	4.0	3.7
Legal framework - challenging regulations	4.1	3.9	4.0	3.4
Transparency of government policymaking	4.2	4.1	4.2	3.8
Foreign competition	3.9	4.1	4.1	4.7
Security	3.9	4.1	3.1	4.5
Burden of government regulation	4.0	3.8	3.7	3.2
Labor Force	4.1	4.2	4.3	3.9
Flexibility	4.5	3.6	4.8	4.4
Flexibility of wage determination	4.0	4.3	5.2	5.0
Hiring and firing practices	4.4	4.3	4.1	4.2
Country capacity to attract talent	3.8	4.1	3.7	3.3
Country capacity to retain talent	3.9	4.1	3.5	3.2
Reliance on professional management	3.9	4.7	4.4	3.6
On-the-job training	4.2	4.5	4.4	3.8
Infrastructure	3.8	4.4	3.7	3.9
Electricity and telephony infrastructure	2.8	4.0	2.8	4.1
Transport infrastructure	4.6	4.4	3.6	3.6
Technological adoption	4.1	4.8	4.8	4.0
Demand / Business Factors	4.5	4.5	4.2	4.2
Domestic market size	6.4	5.7	3.7	4.5
Domestic competition	4.2	4.5	4.5	4.4
Foreign competition	3.9	4.1	4.1	4.7
Control of international distribution	4.0	4.2	3.8	3.7
Local supplier quantity	4.6	4.7	5.1	4.5
Local supplier quality	4.3	4.2	4.4	3.8
State of cluster development	4.4	4.4	4.1	3.8
Quality of Demand Conditions	4.1	4.4	3.9	3.8
Industry Interest	4.0	3.0	3.0	4.0
Total Score	4.1	4.0	3.8	3.9

Lower-middle income economies are usually in the burgeoning stages of retail and cold chain development. These economies often need extensive investment for efficient systems. With less developed retail markets, it may be difficult for many cold chain service providers to find profit opportunities in the local market; therefore, exporting to other consumers markets usually offers the greatest opportunities. The growth of these markets will often hinge on the ease of doing business and trade; government policies and infrastructure development are often the largest impediments to business and to the growth of these economies.

Appendix 3: Citations

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