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Garland Chow

*University of North Texas and University of British Columbia*

Charles Guowen Wang

*China Development Institute*

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# THE TRANSPORTATION AND WAREHOUSING CHALLENGE FOR MULTI- NATIONAL CORPORATIONS IN CHINA

Garland Chow  
University of North Texas  
and  
University of British Columbia

Charles Guowen Wang  
China Development Institute

## ABSTRACT

Logistics is a major challenge for multinational corporations seeking to do business in China. Transportation and warehousing are two core activities of logistics which will have to be outsourced or produced internally by foreign firms entering the China market. This paper focuses on road and rail transportation, the primary forms of transport utilized to move finished goods, as well as the warehousing and distribution center service sector.

Trucking services and costs are observed to be poor by Western standards. There is no established less-than-truckload (LTL) industry and there are limited trucking networks offering one stop shipping across the country. None the less, trucking will have to be the backbone of any distribution network in China for finished products. Rail service is even poorer. There are capacity constraints and finished goods movement is not a priority of the Chinese railways. Warehousing capacity inherited from state owned enterprises is inadequate, but new distribution centers are being built rapidly.

Foreign firms need to recognize these limitations in service, capabilities and capacity in planning their distribution networks. The fragmented nature of both the trucking and warehousing sectors places a premium on the value added by third party logistics providers (3PL's) who have the knowledge and the relationships with local trucking and warehouse firms to minimize the risk of a supply chain breakdown. The selection of logistics suppliers is the most critical logistics decision in the Chinese environment.

## INTRODUCTION

China has enjoyed significant economic growth leading to a position in the world as a global manufacturing center with the ability to produce quality products of all types, at a cost and degree of efficiency that is difficult to match in most other countries. Companies who have produced products in other parts of Asia, such as Hong Kong and Taiwan, have shifted their manufacturing to China. Firms which once found Mexico to be a low cost manufacturing location have begun to relocate production to China. Many of these firms are multi-national corporations (MNC's), outsourcing their manufacturing, or international retailers who are sourcing products for consumption in Europe and North America. In addition, production is increasingly relocated in China as the basis for penetrating the growing domestic market within China itself and the rest of Asia.

The quality and cost of transportation and logistics services are important factors in considering the role of China as a source of products or materials, as a manufacturing location, or as a market for products. MNC's need to assess how products will be moved to and from locations in China to determine the total landed cost of sourcing products or contracting production in China. Sourcing from or manufacturing in China may result in longer, more variable supply lines that affect product availability and responsiveness of the supply chain. This, in turn, may require increased inventories or dependence on premium transportation. Firms that are seeking to enter China to market their products must recognize the logistical capabilities that exist in China and adapt their manufacturing and distribution strategies accordingly.

Most of the economic growth of China has been in coastal regions, specifically around three major metropolitan areas: Guangdong, Shanghai and Beijing/Tianjin. Much of the initial foreign investment, sourcing and manufacturing subcontracting is concentrated in these areas. Further, these regions have become significant consump-

tion centers as the income and local population have grown with the increase in industrial output. These industrial areas are relatively well served by modern sea and air ports and the most highly developed highways in China surround these cities. Transportation and logistics service is available from domestic, foreign and joint venture logistics service suppliers, competing for international and local freight movement. In contrast, the domestic transportation and logistics system connecting these regions to each other is not so well developed and the logistics system connecting these regions to inland China is even less developed. The quantity and quality of domestic logistics services will become increasingly important as the sourcing and production of finished products moves further inland. This is occurring because of growing income and cost disparities between regions in China, making coastal locations more expensive for business. In addition, central government is actively promoting more balanced development across the country. As other geographic regions of China develop, comparative and absolute advantages of each region will emerge. Supply chains requiring intercity and interregional product flows will grow. Finally, domestic logistics is growing in importance as the non-coastal retail markets develop.

The purpose of this article is to evaluate the status of selected logistics service sectors within China for the movement of finished (non-bulk) goods. This may be purely domestic movement or movement of products moving internationally but with a significant inland portion. Transportation and warehousing are two core activities of logistics which will have to be outsourced or produced internally by foreign firms entering the China market. The focus here is on road and rail transportation, the primary forms of transport utilized to move finished goods, as well as the warehousing and distribution center service sector. An attempt is made to appraise the current situation, the underlying problems and opportunities, and the implications for the logistics strategy of foreign firms operating in China.

## MACRO-LOGISTICS PERFORMANCE IN CHINA

Numerous studies have found that logistics costs are comparatively higher in China than in most other developed countries. The Logistics Institute-Asia Pacific (2002) estimated that logistics costs were between 16 and 20% of China's GDP but only 12% for Japan, 10% for Europe and 9.9% in the US in 1999. An estimate of 16.7% of GDP is given by Wang (2004) who also indicates that during the tenth five-year plan period, the nation's goal is to decrease logistics costs to 15% of GDP, providing an annual savings of 240 billion.<sup>1</sup> This aggregate productivity is corroborated by more specific evidence. Morgan Stanley estimates that logistics costs are 40% of total industry product costs in China versus 20% in the U.S. and only 5 to 8% for most MNC's, and that accumulated inventory to GDP is 50% in China versus 4% in the U.S. (Ho and Lim, 2001). Mao, He, and Wang (2004) add that not only do logistics costs account for more than 40% of the total costs of goods, if the costs of packing, transportation, storage and damage resulting from improper transportation and handling are added, logistics costs would exceed 60% of total costs. Ho and Lim (2001) find that electronics and food products cost 40- 50% more to ship in China than in North America. They conclude that the Chinese logistics sector is a "huge market calling for efficiency."

The failing of China's logistics sector is also reflected in perceived service levels. Poor handling and transportation protection is reflected in the higher cost of logistics quoted above by Mao et al. (2004). According to a study by the China Association of Warehouses and Storage in 2001, the goods damage rate for all modes of transport exceeded 2% and on-time delivery was less than 90%. The survey found that 57% of the manufacturing corporations surveyed were dissatisfied with their present logistics outsourcing service, and would seek new logistics service providers in the following year. This showed that most logistics enterprises cannot meet the service standard of the modern logistics market (Ma and Shi, 2004).

China's logistics services sector is composed of third party logistics (3PL) firms, various modes of transport and the providers of warehousing and distribution center services. In the following sections, the road, rail and warehousing/distribution center segments are examined. These are the building blocks upon which most MNC's will have to rely for basic logistics services whether provided through a 3PL or directly by such providers.

### TRUCKING SERVICE AND PERFORMANCE CHALLENGES FOR MNC's

#### The Role of Trucking in China

Trucking is the most widely used mode of transport in the world for moving packaged or finished goods and this is no less true in China (Easton, 2003). As reported in Table 1, trucking accounted for almost 10 billion tons of freight or about 77% of the country's tonnage in 1999. However, trucking is traditionally used for short haul movement less than 500 kilometers with the average ton moving only 59.9 kilometers in 1999. Urban congestion is a problem for such short haul movements, but intercity long haul trucking is the bigger challenge for MNC's as production moves inland and many multinational corporations expand their domestic networks. The lack of efficient and effective intercity truck service is one of the most urgent logistics challenges in China.

#### China's Trucking Industry and Regulation

China's trucking industry is highly fragmented, with more than 5.4 million trucks registered to more than two million truckers and little or low entry barriers (Easton, 2003). Companies tend to be small scale, with the average trucking company having fewer than two units. For example, the Hubei province has 28,600 operators, but each has an average of only 1.43 vehicles. Heilongjiang province has 117,911 registered vehicles and each operator has less than 1.6 vehicles (Xu, 2004). Sinotrans is the largest trucking operator in China with only

**TABLE 1**  
**FREIGHT TRANSPORTATION IN CHINA**

Mode	Ton - kilometers (Billions, 2002)	Tons (Billions, 1999)	Average Length of Haul (KM, 1999)	Kilometers of routes (1000, 1999)
Road	678.3	9.904	58	1351.7
Rail	1551.6	1.672	768	57.9 <sup>1</sup>
Water	2751.1	1.146	1855	116.5
Air	5.2	.017	2482	1522.2 <sup>2</sup>

Sources: *China Statistical Yearbook* 2003, Ho and Lim 2001

<sup>1</sup> Excludes electrified railways

<sup>2</sup> Excludes international routes

3000 registered vehicles specializing in long distance.

The legacy of the planned economy was that most state-owned enterprises (SOE) were vertically integrated, and had their own private fleets that operated at very low vehicle utilization rates (Ho and Lim, 2001). Many SOE's produced and distributed their products regionally or locally and when long distance transport was needed, rail was utilized. These private fleets entered the for-hire market in the 1990's and early 2000's, providing a vast supply of trucking services locally and regionally.

A complicated licensing system restricts competition in the trucking industry. At the national level, the Ministry of Transport requires every service provider to obtain a national truck license. Each provincial government requires a license in the province of origin of the vehicle operation (e.g., the domicile of the operation). In most cities a local transportation bureau requires a local truck title for the purchase of a truck and its registration. Finally, the local police authority will require a local truck operating license to provide transport services within

a city (Hertzell, 2001). Even permission at the national level is no guarantee that local regulations will not prevent a national company from operating in many provinces or cities.

There are few nationwide trucking companies able to offer integrated, one-stop shopping for truck services. Those that exist are not integrated carriers, but generally networks of long haul and local trucking companies. Inefficiency in the form of interlining is caused to a large degree by local protectionism. Long haul freight may mean loading and unloading at provincial borders as it is handled from carrier to carrier (Trunick, 2003).

Today in many localities, out of province trucks are arbitrarily stopped at city borders and subjected to tolls that local trucks don't pay, or to flat restrictions on completing delivery. In many cases this requires an entire truckload to be unloaded and reloaded onto a local truck. This costs both time and money, and also creates opportunities for local protectionism and corruption, (American Chamber, 2002 and 2003).

For example, non-Shanghai trucks are prohibited from entering Shanghai during the 7 am to 11 pm period due to traffic control, while Shanghai licensed trucks have limited access (Ho and Lim, 2001). Permits are also very costly and road tolls are high, with some tolls unauthorized. It is estimated that tolls make up 15-20% of the trucking costs in many traffic lanes compared to 2-3% in Europe (Drewry, 2003). Regulations equivalent to the Interstate Commerce Act in the U.S. do not exist to support free and efficient movement between different cities or states in China. Reform of the highly bureaucratic and restrictive licensing systems seems unlikely in the short run because local provinces would lose a significant source of tax revenue (Drewry, 2003).

In summary, the fragmented nature of the industry, the regulatory restrictions and historical lack of demand for for-hire trucking due to SOE trucking, has provided little opportunity or incentive for developing an integrated truck network across China.

Less-than-truckload (LTL) operations, which involve consolidation of many small shipments into large line haul vehicles, is inherently a network operation. Due the lack of an integrated truck network, shipping partial loads is difficult (Modern Materials Handling, 2002). What LTL services do exist are limited to very long distances where some co-loading takes place. Unless the co-loading is well planned, transit times are usually long and inconsistent, especially on inland routes (Pinnekamp, 2003). The result is that manufacturers usually do not move small loads over long distances and the existing practice in China is that almost all intercity cargo moves as full vehicle loads. What is variable is the size of the vehicle. If the load is 5 tons, then a 5-ton truck is used, and if the load is 8 tons, an 8-ton truck is used and so on. The consequence of industry fragmentation and the heritage of SOE trucking is that an integrated LTL industry has yet to develop and mature.

## Trucking Performance and Operating Practices

Direct transportation and, in particular, trucking costs are not high by international standards but are high as a percentage of the total cost of the product. Unfortunately, the costs of trucking are often minimized through operating practices that are unlawful, unsafe or sacrifice service quality. As a result, the total logistics cost becomes a barrier to profitably doing business in China.

Truck service is frequently evaluated as unreliable when it is cheap, and reliable when it is expensive. The absence of an effective network is a barrier for filling backhauls, thereby requiring the purchase of round trip capacity. This is exacerbated by natural imbalances in freight movement. Front hauls from the coast to western China tend to be finished goods and consumer goods while front hauls from western China to the coast are bulk products. Refrigerated vehicles going west typically run back empty. Door to door service of dry goods to and from top tier cities is easiest and cheapest, but trucking to second tier cities and for specialized commodities such as refrigerated or dangerous goods is much harder. LTL reliability is compromised by the tendency to delay schedules until full loads are accumulated, unless of course the shipper is willing to pay the premium for under loaded line haul movement. Furthermore, the low volume of consolidated LTL freight results in the utilization of small, inefficient line haul vehicles, at least by Western standards.

Although there are large fleets of modern tractors pulling chassis for containers at port cities, the majority of the road equipment is substandard. Historically, trucks were open-back and tarpaulin-covered with poor protection for goods (Alberts, Randall, and Asbury, 1997). Due to the small size of most operators, very few of these trucks are set up to move containerized freight with only 20% of freight trucks in China being containerized (Ho and Lim, 2001).<sup>2</sup> Very

few of these companies can afford to upgrade their equipment because of limited access to capital. Shipments are often hand loaded and unloaded (Pinnekamp, 2003), and people loading trucks sometimes lack the training or initiative to pack a truck in an effective and efficient manner. This leads to cargo damage from cargo shifting and movement which is compounded by the lack of pallet standardization, leading to longer truck loading and unloading times, more cargo shifting and less efficiency.

Many transport vehicles are moving overloaded. It is an issue that almost anyone moving products in China will encounter. Transporters, as a norm, are known to haul 50% in excess of their legal payload, and sometimes as high as three times their legal limit. This is more the standard business practice than the exception with companies in China taking advantage of this cost savings despite the inherent problems that result. Recently, new legislation was applied evenly across state and local levels whereby haulers have to pay RMB 200 for every vehicle overloaded by 30% and about RMB 400 for each overloaded by 50%. Previously fines were a maximum of RMB 50 for each overloaded vehicle.

Before the clampdown, haulers would modify and strengthen their vehicles to carry up to double the legal weight capacity. Checks were also not as stringent then ... now they are conducting checks at toll stations and trucks found to be overloaded will be forced to unload excess cargo on the spot (Viswanathan, 2004).

For those firms which cannot risk violating the law, costs will inevitably rise. SembCorp Logistics (2004) reported that their China operations had been impacted by rising costs of road transportation services brought on by the Chinese government's initiative to control the overloading of trucks. Multinational chemical companies have found that their transport costs had gone up for the same reason.

Fierce and destructive competition between carriers continues to make the whole industry

unprofitable. When competitors can obtain old and frequently unsafe trucks to move goods, they compete with trucks which are fully depreciated. The cost structure of these competitors is very low compared to operators that purchase newer equipment in order to meet or exceed standards of safe operation (American Chamber, 2002). The costs of trucks have been rising due to more stringent emissions standards as well as the demand for newer, safer equipment. Many of the smaller operators do not have the capital to make such investments. However, government enforcement of regulations, such as annual vehicle inspections has increased the pressure to buy newer equipment.

Shippers have difficulties in tracking freight while in transit by road. For most Chinese trucking firms, the cost of installing a satellite tracking system is too high. Cheaper alternatives for track and trace such as mobile locators and telephone call monitoring are being improved and developed. Statistics validate the benefits of adopting new information technology.

Among the 200 logistics service providers in Xian, the 72 highway transportation operators that included (integrated) communication services as part of their overall services had better business performance (Xu, 2004).

### **Highway and Trucking Infrastructure**

In the past, poor trucking service has been the result of a poorly developed highway infrastructure. For example, during the mid 1990's, it was observed that a team of two drivers working 16-hour days could be expected to cover only 496 miles per day, a rate of less than 32 miles per hour (Alberts et al., 1997). However, this has rapidly improved in the last decade. There has been substantial improvement with the Chinese government (Ministry of Communications) investing billions of dollars on new highways. In 2003, the Chinese highway network consisted of more than 1.3 million kilometers, with 0.2 million additional kilometers scheduled for completion in 2005, making up a national network of nearly

1.5 million kilometers. The National Truck Highway program has over 35,000 kilometers of toll roads with a total of five vertical and seven horizontal national routes scheduled for completion by 2015 (Institute of Highway Economics, 2003). The trip from Shanghai to Guangzhou, for example, has been reduced from three to five days to 36 hours with two drivers, thanks to newly constructed expressways (Wu, 2003).

Road quality will continue to vary in such a vast country. Larger cities and coastal regions have decent roads and highways, while western regions and less developed interior areas of the country need major upgrading. The mountainous and desert terrain will always be a problem. Twenty-five percent of villages still have no access to suitable roads. However, the Chinese government has planned a considerable increase in highway investment for the western region (Institute of Highway Economics, 2003). Despite the government's increasing expenditures on new roads, many of the existing roads are still in poor condition or remain unpaved. Thus, average travel speed is quite slow compared to North American standards. It will be many years before the practical speeds and transit times within China will be comparable to speeds in North America and Europe for comparable distances.

In addition to building roads, the Ministry of Communications has planned to build 45 main road hubs in central cities, as well as cargo concentration and distribution centers throughout the country (Institute of Highway Economics, 2003). These would form the fixed nodes in a national logistics network, facilitating freight transfer, consolidation and communication.

### **The Prospects for Trucking in China**

Highway infrastructure barriers are being reduced through massive building programs but the real barrier that needs improvement is how the trucking industry that utilizes the highways is managed and organized. The majority of the trucking industry is too fragmented to meet the demands of modern large scale production. The

majority of the industry cannot offer one-stop shopping, door-to-door shipment visibility or nationwide LTL services frequently demanded by MNC's moving finished products. The potential for loss and damage, unreliable service and slow transit times must always be considered by MNC's in choosing trucking service providers and designing a distribution network in China. MNC's need to exercise a significant amount of due diligence in selecting their Chinese trucking suppliers.

Since January 1, 2001, with China's entry into the WTO, foreign companies were allowed to establish jointly-owned firms with local companies to enter the highway transportation market. From 2003 onward, foreign investors are allowed to be sole proprietors of highway transport companies, and both sole proprietors (local or foreign-owned) and local joint ventures can enjoy the same privileges. This has increased competition within China's highway transport sector. These new entrants will bring new capital and new technology, and bring more experience and advanced business management techniques into the trucking sector (Zhou, Zhu, and Xiao, 2001). However, this will only bring marginal improvements if the regulatory and licensing impediments to developing a truly integrated network for a trucking firm cannot be reduced. The root cause of many operational inefficiencies is the provincial and local restrictions that have limited cross province movement of freight.

## **RAIL: ANOTHER LOGISTICS CHALLENGE FOR MNC's**

### **Rail's Role in China**

Rail is the second most utilized mode of transport in China with respect to tonnage, moving 1.7 billion tons, or about 13% of total transportation tonnage in 1999 (see Table 1). Rail is the main mode of transport in terms of ton kilometers since the average length of haul by rail is more than 13 times the distance by truck. The core of the rail system was built for and is the lifeline for moving bulk goods such as

coal, minerals, and grain, but it is unsuited for transporting finished goods or perishables (Hertzell, 2001; Wu, 2003). Extensive delays, inflexibility, and lack of service orientation have prevented both domestic and international users from using rail, and this is exacerbated by the lack of rail sidings at both plants and ports. Surveys consistently find that foreign joint ventures use rail even less than domestic companies.

### **China's Rail Industry and Regulation**

The rail industry is highly concentrated, with the Ministry of Railways (MOR) controlling most of the country's rail service under the China Rail umbrella (Easton, 2003). Many vestiges of operating as a firm in a traditional planned economic system remain. Therefore, organizational and managerial reforms will be more difficult in this transport sector (Network & Information, 2001).

The MOR has made progress.

Three years into the ninth five-year plan, the China rail system was restructured and major non-transportation enterprises were spun off including rail engineering, rail construction, locomotive vehicle building, communication signaling and civil engineering, ten higher education institutes, and other vocation training or adult education schools. MOR has opened 227 independent stations. The MOR was downsized by 320,000 people in this process. The MOR, in the tenth five-year plan, will try to improve its transportation and service standard. MOR aims to set up a comprehensive network throughout the nation for passenger transport to accomplish the goals for "out by dawn, in by dusk" within 500 km, "out by dusk, in by dawn" within the 1,200-1,500 km range, and "arrival in one day" if traveling within 2000-2500km. For goods transportation, the goals are to improve delivery time, develop express delivery systems, and explore and utilize modern management models to provide complete door to door

transport service. MOR aims to speed up the development in consolidated transport and refrigerated transport in order to expand market availability for new economic growth. To accomplish these goals, MOR will speed up the construction of western railways to strengthen its "eight horizontal and eight vertical" network during the tenth five-year plan. Near the end of this tenth five-year period, the national track network will cover 75,000 km, including the new expansion of over 2,000 km in the West. Express tracks will increase to over 14,000 km, double tracks to 25,000 km and electrical tracks to about 20,000 km. The tenth five-year plan will adopt new technologies including railway modernization, improving IT and communication systems, and setting up safety and security standards, etc., diminishing the shortcomings of traditional railway transport (Translated from Chinese, Network & Information, 2001).

Organizational impediments may have been as significant as infrastructure. In the past, each of the MOR's regional divisions prohibited their locomotives from crossing divisional boundaries in order to retain control over their key equipment. This increased transit time and trip variability. The MOR recently converted its 14 geographical administrations into semi-autonomous legal entities. Each administration manages and operates the assets (infrastructure and rolling stock) allocated, while the MOR carries out overall coordination of inter-administration traffic. This decentralization does not appear to have addressed the power switching issue. Furthermore, the State Planning Commission (as opposed to the MOR) controls the prioritization of industries receiving rail service (Alberts et al., 1997).

### **Rail Performance and Operating Practices**

Numerous studies have documented the failings of the Chinese railway system with respect to the movement of non-bulk goods and perishables (Hertzell, 2001; Ho and Lim, 2001; Wu, 2003). Cost is not one of these failings. Rail cost is

substantially lower than truck cost, not only because of the economic features of rail, but because the state-owned railway is subsidized. However, low costs are more than offset by poor service in the movement of finished goods.

Railroad service is viewed as inefficient and unreliable, and is mostly used to ship cargos that are not needed urgently. Transit times are long and service reliability is poor (Ho and Lim, 2001). Wu (2003) notes that some cross country deliveries take up to 60 days, which is too slow for goods such as perishables or anything of high value. More importantly, train service is not responsive, with long lead times for services. On frequently serviced routes, such as Beijing to Shanghai, bookings can be made a week in advance (Ho and Lim, 2001). For less than carload, two weeks advance booking is required (Hertzell, 2001). For less frequent routes, such as to and from Xinjiang, bookings generally need to be made 30 to 40 days in advance (Alberts et al., 1997; Wu, 2003).

Shipment delays are common and the railways are plagued with seasonal capacity shortages. The general policy is to give priority to passengers and then to basic commodities from the agricultural and extraction industries. Forty percent of rail capacity is taken up by the coal industry, resulting in unmet demand for rail movement from the agriculture sector during the harvest season. This policy results in seasonal availability of services to other shippers as well. Passengers traveling during the long holidays in May, October, and the New Year, coupled with agriculture shipments, result in reduced capacity for the movement of packaged or finished goods (Ho and Lim, 2001). During harvest season, for example, lower density routes require a month to a month and a half advance booking for space (Drewry, 2003). A Chinese firm reported that extra payments may be demanded by local rail line operators to make box cars available or to give priority to a cargo during high traffic periods (Wu, 2003). Recently, general merchan-

dise has been accorded a much higher priority in the MOR's booking system and container block trains have the highest priority within this general cargo sector (Drewry, 2003).

Railways have very few connections to industrial parks and seaports or sidings at manufacturing plants. This means that practically all finished goods moving by rail have to be unloaded and reloaded onto trucks for final delivery. The extra handling results in added exposure to loss and damage. The damage rate on rail is 2-3 times higher than trucking (Hertzell, 2001). Damage usually occurs when goods are transferred from rail to local trucking and is most typically due to transportation workers who are not adequately trained in handling sensitive goods (Wu, 2003). Theft is an endemic problem. This has led manufacturers to employ their own security guards on trains to safeguard goods (Wu, 2003).

Poor information systems make it almost impossible to track goods in transit. There are few services such as notification of arrival at rail stations, automated car tracking, and integrated information technology between the provincial railways. Loss of refrigeration after reconfiguration of compartments at changeovers is also common. Several of these deficiencies appear to stem from the regionalized operating structure of the Chinese railways.

Until recently, most rail cars were 60-ton closed boxcars and containerization was limited (Alberts et al., 1997). A small fleet of five to ten-ton domestic containers that fit onto open-top railcars has recently been introduced and the flatcar fleet is being expanded to handle more maritime containers. In general, however, railway containers are not compatible with those used by shipping companies, and overseas shipments require the unloading and reloading of cargo (Alberts et al., 1997; Wu, 2003). Cargoes have to be unloaded and reloaded when using rail, resulting in higher handling costs and higher damage rates.

## Rail Infrastructure

In contrast to trucking, China's rail infrastructure continues to be a significant part of the problem. China now boasts railways of 73,000 km when electrified track is included (Wah, 2004). Although about 27% of this total is double tracked, capacity is still less than demand, and the rail freight infrastructure has yet to meet containerized multimodal transport demand. Rail system modernization is lagging behind road development, although plans to expand in the West are in place. There is little intermodal capability in China, although this area has been targeted for improvement (Government of Canada, 2003). In 2003 there were more than 100 joint venture railway lines including Maersk, Orient Overseas Container Lines, U-Freight and DHL, operating trial joint ventures with SOE's. Foreign rail operators often bring specialized services and new technology, and this will increase as WTO commitments encourage foreign investors to enter the rail sector. As of 2004, foreign majority shares in rail joint ventures were allowed and the entire domestic rail cargo sector will be fully opened to foreign investment in 2006 under a WTO agreement (Wu, 2003).

## The Prospects for Rail in China

Rail in China will improve but it cannot be depended upon to be a core transportation provider for finished goods across China. The railway continues to be an SOE with the traditional political, organizational, and human resource constraints that impede streamlining operations and making the service-operations mix more market responsive. Many of rail's failings can be traced to economic policies (prioritization of freight), lack of infrastructure (tracks, loading facilities), and organization (regional administration), but the basic fact of life is that the majority of China's rail system is run by an SOE which holds a monopoly on intercity rail service. Commercialization of the enterprise is needed, including incentives for productivity and customer service.

The WTO will require changes in this situation but, while deregulation is in the future, there is little or no potential for privatization in the near term. It appears that the state-owned enterprise in rail will remain, but it will welcome foreign investment. China's rail system will be under pressure to restructure to attract more commercial business and to achieve higher efficiency. One restructuring plan is to establish separate market oriented corporations to manage freight transport, passenger transport and railway infrastructure. Authorities will most likely release control of the transportation of general merchandise and free up prices in incremental steps (Ho and Lim, 2001).

MNC's must recognize the limitations of China's railway system as their economic activities move further inland and into Western China. Unlike the U.S. and Europe, a well-developed intermodal system does not exist, so long distance transport of volume shipments will continue to depend on much costlier trucking. Much longer lead times must be planned for when using rail. On less congested routes, companies have planned around a one week delivery window. On congested routes, a four-week arrival window is more common. Interestingly, this has led some Chinese firms to prefer an imported product to a domestic product in part due to the unreliability of domestic rail transportation (Wu, 2003).

Some third party logistics providers have bypassed the rail capacity and service problem by contracting out rail capacity. G-time Logistics, which had a long relationship with the MOR, has chartered rail services on North-South routes, carrying fresh food and products from the South, and grains from the North. This is similar to the situation in the U.S. in the 1970's and early 1980's, when confronted with poor rail service, APL chartered rail service to go from the West to East coast of the U.S. in land bridge service. Interestingly, APL Logistics, now a wholly-owned subsidiary of Neptune Orient Lines, is in the process of doing the same in China. They signed a memorandum of understanding with

Eastern China Railway Express to take advantage of the railway supply chain network with 160 rail hubs. Other heavy users of rail are third party providers such as Bao Gong, PG Logistics and St. Anda (Chow, Wang, Xu, and Ding, 2003), who all have the scale to charter rail routes to get better control on scheduling and operations. In short, large customers and 3PL's who can aggregate rail freight can contract the train service out to get reliable rail service and assured capacity. MNC's should consider this option if they have the volume, or leverage 3PL's that have established these contracts.

## **WAREHOUSING AND DISTRIBUTION CENTER SERVICES**

### **Warehousing in China**

Traditional warehousing in China focuses on long-term storage of raw materials and manufactured goods that are held as stock that companies sell. These warehousing facilities barely meet the needs of these "push" type supply chains, much less the needs of MNC's and progressive Chinese firms whose supply chains need to be responsive and agile.

Ninety percent of China's warehousing capacity is controlled by SOE's (Easton, 2003). Up to the mid-1980's, SOE's all used private warehousing. By 1985, they realized that they had excess capacity and started selling warehouse services commercially. This warehouse space was generally located and designed for a specific company. Thus, while there was actually a lot of warehouse space, much of it was not up to standard or in the right location. Since most SOE's owned their own space, there was little demand for commercial warehousing and this sector remained underdeveloped. Furthermore, most SOE's served regional markets, with few formal regional warehouse networks and, until recently, no formal national network of public warehouses.

The major exceptions were the state-owned transportation companies that owned and operated warehouses to supplement their transportation operations. Sinotrans is the largest

freight forwarding company in China controlling more than three million square meters of warehousing space. Guo (2001) notes that China Rail offers "an extensive network throughout China and adequate warehousing facilities are available at or near rail stations in most cities." China Material Storage and Transportation Company operates warehousing and trucking across the country. In addition, 3PL's often provide warehouse service as part of their fulfillment services. A recent survey of 3PL's operating in China indicates that approximately 32% contract out warehousing, but most build their own facilities (Dai, Wang, Wong, Wang, and Xiaohong, 2003).

### **Warehousing Performance and Operating Practices**

Most of the warehousing capacity built before the mid 1990's was for bulk cargo and many are multi-story facilities. These warehouses are poorly designed, use little automation, and are highly dependent on manual labor. Poor information systems lead to inaccurate stock counts and high loss rates. Lack of integration between warehousing and transportation service makes it difficult to achieve shipment visibility across the whole supply chain. There is little racking and modern inventory management is absent. Weather protection from heat, rain or snow is minimal. The result of these poor designs is inefficient material flow, including multiple manual handling which leads to high damage and pilferage rates.

A case study of the type of warehousing available to an MNC in northeastern China (outside of the major metro areas of Shanghai, Beijing/Tianjin and Guangdong) is a joint venture automobile plant which did not have enough storage facilities at the plant site. The existing plant complex could not be expanded to provide storage space, but storage space was available at a nearby military base. However, the warehouses were vintage 1930's buildings built by the Japanese during their occupation. They had poor electricity, poor temperature control, substandard pest control, little shelving, and were multi-storied.

They contained no automation to facilitate movement (Pinnekamp, 2003).

Palletization is not common in Chinese warehousing. The older warehouses are not designed for fork lift equipment and the incentive to use pallets seems to be missing from SOE's. More importantly, there is no standard pallet size in China. China uses all the different types of pallets from different countries, though the European 1,000 mm by 1,200 mm pallet is most widely used. Utilization of pallets and other transport aids is also very limited. There is no available or manageable pallet pool for hire.

Finally, the quality of warehouse management is suspect. High discrepancies in actual and recorded inventory data, high damage and missing rates, and a general lack of real-time product and order tracking have forced manufacturers to build (and operate) their own facilities (Ho and Lim, 2001).

### **Distribution and Logistics Centers (Parks)**

The absence of a modern, responsive warehousing industry has led many MNC's, operating as joint ventures, to build their own warehousing capacity or obtain such services from 3PL's.

In the last 20 years, with the emergence of "zero-storage" "logistics alliance" and "logistics supply chain" concepts, the logistics goals for warehouses have become to shorten turnover time, lower storage rate and costs, and improve services. Warehousing holds great significance as it provides a time factor between raw materials, industrial goods and final products. As corporations start to regard customer service as an active and value-added competitive tool, warehousing will become more important. To achieve these goals in warehousing, third party logistics service providers made a thorough analysis of labor productivity and costs. They focused on redesigning the warehouses to build modern logistics centers based on location models, and analyzed

the planning and relocation of advanced logistics centers to speed up the processing of orders and to lower logistics costs (Translated from Chinese, Liang and Yu, 2004).

MNC's and foreign logistics service providers could only have minority ownership of warehousing and storage in a joint venture up to 2002. But in 2003, with the WTO accession, foreign firms can have majority ownership of warehousing and storage, and may operate wholly-owned warehousing and storage subsidiaries by 2005. Private, foreign-operated firms after WTO accession may put government-run facilities at a disadvantage. However, government and private companies are in a program of building modern logistics centers in major cities. This is at both the National and regional levels.

The government stills controls more than 90% of the warehouses and has planned modernization of the warehousing industry in China. The Chinese government is planning to build 45 distribution hubs throughout China over seven years starting from 2002. These hubs operate advanced warehouse management systems with automated materials handling, cold storage and customs clearance. There has been some concern expressed about how capable these government-run centers will be in competing with foreign operated firms once the WTO agreed to relaxation of foreign entry comes into effect (Government of Canada, 2003).

According to the statistics from the State Planning Commission, most cities have plans to build more logistics parks in their region. The Chinese government believes in consolidating types of industrial activity in one area. Many local governments have designated logistics as their pillar industry. In order to encourage development in this industry, each government has their favored policies. In the Yangtze River Delta for example, the government nominates "Key Logistics Firms," based on the firm's record of good service and reputation. With this government recognition, these "key logistics firms" enjoy favored policies which include (Chow et al., 2003):

- Funding of logistics projects where the government either guarantees the loan or provides direct financing.
- Relaxed market entry within Shanghai and in Shenzhen for the Pearl River Delta. By 2005, when a substantial amount of China's WTO commitment will be realized, most firms will be registered in Shanghai or Shenzhen.
- With municipality authorization, companies are charged lower local business fees.
- Favored land price. In China, land prices differ for different land uses. The lowest price level is charged for industrial usage, while the highest is for commercial or trade purposes. When a company applies for the building or development of a new logistics park or project, it enjoys the lowest land price level, the industrial land price.

In Shanghai, three major logistics parks have been developed. They are the preferred locations for logistics development in Shanghai. One of them is WaiGaoQi Free Trade Zone adjacent to the Shanghai Port, focusing mainly on export logistics. There are 700 companies gathered together along with warehouses and distribution centers in this district. The second is PuDong Logistics Park near the PuDong New Airport. This logistics park focuses on air cargo and is occupied by numerous airfreight logistics companies. The third is the North-West Logistics Park. At this location, most of the retail and wholesale stores have their own distribution centers. In addition, Shanghai is planning to build a new port on the two Yangshan islands on the southern border of Shanghai, which will become another important seaport logistics center in China.

However, while the government objective to stimulate new business is a legitimate goal, there is a danger in granting special privileges in a non-transparent manner. The Shanghai government has actually taken equity stakes in some favored firms, granting them special privi-

leges or financial assistance, or free advertising for certain firms solely based on their friendships with the government. For instance, government protection within the air cargo handling business has created a "duopoly" of two companies favored with exclusive licenses to perform air cargo ground handling services at the Pudong Airport. This protection from competition has led to high prices and poor performance relative to global standards (American Chamber of Commerce, 2003).

### **The Prospect for Warehousing in China**

Warehousing capacity and services are rapidly improving to meet the needs of the MNC's who require modern facilities built for movement rather than storage as well as value-added services. The Chinese government's active support of distribution and logistics center development and relaxation of regulations will increase both capacity and quality in this sector. What is more important, the government is actively promoting organizational reform in SOE's, which will increase the outsourcing of non-core activities such as transportation and warehousing, fueling, and the demand for a logistics services industry.

Foreign participation in rail, trucking, and other logistics sectors such as customs brokerage and forwarding are regulated. Unlike those sectors, foreign participation in warehousing and logistics centers is encouraged (Wu, 2003). For example, China's leading 3PL's are large foreign companies licensed to operate as Wholly Foreign Owned Entities (WFOE's). Also growing in importance are foreign companies that are currently restricted to operating as joint venture partners or through free trade zones (FTZ's). In 2001, the government of Shanghai's Pudong New Area lifted all restrictions on warehousing and logistics companies setting up operations in the WaiGao Qiao Bonded Zone, equalizing their position with trading companies in the zone. Foreign companies are now allowed to operate these warehouses themselves to store a wide variety of raw materials, parts and other finished goods for onward sale and shipment into China. In Wai Tao Qiao, foreign operators gener-

ally maintain high standard warehouses at their manufacturing facilities, which can double as regional distribution centers. A growing number of providers are "one-stop-shops" that offer wide ranging import services that extend beyond logistics (Wu, 2003). At the same time, large SOE's in the logistics sector are actively transforming themselves. There is substantial evidence that they are determined to become leading logistics providers, having initiated restructuring plans to transform themselves from basic service providers to 3PL's. Often the changes are in conjunction with a joint venture or a less formal partnership with a foreign 3PL that brings new management and information technologies to the partnership.

### SUMMARY AND IMPLICATIONS FOR MNC's

Multinational companies are taking advantage of China's manufacturing capabilities and require logistics services both within the developed coastal regions and inland. They also want to capitalize on China's growing domestic market. One challenge will be to find reliable and fast truck service in a fragmented, localized industry that operates under a patchwork of local regulations. Another challenge will be to find rail service in the capacity constrained and mostly state owned rail network. Obtaining good distribution center service as opposed to warehousing space is also difficult. China is making great strides in providing new intercity highways, new railway trackage and building modern distribution facilities in logistics parks. However, the full benefit of these massive infrastructure improvements will not be achieved if these assets are not utilized effectively by the service providers themselves.

The root problems that remain are primarily managerial and inherent in the structure of these logistic service sectors. An asset-based, integrated network of either TL or LTL service will not be forthcoming until local and provincial regulations that restrict competition in trucking are removed. These same barriers impede the growth of larger scale firms which can better

afford information technology. The railroad monopoly that exists today is unlikely to disappear in the near future so change in the railway's operating practices and service priorities will come about slowly. Only in the warehousing sector, where there are both government investment and relaxed entry to foreign operators can major improvements in service levels and capabilities be expected in the near term. MNC's now have more options to build their own distribution facilities when for-hire services are inadequate. The overall reality is that MNC's will find transportation and warehousing services in China to be slower, less reliable, less visible, less responsive, more expensive and perhaps less available than in most Western countries. MNC's will have to plan their overall distribution network and supply chains to recognize these realities.

Many industry observers and even the Chinese government sees the development of a healthy and competitive third-party logistics industry as one of the solutions to the lack of integrated and professional trucking services. Wu (2003) indicates that while foreign companies often form a patchwork of partnerships with local logistics and transportation operators to form some sort of distribution network, few licenses for transportation are granted for nationwide operations (and even those are subject to protectionist measures of local governments). Thus, 3PL's have emerged as a popular choice for MNC's seeking to move products across the country. These include non-asset based as well as asset-based 3PL's who are knowledgeable of local regulations and who can build relationships with local logistics service suppliers in the truck and warehouse sectors. Some of these 3PL's are large global logistics service providers who have expanded their coverage in China by working with many Chinese agents in order to provide broad coverage of China. Others are SOE's with large transportation or warehousing assets across the country such as Sinotrans, China Post or China Material Storage and Transportation Company who are seeking to modernize rapidly. Many are regional transportation companies which have successfully serviced important MNC

clients and leveraged their success into wider operations and expanded services. Similarly, some of the most successful 3PL's have risen from in-house logistics divisions that are leveraging the logistics capabilities and network developed for the parent company. Another benefit of using established 3PL's of significant size is that they may be able to open the doors to reliable rail service in corridors where they have contracted out rail capacity. It may still be unwise to only deal with one 3PL, as all the provinces have different rules and regulations and no one agent can provide full coverage. A strategic solution is to focus on achieving depth, rather than breadth, of market penetration. By focusing activities on a single city or region, the distribution problem is simplified.

Manufacturers and exporters should consider regulatory risks whether using a 3PL or working directly with multiple transportation and warehousing suppliers. Enforcement of commercial regulations at the national level has become transparent under the WTO but local enforcement remains arbitrary. Some rules are not widely publicized, while others are vague and open to interpretation. Reliance on a favorable interpretation of the regulations is dangerous. Companies should be aware of the potential risks and consider preparing a strategy to cope with an unfavorable change in interpretation. Since many of the rules are not publicized, identifying them will require working closely with an experienced Chinese partner. Consequently, carrier or 3PL selection is perhaps the most important logistics decision an MNC can make once it has decided to enter China. Chinese partners can be the key to success especially if they have prior experience in the geographic

area requiring logistics services. Such partners will be able to identify potential pitfalls and will have the network of business and government contacts needed to do business in China. To remain adaptable in China's ever-changing markets, it is advisable not to become overly reliant on a single partner.

Partnerships between shipper and logistics service providers have long been offered in Western economies as a means for achieving increased productivity. In the Chinese transportation and logistics environment, partnerships may be a strategic necessity to ensure that products indeed move to the right place at the right time at the right cost.

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### ENDNOTES

1. China's 10<sup>th</sup> five year plan is for the period 2001 to 2005. These plans reflect the economic development priorities of the country and provide a blueprint and strategy for government economic development and reform activity. The first plan in 1953 targeted heavy industry. The tenth five year plan focuses on information technology but also identifies logistics as an industry to develop.
2. Containerized trucks refer to closed van type trucks versus open trucks such as flat decks or "open bed" vehicles.

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#### AUTHOR BIOGRAPHY

Garland Chow is associate professor in the College of Business Administration and director of the Center for Logistics Education and Research at the University of North Texas, and is on leave from The Sauder School of Business and Centre for Transportation Studies at the University of British Columbia. He is the author of numerous studies and papers on logistics strategy, performance measurement, third party logistics, and e-business applications in the logistics services industry.

#### AUTHOR BIOGRAPHY

Charles Guowen Wang, Ph.D., is senior research fellow and director, Research Center of Logistics Management at the China Development Institute (CDI). CDI is the first non-governmental policy research and advisory organization in China. With an average of 30-40 projects per year, it provides services from policy advisory to business consulting. CDI also provides training and education with its prestigious Ph.D and postgraduate programs.