

Customer-driven Rail Intermodal Logistics Unlocking a New Source of Value for China

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Rail intermodal logistics—the movement of containerized cargo from origin to destination where a portion of the journey takes place on rail—have gained significance in North America over the past 10 to 15 years based on cost and operational efficiency. In China, however, the story has thus far been different. Considering the length-of-haul and commodity characteristics of China’s manufacturing sector, the country has a persistently low incidence of rail intermodal participation in domestic and international supply chains. We find that the binding constraints behind the low incidence of rail intermodal services in China are most likely to be found on the supply side, not the demand side of the equation. Specifically, the regulatory and institutional environment, which regulates freight tariffs and provides little or no flexibility for China Railway Corporation (CRC) to tailor services to customer needs, is at the root of this challenge. This note outlines the success of railways in North America in (a) tailoring rail intermodal service offerings based on customer needs and willingness to pay; and (b) collaborating with other logistics service providers so as to concentrate on their core (rail transportation) competency, while leaving other segments of the end-to-end intermodal supply chain to those most efficient in those segments. The current policy and economic environment facing CRC seems favorable to pursuing reforms towards adopting similar practices.

The growth of China’s freight transportation activity over at least the past 15 years has been breathtaking.¹ In the 15 years between 1998 and 2013, total freight ton-kilometers transported grew at an average annual rate of 10.4 percent, faster than the rate of growth of the economy as a whole (9.7 percent²). In volume terms, both exports and imports grew at double-digit levels over the same period (15.5 and 15.0 percent, respectively, per year²), generating significant transport demand in the process. Not surprisingly, estimates show that between 1990 and 2008 the exports sector contributed between 15 and 30 percent to China’s GDP growth.³ The freight transport sector has been instrumental in enabling China’s trade- and investment-led growth model.

Yet when looking at the composition of China’s freight transport demand over the past several years, a clear picture emerges: it has primarily been facilitated by the highway (primarily) and waterway (secondarily) sectors at the expense of the rail sector. Between 2008 and 2013, the most recent period for which official statistics are available utilizing the same measurement methodology, China’s freight ton-kilometers transported over the road grew at an average annual rate of 16.7 percent—nearly double the rate of growth of the economy and nearly three times the rate of growth of rail freight ton-kilometers, which stood at a comparatively low 5.8 percent. While in 2008 the rail sector accounted for 22.8 percent of all freight transport activity, by 2013 this had dropped to 17.4 percent. Conversely, over the same period the highways’ share of freight activity increased from 29.8 to 33.2 percent, as did that of the waterways, from 45.6 to 47.3 percent; that is, nearly all market share lost by the rail sector between 2008 and 2013 was gained by the highways (3.4 percentage points) and the

¹ Unless otherwise noted, all freight volume statistics cited in this note were obtained from the National Bureau of Statistics of China. The Bureau adjusted the method of calculation of road transport statistics in 2008, making some of the numbers not fully comparable over the period.

² International Monetary Fund (2014).

³ Guo and N’Diaye (2009).

waterways (1.7 percentage points)⁴. A long-standing lack of capacity in the rail network to accommodate more freight traffic has been a key determinant of this shift in mode share.

Historical trends in China's infrastructure development bear out a road-dominant pattern, particularly relative to the transportation of containers on rail. For example, between 1998 and 2013 the length of expressways in China grew at a remarkable 18.0 percent per year, compared to 7.0 percent for the length of electrified railway lines and a mere 3.0 percent per year for the length of overall tracks in operation. More strikingly, by 2010 only about 10 Chinese ports nationwide were engaged in rail-waterborne transport intermodal logistics operations, out of approximately 135 government-approved ports.⁵ China's overall lack of on-dock rail capabilities is particularly concerning given the country's track record of rapid growth in trade in general and in container throughput in particular, especially in recent years. Just between 2003 and 2009, for example, port container throughput in China grew at a rate of 16.3 percent per year,⁶ most of this off rail tracks, as further elaborated below.

Developments in service delivery are also consistent with an environment of sustained market share losses for the rail sector vis-à-vis the roads. A recent assessment of China's freight mobility by the U.S. Department of Transportation⁷ noted that "the movement of containers receives low priority on China's rail network, following military, passenger, energy, and food movements." And while the trucking sector also faces service delivery challenges, including industry fragmentation, a persistently high incidence of empty backhauls (on at least a third of all truck trips, according to one

estimate⁸), and lax safety regulation, industry practitioners have reported that rail intermodal—defined as the movement of containerized cargo from origin to destination where a portion of the journey takes place on rail—is typically uncompetitive with trucking on a full distribution cost basis.⁹ This is partly a result of the sizable investments made in improvements to China's highway infrastructure, which can mask, to a considerable degree, shortcomings in service delivery. It also reflects the government's policy to preserve rail capacity for long distance transport of non-containerized cargo, like coal and grain, as a priority.

As a result of the above effects, and despite economic geography features that would suggest the opposite, China's containerized supply chains today make scant use of rail intermodal logistics. According to Liu et al. (2013), in 2010 only 1.3 percent of China's maritime port container throughput was moved to/from ports via rail. By comparison, 85 percent of all containers handled entered or left the ports mounted on truck chassis on the highways, while the remaining 14 percent used the waterways. At the port of Shanghai, the world's largest port by throughput, only 0.5 percent of containers are moved in and out via rail, even as the use of multimodal itineraries via the waterways has accounted for as much as 20 percent of Shanghai's container throughput in recent years. In other words, there appears to be ready demand for multimodal transport on the part of containerized freight shippers and their logistics service providers, consistent with China's economic geography features regarding, primarily, lengths of haul. This suggests that the binding constraints behind the low incidence of rail intermodal services in China are to be found on the supply side, not the demand side of the equation. Inadequate rail intermodal capacity—along the infrastructure and service provision dimensions—seems to be the critical limitation.

⁴ Since 1990, the rail, waterway, and road sectors have collectively accounted for at least 98 percent of China's freight ton-kilometers transported.

⁵ Liu et al. (2013).

⁶ Ibid.

⁷ Cole et al. (2008).

⁸ The Economist (2014).

⁹ Szakonyi (2013).

Rapidly rising production costs along China's Eastern seaboard, coupled with explicit guidance and policy by the State Council and other relevant departments in support of shifting some of the industrial activity towards western and central provinces, make an even stronger case for China to fully develop the rail intermodal sector as a priority. According to government data, manufacturing wages in urban settings nationwide grew at an average annual rate of 14 percent between 2003 and 2013. Wage pressure in the main production markets in coastal provinces has been even higher, due to labor shortages and the increasing cost of living in large coastal cities.¹⁰ This has led domestic- and foreign-invested manufacturers to either outright relocate or at least consider facility location decisions away from China's coast. Such shift, which increases lengths of haul, favors rail-based logistics, other things being equal. This will further add to the already existing—and likely considerable—pent-up demand for rail-supported containerized supply chain solutions for both domestic and international itineraries.

The challenge for China is how to modernize and develop its rail intermodal sector in a way that matches the remarkable performance improvements attained by the highway and container terminal handling sectors (and, on the passenger side, by high speed rail). In this respect, the experience of improving intermodal rail services in North America can be a useful parameter, not least because, for a significant share of China's containerized exports, the North American rail intermodal network is a continuation of the same supply chain.

China, and its national railway operator China Railway Corporation (CRC), are in the midst of a particularly favorable environment towards reforming the rail intermodal sector. This is due to the fact that (a) massive high-speed rail investments over the past several years have for the first time freed up freight rail capacity (in

many cases on a dedicated basis) and placed CRC in a position to manage freight capacity relative to demand, rather than simply making capacity available in an environment of seemingly constant under-capacity; and (b) on-going reforms at CRC, and broader economic reforms in China, which have called for the market to play a decisive role in the allocation of resources, are thoroughly consistent with the type of reforms that allowed the North American intermodal sector to modernize.

Intermodal Services in North America: 30 Years of Customer-driven Transformation

The most salient driver that allowed the North American intermodal network to become arguably the most competitive rail intermodal system in the world is a focus on the customer, which was enabled by partial—but decisive—deregulation.¹¹ Prior to 1980, rail transportation of freight in the U.S. was heavily regulated, particularly with regard to government-mandated rates (tariffs) and service routing. This resulted in limited economies of scale in operations due to fragmentation in service delivery,¹² combined with over-capacity. Lack of innovation prevailed. By the end of the 1970s, 21 percent of installed tracks nationwide were operated by railroads in bankruptcy, and the rate of accidents associated with track or equipment failure was nearly four times what it had been a decade earlier.¹³ Amid this backdrop, in 1980 the U.S. Congress passed the Staggers Rail Act, which deregulated many, though by no means all, aspects of rail transport infrastructure development and service provision. In particular, the Staggers Act (a) eliminated government-regulated tariffs where modal competition

¹¹ The U.S. rail intermodal network is also the most comparable to China's among major rail markets around the world from the point of view of scale and lengths of haul.

¹² In 1970, there were 71 major railroads in the U.S., compared to seven today (including two Canadian operators with operations south of the U.S.-Canada border).

¹³ Ellig (2002).

¹⁰ Accenture (2011).

existed; (b) allowed for confidential contracts to be negotiated between rail carriers and their customers on the basis of supply and demand as well as service level needs; and (c) allowed carriers to discontinue services to financially non-viable (i.e., unprofitable) lines. To protect “captive shippers” dependent on rail access provided by a single carrier, the Staggers Act kept in place a regulatory agency tasked with assessing and ruling on cases of potential rent-seeking behavior by carriers on the basis of market dominance.

Routing, operational, and pricing deregulation in the U.S. rail transport sector resulted in significant gains for shippers, carriers, and the economy. Since deregulation, revenues per ton-mile among U.S. Class 1 railroads¹⁴, a proxy for pricing, have reduced dramatically in real terms, down 44 percent over the past 30 years. At the same time, productivity (ton-miles per inflation-adjusted dollar of operating expenditures) has more than doubled, annual ton-mile volumes have doubled, and the train accident rate has fallen by 82 percent. The majority of the financial benefits borne out of these productivity improvements, equivalent to US\$20 billion per year by 1996 according to one estimate,¹⁵ were passed on to customers in the form of lower rates. For the rail intermodal (i.e., containerized) portion of the market in particular, these services have grown rapidly, particularly since the manufacturing network shift to China took hold at the end of the 1990s. Between 2000 and 2006—a period of rapid acceleration of China-originated import freight flows into the U.S. prior to the onset of the 2007-2009 financial crisis—U.S. rail intermodal volumes (containers and trailers moved) went from 9.1 million to 12.3 million annually, a rate of growth (5.2 percent) approximately twice as fast as that of both the U.S. economy as a whole and U.S. exports of goods over the same period, and slightly faster

than the rate of growth of U.S. imports of goods over the same period. After crisis-driven volume declines in 2007-2009, U.S. intermodal volumes recovered smartly, growing at 7.1 percent per year during 2009-2012. While U.S. containerized import volumes have not grown as fast since the financial crisis as they did during 2000-2006, rail intermodal has until very recently benefited from an environment of elevated diesel prices, combined with trucking sector capacity constraints due to increasingly restrictive hours-of-service regulation and a shortage of long-haul drivers. These trends, which China may also face in the future, have made U.S. intermodal itineraries increasingly attractive relative to truck-based logistics.

Taken as a whole, the competitive provision of rail intermodal services in the U.S. has contributed to lowering logistics costs, reducing emissions of greenhouse gases (GHG) per ton-kilometer, and alleviating congestion on highways, while enabling international trade and domestic manufacturing activity. With regard to logistics costs, while rail intermodal is neither a panacea nor the most cost-effective logistics solution for all commodities and all shippers, it provides lower total logistics costs—that is, taking into consideration not only transportation costs but also inventory carrying costs—for an increasing array of commodities, particularly over long distances, in an environment of capacity constraints in trucking. One of rail deregulation’s most beneficial impacts from the perspective of shippers and beneficial cargo owners is the reduction in transport costs that it spawned. This is significant given that one commonly espoused rationale for rate regulation is precisely to “protect” end-users from unreasonable rate increases. With regard to GHG emissions, on a per-ton-kilometer basis rail intermodal produces one-third of the emissions produced by truck transport, according to the U.S. Environmental Protection Agency (EPA). And with regard to highway congestion, the mobilization of a single double-stack unit train, typically carrying 200-300 containers, is roughly equivalent to

¹⁴ These are the largest rail carriers in North America by revenue.

¹⁵ Transport Research Board of the National Academies (2007).

displacing 280 trucks out of the highways per service.

The most fundamental change brought about by freight rail deregulation in North America was a paradigm shift from a focus on guaranteeing service availability to a focus on providing services to customers. By allowing carriers to divest low-density routes, prioritize service level improvements at high-density routes, and enter into individual contracts with customers (while keeping protections in place for “captive shippers”), deregulation paved the way for market segmentation, tailored services, and, eventually, higher returns on capital employed despite significantly lower rates and higher levels of privately-funded capital investments. This, in turn, facilitated innovation.

A key enabler of innovation and customer responsiveness in the provision of freight rail services in North America has been specialization—particularly for the rail intermodal segment of the market. The fast-paced, cost-focused, complex nature of containerized supply chain management has given rise to a global industry of freight transport intermediaries who have taken over the shipment origination/retail segment of the intermodal transport value chain through specialization. Specifically, these nimble firms specialize in the use of technology to optimize freight shipments across carriers’ networks and fleets on behalf of individual beneficial cargo owners. Collectively known as third-party logistics service providers (3PLs), such intermediaries include, inter alia, freight forwarders, truck brokers, asset-based trucking companies, and non-vessel operating common carriers (NVOCCs). In North America, while much of the flow of international (i.e., marine ISO¹⁶) containers on rail is originated by freight forwarders/NVOCCs and the container shipping lines themselves, a particular type of

¹⁶ An ISO container is a standard container used in the international transportation of cargo. ISO containers are typically defined by their length—20, 40, and 45 feet.

intermediary has emerged to primarily serve the domestic segment of the rail intermodal industry: Intermodal Marketing Companies (IMCs). IMCs act as intermediaries between Class 1 rail carriers and asset-based truck carriers on the one hand, and shippers and other retail customers on the other. IMCs do not operate “heavy assets” like trains or trucks. Instead, their assets are in the form of IT and human resources (primarily), and intermodal equipment such as containers and chassis (secondarily). IMCs add value to shippers by securing blocks of rail linehaul and truck drayage¹⁷ capacity, including at peak periods, at rates and/or at times that retail customers would not be able to access individually. IMCs do this by entering into long-term contracts with rail and truck carriers and by having access to a wide array of carriers. The growth of large North American IMCs like Hub Group and Pacer International has allowed Class 1 rail carriers to largely exit intermodal retail sales and focus instead on their core competency: providing linehaul (i.e., ramp-to-ramp) container on flat car (COFC) and trailer on flat car (TOFC) transportation in a way that maximizes returns on capital employed. In addition to IMCs, many North American asset-based truck carriers¹⁸ have developed sizable intermodal businesses and compete head-to-head with IMCs for retail business. Examples of asset-based truck carriers with large intermodal businesses include J.B. Hunt, Swift Transportation, and Schneider National. North American non-asset based trucking companies, also known as truck brokers¹⁹, firms like C.H. Robinson and Landstar, have also entered the intermodal intermediation business. By selling to

¹⁷ Truck drayage, sometimes referred to as pre- and on-carriage, is the portion of the intermodal value chain where containers are picked-up and delivered at origin or destination by local trucks over relatively short distances compared to the main (i.e., “linehaul”) portion of the journey, which takes place on rail.

¹⁸ Trucking companies who lease/own all or most of the trucks they operate.

¹⁹ These firms generally do not own the trucks and other transport assets used to move the cargo they originate. Instead, they act as intermediaries between truck owners and shippers.

intermediaries like IMCs, truck carriers, and truck brokers, as well as more traditional wholesale customers like container shipping lines and freight forwarders, Class 1 rail carriers have been able to concentrate on their core task of managing their fixed networks and delivering (linehaul) rail transportation services.

Outsourcing and specialization in intermodal services by North American Class 1 railroads is not limited to retail sales. For example, BNSF, a large Class 1 carrier, outsources most operations at its intermodal facilities, including yard management, gate management, and repair services, while retaining ownership of the infrastructure. This arrangement allows BNSF to deploy best-in-class services, where it may not have a competitive advantage, while focusing on the core railroad competencies of infrastructure provision and linehaul operations.²⁰ Similarly, by exiting the shipment origination (i.e., retail sales) segment of the intermodal value chain, Class 1 railroads in effect outsourced the container drayage segment of the value chain, as IMCs, truck brokers, and asset-based trucking companies are in a much stronger competitive position to provide these services. Some Class 1 railroads, notably BNSF, though by no means all, have even exited the container and chassis management (ownership/leasing, deployment, maintenance, repair, and scrappage) segments. These practices have further allowed Class 1 railroads to focus on their core value-added functions.

The above suggests that behind the competitive delivery of end-to-end rail intermodal services in North America there is an ecosystem of specialized service providers that both compete and collaborate. Container shipping lines, marine terminal operators, independent drayage operators, Class 1 rail carriers, IMCs, asset- and non-asset based trucking companies, and freight forwarders all participate in the various operations involved in door-to-door intermodal itineraries, whether in intercontinental or

domestic supply chains. The specialization and core-business focus of this model has led to meaningful productivity improvements across the supply chain. It must be noted, however that this has not eliminated risks, as supply chains are exposed to weakness in any one of their component links. For example, as rail carriers have invested record amounts (to the tune of US\$8 billion per year or more) over recent years in expanding their networks and improving service levels, and as container shipping lines and container terminal operators have invested in larger vessels and more capable handling equipment, perhaps the drayage portion of the North American intermodal supply chain remains its weakest link. This is a sector still plagued by fragmented, undercapitalized carriers constantly exposed to significant delays due to the nature of their operations, often involving moves in congested inner-cities and in and out of congested port terminals. Modernizing the drayage portion of the intermodal network is one of the biggest challenges facing the logistics sector in North America at present.

Implications from the North American Experience for China and CRC

The most fundamental corollary of the North American freight rail modernization experience, including intermodal services, is that there is a mutually reinforcing relationship between pricing and service-level flexibility, market segmentation, and customer centricity. In the view of some industry observers, one of the primary reasons why rail intermodal penetration in China remains strikingly low is that CRC, while technically competent, has not developed a full-fledged customer service and customer responsiveness capability.²¹ Yet, to the extent that this observation is accurate (and the above-shown volume and market share statistics certainly support this assertion), this should best be seen as a symptom, not a root cause. The true root cause is more likely to be CRC's regulatory and institutional environment, which

²⁰ Van Hattem (2006).

²¹ Szakonyi (2013).

regulates freight tariffs and provides little or no flexibility for CRC to tailor services to customer needs. In other words, the North American experience has shown that rate and service-level flexibility is a pre-requisite of customer centricity. The recent National Development and Reform Commission (NDRC) Notice No. 2928 (2014) offers an opportunity to start introducing flexibility in China's railway sector. This could include the introduction of railway pricing reform in a manageable yet meaningful manner.²²

As for service-level flexibility, which goes hand-in-glove with pricing flexibility, one option is the use of service differentiation on the basis of customer segmentation. For example, North American rail carriers typically offer "hot box" services that give specific containers expedited treatment through their networks, at a cost premium. It is also well known that domestic (53-foot) containers²³ are given preferential treatment at rail intermodal terminals due to the long-standing relationship between Class 1 rail carriers and domestic less-than-truckload and ground package carriers. This service-level differentiation has, inter alia, given rise to the rapidly growing and increasingly mainstreamed transload segment of the intermodal market²⁴. CRC could similarly tailor service offerings on the basis of customer logistics needs and willingness to pay.

The second lesson from the North American experience is that door-to-door/port-to-door/door-to-port intermodal itineraries are delivered by an ecosystem of (public and private sector) firms and regulators, rather than a single dominant firm. Within this ecosystem, the fact that a supply chain is only as strong as

its weakest link ensures that participants have a vested interest in strengthening not only their own performance but that of the chain as a whole. This yields several useful implications for China, including the following:

a. CRC need not control the end-to-end intermodal chain in order to be a successful participant in China's rail intermodal ecosystem. Instead, CRC may choose to participate in those segments where it has a core business rationale (e.g., infrastructure provision, network management, rail linehaul service delivery, wholesale marketing and sales) and consider whether and to what extent to remain in segments where the competitive advantage rationale may be weaker (such as retail marketing, operation of intermodal terminals, and delivery of local drayage services).

The process of exiting segments need not take place simultaneously, but sequentially and in a responsible, feasible manner. For example, pilot projects may be utilized to test out and allow third-party service providers (say, maintenance operations at intermodal terminals) to develop service capabilities consistent with the level of quality CRC seeks to provide for its customers.

A thorough operational efficiency analysis, including the use of international benchmarks, would help assess the rationale for CRC to retain participation in those segments deemed to be "non-core." For core segments, it would mean embedding in CRC's on-going practices operational efficiency and management with a focus on customer responsiveness and optimization of returns on capital employed.

b. Being part of an ecosystem also means that CRC would be incentivized to collaborate and reach mutually beneficial agreements with partners in most segments of the rail intermodal value chain, just as U.S. Class 1 railroads currently do with shipping lines, asset and non-asset based truck carriers, and consolidation-deconsolidation service providers. In the case of CRC, it has been reported that a lack of

²² Scales, Ollivier and Amos (2011).

²³ Not to be confused with "marine" ISO containers, typically 20- or 40-foot in length and the mainstay of international container shipping.

²⁴ This refers to the practice of shifting ("transloading") cargo from international (e.g., 40-foot) containers to larger domestic (53-foot) containers in order to reduce transport and other operating costs.

agreements with shipping lines as to the handling, maintenance, and repair of containers inland from maritime ports is particularly impeding broader penetration of rail intermodal into western China supply chains, for example. The collaborating and partnering function becomes essential in rail intermodal operations.

c. “Deregulation” does not mean absence of regulation. On the contrary, regulating intermodal markets is essential to their competitive performance, and in this respect China’s intermodal sector may benefit from new and/or enhanced regulation—and its enforcement. New or enhanced regulation is needed in the following two priority areas of China’s rail intermodal value chain:

Trucking sector barriers to entry, in the form of improved design and enforcement of trucking safety regulations, coupled with support for compliant service providers. Like in many other developing Asian countries, China’s truck sector features over-capacity, cut-throat competition based on rates alone rather than service levels, chronic overloading, under-capitalized carriers, and under-developed intermediation between shippers and carriers. While these challenges are true across all trucking segments, they are further exacerbated in the truck drayage portion of the market—a key component of intermodal moves—because players in this space tend to be even more fragmented and less exposed to the use of IT and other modern tools than long-haul and regional truckload and less-than-truckload operators. The reliability, predictability, and cost effectiveness of intermodal services is partially dependent upon a well-functioning drayage sector. The GoC and, where relevant, CRC, could promote consolidation in the trucking industry by better enforcing safety regulations like axle load controls, vehicle roadability inspections, and driver training and licensing, and by providing access to credit to well managed operators with credible business plans for fleet expansion. CRC could develop a roster of “preferred” drayage carriers to share with its

customers, to act as a form of quality certification.

Standardization of intermodal equipment. One of the greatest strengths of the North American intermodal value chain, which is often taken for granted, is the ubiquitous use of standard equipment across carriers and service types. In addition to the already accepted global standard of ISO marine containers, this includes domestic containers and trailers, drayage trucks (known as “day cabs” in the U.S., as they typically lack a sleeper berth, typically classified as Class 7 or Class 8 according to engine power), adjustable chassis, double-stack capable articulated well cars, and terminal handling equipment like rubber-tire gantry cranes and straddle carriers. In contrast, logistics operations in China—whether mono-modal or multi-modal—make use of a wide array of non-standardized equipment, which makes common practices like drop-and-hook or the management of container and chassis pools difficult or even unfeasible. While the GoC has already issued regulation of various kinds to promote the use of standard equipment in the logistics industry, this effort is still in its early stages and would be worth extending and accelerating. Greater availability of credit and/or tax incentives to service providers wishing to standardize their fleets are possible options for doing this.

A final lesson is that the rise of IMCs and truck carriers was instrumental to the growth of rail intermodal in North America—and something similar could happen in China. Much of the discussion of rail intermodal growth in North America has centered on the shipment of international ISO containers. Sometimes referred to as inland point intermodal (IPI) moves, these itineraries are typically originated by container shipping companies and freight forwarders. But the origins of rail intermodal transportation in North America, and much of the more recent growth in traffic, resulted from the shipping of *domestic* equipment (containers and trailers) facilitated by origination from IMCs and truck carriers. As China transitions to an economy

more reliant on domestic consumption rather than exports, providing cost effective logistics solutions for purely domestic supply chains will become increasingly critical—particularly for long haul routes linking western and eastern provinces. The GoC could consider policy options to spur the development of logistics intermediaries specialized in the domestic market, akin to the role played by IMCs and truck carriers in the U.S. Such options could include support for joint ventures between North American IMCs and Chinese 3PLs; knowledge exchange between Chinese and international 3PL firms, logistics experts, and policy makers; and a formalization of the role of this type of freight intermediation in domestic regulation. Such efforts would have to be complemented by, and timed with, reforms at CRC to allow for the outsourcing of the shipment origination segment of the rail intermodal value chain.

A Promising Road Ahead

Current conditions favor regulatory, operating, and ecosystem improvements in China's rail intermodal sector. The transformations underway in China's economic geography caused by increasing manufacturing activity inland from the country's Eastern seaboard, coupled with road congestion in some urban markets and the cost impact of highway tolls, low service levels in trucking, and environmental degradation from heavy truck emissions, are all favorable conditions for a surge in rail intermodal demand in China. In fact, much of this demand has likely already materialized, but is unable to be fulfilled due to supply-side constraints. The low incidence of containerized rail transportation in China is at odds with the freight modal mix of countries with similar economic geography features, such as the U.S. And as the development of high speed rail has in effect freed up capacity for freight rail at key portions of China's rail network, CRC is increasingly in a position to undertake supply management measures such as those espoused in this note.

The service delivery and capacity expansion initiatives in rail intermodal currently undertaken by CRIntermodal, a joint venture between CRC and four private sector partners, is a step in the right direction, but more of this will be needed. CRIntermodal is developing a network of 18 rail intermodal terminals nationwide and is a full-fledged logistics service provider offering terminal handling, intermodal unit train operations, and value added logistics services to/from major domestic markets. These operations are an innovation in China's freight rail space in that (a) they offer integrated, door-to-door services across the entire intermodal value chain; and (b) are an example of CRC collaborating with other members of the rail intermodal ecosystem.

While these are welcomed developments, three key factors are likely to be critical going forward: (i) the extent to which the proposed terminal network will provide adequate coverage and sufficient capacity relative to market demand, including connections to international gateways like maritime ports; (ii) the extent to which these terminals are developed in conjunction with complementary logistics service facilities such as warehouses, container depots, and terminals for other modes; and (iii) the extent to which CRC will customize intermodal service delivery to match divergent customer needs based on factors like willingness to pay, commodity type, volumes tendered, supply chain routing, and the like.

The combination of these three factors—supply-demand balance, integration with other service providers, and responsiveness to divergent customer needs—sums up what this note has referred to as customer-centric rail intermodal logistics. A focus on these drivers by CRC, in collaboration with other partners in the sector, are likely to bring meaningful benefits to China-based freight stakeholders and to the overall Chinese economy, just as they have in North America over the past three decades. Having been formally requested to operate differently by China's central Government, including the

Premier, in a policy shift announced in June 2013, CRC finds itself not only in a favorable economic environment for reform, but also with the mandate to do so.

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