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A Comparative International Study of Technology and Policy in the Development of Railway Freight Containerisation in the US & UK

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Abstract:

The safety, security and speed of delivery for goods in transit have been a prime concern for the railways of the United States of America and the United Kingdom. Indeed, while many aspects of US and UK railway operation remained very different, especially in terms of regulation, loading gauge and the use of automatic couplers as well as air brakes, there is evidence of an international dialogue in both technological and organizational practices. Many of the practices, though they may have evolved separately on one side of the Atlantic or the other, either mirrored each other unconsciously or were copied, having been noted during visits of railway managers. The cross Atlantic interest was especially great during the 1920s and 1930s when many pioneering mechanical, methodological and managerial advances were made by railways in both countries.

This paper, with input from the two nations, continues an exploration of the importance of the intermodal, safety and containerization developments from there beginnings to the present, set against the regulatory regimes in which such innovations were developed. It is seen as a contribution toward a more formal exploration of the issue that will further inform the larger historical debate over the progress of technological innovation through considering the adoption and evolution of technology, together with management techniques. These topics will be set against the managerial and regulatory circumstances in both countries.

THE LITTLE BOXES THAT DIDN'T: CONTAINERIZATION PRACTICES ON AMERICAN AND BRITISH RAILWAYS

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¡°*You can take that book and apply the principles outlined there to any job you are doing*[i]*"*

In addressing a meeting of the Institute of Production Engineers on 5 November 1943, former LMS Vice President (Operating and Commercial), Sir Ernest John Hutchings Lemon praised the *Twelve Principles of Efficiency* a 1912 work by Harrington Emerson[ii], an American efficiency engineer who applied the principles of scientific management to locomotive maintenance shops. The selection of the work is but a small indication of the value placed on improving efficiency shared by American and British railway managers. Simultaneously, it is also indicative of differing views in how to best improve efficiency. In the United States the work was largely dismissed by railroads that came to despise it due to its use as an exhibit by Louis Brandeis in arguing against rate increases on the eve of WWI. Few of the work's suggestions were ever applied by American railroads.

At the close of World War I, the railways of the United Kingdom and the United States focused on efficiency in deciding how engage with emerging of intercity trucking services and newly reformed regulatory regimes. Railways in both nations saw freight containerization as a means to engage both developments and recapture earlier levels of prosperity. Ultimately differing outcomes arose in both nations in spite of common goals and technologies.

Examining interwar containerization from a comparative-international perspective provides a means to assess the reception of containerization across differing regulatory regimes and institutional objectives and factors that guided its evolution. The ultimate success of containers depended not on the inherent viability of the engineering but on the sophistication of regulators in recognizing and evaluating intermodal competition and the possible outcomes for container service.

The meaning of *first* in the context of this paper

The idea of using a larger container, an item that facilitated the transportation of goods from the shipper's door, to a road vehicle, and finally loaded onto a railway car without transloading

had long roots in freight transportation. The long evolution of barrels and crates in maritime and overland shipping evolved as a strategy to minimize transloading. The Liverpool and Manchester Railway began using containers for both coal and goods in the 1830s. "Simple rectangular timber boxes, four to a wagon, they were used to convey coal from the Lancashire collieries to Liverpool, where they were transferred to horse drawn carts by crane"[iii] is perhaps one of the very early forms of intermodal traffic. Interestingly, however, judging by Brunel's experience in South Wales it would seem that the boxes or containers were owned by the collieries, as it was the colliery owners who were concerned over the breakage of valuable large lumps of coal tipped into ships. The coal owners preferred the gentler method of lifting the box or container by crane into the hold of the ship, thus when the bottom was opened the coal had less far to fall. The need to provide transport for these boxes forced Brunel to provide for the containers' transport. American and British railways adapted to handle goods in crates and barrels on flat cars or within enclosed boxcars. In his survey of American railway freight car technology John White[iv] notes many instances where railways handled goods in rudimentary containers in the Antebellum (pre-civil war) period. A notable example from this period was the Camden and Amboy's use of mounting removable boxes built to a standard design on flat cars to handle passengers' baggage on passenger trains that could be transferred to ferries. In Britain, the London and South Western Railway used containers for similar purposes. Numerous, albeit isolated, examples show that railways cooperated with wagon haulers, even to carrying wagons between points on flat cars.

Interwar promoters of containerization were quite aware of these 19th century precedents were not lost on, who selectively drew on them to illustrate the soundness of their concepts or to invoke national or institutional pride in pioneering an innovation. Interwar containerization differed sharply in offering a standardized system that could meet railway's common carrier obligations; unlike 19th century innovations that primarily served niche demands. Moreover, interwar containers, as a technological innovation, relied on innovations in pricing schemes to facilitate their adoption by markets. As interwar railway regulators and managers examined containerization, they focused on developments that first combined innovative technologies and pricing within a given market. The authors of this paper share this perspective as it provides a common context in which to recreate evaluate events.

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Note on Sources

In researching this narrative, the authors confronted a dissymmetry in the sources available on this topic. In researching the British context, it was possible to locate and access internal reports and correspondence detailing corporate strategy and surveillance surrounding containerization. Though, frustratingly, only fragments of the Executive Minutes of the London Midland and Scottish Railway, which we would wish to cite to inform our questions remain. The American context however proved to be even more complex. The records of the principle railroad and interurban companies developing containerization have been lost. The regulatory dockets, which would contain extensive exhibits and hearing testimony have either been lost or destroyed. The American story presents information from published on containerization within an analysis of contemporary regulatory trends and corporate strategy.

THE DEVELOPMENT AND FUNCTION OF CONTAINERS AS A TECHNOLOGY

American Steam Railroads

By the dawn of the 20th century, railroads provided multiple options to move small shipments quickly and consistently between major cities and the smallest towns in the hinterland. This traffic fell into two categories express and less-than-carload (or LCL). Express traffic grew from practices of handling goods that predated the formation of railroads and that used a combination of rail, road, and water transportation to handle freight. This industry underwent a several consolidations in the late 19th and early 20th centuries and was consolidated into the American Railway Express Agency under federal control of the railroads during WWI and ultimately reorganized into the Railway Express Agency (REA). In return for the higher rates, they offer quicker delivery times and The REA shipped small consignments of goods at a premium – and in return offered a wide range of door-to-door services and other accommodations such as cash on delivery collection.

Railroads' LCL service offered an alternative to the REA for transporting small lots for shippers who did not require the REA's premium services. The conventional method of handling LCL traffic required the shipper to deliver the goods to the railroads' freight house where the railroad would then hand-load into the boxcar. If there were a sufficient amount of goods heading to a particular destination, the station would load an entire car. If not, then the goods would be loaded into a car headed to a transfer point where it would be unpacked and re-

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loaded into a different car heading to the final destination or another transfer point. When the goods reached their final destination, they would be unloaded and stored at the freight house before the receiving party retrieved it.

The Post World-War I Context for Container Development: Many Problems – One Technology

World War I had a profound impact on the American railroad industry in developing new transportation technologies and demonstrating the power of government to compel action in the railroad industry. Federal control of railroads between 1917 and 1920 under the United States Railroad Administration (USRA) provided an opportunity for the government to implement theories derived from scientific management for applying new technologies and to increase efficiency through mandating the cooperative use of terminal facilities. Moreover, the USRA recognized railroad unions as a means to guarantee labor stability during the war. Finally, the motor truck, used during the war domestically and by American Expeditionary Forces abroad, demonstrated its capability to reliably haul large amounts of freight long distances under difficult circumstances.

While containerization was rooted in long-established strategies for facilitating goods movement – its development in the wake of WWI depended on new technologies. The further development of electrification and of electrical motors made it feasible to equip freight stations with multiple electric made it conceivable that large containers could be handled quickly. Additionally, the development of motor trucks with engines and frames capable of handling large loads facilitated over-the-road handling of containers.

The New York Central railroad made the single greatest commitment toward evaluating the potential of the container in handling LCL service. The railroad's primary routes linked New York City and Chicago with other mainlines extending to Boston, Montreal, Pittsburgh and St. Louis. Contemporary geographers described this region of the United States as the manufacturing belt due to the fact that this region contained more than half of the nation's manufacturing activity. LCL containerization would provide a means for the NYC to offer a new shipping alternative to customers shipping to points within its railroad system.

Containerization provided the NYC with an opportunity to have a competitive advantage in offering a shipping option that had numerous features designed to enhance the security of

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shipments. While the security of goods in transit has always been a concern of shippers – in the early 1920s it was one of national emergency. At this time a series of robberies targeting mail and express shipments created widespread demands for improved security of high valued shipments. The response to these events included the mobilization of the US Marine Corps to guard mail shipments within the US, the arming of railway post office clerks, and the construction of additional steel mail and baggage cars. At their debut, the NYC's container system was demonstrated in mail service as a means to secure mail shipments between post offices and railway stations and during shipments. This system avoided the need to transfer mail between vehicles – where most robberies to occurred.

While the containerization of mail lasted only a brief time, introducing containerization in this fashion provided an opportune time to highlight the advantages that the system offered to shippers of LCL freight. Shippers and railroads were quite conscious of the challenges associated with LCL service. Every point where goods were handled by hand provided an opportunity for damage, misrouting, loss, or pilfererage. In 1927, railways reported that 26.5 percent of all damage claims paid was on LCL shipments – at a time when LCL comprised less than 3 percent of total traffic.[v] Moreover, this system required that railroads maintain large numbers of workers at their transfer points and freight stations to move goods by hand.

Under container operations, railroads would furnish shippers with a container that the shipper would load, lock, and seal. The railroad would then pick up the container and load it with a crane onto a specially designed car equipped with a locking mechanism for holding the container in place. The NYC primarily relied on modified gondola cars, whose raised sides made it impossible to open containers once placed in the car.

The strategy for containerization relied on innovative marketing as well as innovative technology. A key feature of containerization was pricing based on weight alone – bypassing the standardized railroad tariff structure that delineated rates by individual product classes. Moreover, containers offered shippers the opportunity to sidestep the packing requirements dictated by consolidated classifications. These classifications required that shippers use specific packing materials designed to minimize damage.[vi]

The NYC and PRR used subsidiary companies, the LCL Corporation and the Keystone Container Car Company, respectively, that built and owned the containers. Freight forwarders acted as intermediaries in the LCL field by offering pick up and delivery services as well as

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lower rates through their ability to consolidate loads into carload lots. In this fashion, the true door-to-door function of containers as originally practiced by the railroads was lost, however their use still eliminated handling at transfer stations. Container traffic increased dramatically after Universal began their load consolidation operations, as railroads found that there were few shippers who could produce 4000lbs shipments (the capacity of a single container). [vii]

The Pennsylvania Railroad emulated much of what the New York Central developed for their container system. However, the PRR did make notable advancements in advancing the overall efficiency of handling containers. Unlike the NYC, the PRR relied primarily on flat cars to handle its containers. By the time the PRR's system debuted, frequency of train robberies had declined significantly. Using flat cars offered a substantial reduction in tare weight comparison to the steel forming the gondola sides. The PRR made an additional accomplishment through using a 60-foot flat car, then among the longest flat cars anywhere in the US, specially designed to handle the relatively low weight-to bulk ratio of containers.

The PRR also developed a terminal at its Enola yard, near Harrisburg, Pennsylvania specifically designed to transfer containers between cars. This terminal, which performed the function of a traditional LCL transfer station, used a single 900-foot long crane spanning seven tracks to transfer loaded containers between cars. This terminal allowed for single cars from outlying points to be loaded with containers for multiple destinations – emulating one of the main efficiencies associated with traditional LCL service. Finally, the PRR built a large freight house in Philadelphia specifically designed around handling containers.

Containerization and American Interurbans

Construction of interurban railways began in 1890's, primarily under the direction of electric utility companies, real estate developers, and local business interests. They provided frequent service over moderate distances (10 to 200 miles) that were much faster than horse-powered transportation available up to this point. Their primary focus was on passenger traffic. Freight was an afterthought on most of these lines. They regularly handled shipments of local packages, perishable agricultural products, and some had mail contracts. The vast majority were built with very light construction standards and shared streetcar tracks which made handling standard steam-road freight cars very difficult or impossible.

As passenger traffic began to erode in the early 1920's with the rapid spread of both

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automobile ownership and paved roads, larger interurban railways realized that they would have to make efforts to increase their competitive position for both passengers and freight if they were to survive. At this time, many of the smaller lines began to fail at this time. Military strategists would describe the interurban's situation as one lacking *strategic depth.* That is without a diverse traffic base or a geographically large service area; any loss of traffic was very significant. Because of this, interurbans were well motivated to retain the traffic they had and to go to great lengths to develop new traffic sources. Interurbans' innovations were far more wide-ranging than that of the steam roads. They were also more *diffuse,* that is while interurbans were more willing to try innovative strategies they generally lacked the capital necessary to develop them to any great extent. The form of innovations was also shaped by their respective traffic patterns and type of freight handled.

A significant feature of the interurbans' efforts is their willingness to apply novel concepts for integrating road and rail vehicles in addition to developing container schemes. This is best illustrated by the experience of the Lake Shore Electric Railway (which operated between Toledo, Ohio and Cleveland, Ohio) and their use of the Bonner Rail Wagon. Col. C. Joseph Bonner of Toledo, Ohio developed this scheme in the late 1890's, making it one of the earliest formal methods for integrating road and rail service, being demonstrated in Toledo, Ohio, Detroit, Michigan and on the tramways of the Isle of Man UK.[viii] It appears that this strategy largely disappeared until 1929 when the Lake Shore Electric Railway, one of the larger interurbans that connected Cleveland and Toledo Ohio and interchanged freight that traveled to Detroit and other points in Michigan. The railroad ordered several other cars in the early 1930's and hoped to develop a pool service with other inteurbans in their region, however both the company's financial condition and regulatory rulings (in Ohio) prevented the service from developing further.[ix]

The Chicago North Shore and Milwaukee, a well developed interurban that offered frequent fast service between Chicago and Milwaukee and which was capable of handling steam-road freight equipment developed a means for handling freight that many historians consider to be the ancestor of present day trailer-on-flatcar service. However, in the context of this study, this service can be seen as an offshoot of containerization service as practiced by the steam roads, primarily as the North Shore deployed the service as an extension of their existing LCL service, and not in participation with trucking firms (as it functions today in the US).

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Their innovation involved using flat cars to carry truck trailers between Milwaukee and their freight station on the north side of Chicago. The first developed this service using only trucks as a means to transfer goods from their freight station located in a predominantly residential neighborhood on Chicago's north side directly to steam road freight stations primarily located west and south of Chicago's central business district.[x] However, they quickly found a niche market in being able to provide door-to-door service using motor trucks in both cities.[xi] Several steam roads took notice of this service. The first was the Chicago and North Western who fiercely competed with the North Shore for freight and passenger traffic between the two principal cities.

The Milwaukee Electric Railway and Light Company (TMER&L) developed a container system that in many aspects excelled that of the schemes used by the their more prosperous steam roads. The TMER&L designed a container that could be readily transferred between motor trucks and freight cars. They constructed a series of enclosed 50-foot cars (longer than most steam road cars used in container service) where containers would be loaded through the ends with the use of an electric winch located inside the car. This method obviated the need for the specialized cranes required for the steam roads' service, allowing the TMER&L to deploy it throughout their network in the greater Milwaukee area. The TMER&L built a large freight house in Milwaukee specifically designed to accommodate this traffic. Arguably, this building represented the greatest single investment that any US railway made in container services. The TMER&L ran foul of Milwaukee's government over complaints received with the handling of steam road freight cars on its lines (whose wheels caused a loud screeching noise on rails designed for the shallow flanges of streetcars). Both the city and the state made a series of regulatory rulings that effectively ended this service by 1938.[xii] The TMER&L sold the freight house in 1943 and it survived in industrial use until 2006 when it was demolished for an expanded freeway interchange.[xiii]

Steam Roads seem to have ignored these innovations. Throughout their short existence, there existed at best a gap and often outright hostility between the steam roads and interurbans – primarily as the former saw the latter as a potential competitor. As a result there seems to have been a clear demarcation over what was considered to be a steam road technology or practice and what was the domain of the interurbans. As the last interurbans ceased operations in the 1950's much of their technological innovations also reached a dead end.

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Containerization and Railways of the United Kingdom

In his seminal 1912 work on railroad freight traffic, John Albert Droege described British railway traffic as "decidedly retail in character, while that of America is wholesale. [xiv]" (p300) Droege rightly notes that British merchants, because of the relatively short distances involved could keep low stocks and be assured of fast deliveries from wholesalers. As a result, the standard handling of freight in the UK more closely resembled that of LCL freight in the US.

In the 1920s, railway managers in the United Kingdom were confronted with a set of challenges similar to that of American railway managers. As in America, the national government paid increasing attention to railroads, with widespread demands for modernization if not outright nationalization, with the public and Parliamentary interests having seen the benefits of central control. The result was the Railways Act of 1921 that came into force in 1923 and amalgamated 123 companies into just four new railway groups, privately owned but tightly regulated. This brute force application of Government power created 4 monoliths, a direct regulatory contrast to the situation in the USA The London Midland and Scottish Railway (LMSR) was the largest, indeed, at the time of its formation it was the largest joint stock corporation in the world.

Sir Josiah Stamp acceded to the presidency of the LMSR in 1926 after a career involving both civil service and the management of Britain's leading chemical manufacturer, and is noted for leading the LMS into adopting American managerial organizational structures and strategies. A key facet of implementing this strategy was appointing three vice presidents who demonstrated capabilities in realizing dramatic improvements in efficiency in the railroad environment and welding them into an executive committee, which by 1932 was in its final form.

LMSR Vice President E. J. H Lemon was a production engineer of great brilliance, who having risen through the ranks from an apprenticeship at the North British Locomotive Company in Glasgow. A tireless advocate of asking the question "Why?" he was open to the statistically based management practices that were in vogue in the 1920s and 30s in the USA.

Containerization would provide the LMSR with a powerful tool to realize substantial improvements in goods traffic. A significant report entitled "Freight Transportation in Container

Trucks"[1] released exactly one year after Stamp took the helm is notable in framing the problems and opportunity facing the LMSR.

In the wake of WWI 48,000 "motors… being thrust upon the market at low prices, whilst war time duties had trained at least as many men to drive them, who were being rapidly diverted to civilian employment." (para.12).[xv] The motor trucks, or road hauliers had significant advantages in handling goods by virtue of their ability to provide seamless, door-to-door service without intermediate handling required for shipping by rail; eliminating much packing and loss or breakage. Additionally, UK road hauliers had a strategic advantage in that, unlike railways, they were not bound by common carrier obligations and could select the most profitable and easy to carry loads. The LMS recognized the growing threat posed by road hauliers, who were directly benefitting from government road improvement programs and the demonstrated ability of the hauliers to reduce their rates, as they did during the economic crisis of 1920 (para. 15)[xvi]

The LMS starkly realized the gravity of the situation they faced: "a rigid adherence to the prescriptions of an era which has closed will leave the Companies with only that business which others cannot carry (paras. 336/7)[xvii]" Given a greater flexibility in the charging system and giving COST (their emphasis) more prominence than VALUE (their emphasis) the adoption of a container system would "present an attractive means of bringing Railway policy into line with the needs of the times" (para. 339)[xviii] Even if the rating system cannot be adjusted, containerization would still present value to the railways in that it would prevent further loss of trade to road haulage and indeed would recover some of that which had already been lost. Combining a rate reappraisal with containerization, as long as the railway plant could be adapted to meet the new demands that would be placed upon it, "should leave little doubt as to the future..." (para. 340)[xix]

More of the old traditional methods would clearly not answer the problem and the report recommended that "Improved facilities and conditions corresponding as nearly as possible to road transport" needed to be provided. Indeed, the report noted the need for both faster cranes but revised accounting methods to assess their depreciation. [xx] The Container, the report contended, provided a possible means of competition. It was a door-to-door service, eliminated

1 Goods Department "Freight Transportation in Container Trucks" - London Midland and Scottish Railway Company internal publication [un-numbered pages paragraph nos. given in text] Rail 421/146, The National Archive, Kew. UK

the need for heavy packing and increased the safety and security of items in transit. Packing items for railway transport was done by either the railway company or the manufacturer and not only was this labour intensive it also meant that a proportion of the packaging was due for return to one or the other. It cites the case of Messrs Selfridges who, having purchased toys in Gloucester for delivery to their store in London refused to receive any packaging with them, "but for a railway container" says the Report, "the traffic must have passed by road." (para. 100)[xxi]

Unlike the American context, where the boxcar was the standard conveyance for the vast majority of freight traffic – the UK had a long tradition of using differing forms of containers for goods transport. While the report noted that, in 1926, the LMS utilized three types of containers were in use – they were not being used effectively as a true intermodal vehicle:

It is most important that the hybrid character of the container as an integral part of a road or railway VEHICLE (their emphasis) should be fully appreciated and accepted, as this conception of the appliance as opposed to the view that it is a substitute for a packing case has a vital bearing upon the facts and arguments contained in this review, particularly in relation to existing principles governing the carriage and charging of traffic. . . . Prior to the existing experiments, however, no attempt appears to have been made to exploit the possibilities of container-trucks in the sphere of door - to - door service, which is the prime characteristic of the road motor and its attractiveness to traders, as an element in the field of freight transport." (para.122 123)[xxii]

Contrasting with the strategy of its American counterparts, who developed systems that offered few opportunities for interchangeability, the LMS sought to develop a system of containerization in concert with the other railways through the Railway Clearing House founded in 1842 primarily as a means of facilitating and regulating freight and passenger revenues across competing railway companies, that also gained the maintenance of technical standards for freight stock as one of its many functions. Adopting standards from the outset of service would allow for the widest possible area of service and raise the potential for back-loading.[2] The result was that, because other companies had had containers albeit to a limited extent, a consensus was reached that a degree of standardization was introduced. Thus as the LMS followed by the rest of the big four groups introduced the later containers the RCH achieved standardization of dimensions and the position of lift points. Standardization in dimensions and lift points would

2 Goods Department "Freight Transportation in Container Trucks" – op. cit

allow the interchangeability of handling and rolling stock while guiding innovations made by other railways and major shippers.

The LMS's board enthusiastically received the report in early 1927 with the railway moving immediately to implement its recommendations. By 1930, the LMS had over 4,000 containers, built to 4 standardized designs, in regular service. Marketing for the service echoed that of the NYC and PRR in the US, focusing customer's attention on the fact that container will be secured with the customer's own lock and not be opened until reaching the receiver's premises. Differences in speed and packing costs were cited cost saving means for the customer.[xxiii] What the 1926 report had foretold was, it seems, coming true. Such a dramatic programme resulting in significant revenue growth could not as the progenitors of the scheme had foreseen be ignored by the three other groups. As mentioned earlier the RCH largely accepted the LMSR designs and these were in the main replicated across the groups.

Container Security in the UK Context

As in the US, containers benefitted railways in eliminating the need to handle individual items at Goods Depots, with a70-percent reduction of per-ton handling costs with containers compared to general good. However, containers also provided railways with a means to eliminate damages resulting from the inherent disadvantages associated with British rolling stock conventions where freight wagons lacked power brakes and had minimal shock absorbers. The container's smaller size, compared to that of a van, reduced the likelihood that empty spaces would remain after packing that could allow goods to shift in transit. In their internal reports, the LMS proudly described their ability to retain business in hauling gramophones, items especially sensitive to rough handling and susceptible to being shifted to road haulage. [xxiv]

The LMS's Vice President E.J.H Lemon went further to develop a shock absorbing wagon[xxv] that provided a moveable frame that carried containers aboard the wagon, absorbing shocks caused by shunting. This development mirrored that in the US where some railroads (most notably the Baltimore & Ohio) fitted cushioned under frames to freight cars to minimize damage to lading and the cars themselves due to rough handling.

How Commercially Successful was this LMS Initiative

As noted earlier even in the UK detailed statistics are difficult to find, though the LMS claimed in a publicity leaflet produced in 1933 that "The traffic carried in 1933 shows a 770% increase over that of 1927 in spite of the unprecedented depression of recent years.[xxvi] However, as Colin Divall in conversation with the authors noted "770% of nothing is still nothing", hence it was gratifying recently to find an article by Sir Josiah Stamp, President of LMS which states:

> The volume of traffic carried in containers by the L.M.S has rapidly and progressively increased from year to year. Thus in 1928, the inaugural year of the container service by all the main line railways, the L.M.S carried 25,248 container loads representing a tonnage of 46,553 tons. By 1930 these figures had expanded to 66,754 loads and 129,003 tons, while in 1932, (the last full year for which figures are available) the L.M.S. conveyed 101,692 container loads representing a tonnage of 196,496 tons[xxvii]

Hence at least for this short period loads were increasing rapidly, though the authors have yet to discover any documentary evidence of the exact revenue gained, or the economic impact on road competition.

NATIONAL REGULATION

¡°British Set Fine Example in Co-operative Results[xxviii]"

In an address on their aspirations for regulatory form, Elisha Lee, a Vice President for the Pennsylvania Railroad looked admiringly toward Britain, seeing a regulatory regime that rapidly evolved to engage the challenge of balancing road and rail competition. This balancing act began at the close of WWI with Parliamentary acts that simplified railway oversight and opened new avenues for truck and bus operation by railways. These reforms only occurred in response to the desperate condition of the railways in wake of WWI necessitated that *something* be done to restore the quality of railway service, providing proponents for nationalization with a remarkable opportunity at the end of WWI. The need to renew rolling stock and infrastructure heavily used during the war resulted in the Ministry of Transport act in 1919 that extended government control over railways in order to immediately raise rates to generate funds for reconstruction and provide a window of time to consider the future direction of railway policy.[xxix] In the following two years, a vigorous debate weighted whether private enterprise or nationalization would provide best path toward a more efficient railway network. Much of the initial debate focused on the question on nationalizing the railways – an alternative that would provide the means to restore railway service while addressing long standing questions over regulatory structure.

The salient question in Britain's r*ailway problem*, whether to nationalize railways, was

answered with a comprehensive program to restructure both railway regulation and the structure of the industry itself. In the Railways Act of 1921, Parliament settled on a plan that featured as its centerpiece a mandatory grouping of 123 railway companies into 4 large systems, with the goal of improving efficiency by eliminating duplicative facilities and administrative structures and creating economies of scale. The act also included sweeping revisions to rate making, substantially replacing prior rate making structures with a standardized set of tariffs based on 21 commodity groups with oversight provided by the newly created Railway Rates Tribunal.

The explosive growth of road hauliers, unimpeded by regulation, forced railways into a situation where price competition with road hauliers could only depress their already fragile profit base. In facing the challenge of renewing and modernizing infrastructure and recognizing the potential for using motor technology to amplify the effectiveness of their services, railways saw a reshaping of the legislation governing road hauliers. While numerous depositions by railways to Parliament and the appearance of over 100 articles on the issue between 1925 and 1927 in the Times of London on integrating road-rail services, the Government and the public remained skeptical, at best. Memories of the near monopoly position in transport terms that the railways had enjoyed pre-1914 were still fresh and the Government frankly vacillated in the face of the various lobbies.

The commitment to procuring a strong railway system through private enterprise manifest in the Railway Acts of 1921 required a government response. An address by Transport Minister, Col. Wilfred Ashley in 1926 foretold of future events: January 12th, 1926 Colonel Wilfred Ashley, Minister for Transport, said:

> . . . when trade revived, and it was reviving, the railways would return, if not to their prosperity of 30 years ago, at any rate to a reasonable measure of prosperity. The ideal thing was to combine road transport with railway transport. There was nothing antagonistic between those two means of transport. Road transport ought to be directed to be a feeder to the railways. There should be equal competition between railways and road transport . . .xxx

With the policy and procedural floor created by the Railway Acts of 1921 allowed the formulation of a response to the impact of modal competition without *broaching larger questions inherent in the Railway Problem. The delayed implementation of the act's provisions, with grouping formally occurring on 1923 and the transition to a new railway rate structure administered by Railway Rates Tribunal in 1928, provided an opportunity bring forth new regulatory reforms. While Britain's railways had extensive fleets of road vehicles to serve their*

goods depots, passage of Railway Road Transport Acts of 1928 provided railways with a defined authority to expand to directly compete with road hauliers.[xxxi]

The timing of the Road Transport Act and Rate Revisions with the LMS's introduction of container service is not coincidental. The use simplified rates and road haulage amplified the effectiveness of container service as an alternative for door-to-door service provided the railways the means to meet two key advantages heretofore the domain of road hauliers.

Railways remained vulnerable to the privacy of road hauliers' rates that provided them with a unilateral advantage to engage railways on price competition. Moreover, road hauliers continued freedom from common carrier obligations and ability to restructure services gave an ability to capture the most profitable traffic from railways.[xxxii] *These issues were addressed by the Road and Rail Act of 1933 that created a licensing structure to limit the expansion of road haulier services to markets not served by incumbent road or rail services. Reviews of licensing petitions rested solely on service characteristics, with the Licensing Authority allowing incumbent transport providers to present evidence against granting permits. These hearings only considered qualitative aspects of transport availability; the Licensing Authority did not view questions on rates as relevant evidence.*[xxxiii] *The Road and Rail Act also provided railways with the ability to use contracts, or agreed charges, to make specific rates with a shipper. Agreed charges could be formed on an "all-in" rate that would be standard regardless of the item shipped – dramatically simplifying billing procedures.*[xxxiv] *The adoption of agreed charges was internationally regarded as a major innovation in transportation policy.*[xxxv]

The Railways Act of 1921, the Railway Road acts of 1928, and the Road and Rail Act of 1933 set boundaries to a regulatory environment that provided a means to weight modal conflicts directly on the basis of the service characteristics of a mode. While fraught with imperfections that both railways and road hauliers worked to resolve up to the beginning of WWII, the evolving methodology for mediating modal conflicts permitted a broad consideration of technology, its application, and direct impacts on both shippers and incumbent transportation providers.

United States Regulatory Context - "Railroads and Trucks: What is a Fair Deal for Both?"

Elisha Lee's address was written at a time shortly after the delivery of the Saltier Commission, whose findings would be incorporated in to the Road and Rail Act of 1933. The continued engagement by Parliament and resulting fluidity of Britain's regulatory framework

stood in marked contrast to that of the United States.

Regulation has been a defining element government-railroad relations since the beginnings of the industry in the 1830s. The locus of regulatory policy shifted from clauses in state charters for railroads to state regulatory boards, culminating with the creation of the Interstate Commerce Commission in 1887 – the nation's first federal industrial regulatory agency. Concerns about the differential treatment of shippers remained at the core of regulatory efforts, stemming from the view that railroads were private enterprises operating for the benefit of the public. The differential treatment, or discrimination, between shippers was specifically prohibited on: discounted rates given on a personal basis, "undue preference or prejudice" between shippers or localities, discriminating on the basis of distance "under substantially similar circumstances and conditions." While the Interstate Commerce Act provided the ICC with investigatory powers with later acts strengthening its enforcement powers and broadening its rate-making abilities; the day to day fulfillment of anti-discrimination principles relied on the standardization and publication of rates.

As in Britain, the necessity of reconciling the effects of Government directed operation and the demands of wartime traffic presented an opportunity for Congress to reconsider the form of the railroad industry and its regulation, culminating in the passage of the Transportation Act of 1920. While the act passed several significant regulatory reforms, the core tenants of ICC regulation remained unaltered. A notable group of reforms sought to expand the commission's role include a consideration of railroad's net revenue. A notable provision in the Transportation Act of 1920 required the ICC to consider net revenue in oversight activities. As the ICC clarified in a later case, this provision provided that the "exercise of our rate-making . . . shall reflect our best judgment as to the basis which may reasonably be expected for the future to yield the prescribed return." This provision was sought after by railroads since 1910, when the Mann-Elkins Act broadened the ICC's authority over setting rates and placed the burden of proof on railroads to justify rate increases. Shippers used a public movement for railroads to adopt scientific management methods as a bulwark against railroads' attempts to increase rates on the eve of WWI. A broader mandate directed the ICC to prepare a plan for consolidating railroads into a series of regional systems. As in Britain, implementation to increase efficiency and provide a basis on which to consider broader regulatory reforms. Consolidation also proposed to solve the problem of improving the overall strength of the industry by eliminating disparities

between weak and strong railroads. Consolidation remained voluntary and was staunchly opposed by the railroad industry until its final repeal in the Transportation Act of 1940.

Unanswered questions over the future structure of the railroad industry created a stalemate where future regulatory reforms remained wedded to compliance with government mediated consolidation. This situation placed the ICC on the front line of addressing emerging questions surrounding intermodality without new legislative guidance. In addressing questions raised by containerization, the ICC was armed only with its established precedents that provided constrained framework with which to engage issues with broad implications.

In reviewing the ICC's responses to containerization it is important to underscore that the ICC was not interested in the development or application of technology in itself. Indeed, it had no specific authority over technology apart from its oversight of rolling stock safety appliances and traffic control technology. The ICC's Containerization cases instead only examined containerization's shadow – the real or anticipated impact of the technology and its innovative rate structures in the market place. The ICC's oversight of containers began in 1929 with Investigation & Suspension hearings into the rates charged for container services initiated in the Southwestern rate territory. (At this time the ICC divided the US into regions that had differing rate structures – a decision in one region did not have currency in another). These cases are important for signaling the Commission's growing concern with containerization's potential impact on the ICC's rate classification system and its usefulness as a tool to control rate discrimination.

The ICC ultimately ruled on containerization in a Finance Docket, a ruling by its board of commissioners following a lengthy investigation and public hearings that set the direction of future national policy. It was not the intermodal nature of containers and their ability to offer seamless store-door service that raised eyebrows at the ICC. Rather it was the strategy of integrating containers with innovative rates and freight forwarders that outflanked existing regulatory structures. Unlike railroads, freight forwarders were not regulated and could enter into private contracts with shippers – a practice that stood in direct contravention to railroads which had to publish their rates. Commissioners suspected that forwarders' operations were subverting rules intended to prevent railroads from discriminating between shippers. Unfettered by common carrier obligations, they would be free to pursue the most lucrative traffic.

The resulting investigation principally focused on the rate structure on which railroads

charged for containers, which they based solely on the loaded weight of the container and not on its contents. This approximated the way that railroads charged for mail, and differed sharply from other freight whose rates were determined based on the item being shipped. Charging based on weight offered simplicity to shippers, as it was easy to calculate shipping costs. Standard LCL rates, which depended on the commodity being shipped, its weight and packing, were difficult for shippers to compute independently. The ICC, however, saw the weight-based rate structure as being very disruptive to established rate relationships, creating competition between shippers and localities served by containers and those without such services. Furthermore, the ICC held that these low rates would place a burden on acquiring new capital to accommodate this service – and the advantages of the service were likely to mean that the development of containerization would continue if standard LCL rates were charged.[xxxvi]

Finally, the ICC urged railroads to develop a standard design to facilitate the interchange of containers between railroads, noting that the Baltimore and Ohio and Missouri Pacific proposed to develop similar services. They considered the lack of standardization to be as serious as the differences of track gages that hindered antebellum (pre-Civil War) railroad development. [xxxvii]

Thus far, it has been difficult to determine precisely how the ICC's action affected the service. While the railroads were quick to boast of innovations, they remained reluctant to elaborate on how they retreated from their services. The net effect was that it stunted the growth of the LCL service on the NYC. They received a revision to the rates in July 1932 that allowed them to charge on a per-container basis rather than on the standard LCL rate structure, with the ICC finding that NYC service could collapse completely without a change.[7] The PRR's service appears to have grown through the 1930's. In 1936, they announced plans to deployed containers as "sectionalized boxcars" where several containers on a single flat car would be loaded for specific destinations and transferred at the Enola Yard (Harrisburg, Pennsylvania) crane transfer station for final destination. They clamed this innovation would allow the continuation of service to many points where it would otherwise not be possible because of decreased traffic due to the depression.[xxxviii]

The North Western launched its own container service in 1930 and pressured the ICC to review the legality of the North Shore's rates in 1931.[xxxix] The ICC's review of the North Shore's service, which ultimately upheld its legality, is significant for clarifying the standards that they applied in reviewing such services. As the North Shore was not a Class 1 railroad, the

ICC's earlier ruling on the NYC and PRR services did not apply to them. The ICC upheld the North Shore's service on the basis that principally performed the services of a trap car (a boxcar assigned to transfer LCL between different railroads in terminal areas). They also saw the North Shore's service as a necessary adaptation as they did not have the ability to use trap cars because of the inherent limitations of their infrastructure. However, the ICC also found that the North Shore's rates did not violate their established principles of rate discrimination, it earned less than half its revenue from freight, was isolated from other means of interchanging traffic, and that no complaints were received from shippers or communities (as they were in the review of steam roads' container service).[xl] When the ICC received the New York Central's request to review its previous ruling, it cited the North Shore case as a precedent in revising its rate imposition.

Was the ICC Against Technology?

Examining the container cases historically poses a particular problem. The holdings for this particular finance docket are not among the nearly 5000 cartons containing other finance docket in the National Archives. The complete dockets contain hearing testimony, exhibits, and correspondence from ICC staffers and commissioners. The loss of this docket (hopefully it exists, somewhere) makes it difficult to say for certain the range of options the ICC or railroads saw as an outcome of this case. More disturbing is the destruction of the complete set of Investigation and Suspension dockets by the National Archives approximately a decade ago has removed forever a significant and rich material that can inform these questions.

Recognizing these limitations, it is still possible to consider reasons behind the ICC's conclusions. It is important to underscore that, in its ruling on containerization; the ICC did not prohibit the technology per-se. Constrained by their existing jurisprudence, they had no choice but to uphold the principles against price-discrimination enshrined in their jurisprudence. The framing of freight-all-kind rates for LCL containers as discriminatory proved to be an insurmountable problem. The wave of popular sentiment and legislation against price discrimination in the US at this time made it politically untenable for the ICC to break with its own precedent, let alone act in contravention of wider legislative efforts.

The Motor Carrier Act of 1935, a close corollary to the Road and Rail Act of 1933, established a standardized rate regulation framework used by railroads and required that motor carriers engaged in interstate commerce receive a certificate of Public Convenience and Necessity from the ICC. Unlike Britain's Road and Rail Act, the Motor Carrier act placed additional scrutiny upon railroads seeking road operations, but contrary to the findings of some recent scholars, the act did not contain an outright prohibition of motor carrier actions by railroads. The Motor Carrier Act did contain language requiring that the ICC make specific findings about the public interest regarding the establishment of motor carrier service by a non-motor carrier. This non specific language that hinted at railroads was amended in 1940 to specifically refer to railroads. In reviewing petitions to establish or acquire motor carrier operations by railroads, the ICC approved service only where motor carrier services were "auxiliary and supplementary" to existing rail service and did not duplicate or compete against existing rail service.[xli]

Moreover, lingering concerns over railroads' monopoly power lay in the background of both

rulings. The theory of Cross Subsidization, advanced by Gerald Faulhaber in 1974 is useful for parsing the logic behind these rulings.[xlii] This theory suggests that when firms are compelled to provide service at a loss, it does so by transferring resources away from profitable services. The evolution of Cross Subsidization has also shown that firms may voluntarily transfer costs away from a service in order to lower prices to gain a competitive advantage.[xliii] The ICC's concern about the rates being charged for container service may not have been a matter of "saving the railroad from itself" but, rather, a legitimate (albeit poorly stated) over potential predatory pricing. The lack of sophisticated cost allocation methods at this time would have challenged the articulation and prosecution of a case on these grounds. Unfortunately, the loss of the ICC Finance Docket containing the full breadth of evidence in the Container Cases makes it difficult to discover the commission's true intent.

OUTCOMES

In spite of the significant problems inherent with conventional LCL handling in the US, the system provided a reliable and interconnected network of complex arrangements for interchanging LCL traffic that required no standardization in handling equipment.[xliv] Moreover, railroads could reassign boxcars used in the service to handling carload freight or bulk grain as demand warranted. While a handful of railroads investigated containerization as a means of revolutionizing LCL handling, the wider industry focused on means to incrementally remedy the worst aspects of the existing system. By the mid-1930's American railways began to redefine how they used the 'container.' Rather than using the term for a specialized box that would travel on a specialized car – they applied the term to any shipment that was grouped in some fashion and handled in a conventional boxcar. As such, "containers" took the form of smaller boxes that could be loaded into, boxcars or shipments grouped on to pallets and ready for "mechanical" handling. During WWII, the US Navy developed standards for pallets that facilitated the use of standardized forklifts. While railroads continued to experiment with various schemes for containerization using small containers within boxcars or on flatcars, palletization quickly became standardized as it provided a means retain the flexibility of their existing handling arrangements and terminals while both improving labor productivity and reducing damage. The PRR and other railways responded by deploying boxcars specially equipped to secure such loads (and often painted to promote the service). Load restraint boxcars (often marketed as Damage

Free) quickly became popular with carload shippers as well. The last containers left LCL service with the PRR in 1953.[xlv] It is not known to the authors when the NYC ceased their LCL container operations.

However, both railroads continued to support the use of bulk containers that were developed parallel to LCL containers for handling various types of bulk commodities - principally dry cement. The use of these containers continued unimpeded through the 1930s as they used conventional rates. Their discontinuance came in the 1960s with the universal adoption of covered hoppers for handling these loads by rail.

The ultimate successor to containerization was trailer-on-flat-car (TOFC) or piggyback service. The growth of intercity trucking quickly changed the standard lots from many products from (rail)car-load lots to truck-load lots. TOFC rates approved by the ICC in 1953 allowed railroads to charge flat rates for trailers regardless of its contents – an innovation pioneered in containerization. Furthermore, adapting to trailers provided railroads with a degree of standardization and interchangeability not reached in the limited development of LCL containers.

Containerization develops further in the UK.

The Liner Trains described by Beeching proved effective though changes in ISO container lengths entailed some new rolling stock. Freightliner Limited was regulated as a separate company via the Transport Act of 1968 though a controlling share was held by the National Freight Corporation. Growth in traffic was rapid by 1982 the service had carried ten million containers. Changes of ownership continued via the Transport Act of 1976 and two years later it became a wholly owned subsidiary of the British Railways Board. The final move prior to privatization was incorporation into Railfreight Distribution in 1988. The privatization of 1996 saw a management buyout and the transformation of the company into a fully intermodal business, which has developed from one company into a group and now not only handles its own maintenance, but has separate operating companies for Heavy Haul and Intermodal traffic.

However, as Hetherington has said:

> Since then, Freightliner has gone from strength to strength, but whilst it is the logical successor to the container trains of the 1930s, 40s and 50s, it should be noted that its concept is really quite different. Freightliner concentrates on bulk shipping between dedicated terminals, whereas the traditional container could be handled at virtually every local station goods yard and anybody could hire one, if they so wished, for such ordinary activities as moving house. Thus, whilst the method has evolved into a modern and

efficient service, the traditional traffic has effectively disappeared.[xlvi]

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