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Examining Collaborative Chassis Management Practices at the Ports of Los Angeles and Long Beach

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Abstract: Chassis shortages affect supply chain efficiency by limiting the volume of containers moving through a port. In the past 20 years, the Ports of Los Angeles and Long Beach have faced unique chassis management challenges due to the state government's emphasis on reducing freight emissions and congestion, and changing industry approaches to supply chain management. This paper studies the evolving management practices of chassis in the San Pedro Bay port complex by documenting the stakeholder collaboration process. Chassis management at ports has implications beyond the local supply chain, and the research reveals the complexity of chassis management at ports and the far-reaching implications for regional goods movement and supply chain optimization. Port-related supply chain inefficiencies in Southern California can affect operations in other parts of the United States. This paper aims to inform further discussions of chassis management at ports and facilitate better decision making regarding chassis operations. This study will also reveal challenges and opportunities for other port-related collaboration.

Keywords: chassis, equipment management, ports, port collaboration, stakeholder collaboration

1. Introduction

A chassis pool is a fleet of marine container chassis that two or more equipment providers agree to make available to truck drivers when moving the containers. The "pool of pools" (POP) model is a multi-pool agreement between two or more third-party equipment managers each with its own pool. The POP is the most recent chassis management system to evolve in the San Pedro Bay port complex after continued pressure resulting from chassis shortages experienced at the Ports of Los Angeles and Long Beach. In Southern California, the POP is made up of three intermodal equipment providers (IEPs) and spans a combined fleet of over 67,500 marine container chassis (Pool of Pools 2015). This paper builds upon research on supply chain collaboration by detailing the chassis management process at the Ports of Los Angeles (LA) and Long Beach (LB) in the context of the regional supply chain and seeks to understand: (1) why ocean carriers divested themselves of chassis; (2) the broader supply chain pressures that led to the creation of chassis pools; and (3) the unique Southern California conditions that led to the creation of the pool of pools concept.

2. The Evolution of Chassis Management

The United States is unique in that ocean carriers have historically owned the chassis used in intermodal freight transport rather than motor carriers and shippers. This model was established during the introduction of containerization (Le 2003; Prince 2006). The invention and implementation of containers revolutionized the shipping industry, and ocean carriers saw the benefit of owning chassis to increase their access to other portions of the U.S. domestic market. However, this model required truckers to return the chassis back to the port after dropping off a container. "[Because chassis belonged to the ocean carrier and were stored at the terminal,] this resulted in many non-revenue generating trips for truckers and limited the number of revenue-generating trips or turns a driver could make in any given day (O'Brien, Reeb, and Kunitsa 2016)." The storing of chassis on terminals also resulted in less space at terminals and. delays when truckers returned a chassis to the wrong terminal (Le-Griffin and O'Brien 2013).

The inherent inefficiencies of this model, the 2008 economic downturn resulting in an oversupply of chassis, and associated storage and handling costs called for new and wide ranging chassis management practices aimed at increased efficiency, interoperability, and availability of chassis at ports. In addition, while ocean carriers branded well-maintained chassis as part of the service they offered to customers, federal roadability regulations that standardized chassis maintenance and repair translated into fewer differences in equipment across providers (O'Brien, Reeb, and Kunitsa 2016).

The implementation of a chassis pool was the first major shift in chassis management practices. Initially, a chassis pool was a collection of chassis that two or more shipping lines agreed to share when moving their containers. The first chassis pool was created in 1995 by Maher terminals at the Ports of New York and New Jersey. Later on, chassis pools were established by the Virginia Port Authority, the Georgia Ports Authority, and the South Carolina Ports Authority (O'Brien, Reeb, and Kunitsa 2016; Brennan 1997). Chassis pools were created and implemented to increase overall chassis efficiency and availability and reduce congestion and emissions at the ports. However, while they provided a more reliable chassis supply, this method did not resolve the repositioning issues. Also, legacy agreements between ocean carriers and shippers were still in place, which required certain chassis to be used for certain containers, limiting the interoperability of pooled chassis (Le-Griffin and O’Brien 2013).

An alternative to a terminal-run pool is a gray (or neutral) chassis pool, in which a third party leasing company provides all the chassis in the pool (Le-Griffin and O’Brien 2013). Ocean carriers were also reluctant to support neutral chassis pools because of the possibility that chassis lessors could fix unfavorable rates as part of their management of chassis storage yards (Le-Griffin and O’Brien 2013).

The various types of chassis management structures are summarized in Table 1.

Table 1: Chassis Management Structures at the U.S. Ports

Management Structure	Equipment Owner	Equipment Manager	How Is It Facilitated?
Ocean Carrier Provided (Traditional Model)	Ocean Carrier	Ocean Carrier	Master agreement between ocean carrier and marine terminal operator allows for storage, maintenance, and repair
Terminal Pool	Combination of ocean carrier and marine terminal. May include chassis contributed by third-party operators	Terminal operator	Through terminal operator management of terminal facilities
Regional Pool (or Market or Co-op) Pool	Ocean carrier with some chassis contributed by third-party operators	Usually performed through a third-party management company	Multi-party agreement or LLC required
Gray (or Neutral) Chassis Pool	Chassis leasing company	Intermodal Equipment Provider (IEP)	Agreement between pool operator and marine terminal
Pool of Pools	Three separate chassis companies: Direct ChassisLink, Inc., Flexi-Van Leasing, TRAC Intermodal	Three Intermodal Equipment Providers (IEPs)	Agreement between chassis lessors and terminals

The landscape changed most dramatically in the wake of the great recession when carriers started to divest themselves of chassis in a cost-cutting move. In June 2009, Maersk Line established a nationwide chassis pool (Leach 2009; Le-Griffin and O'Brien 2013). In early 2012, the company divested itself of its chassis division altogether in order to reduce costs by establishing Direct ChassisLink, Inc. (DCLI) (Leach 2012). This move by the largest ocean carrier set in motion a general shift toward chassis divestiture by other ocean carriers. In 2011, around the start of chassis divestiture, there were approximately 670,000 marine container chassis in North America registered with the Intermodal Association of North America (IANA) Global Intermodal Equipment Registry (GIER), 70% of which were owned and supplied by the ocean carriers. By 2014, there were 640,000 registered chassis, only 32% of which were owned and supplied by the carriers (O'Brien, Reeb, and Kunitsa 2016).

The divestiture process created disruptions to the supply chain, particularly in Southern California where recovering trade volumes and larger vessels created a demand for more chassis just as many were being taken out of the system in the transition of ownership to third party operators. Lack of equipment availability resulted in increased congestion at the 12 container terminals spread out over the 10,000 acre complex straddling two cities. Furthermore, the formation of carrier alliances by shipping lines created additional chassis management challenges. The larger alliance vessels transport the cargo of multiple carriers, discharging that cargo at a single terminal, but in some cases requiring the repositioning of chassis between terminal partners across the entire port complex.

As a result, goods movement industry stakeholders explored alternative strategies to increase chassis availability. In August 2012, a Chassis Operations Group was established which included the Ports of Los Angeles and Long Beach and other key stakeholders (O'Brien, Reeb, and Kunitsa 2016). On behalf of both Ports and the entire Chassis Operations Group, in April 2013, the Port of Long Beach issued a Request for Proposals (RFP) for the development of an efficient chassis management system (O'Brien, Reeb, and Kunitsa 2016).

The chassis shortages made national headlines in 2014 (Morris 2015). The Port of Long Beach subsequently created a Congestion Relief Team in September 2014. The team's primary goal was to provide a steady stream of updates on chassis positioning. The team's secondary goal entailed holding regular meetings to find short-, medium-, and long-term solutions (O'Brien, Reeb, and Kunitsa 2016). The first meeting included DCLI, terminal operators, truckers, and beneficial cargo owners (BCOs). By October 2014, the Congestion Relief Team moved into the medium-term phase with two chassis leasing companies DCLI and TRAC Intermodal adding over 3,000 chassis to their local fleets (O'Brien, Reeb, and Kunitsa 2016). That collaboration led to the creation of the pool of pools model, which is a multi-pool agreement between the three major marine container chassis pools—DCLI, Flexi-Van Leasing and TRAC Intermodal—operating in the San Pedro Bay port complex and offering approximately a total of 66,500 interoperable chassis across 18 different start and stop locations (Pool of Pools 2015).

3. Stakeholder Interviews

The stakeholder environment at the port is a complex one involving port authorities, marine terminal operators, ocean carriers, truckers, rail companies, and labor all of which have occasionally conflicting objectives. Because of this, observing different examples of port collaboration is vital in order to determine what constitutes a Best Practice and if it is likely to be repeated in another context. The perception of the POP strategy as either a success or failure, or somewhere in between, will depend upon your position in the supply chain.

In order to determine the impact of the POP strategy, we conducted seventeen interviews of various stakeholders over twelve months from October 2014 through October 2015 from the trucking and port community. Interviews focused on short- and long-term impacts on the supply chain. The focus on trucking companies was intentional as we were particularly interested in whether or not pooled chassis allowed truckers to operate more efficiently and possibly increase the number of turns made on a daily basis. The interviews also included questions designed to understand the flow of truck moves in and around the port complex pre- and post- the pool of pools.

Table 2: List of Interviewees

Director, Corporate Compliance	Trucking Company
Senior Executive Lead, Supply Chain Optimization	Port Authority
President (4 total)	Trucking Company
Business Development Manager	Port Authority
Director of Operations, West Coast	Chassis Leasing Company
Principal	Maritime/Trade Consulting Firm
Director, Public Affairs	Rail company
Director of Business Development	Port Authority
Director of Policy	Trucking Trade Association
Owner and Partner	Trucking Government Relations Consulting Firm
Chief Operating Officer	Transportation/Trucking/Rail
Founding Partner	Port Public Affairs Firm
Director of Operations	Trucking Company
President and Chief Executive Officer	Chassis Leasing Company

Questions for truckers focused on chassis operations, maintenance and repair. Responses provided information on process flows. Some trucking stakeholders asserted that the POP model was a temporary solution, with broader challenges remaining in chassis storage, the roadability process, and the broader supply chain (O'Brien, Reeb, and Kunitsa 2016). Truckers expressed an interest in purchasing their own equipment to avoid having to pull from the pool or the risk of finding a chassis unavailable, but the lack of storage is a hindrance.

For ports and terminal operators, the questions were focused on the consequences of the divestiture: on land use, turn time, productivity, container management changes, elimination of terminal pools, and the role of labor in roadability inspections. Port Authority stakeholders hold interest in promoting competitiveness by resolving issues related to intra-terminal chassis movements and transactions through the pool of pools (O'Brien, Reeb, and Kunitsa 2016).

Rail stakeholders noted that the POP helped prevent shortages when moving containers off rail facilities. However, rail operators noted that identifying chassis owners is an increasingly difficult process, a problem that could be resolved by using technology to track equipment. Furthermore, once chassis leave the terminal and are dropped off at a distribution facility, the motor carrier loses track of it. Keeping track of chassis is a major issue, tagging them so that they can be traced via GPS is costly and the question of who will pay for it remains (Mongelluzzo 2017a).

Finally, intermodal equipment providers argue that the long-term sustainability of their operations depends on developing customer relations outside of the pool of pools and they are more concerned with land availability for chassis storage. The pooling of resources (without integrating operations) was a solution designed specifically for the Southern California market and not one likely to be replicated anywhere else.

The consensus among the respondents is that the pool of pools is a short- and mid-term solution and that further research is necessary to find a long-term solution. Many respondents expect a transition to a business model involving long term lease arrangements which allow trucking companies and owner-operators to maintain control over daily use of the equipment but which keeps storage, insurance and maintenance/repair responsibilities with the equipment provider.

4. Tracking Process Flows

During the interview process, trucking companies were asked to provide information on chassis movements before and after the implementation of the POP model in order to develop a series of transaction scenarios and process flows. Following is a common scenario prior to the establishment of the POP, and six scenarios that occurred after the implementation of the POP.

Before the pool of pools, a driver dispatched to pick up a container at a marine terminal followed a series of steps generally described as:

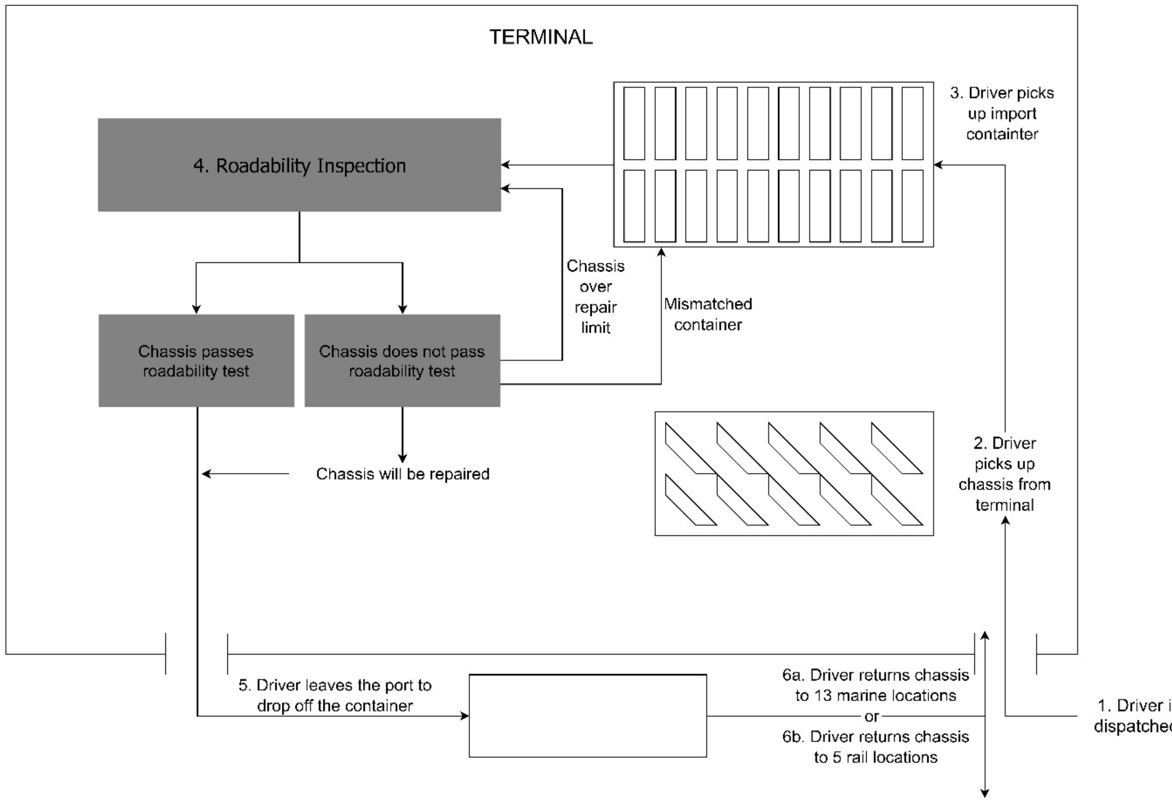
1. A trucking company dispatches a driver to pick up a container at a marine terminal.
2. The driver picks up a container on a chassis at the terminal or hooks up to bare chassis and has a container loaded at the terminal.

3. The driver may have to go through a roadability inspection if the terminal requires one.
a. If the driver fails roadability, he/she must find another roadable chassis on site.
4. The driver brings the container to a distribution center or warehouse location for drop off.
5. The driver returns to the terminal with an export container or bare chassis.
    a. If the return load is designated for the same terminal as the original pick-up location
        i. The driver must drop off the container (if there is a return container).
        ii. The driver drops off the bare chassis.
    b. If the return load is designated for a different terminal than the pick-up terminal
        i. The driver must drop off the container at the correct terminal for the container.
        ii. The driver must return the bare chassis to the original terminal.
6. The chassis is dropped off at the terminal along with the container if there is one.
7. The driver picks up a new chassis for the next transaction.

After the pool of pools, the number of scenarios described by truckers increased, depending largely upon the availability of chassis.

Scenario A: If a chassis is available at the terminal
1. A trucking company dispatches a driver.
2. The driver picks up a chassis from the marine terminal.
3. The driver picks up an import container from the marine terminal.
4. The chassis must go through a roadability inspection before leaving the terminal. During inspection there are two possible outcomes:
    a. Chassis passes roadability:
        i. The driver leaves the terminal
    b. Chassis does not pass roadability:
        i. If chassis is over the repair limit at roadability:
            1. The driver must flip the chassis and pick up a new one
            2. The driver goes through a roadability inspection again
        ii. If the chassis can be repaired:
            1. The chassis will be repaired while the driver waits
5. The driver leaves the port to drop off the import container
6. The driver can return chassis to any of the:
    a. Thirteen marine locations, or
    b. Five rail locations.

Figure 1 (Scenario A): If a chassis is available at the terminal



The post POP environment resulted in other kinds of chassis transactions:

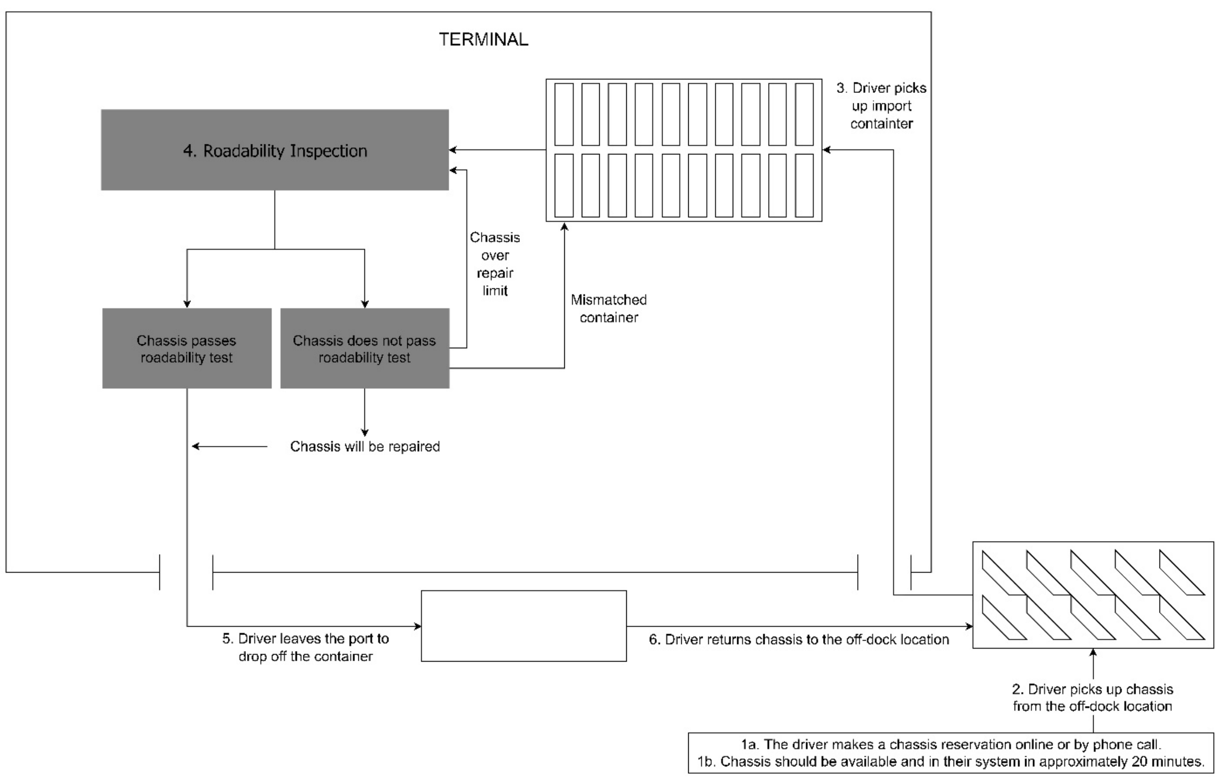
Scenario A	If a chassis is available at the terminal
Scenario B	If the right size chassis is not available at the terminal during the day
Scenario C	If the driver wants to use the same chassis all day (different terminal locations)
Scenario D	If the driver picks up a chassis that needs to be flipped
Scenario E	Owning and using your private chassis
Scenario F	Leasing from a third-party leasing company (not part of the POP)

The variety of scenarios reflects the complexity of operations in Southern California even with pooled equipment. Furthermore, they reflect the law of unintended consequences. The unexpected lack of chassis availability actually created a scenario in which drivers would be required to go off-site to lease a non-pool chassis from a third party, even if that third party contributed other chassis to the pool.

Under this scenario, the trucking company makes a reservation for the chassis either after dispatching a driver to the terminal and learning that a chassis cannot be secured or being informed of equipment shortages in advance. At that point,

1. The driver/trucking company makes a chassis reservation online or by phone. (A chassis is normally available in approximately 20 minutes.)
2. The driver picks up the chassis from an off-dock location.
3. The driver picks up an import container at a marine terminal.
4. The driver goes through a roadability inspection. During inspection there are two possible outcomes:
    a. Chassis passes roadability:
        i. The trucker leaves the terminal
    b. Chassis does not pass roadability:
        i. If chassis is over the repair limit at roadability:
            1. The driver flips the chassis
            2. The driver goes through a roadability inspection again
        ii. If the chassis can be repaired:
            1. The chassis will be repaired while the trucker waits
5. The driver leaves the terminal and drops off the container at a distribution center/warehouse location
6. The driver returns the bare chassis to the off-dock location

Figure 2 (Scenario F): Leasing from a third-party leasing company (not part of the POP)



In this scenario, additional equipment hand-offs are created when off-site equipment storage takes place, which is also the case when truckers provide their own equipment or lease from a third-party leasing company that is not part of the POP. Mapping truck movements also shows the effect that roadability and inspections have on the turn-time and that the jurisdiction of roadability is a crucial factor in supply chain efficiency. Roadability is also a critical factor in incentives for truckers to invest in their own equipment, or to enter into long-term chassis leases.

Furthermore, even pooled chassis are vulnerable to unexpected supply chain disruptions. On August 31, 2016, Hanjin Shipping filed for bankruptcy and left chassis stranded across terminals at the Ports of Los Angeles and Long Beach. These chassis (often with containers on them) accrued storage costs (Mongelluzzo 2016a). There are also potential impacts from labor related disputes. The International Longshore and Warehouse Union (ILWU) claims jurisdiction on chassis maintenance and roadability under its collective bargaining agreement. Pools located on marine terminals are often required to use union labor regardless of ownership, which is considerably more expensive than off-dock labor, resulting in increased chassis maintenance and repair costs (Prince 2006).

5. Implications

While it is difficult to take away long-term conclusions from an on-going process, some short-term impacts are apparent. First, the role played by the ports as a convener of private sector stakeholders is significant. The port's role is essential in the effort to advance supply chain optimization and can be used as an organizational and institutional reference that could be useful to ports around the world (O'Brien, Reeb, and Kunitsa 2016). Even though this study focuses on the ports of Southern California, this analysis is valuable because many ports and inland distribution hubs experience chassis availability issues to some degree (Mongelluzzo 2017a).

The pool of pools had effects on each of the stakeholders. For truckers, this solution demonstrated the benefits of more control over equipment, while for the port authority it showed the benefits of more efficient land use at the ports when space does not need to be allotted towards chassis storage. This is important as the creation of bigger ships and ocean carrier alliances requires more efficient use of land to handle increasing cargo volume surges. Ultimately, the pool of pools is a temporary solution as it has inherent inefficiencies with three different companies running chassis operations, such as logistics and stock control, customer coordination, and labor coordination (O'Brien, Reeb, and Kunitsa 2016).

While the pool of pools was viewed as a temporary solution by stakeholders, there were still benefits created, such as reduced total trip time and improved turn time on-dock (O'Brien, Reeb, and Kunitsa 2016). However, while the pool of pools is more efficient than termina;-based chassis pools, it still has not eliminated the issue of equipment repositioning. The pool of pools also created additional issues regarding roadability jurisdiction between ocean carriers, truckers, and the ILWU, an issue that will likely go to the courts to be resolved (O'Brien, Reeb, and Kunitsa 2016).

There are other implications beyond the immediate vicinity of the port as well. From a planning perspective, further research that places the chassis management strategy in the broader context of supply chain optimization will benefit those who must plan and accommodate freight movements.

For planners, particularly those in California, the outcome of the pool of pools effort is also of interest. From a port-supply chain perspective, the shift to management by third-party providers, whether operating independently or as part of the pool of pools, may create a need for chassis storage facilities near the ports and rail yards and at inland locations near distribution centers and warehouses. Chassis being stored on marine terminals have been the traditional practice since the beginning of containerization. Chassis storage takes up about 10 to 20 acres of land at each of the 13 terminals at San Pedro Bay port complex. Moving the chassis to near-dock, common-user sites will free up hundreds of acres of waterfront property for direct, more efficient cargo handling (Mongelluzzo 2017c). This has the potential to change intra-metropolitan freight flows, creating demand for infrastructure, including new access roads, particularly near ports. Fewer truck movements, because of reduced repositioning, also have the potential to reduce vehicle miles traveled and emissions.

6. Conclusion

The paper reviews the chassis pool implementation process at the Ports of Los Angeles and Long Beach over the past decade, by first looking at chassis inefficiency in the traditional ocean carrier model, then tracking issues with the implemented solutions—chassis pool and pool of pools, while looking at stakeholder feedback throughout the whole process. Interviews were conducted with a variety of key stakeholders including truckers, marine terminal operators, the ports, rail companies, and chassis pool operators to better understand the incentives for these stakeholders to take part in shared equipment management strategies. Process flow maps and chassis positioning scenarios were developed to better understand the impact of pooled operations.

Chassis management issues mirror many supply chain issues, and these are not unique to Southern California. Some of these issues include (but are not limited to) increasing supply chain transparency and visibility to reduce risk and uncertainty, congestion management, and conflicting goals among intermediaries. Chassis congestion issues are a product of a dysfunctional supply chain and are acute in Southern California but the potential for wider impact is great. Goods from the Los Angeles and Long Beach ports are shipped across the nation and any delays at the Ports mean delays in the nation's entire supply chain.

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