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Statement from David A. King, Ph.D. and Jonathan R. Peters, Ph.D. to the
Committee on Transportation and Infrastructure of the U.S. House of Representatives
Panel on 21st Century Freight Transportation

July 26, 2013
New York, New York

Dear Members of the Panel,

We are pleased to be able to contribute to the discussion regarding freight movements in the United States. We are academics who are engaged in the research of transportation matters on a national and international scale. We have a particular interest in matters related to the New York Metropolitan Region, as we are located in this area.

The Port of New York and New Jersey is the third most active maritime port in the Nation and the most active port on the Eastern Seaboard. As such, the success of this port has regional importance as well as for the United States as a whole. Your committee is studying the future national policy as it relates to freight and we commend your efforts. Unfortunately, we have a long way to go to get to a single and clear national policy on freight movements.

The Port of New York and New Jersey is an excellent case to study with respect to conflicting goals and outcomes for freight movements. The physical infrastructure of this large and important maritime freight port is located in various areas - some on the mainland of the United States, some on a somewhat isolated peninsula and the rest on two islands around the fabulous deep and safe natural harbor. Over the last 150 years, regional planners have developed highway, bridges and tunnels to link these various port facilities to facilitate freight movements.

Yet, these facilities face very divergent futures if the current policies continue and operational practices are not coordinated. Like all ports around the world, The Port of New York and New Jersey needs significant capital investment to remain competitive in the world freight market. These investments are both on the land side as well as in the actual maritime facilities. The Port Authority of New York and New Jersey is actively engaged in moving forward some of these capital investments - but the benefits of these investments seem to be biased towards certain states and will come at the expense of other areas.

The Committee should seriously consider the impact of regional policies such as toll rates and road pricing and their impacts on national transportation assets. Your committee is being charged with examining our national policy to address the needs of national freight movements. Much as we need to discuss the national interest and funding for these projects – so we should

also consider how regional policies impact national assets. With the need to commit billions of dollars to deepen ports and raise bridge facilities, the sad reality is that the pricing of the road assets may render these investments unproductive.

In our recent work, with Cameron Gordon of the University of Canberra, "Does Road Pricing Affect Port Freight Activity: Recent Evidence from the Port of New York and New Jersey", which is currently under review for publication at the academic journal Research in Transportation Economics, we found that by examining port trucking data in New York and New Jersey, we estimate that bridge and tunnel toll costs may represent over 50% of the cost of moving freight into and out of the port facilities for the facilities located in New York State. This is way above the national norm and significant higher than the cost of moving goods into and out of the New Jersey port facilities.

These toll costs for the New York – New Jersey crossings are not driven by cost of providing the actual service – but in fact are linked to other expenditures and costs at the Port Authority of New York and New Jersey. Bridge tolls have increased 60.2% percent over the last three years and the Port Authority has already approved a series of three additional increases that will result in bridge prices that will be roughly 241% of the 2010 rates – or about $110.00 per trip in 2015 for a five axle truck (an 18 wheeler). These bridge tolls will be 81.9% profit to the Port Authority by the year 2015 if this occurs.

The net effect of this is that maritime port facilities that are located in New York City in Brooklyn and Staten Island will effectively be driven out of business by these costs. They will be unable to compete with other regional facilities and we may in fact drive cargo that should naturally flow into the Port of New York and New Jersey into other ports that are more remote from the final demand for the products. This will increase road congestion, increase greenhouse gas emissions and lower our regional job base.

We thank you for this opportunity to inform the committee and we would be happy to discuss these matters further with the committee or staff if they would help in your deliberations.

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Does Road Pricing Affect Port Freight Activity: Recent Evidence from the Port of New York and New Jersey

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Abstract:

In this paper, we examine the movement of container freight in, out and around the third largest maritime port in the United States and the use of toll facilities by these freight movements. Understanding how road pricing affects freight activity through the spatial distribution of logistics flows and labor concerns are of significant interest to transport planners, port operators and economic interests with regards to regional competitiveness and economic development.

Using a unique survey of truck activity at two maritime terminals in the Port of New York and New Jersey, we are able to examine the frequency of truck trips, toll costs and trip distance, and how these characteristics affect port freight costs and operations by location. The Port of New York and New Jersey has a number of maritime cargo terminals, with a number of these facilities located on the island (East) side of toll bridges and tunnels – with truck freight required in most cases to pay a toll to access the port facility. In addition, the major highway access to all the port facilities in the port of New York is The New Jersey Turnpike, a toll highway that serves as a segment of I-95 – the major North – South highway corridor on the Eastern Seaboard. As such, this area offers us a unique opportunity to explore the interaction of port freight movements and toll systems. The authors estimate the relative cost of operation for port containers at the various container freight facilities in the New York City region as well as the total cost of an average move in the port commerce trade and the contribution of toll costs to total operating costs of trucks by mile and hour.

Key initial findings indicate that the New York ports serve 19 states and Canada, with the vast bulk of cargo trips being short hauls of less than 50 miles one way from the port facility. We also find that toll charges in the New York Metropolitan Region may represent over 50% of the total costs for a short haul truck trip into or out of a maritime port depending on the location of the port facility. The results presented suggest that road toll programs in the New York region place non-trivial costs on individual truck trips to certain locations. The implications of these toll costs on environmental, labor and locational outcomes are discussed.

Introduction

The New York City metropolitan area represents a massive market for goods movement, both for end point consumption and as a trans-modal point of entry for air and maritime freight. The region boasts nearly 20 million residents and is the largest metropolitan area in the United States. Goods movement into and out of the New York and New Jersey region is a major economic activity, and the transport and delivery of goods represents about eight percent total employment growth in recent years. Seven hundred million tons annually leaving, arriving and moving through the ten-county region within the New York Metropolitan Transportation Commission (NYMTC) jurisdiction had a total economic value of $120 billion. Unlike many other ports in the United States, much of this freight arrived at and left the ports by truck, 1 in 13 jobs in New York State is being supported by the trucking industry. In 1998, major vehicular daily crossing between New York and New Jersey was 2.75 million vehicles per day, including 338,000 commercial vehicles (New York Metropolitan Transportation Council 2001). Figure 1 maps the region and the major freight terminals in and around New York City.

FIGURE 1: Map of NY& NJ Toll and Port Facilities

Hauling freight by truck in New York City is a challenging undertaking. To quote NYMTC:

> "The main constraints to more efficient truck freight operations are infrastructure inadequacy: weight limits on bridges and underpasses, clearance restrictions, tight curves and turning radii and narrow travel lanes. Congestion on major regional highways, access to facilities, terminal gate congestion and limited parking possibility are additional constraints. Many other factors contribute to high costs, delay in delivery, insufficient signage, grade crossings with railroads, and inadequate accident/incident management." [(New York Metropolitan Transportation Council 2001), p. 4]

Yet there is one factor not mentioned in that list: road pricing. The New York City region's roads in particular are heavily and highly priced. Roughly one quarter of U.S. road toll revenue is raised in the New York City region. While most of the literature on road pricing has focused on passenger travel, road tolls certainly have both efficiency and equity effects on freight movements. This paper utilizes detailed survey data on truck movement in and out of major maritime terminals in the New York and New Jersey region to quantify and understand these impacts, concluding with some policy implications and suggestions for future research.

Road Tolls and Goods Movement in Urban Areas

Road tolls are currently not widely used in the United States, but constraints on traditional revenues for transport investment and maintenance, plus concerns about productivity lost to congestion, have lead many governments to consider expanding the use of tolls. The federal gas tax—the primary revenue source of federal transport investment—has not been increased since 1993, and many states are reluctant to raise local gas taxes. Instead of raising revenues through higher fuel taxes, states are turning to sales taxes and user fees to pay for maintenance and expansion of transport infrastructure. Unfortunately for the states, new taxes and tolls are politically unpopular. A number of studies have explored ways to make tolls politically acceptable through distributions of toll revenue (Gomez-Ibanez 1992; DeCorla-Souza and Whitehead 2003; Arnott, Rave et al. 2005; King, Manville et al. 2007; Ecola and Light 2009), and private trucking companies are generally opposed to congestion tolls (Golob and Regan 2000). Mostly, efforts to generate political coalitions of support have rarely considered the impact tolls have on freight movement.

In part the lack of interest in trucking in the context of road pricing is explained by the dominance of passenger travel in transportation planning and policy.[1] While scholars argue that the theoretical and empirical support for road pricing is relatively straightforward for automobile traffic, few consider that the characteristics of freight activity are not consistent with passenger

travel (Holguín-Veras, Wang et al. 2006; Holguín-Veras 2010). Scholars David Hensher and Sean Puckett considered how variable tolls would influence the trucking industry (Hensher and Puckett 2008), and European nations have experimented with truck tolling for many years in order to pay for infrastructure (McKinnon 2006). With regard to peak hour fees, though, truckers have less freedom to switch the time and location of their travel than passengers do, and for the large majority of cases freight carriers are unable to pass toll costs onto their customers (Holguín-Veras, Wang et al. 2006). Research using driver surveys from the US and Canada suggests that tolls are a significant influence on route choice for truckers depending on shipping and employment terms (Sun, Toledo et al. 2013). Ultimately, the receivers of goods represent a hard constraint on the ability of truckers to switch their time and location of travel. This means that congestion pricing will be less effective for limiting truck trips without incentives for receivers because of limited options for avoiding or minimizing tolls. The challenge for researchers and policymakers is to design road toll programs that respond to multiple goals from different users of the road network.

States in the Northeast part of the country have long used tolls as a way to finance infrastructure. Historically tolls in the region have been used to pay for road facilities and include different toll rates for cars and trucks based on axles and weights. These differences in payments are sensible in the context of damage caused to roadways by axle weight (Small, Winston et al. 1989).But in many areas road tolls are used for purposes beyond road maintenance such as congestion reductions or cross-subsidies for other facilities and non-transport uses. In these cases, our poor understanding of how road tolls affect the distribution of freight activities is potentially damaging. For instance, in 2007 New York City proposed a congestion pricing program where all passenger cars entering lower Manhattan (the Central Business District of the city and region) would be charged $8 daily, and trucks entering the tolled area would be charged $21 (Schaller 2010). Without opportunities to minimize tolls paid through changes in routes or time of travel - additional tolls will increase the cost of consumer goods through direct pass through to end users, reduce driver wages, or by making the market less competitive for goods movement.

The Freight Market and Infrastructure in the New York City region

In New York trucking is the main way of moving cargo brought into the region and much of the truck movement is going to and from marine terminals. Over 90% of freight movement in the New York metropolitan area was by truck in 1998, two times higher than the national percentage. “For the transport of goods originating in or destined for the NYMTC region counties (not including regional through movements), the truck modal share for commodity flows by weight accounts for 73%, while water transport accounts for 26% and the remaining 1% is split between air and rail mode.” ((New York Metropolitan Transportation Council 2001) p. 6)

A recent report notes some of the unique features of the New York freight market, namely a substantially higher percentage of locally consumed cargo processed at the Port of New York

as compared with other major US container ports; a 15% share of the cargo handled by rail; 60% of cargo moving to the four surrounding New Jersey counties, much of which is transloaded for delivery in New York and other northeastern cities; 4% of this moves to locations within 260 miles to nearby destinations in NY, CT, PA, MA, and RI., with another 15% to U.S. locations beyond 260 miles such as Pittsburgh, Cleveland, and Buffalo and another 3% to Canadian locations such as Montreal and Toronto. The high share of local consumption means a predominance of landside access by motor carriers. [(Tioga Group 2009), pp.8-9]

Table 1 shows outbound truck traffic from one of the major container terminals in the area, the Global Marine Terminal and the New York Container Terminal (NYCT). The source of this data is outlined later in the paper. These data confirm the more general nature of the New York freight market, namely its focus on movements between New York and New Jersey. The vast majority of trips out of Global Terminal and the NYCT are to and from these two states.

Table 1: Outbound Freight Destinations from the Port of New York and New Jersey

	Port			
Destination	Global		NYCT	
	Trips	Share	Trips	Share
Canada	90	2.5%	14	0.4%
Alaska	1	0.0%	0	0.0%
Connecticuit	41	1.1%	32	1.0%
Delaware	7	0.2%	6	0.2%
Georgia	0	0.0%	1	0.0%
Illinois	1	0.0%	0	0.0%
Massachusetts	81	2.3%	56	1.8%
Maryland	10	0.3%	6	0.2%
Maine	6	0.2%	3	0.1%
Missouri	1	0.0%	0	0.0%
New Hampshire	1	0.0%	0	0.0%
New Jersey	2813	78.6%	2607	82.5%
New York	311	8.7%	211	6.7%
Ohio	13	0.4%	6	0.2%
Pennsylvania	125	3.5%	180	5.7%
Rhode Island	4	0.1%	6	0.2%
Tennessee	1	0.0%	0	0.0%
Texas	2	0.1%	0	0.0%
California	0	0.0%	7	0.2%
Wisconsin	2	0.1%	0	0.0%
Missing	69	1.9%	25	0.8%
Total	3579		3161	
NY& NJ	3124	87.3%	2818	89.1%

Figures 2 and 3 provide an overview of the spatial analysis of the port origins and destinations as noted above. It is interesting to note the wide range of origins and destinations around the region and even into Canada. The high frequency of trips in the immediate local region are of significant interest to regional planners to understand the impact of tolls a component of total costs for port maritime commerce activity. The vast bulk of New York/New Jersey container traffic has local destinations for at least the initial leg of trip and trucks dominate this traffic. The question is why. Does this pattern reflect an economically efficient activity outcome? Or are there factors, such as infrastructure limitations, that help lead to this pattern in regional freight movement? In particular how might area road pricing policies drive route choice and movements?

Figure 2: Origins and Destinations of Truck Drayage for New York Container Terminal

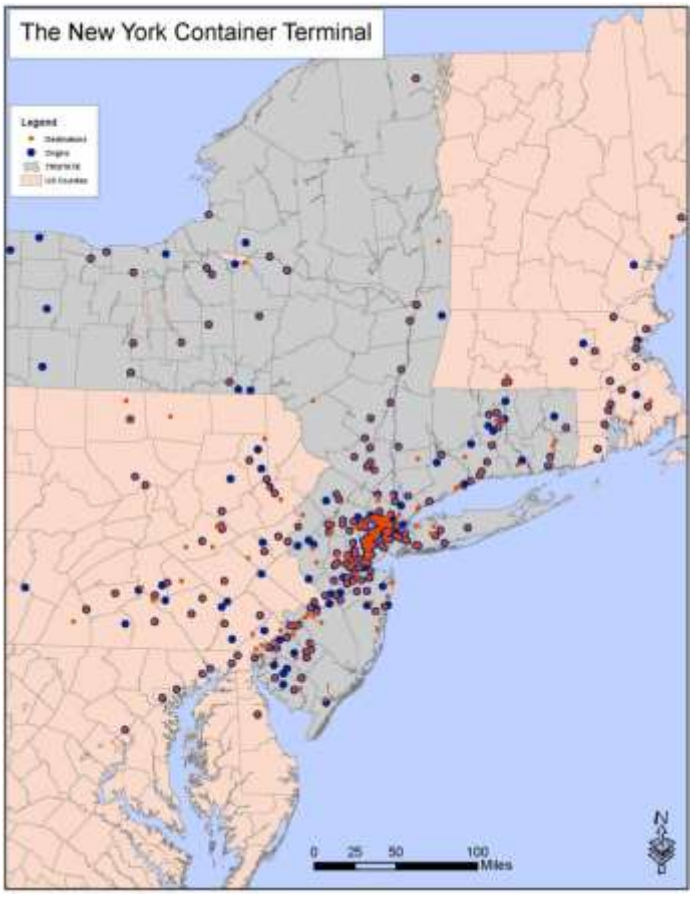
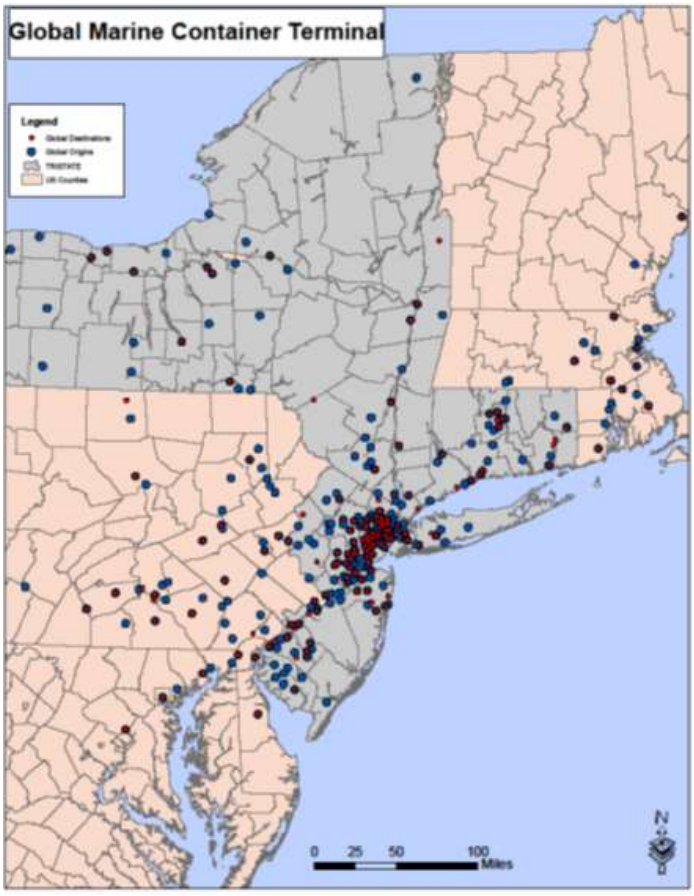


Figure 3: Origins and Destinations of Truck Drayage for Global Marine Terminal



The shipping and carriage decision conceptually

The decision of where to ship things is a dynamic balance between supply of the final good and the location of the demand for that good. Suppliers will seek to maximize profits (total revenues minus costs) and will arrange the whole variety of their operations, from facility location to distribution, to achieve that aim. Transport is traditionally seen as a derived demand, that is, not as an end in itself but a means to an end. So minimization of transport, and the inherent costs associated with it, will be a key objective of suppliers when meeting final demand.

This paper does not undertake a full-blown cost modeling and analysis of truck freight movements around the New York metropolitan region. Nonetheless some conceptualization is useful in considering how tolls might change freight flows.

To that end the simple inventory-transport tradeoff model developed by Baumol and Zinod ((Baumol and Vinod 1970)) is a good starting point. This model posits total annual cost (TAC) as consisting of four major parts: the sum of cycle inventory holding; ordering cost; the

cost of owning goods in transit; transportation expense. This can be expressed in the following equation:

$$TAC = (Q*v*W/2) + A*(D/Q) + t/365(D*v*W) + T*D + S*v*w \quad (1)$$

where:

TAC = Total Annual Cost

Q = Order Quantity

D = Annual demand

v = Unit price of the goods

w = Holding cost expressed as a percentage

A = Unit cost of an order

t = Time in days for transport

T = Per unit transportation cost

S = Safety Stock

This model leaves many things out since it is primarily an inventory rather than a production model but it does form the basis of much logistics and supply-chain management analysis and decision-making. What is of most interest for this paper are the terms D, t and T. The New York region is an area of large final demand so D is going to be a major driver of shipping and carriage. However expensive or difficult it is to get to and from the region, a large amount of goods will be moving there because of the presence of so many consumers.

But it is difficult to be a trucker operating in New York/New Jersey and this is where t – transport time – and T – per unit transportation costs – enter in. And the focus of this paper being tolls, T is the key variable.

General trucking industry practice regarding tolls

In the logistics and supply chain world shippers are the ones asking for transport services and carriers are the ones providing those services. There are cases where shippers and carriers are unified, such as a food purveyor that operates its own fleet of delivery vehicles. But more commonly carriers are separate entities devoted to carrying other people's goods.

The trucking industry is segmented into many different fleet sizes - from large fleet operators down into small individual owner-operators. There is also a distinction between long-haul operations and drayage, the latter usually involving journeys of less than 75 miles. What is

common across these segments is that the catch-all category of various fees and charges that fall outside core transport expense, known as 'accessorials' (Cassidy 2011), which are typically not charged to shippers directly but are absorbed either into stated carriage rates (more often the case with large fleet operators) or eaten by the carrier (very often the case with small fleets and owner-operators) ((Wood 2011)).

Tolls are an example of accessorials and there are two main ways to deal with these: avoid them or pay them. Long-haul carriers often can avoid them, except when coming into destinations of final consumers where they may be unavoidable (though these final legs to consumers may well be done by drayage firms). The size of the toll relative to the total transport cost can be a determinant of whether a carrier will re-route a shipment. Of course this will only be done if the toll cost is greater than additional time and operating cost that diversion incurs.

A recent NCFRP study (Wood 2011)) indicated that tolls are a factor for truck carriers, but not a major factor, in most areas of the US. Large carriers can spread them across scale economy savings which can be easily either passed on to the shipper in rates bumped up by very small amounts, or absorbed without much bottom-line impact. They are more problematic for drayage and owner-operators, though the impact depends upon how high the toll is. Considering that the "last mile" section deliveries accounts for between 13% and 75% of the total logistics costs (Macharis and Melo 2011), tolls can dramatically affect the overall costs of shipping goods.

An example from the NCFRP study comes from surveys of trucking firms of various types operating throughout the US. One US region with high tolls overall is the Northeast and a major carrier with 6,000 trailers and revenues of $400 million per annum reported paying $1 million in tolls in 2009 ((Wood 2011), p. 13). Even in a region with high road tolls, while widely despised by the industry, they are often a relatively small component of operating costs. Based on data from the American Transportation Research Institute, tolls typically were 2 cents of the $1.71 average per mile operating costs of trucks – or about 1% of costs.

Except, perhaps, in the New York City area. This same firm reported charging a flat amount of $130 to go anywhere in Manhattan and to include the toll for crossing the George Washington Bridge explicitly to any shipper whose goods required passage across that bridge ((Wood 2011), p. 13). Further confirmations of this fee differential have been confirmed via posted drayage rates and also from industry experts – with a $120 toll surcharge for Staten Island port deliveries.

Even drayage firms seemed to follow this practice. Though they have much less market power and fiscal absorptive capacity than large long-haulers, the George Washington tolls are high enough that one carrier felt the need to make an exception to their usual practice of just rolling tolls into rates which did not fully reflect total costs and to invoice shippers for the toll. Unfortunately this same carrier reported that 15% of these invoices were unpaid and had to be

written off ((Wood 2011), pp. 14-15). So, there is some complexity as to who actually gets burdened with toll costs – formally billed and paid or as a residual unpaid cost.

In fact, long-haul carriers do have more options when it comes to toll avoidance and many of them may be avoiding both locations behind the toll walls of New York City proper and those around the major terminals in the area. There are many available software packages to calculate minimum distance-minimum toll routes that these carriers use ((Wood 2011), p. 17) and many of these may well suggest that these firms avoid New York/New Jersey destinations altogether and leave what they can to the unfortunate owner-operator drayage truckers.

Road pricing and freight in New York

The Port Authority of New York and New Jersey (PANYNJ) operate a broad range of public facilities in the New York Metropolitan Region – in an area defined as a 25 mile radius from the Stature of Liberty. These include airports, real estate projects, regional development, toll bridges and tunnels, maritime ports and mass transit systems. The PANYNJ operates based on a revenue-based system, where income from various projects is utilized to support bond issues that provide the capital for major projects. In recent years toll rates for PANYNJ (and MTA with interborough trips in New York) facilities have increased sharply, leading to considerable interest in the impact of tolling on regional port commerce. The container ports located east of the PANYNJ toll facilities in New York City – the container facilities in Brooklyn (AKA Red Hook Container Terminal) and Staten Island (The New York Container Terminal – AKA Howland Hook) are only are accessible from the west only through the use of toll bridges – unless one wishes to add over 300 miles to the trip to cross the Hudson River by the Dunn Memorial Bridge at Albany [2]. In addition, these tolls are set considerably above the cost of operation for these facilities, with the PANYNJ toll facilities charging $1.034 Billion in 2011 and a reported cost of operation of $554 Million with a resulting profit of $490 Million each year (46.9% surplus).

In sharp contrast, the major container port facilities are currently located in New Jersey along the I-95 Corridor of the New Jersey Turnpike. While the New Jersey Turnpike is a toll facility, it serves as the exclusive main north-south highway corridor in the region. As such, cargo that enters this corridor from Newark (Exit 14) in the North to Elizabeth (Exit 13) in the South has entered the major freight corridor for the New York maritime freight market. As such, the main maritime terminals of Port Elizabeth and Port Newark can enter this key corridor with no additional costs. Freight arriving from other locations – either in Hudson County (Global Terminal) or across the Hudson in New York City (New York Container Terminal (NYCT) or Brooklyn Terminal) is likely to have additional toll costs in the range of $22.50 to $130.00 for each round trip. These costs represent a significant component of the port drayage costs and appear to present a significant cost barrier to certain port facilities.

To evaluate the impact of tolling on regional port competitiveness in the New York and New Jersey region, the authors utilized the highway network from the National Transportation Database (NTD) and loaded the data into the Transcad® software to calculate road network distance by county centroid for every county in the United States from the Ports of Baltimore, Norfolk and New York/New Jersey. For New York/New Jersey port activity, we further subset the distance data for the major container terminals in the region: Port Elizabeth/Newark, Global Terminal (Hudson County), New York Container Terminal (Richmond County) and Brooklyn Container Terminal (Kings County).

Trips were then priced based on the reported average ton mile cost for freight as reported by Delcan Corporation based on the Cass Freight Index for freight movements into the ports of New York, Baltimore and Norfolk. Based upon the distance traveled and the rates for rail and truck transport, the authors were able to estimate the cost of delivery to counties either by rail or truck from the three ports in general. The freight cost per ton-mile are shown in Table 2 below (see (Systems 2013)). These data suggest that the New York area ports are substantially more expensive than other ports along the Atlantic for both rail and truck movements.

Table 2: Ton Mile Rates from Cass Freight Index

Port Area	Rail Cost	Truck Cost
New York Metro	$ 0.79	$ 1.36
Baltimore	$ 0.56	$ 0.66
Norfolk	$ 0.52	$ 0.66

We then further developed a general toll pricing algorithm to more accurately reflect the regional variation in toll prices on freight movements in and around the Port of New York. The toll prices are based on an estimated blended rate of travel due to some level of variation in price by method of payment (cash versus electronic toll payment). In addition, some additional variation in price would be driven by axle count as well as time of day price variation on Port Authority Bridges and Tunnels for electronic toll payers. Rates were applied as surcharges to the calculated Cass Freight Index cost to more accurately reflect the regional variation in prices by area for various port destinations.

The toll costs per trip were pro-rated on a ton mile basis for trips in the region and applied to the various port facilities. Toll burden was priced based on origin/destination point relative to a particular port facility. Port moves that reflected no marginal toll costs were priced accordingly (say from the Brooklyn Container Terminal to Suffolk County in Long Island – $0 toll cost) and moves that faced multiple toll barriers were repriced as well (for example Brooklyn Container Terminal to Monmouth County, New Jersey - $115 dollars in toll cost). Table 3 provides the general toll costs for freight moving from various NY Metro port facilities to the Mainland of the United States in New Jersey based on this method. Further toll costs would result if certain routes were selected – but these impacts are the very short haul distance impacts of New York metro tolls. Table 3 provides the local toll costs for 5 axle trucks for each major NY/NJ terminal.

Table 3: Toll Rates from Select New York and New Jersey Port Facilities to Mainland

Port	PANYNJ	MTA Bridges	NJ Turnpike	Total	$ per Ton
Brooklyn	$ 55.00	$ 60.00	$ -	$ 115.00	$ 4.60
NYCT	$ 55.00	$ -	$ -	$ 55.00	$ 2.20
Global Terminal	$ -	$ -	$ 11.25	$ 11.25	$ 0.45
Port Elizabeth/Newark	$ -	$ -	$ -	$ -	$ -

The authors were then able to classify the optimal port for a given county based on the Cass Freight price, county distance from a given port and toll costs. Figure 4 provides an example of the optimal port for freight moving by truck in terms of costs to various points in Massachusetts, Connecticut, New York, New Jersey and Pennsylvania.

Figure 4: Lowest Cost Port by County – Truck Freight

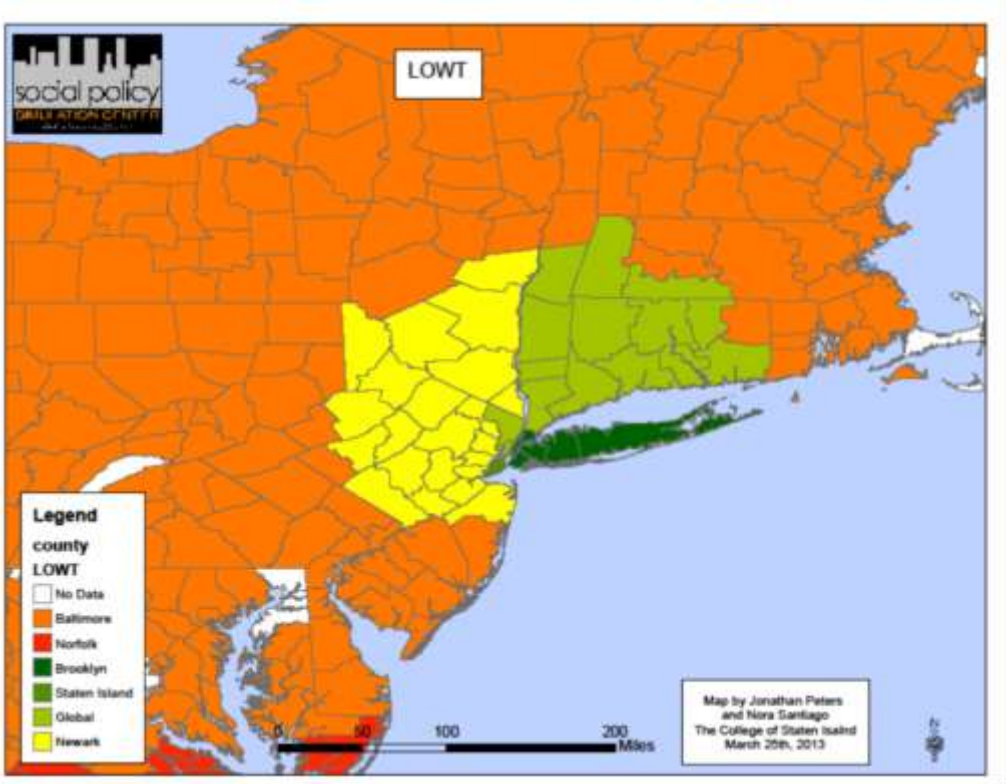
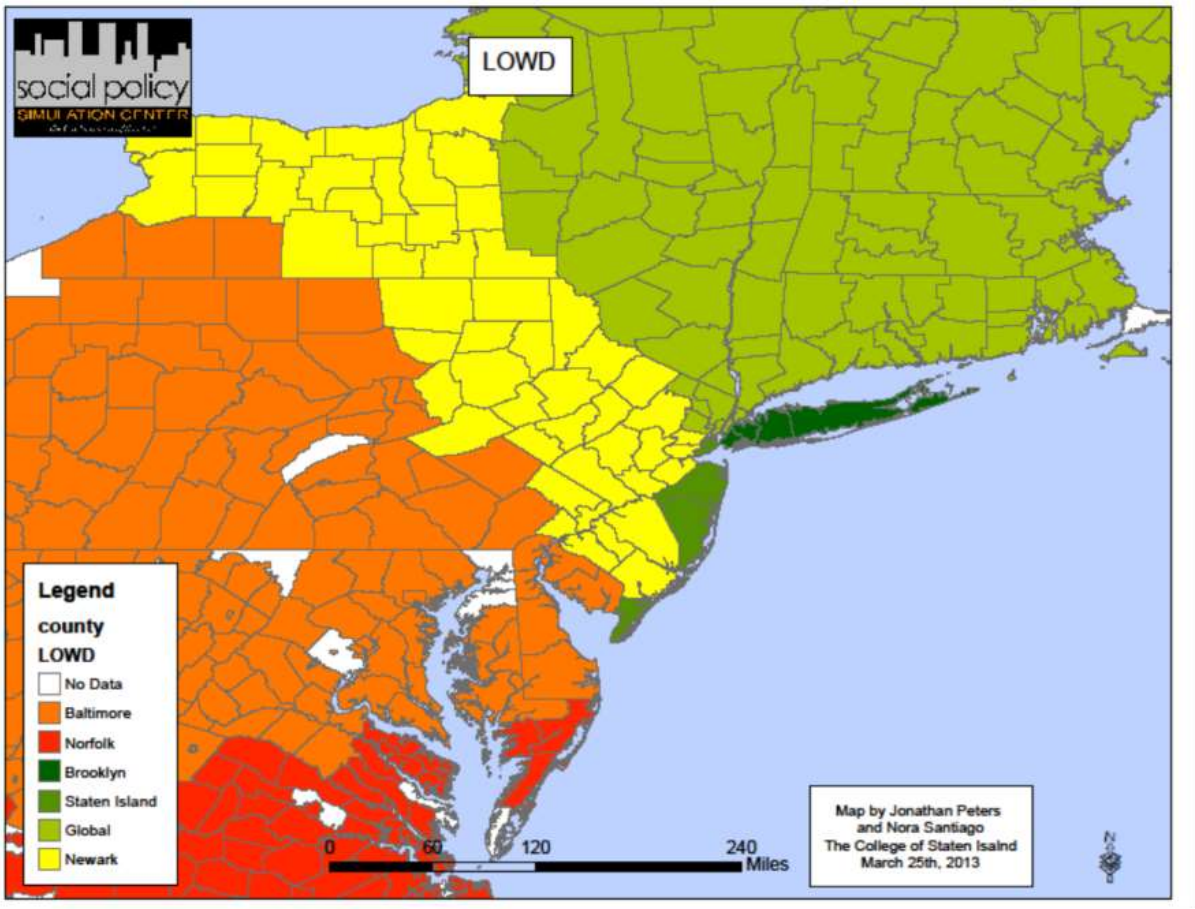


Figure 4 allows us to understand both the minimal route distance to any particular county in the Northeast region as well as the toll impact on the price of freight movements. The results here sharply contrast with the carbon footprint minimizing distance for truck freight (longest sea transport trip and then shortest truck haul from port). The areas shaded in yellow and light green are counties served via minimum total cost from Newark and Global ports, respectively. The area shaded in orange is best served via the port of Baltimore, which is approximately 180 miles southwest of Newark. Figure 5 provides the minimal distance port for each county in the Mid-Atlantic region. As you can clearly see, the port of Elizabeth/Newark should optimally serve the

Northern Tier of New York State as well as most of New Jersey. Global Terminal is in a dead heat with Port Newark to serve Western New England. Taken together, Figures 4 and 5 suggest that road tolls dramatically alter the lowest cost trucking routes for destinations throughout the Northeast US, and that when accounting for road tolls the Ports of New York and New Jersey are competitive within the metro area but substantially less so for truck trips outside of the region.

Figure 5: Minimum Distance from Mid-Atlantic Ports



Adding freight tolls to the mix radically reduces the low cost shipping shed for New York Metro Ports to basically the Greater New York Metro region and Southern Connecticut. The New York Container Port and Brooklyn Container Terminal are basically made uncompetitive by the toll facilities, with NYCT having a single low cost county (Richmond – only 480,000 people in terms of population) as compared to other terminals and the Brooklyn Container Terminal having competitive truck price advantage only for freight destined for New York City (excluding Richmond County) and Long Island. While large in terms of population, these markets are about one-fifth of the regional market that is beyond the toll barriers to the west of these port facilities. In addition, the high cost of moving across these toll barriers is expected to undermine the competitive position of these port facilities as maritime shipping firms as well as major freight

customers operate on a global scale with complex ship and cargo movements coordinated across nations and regions. Tolls this high relative to other tolls in the region and across the country are likely to have some effect on freight movements by truck into and out of the region. The question is in what way and how much? The answer can be found by looking at theory, industry practice and specific data for the region. All of this is done next.

The Data

In response to the PANYNJ toll increases in July 2011, the operators of the NYCT in partnership with the PANYNJ (their landlord) commissioned a joint study of the impact of these tolls and their recent increase on the competitive position of the NYCT. The study was funded equally by the NYCT and the PANYNJ, however, the PANYNJ required the NYCT to abide by a non-disclosure clause in the contract and the release of the report and the data to the public was subject to PANYNJ approval. The study was performed by SY&CC LLC and was completed in May 2012. The release of the report was subject to a Freedom of Information Act Request from NYS Assemblywoman Nicole Malliotakis. The PANYNJ refused release of the report and the request was the subject of a NYS Superior Court case. During that process, the authors received a copy of the raw data to assist in the Freedom of Information Act case and in January 2013 the report was released to the Assemblywoman. During this period, it was announced that the NYCT was expected to close due to the high differential in costs of freight trips into and out of that facility relative to the New Jersey Port facilities caused by the high toll costs.

In reviewing the data, the authors identified a number of additional measures of freight outcomes that may be of interest to the practitioner and research community. In general, with modern GPS tracking, firms can be informed as to the location of their trucking, but load status and destination is generally of not available for researchers to examine in detail. In addition, the sharp division of the port facilities in New York between various toll regimes offers the research community an opportunity to study the impact of tolls on regional freight movements and the relative cost of using freight facilities in urban regions with tolls.

The survey contained 6,740 observations collected from February 27 to March 2 2012 at two facilities – the Global Marine Terminal in Hudson County and the New York Container Terminal in Richmond County (the Borough of Staten Island). The gate security personnel conducted the survey and it has a number of limitations as indicated by SY&CG (2012). The data also provides a significant amount of information regarding the origin – destination of the regional freight movements at the New York Metro port facilities. The data surveyed roughly 40% of the truck freight activity that occurred at these facilities during the sample week.

The Global and NYCT Terminal handles roughly 8% each of the regional container traffic – with the major port facilities in Elizabeth and Newark – who handle roughly 77% of regional container freight. The Port of New York and New Jersey ranked as the 24th most busy container port in the world according to the Association of American Port Authorities with

5,503485 TEU's (twenty foot equivalent units) in 2011 (third in the U.S. behind L.A. and Long Beach). According to MARAD (the U.S. DOT Maritime Administration), in terms of ship calls, LA/Long Beach was first in terms of containership calls with 2,610 calls in 2010, NY/NJ was second at 2,421 and the Virginia Ports a close third at 1,908.

Further analysis of the data allows us to identify a number of metrics of performance as related to truck freight including the origins of trucks arriving at the port facilities, their arrival trailer and load condition and their departure trailer and load condition. Many of these basic statistics are reported in then SY&GC LLC (May 2012) report. Of key interest are the spatial aspects of the data, where we can examine the percentage of trips that originate and terminate in the same locality. We can also examine the relative scale of the haul of trucks leaving the port areas.

As is clearly observable in Figures 2 and 3 above as well as Table 1 above, the origin and destination mix from both container ports is heavily skewed towards local traffic. As such, the overall length of haul for port related trips is generally short in distance. This is important as we consider the relative impact of toll costs on the overall cost of a port related trip as well as the impact of various toll surcharges on the decisions of various port related firms and operators – be they shippers (people or firms who send goods through the port), maritime ship operators, port drayage firms and the owner-operators who tend to own and drive the port drayage trucks.

Of the survey reported, 2066 of the New York Container Terminal and 2455 of the Global Terminal data were represented by bi-directional matching trips – beginning and ending in the same county – so 67.1% of trips into and out of the maritime ports were roundtrips. Of these roundtrips, 81.8% of the roundtrips began and ended in New Jersey. A greater share of round trips to and from New Jersey occurred at NYCT (84.7%) as compared to Global Terminal (79.4%) – making the NYCT traffic more dependent on New Jersey trips as compared to the Global Terminal. Table 1 above provides the relative importance of New Jersey as an origin and terminal point for these two port facilities.

Transport cost impacts of New York City area tolls

Table 4 provides calculations based on two port areas –New York Container Terminal (Howland Hook) and Global Marine Terminal based on data from the American Transportation Research Institute (see (Institute 2012)). The cost of tolling for the NYCT trips represents over 50% of the overall cost of operating a 20 mile trip for a regional freight trip, and nearly double the cost of a similar trip from a New Jersey port facility to the mainland of the U.S. While this estimated is based on a naïve model of a truck trip in and out of the container port, these estimates represent a useful structural analysis of the impact of tolling on regional business location decisions. As such, one can see that firms would react to this cost per trip as a significant segment of their business cost.

Table 4: Toll and Operation Cost Estimates for 20 Mile Trip from New York Area Ports, 2011

Cost of Operations	Average Cost per Mile	U.S. Average Total Costs	U.S. Average % of Costs	To and From Global Total Costs	To and From Global % of Costs	To and From NYCT Total Costs	To and From NYCT % of Costs
Vehicle Based							
Fuel and Oil	$ 0.59	$ 11.90	35%	$ 11.80	27%	$ 11.80	14%
Truck/Trailer Lease or Purchase	$ 0.19	$ 3.78	11%	$ 3.78	9%	$ 3.78	5%
Repair and Maintenance	$ 0.15	$ 3.04	9%	$ 3.04	7%	$ 3.04	4%
Truck Insurance Premiums	$ 0.07	$ 1.34	4%	$ 1.34	3%	$ 1.34	2%
Permits and Licenses	$ 0.04	$ 0.76	2%	$ 0.76	2%	$ 0.76	1%
Tires	$ 0.04	$ 0.84	2%	$ 0.84	2%	$ 0.84	1%
Tolls: General	$ 0.02	$ 0.34	1%	$ 0.34	1%	$ 0.34	0%
Tolls: Bridges				$ 8.97	21%	$ 48.22	59%
Driver-based							
Driver Wages	$ 0.46	$ 9.20	27%	$ 9.20	21%	$ 9.20	11%
Driver Benefits	$ 0.15	$ 3.02	9%	$ 3.02	7%	$ 3.02	4%
Total Costs	$ 1.71	$ 34.12	100%	$ 43.09	100%	$ 83.34	100%

Note: Estimates are of overall cost of a 20 mile trip. General operating costs from 2012 ATRI Average Carrier Costs per Mile. Calculations by Jonathan Peters.

Further analysis of the total cost of freight operations is necessary to allow us to understand the total cost of freight and warehousing. But it certainly appears that for trucking operators who work within this region, the location of port facility can have a major impact on total costs for a trip simply because of toll barriers that must be passed to get to it.

Diversionary impacts

The simple tradeoff for carriers is between transport cost and market area: the lower the transport costs, the greater the market area, all other things being equal. Tolls tend to be a relatively minor transport cost component in much of the US but a significant one on certain facilities in and around New York City metro. Road pricing is inherently good if used (1) to allocate scarce capacity to the users most willing to pay (and hence, it is assumed, with the greatest productivity since they have the highest value of time); and (2) to achieve social and environmental goals by pricing things underpriced or unpriced by the market, such as an externality like pollution.

Of course tolls will have a distortionary impact in the form of making some attractions more or less attractive than others. This shows up in the form of trip diversions. These have a cost to society but hopefully the benefit of the toll in the forms indicated above outweigh these costs (to say nothing of the use of the toll revenues which, if invested properly, should generate

additional social return). However as we can see, tolls also have the potential to cause distortionary impacts on optimal routes if toll rates are greater than direct cost for road services or congestion and other ports areas are free of such charges.

This paper does not directly analyze social cost and benefit. But it does, using the dataset available here, do some analysis of freight shipment patterns and then considers how the tolls are likely affecting these flows. Then some conclusions can be drawn about the relative social benefit that might or might not be accruing. Figures 6 and 7 show potential markets for carriers in the northeastern United States by cost by port facility. Figure 6 shows the potential markets for each port if carriers seek to minimize distance traveled, and Figure 7 shows the markets for each port if the carriers seek to minimize the tolls paid.

Figure 6: Estimated Low Cost Truck Coverage by Distance

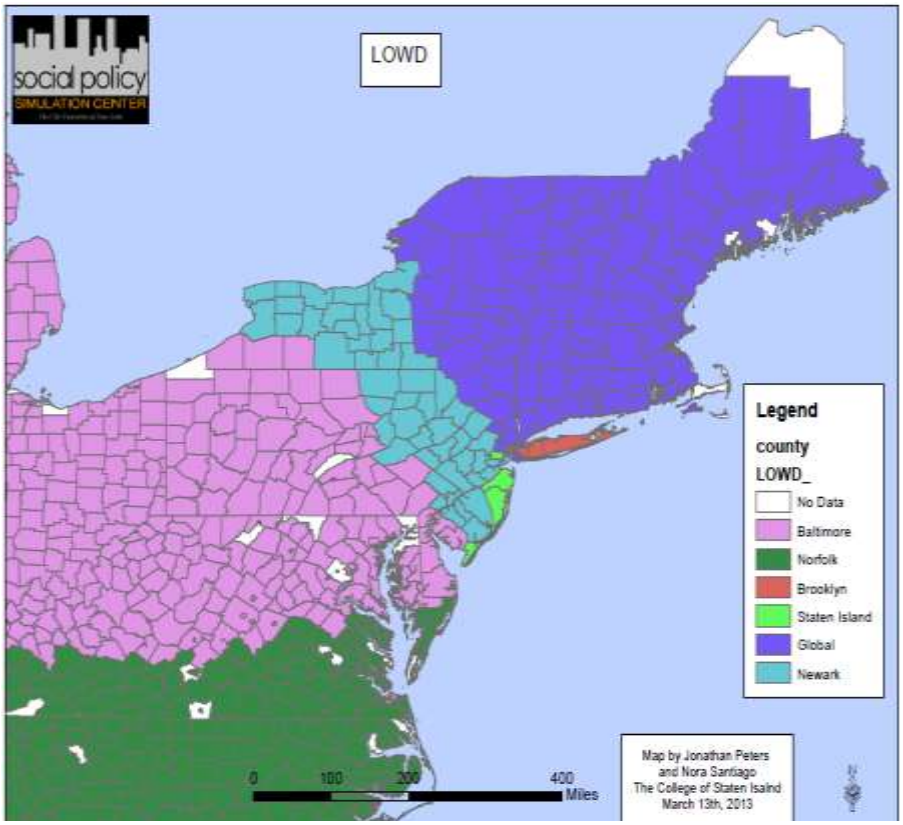
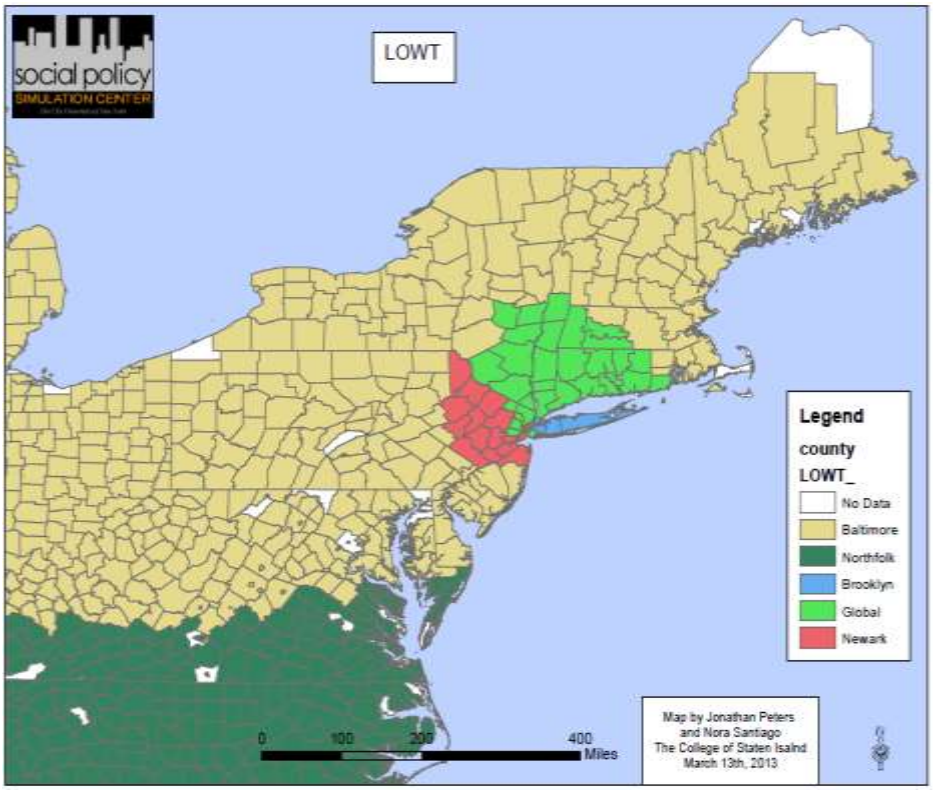


Figure 7: Estimated Low Cost Truck Coverage by Toll Amount



The story that these maps tell is striking. First, in Figure 7, the major terminals in New York and New Jersey service a relatively narrow number of counties closely clustered around areas of final demand. This pattern is consistent with freight origin-destination data examined earlier. It does suggest that the metropolitan area focused mainly on servicing the local area rather than being a major transhipment or freight servicing function.

Narrowing down on more specific areas and facilities, the patterns become more distinct. Brooklyn clearly could serve Long Island. Newark serves mostly Northern New Jersey. And Global serves mostly Connecticut and greater downstate New York. This is based on potential road costs – this may conflict with maritime transport costs or shipper corporate goals for regional distribution centers. These maps make clear that road tolls may dramatically affect the cost of trucking to the final destination, and tolls have the potential to affect shipping decisions across the region.

Conclusions

The analysis here indicate a few important points about the effects of tolling on urban freight trucking movements and operations, both in the New York region and in urban areas more generally, This research used unique survey data collected from truckers using the Port of New York and New Jersey to explore how road tolls influence route choice and affect shipping prices. The analysis shows that when tolls are accounted for the Port of New York and New Jersey is associated with higher trucking costs for all trips except those in the immediate vicinity of the city. The implications of this include larger environmental footprints for goods as trucks and carriers may shift activities to more distant ports to access larger markets with fewer tolls, such as entering through the Port of Baltimore to truck goods to upstate New York.

Tolling should lead to more efficient use of existing road and freight terminal capacity. But the evidence presented here clearly shows that tolling in the New York area creates marked inefficiencies in capacity utilization. High toll barriers artificially segment the freight market, create significant diversions, and may lead to under-use of some terminals and transhipment points relative to final markets and over-use in others. It is clear that existing tolling in the New York area is not designed from a network freight traffic flow perspective and that it should be. This is likely to be the case in many other US cities though the problems there may not be as intense because average tolls there are typically lower.

Although not explored in detail in this paper, our evidence suggests that existing tolling in New York also distorts the way in which carriers structure their trucking operations. Nationwide the trucking industry is divided into long-haul and drayage operators but the bifurcation between those two segments is especially acute in New York where long-haul operators, typically much larger in scale and market power, almost completely shun drayage and leave it to small operators who specialize in that business locally. Large urban areas such as New York would see some of this sort of market structure without tolls because of the high time and incidental operating costs present there, but tolling of the magnitude seen in this region exacerbates the problem. The effects of tolling on freight operations is something that bears more close study and something that toll setters should keep in mind when designing and imposing road tariffs.

This work also suggests a number of avenues for future research that are presently under-considered in the literature. First, the literature on freight operations does not typically consider the burden of tolling with respect to the ability to bear it. It is, however, an important issue and the evidence presented here suggests that small independent operators and very small fleet operators in New York are 'eating' more of the toll than larger carriers with more market power. In fact, some of these small operators, especially on Staten Island, may be absorbing the entire cost of the toll and not recovering it through charges to shippers. On top of low priority given to many such operators at terminals, small truckers may be very disadvantaged in terms of toll cost bearing.

Second, the environmental impact of toll facilities may be larger than we think. Diversionary freight movements, high idle times at terminals, excessive dead-heading: all these create significant externalities such as increased emissions of particulates, carbon dioxide and greenhouse gases. Tolls in theory should seek to internalize some of these costs. The evidence here suggests that they are in fact quite possibly increasing such costs.

Lastly, tolls may be locally desirable for financing infrastructure or managing congestion, but these prices may also represent an implicit industrial policy. This paper does not examine the linkage between toll-induced changes in freight flows and investments in terminals and warehouses and corresponding changes in local economic structure and land-use. Nor does it examine the purposes to which toll revenues are put by the agencies collecting them. However, in New York a significant amount of revenues are being raised and then spent and a significant effect on the freight sector is being observed. This surely is having some impact on the way land-use and economic activity is structured in and around the city. Is this leading to an implicit yet unconscious sort of industrial policy in which some sectors are favored by being on the 'right side' of toll barriers (and toll proceeds usage) and other are disadvantaged by being on the 'wrong side'? This is a provocative statement but it does merit deeper study both in New York and elsewhere.

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[1] Most transport investment and planning focuses on the movement of people, and in many cases a primary goal of transport policy is to reduce personal travel through reductions in Vehicle Kilometers Traveled (VKT) and auto trips, and road pricing is promoted to internalize many of the external costs associated with automobility. Some of the reductions in auto travel are substituted with increases in goods movement through Internet shopping and home deliveries. Ultimately, current trends and policies suggest that freight travel will grow as a share of overall travel in urban areas and policymakers and planners deserve a fuller understanding of the implications road pricing has on goods movement.

[2] The PANYNJ is the residual owner of the World Trade Center site and in the wake of the events of 9-11, the agency has had significant financial challenges. The debt load on the organization ballooned from 9.1 Billion in 2001 to 19.5 Billion in 2012 (Navigant 2012). As such, the agency was under considerable pressure to raise revenue and a series of toll increase were instituted in 2011 along with other fees to provide additional revenue to the agency. Considerable controversy has revolved around the use of this toll revenue, as by state ruling, toll revenue is supposed to be channeled into regional transportation projects, not other services – such as real estate development (AKA for PANYNJ – The World Trade Center Site).