

# Container ports, local benefits and transportation worker earnings

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**Abstract** Over the past 50 years, containerization has both enabled and reflected the articulation of increasingly concentrated and complex global trade flows. Once close infrastructural, economic and institutional ties between seaports and port cities have been loosened, since major ports now serve producers and consumers in widely dispersed hinterlands. This process has been especially intense in North America, where west coast ports serve markets across the continent. At the same time, many of the external costs of increased port activity are incurred in port cities. Hence, questions about the changing nature of employment in port and related goods-handling sectors have become increasingly important for understanding the share of economic benefits received by port cities. This paper focuses on the effects of containerization, and related changes in transportation regulation, on port-logistics worker earnings in major United States port cities since 1975. A difference-in-differences framework is used to examine the relative annual earnings of dock, trucking and warehouse workers in major container port cities. The analysis shows that, with notable exceptions, port-logistics worker earnings in major container ports are not necessarily higher than those of comparable workers. The findings provide further

insights into the strained relationship between seaports and port cities in the era of containerization and economic globalization.

**Keywords** Containerization · Dockworkers · Earnings · Port cities · Trucking · United States · Warehousing

## Introduction

Over the past 50 years, the container has both enabled and reflected the articulation of increasingly concentrated and complex global trade flows (Levinson 2006). The process of containerization is controversial, in large part because its effects are so intensely geographical (Herod 2001). Containerization's negative effects on localities, visible in costly infrastructure development, congestion and pollution have been significant and highly uneven (McCalla 1999; Hesse 2006). At the same time, once close infrastructural, economic and institutional ties between ports and their traditional city-regions have been loosened, since major ports now serve producers and consumers in widely dispersed hinterlands. These processes have been especially intense in the United States, which is the geographic focus of this paper. As the local and regional economic linkages embodied in the goods that are shipped through ports have been loosened, questions about the changing nature of employment in port and port-related sectors have

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become more salient. It is thus important to examine employment in goods handling sectors in port cities, because this goes to the heart of understanding what share of the economic benefits of containerization are received by the residents of port cities.

This paper focuses on the effects of containerization, and related changes in transportation regulation, on port-logistics worker earnings in major United States port cities since 1975. The scope of the paper is general; it seeks to identify changes in relative annual earnings over a long time period and across a wide geographic area, rather than seeking to identify labour market processes and outcomes in specific places. The analysis builds on previous research on the effects of deregulation on relative hourly and weekly earnings in the transportation sector, adding an explicitly spatial component to the analysis. This literature is reviewed in the next section. The third section contains a brief discussion of the data used in the study, followed by an introduction to the framework that is used to compare earnings for dock, trucking and warehouse workers in major container port cities. The results of the difference-in-differences and earnings model are then presented in two sections. They show that, with notable exceptions, port-logistics worker earnings in major container ports are not necessarily higher than those in other locations. The findings provide further insights into the strained relationship between seaports and port cities in the era of containerization and economic globalization.

### Containerization and transportation worker earnings

The relationship between seaports and port cities has been profoundly altered by the processes of containerization since the 1950s and, more recently, by the rise of global freight logistics. This is especially the case in North America, where west coast ports now serve as continental gateways. It is not that seaport gateways have ceased to be sources of great added value; rather it is the nature and geographic distribution of those benefits that is of central concern here. Before containerisation, ports in the developed world were all closely related to a clearly identifiable port-city and hinterland. Large numbers of unskilled men, typically from neighbourhoods close to the port,

found work loading and unloading cargo. The huge efficiencies afforded by containers loosened these highly local economic ties over 30 years ago. For example, Levinson (2006, p. 274) reports that between 1963 and 1976, total longshore hours worked in New York City fell by three-quarters.

These quantitative changes in port employment were accompanied by, and indeed shaped by, the strategic responses of both employers and workers. It is also important to recognise that these changes in port-logistics employment and geography are closely related to wider processes of economic restructuring, and in particular, the emergence of global value chains and production networks (Dicken 2003). Transport geographers have wrestled with how to conceptualize and study contemporary seaports, which are place-bound infrastructure nodes at the nexus of several intersecting and competing global supply chains (see Robinson 2002; Olivier and Slack 2006; Hall and Robbins 2007). Herod's (2001) work on the geographical implications of containerization for the organization of longshore labour on the US east coast shows how new transportation technologies and organizational forms allowed employers to experiment with ways of reducing labor costs, while providing workers with new opportunities of organizing along supply chains.

Another consequence of containerisation was intensified competition between ports. Container carriers enjoy enormous economies of scale, and so they seek to visit fewer ports in a given port range. For example, several trans-Pacific services to the North American west coast visit the Ports of Los Angeles and Long Beach and only one other port before returning to Asia; the competition between Oakland, Portland, Seattle, Tacoma and Vancouver (British Columbia) to be that other port is intense. Win or lose, port authorities have been left feeling that they were mere "pawns in the game" (Slack 1993). Competition between ports also places great demands on localities—including employers and workers—to respond creatively and rapidly (McCalla 1999). The flip side of intense competition between ports for ship calls is intense competition to serve the shared hinterland. North American west coast ports have been competing with each other, and indeed with east coast ports, for over 25 years to discharge cargo destined for locations across the continent. Notteboom and Rodrigue (2005) have argued that

port development has become increasingly regionalized on both sides of the north Atlantic as port authorities and terminal operators have sought to secure access to their hinterlands through a variety of infrastructure investments.

One of the most palpable manifestations of these competitive changes in the shipping industry is the concentration of cargo flows in a smaller number of ports. The first two columns of Table 1 trace how just three ports in the United States—Los Angeles, Long Beach and New York-New Jersey—have come to dominate the most valuable part of the container trade, namely the trade in loaded containers for import and export. By 2004, these three ports accounted for almost three-fifths of all such container movements through United States ports. A similar but less intense process of concentration is visible in the statistics on all container handling, which include empties and units without a foreign origin or destination (see the rightmost columns of Table 1).

Taken together, the changes in cargo handling, port competition and the rise of production networks have reinforced the sense of economic disconnection between seaports and the city-regions in which they are located (Hall 2007). This disconnection is most intensely felt in the local labour market where residents also experience the local environmental externalities of port activity. For example, since the 1970s, the Ports of Los Angeles and Long Beach have consolidated their position as the dominant gateway seaports in North America. The most recent economic impact statements of the two ports provide an ‘order of magnitude’ reflection of the disconnection problem. The Port of Long Beach claims that port operations support nearly 30,000 jobs in Long Beach, but as many as 1.4 million jobs in the United States (POLB 2007); everything else being equal, this is a local to national benefit ratio of 1 job in every 47.

The Port of Los Angeles reports similar national benefits (1.35 m jobs), but notes that port industries that are involved in the moving and handling of maritime cargo account for 16,360 jobs, of which 85% are trucking and warehousing jobs (POLA 2007).

The shift to trucking and warehousing jobs is at best a mixed blessing because these are not high-wage occupations (see Talley 2004; Monaco and Grobar 2004). Husing (2004) has argued that warehouse, trucking, courier and transportation support service employment offers long-term opportunities for upward mobility because of the application of technology in just-in-time logistics. However, the record to date provides little reason for such optimism. Bonacich and Wilson (2007) examined wages, unionization, employment security and the social structure of labour markets for seafarers, longshore workers, port truckers, railroad workers and warehouse workers in southern California. They argue that working conditions have generally declined along the entire logistics chain. Although they do not adopt an explicitly geographical analysis, they echo and update Herod’s (2001) analysis in arguing that the rise of logistics has allowed employers to take many cargo-related jobs outside the port authority precinct and hence outside the jurisdiction of traditional employment regulation mechanisms by contracting out and/or relocating work sites.

This paper builds on literature in labour economics that has used the timing of deregulation in the transportation industry in order to understand how these regulatory changes affected the earnings of transport sector workers (for a review see Peoples 1998). This literature typically does not explicitly address the spatial effects of changes in the port and related logistics industries. The study that goes furthest in doing so is Peoples and Talley’s (2004)

**Table 1** Increasing dominance of largest container ports

	Loaded import-export TEUs <sup>a</sup>		All TEUs handled <sup>b</sup>			
	1995	2004	1984	1990	1995	2004
Top three ports	41.4%	59.2%	40.2%	36.0%	34.3%	45.5%
Top ten Ports	76.5%	83.9%	73.8%	74.8%	65.8%	77.1%
Total, all ports, thousands of TEUs	13,328	23,851	11,771	15,572	22,337	38,655

<sup>a</sup> Authors analysis of loaded international container statistics, Table 19 of BTS (2006)

<sup>b</sup> All container units handled regardless of destination as reported by AAPA (2007)

study which argues that owner-operated truckers in port cities enjoyed a statistically significant increase in relative earnings following deregulation. They argue that demand for owner-operated trucks increased in port cities following implementation of the 1984 Shipping Act which permitted intermodal (or door-to-door) service contracts. This stimulated demand for drayage trucking by owner-operators within port cities. Their empirical strategy informs the one used here, but instead of comparing the 50 largest port cities, this paper focuses on only the eleven largest container ports.

Why might we expect the earnings of port-logistics workers in major container port city-regions to be different from otherwise equivalent workers in other locations? On the one hand, we might expect earnings of port-logistics workers to be higher in and around major container ports reflecting increased aggregate demand, the application of the newest technology in the largest port complexes, and the enhanced bargaining power that workers enjoy because they may threaten to disrupt the most important trading nodes. On the other hand, we might also expect especially intense resistance from employers to increased labour costs in and around major ports, since land and waterfront access are more costly in these locations. On the United States west coast, and increasingly in other locations, major ports also entail high fixed-to-variable cost ratios due to the structure of long-term terminal leasing arrangements (see Slack and Fremont 2005). In these circumstances, employers have an incentive to try to reduce wage rates and to increase employment flexibility. To the extent that employers are able to implement technologies and work practices that allow for de-skilling and casualization of the workforce, we might expect lower earnings in these places. Finally, in contrast to these extreme scenarios, we may expect port-logistics worker's earnings in this, the most mobile of all economic sectors, to be relatively independent of geography. Factors such as the coastwise labour contracts between the International Longshore and Warehouse Union (ILWU) and Pacific Maritime Association (PMA) on the US West Coast, or the National Master Freight Agreements between the Teamsters Union and motor carriers may also reduce earnings differences between locations.

The remainder of this paper examines the following question empirically; do truckers, dockers and

warehousemen in major container port cities in the United States earn more or less than otherwise comparable workers? Are the jobs created in the port-logistics sector any better or worse in those city-regions that handle a disproportionate share of container movements? The answer to this question has important consequences for how we think about the relationship between seaports and the city-regions which host them in the era of containerization.

### Data issues

The data for this study are the March survey files of the United States Current Population Survey (CPS) for the years 1976–2006 inclusive. The CPS is a monthly survey conducted jointly by the Bureau of the Census and the Bureau of Labor Statistics. Each March, CPS respondents are asked additional questions about a variety of issues, including their annual earnings from the previous year (i.e. 1975–2005). These data are known as the Annual Demographic Files. This is the only part of the CPS which provides annual earnings data, arguably the best available measure of the livelihoods created through employment. Other parts of the CPS, such as the one-quarter of the monthly sample in the so-called 'outgoing rotation group' as well as a supplement to the May survey, provide hourly and weekly wage data. The actual data files used in this study were accessed via Unicon Research Corporation which distributes CPS and other survey microdata to researchers.

Combining data from the March CPS files for 31 years provided a sample of 2.63 million individuals aged 15 years or older. Earnings were inflated to 2006 dollars using the consumer price index for All Urban Consumers (1982–1984 = 100). The analysis was restricted to those aged 16–70, in private sector and self-employment, that worked at least 1 week in the previous year, earned at least \$10 in the previous year and less than the top-coded income, and for whom the Metropolitan Statistical Area (MSA) of residence was known. The last of these restrictions is important because over the three decades of data, an increasing number of places were identified with an MSA code. To ensure comparability of groups of cities over time, only the identifiable places were included. These restrictions resulted in an effective sample of 1.69 million individuals, of whom 1,301

are dockers, 1,420 are warehouse workers, and 20,227 are truckers.

The data do have some notable limitations. First, since we are interested in the overall livelihood circumstances of people working in the port-logistics industry, annual earnings is taken as the primary measure. Annual earnings data are however limited in that they do not include benefits. In the United States, where there is minimal state-provided medical and old-age pension assistance, employer-provided benefits can represent a significant portion of total compensation. However, benefits are typically positively correlated with higher earnings, and so the missing data are unlikely to contradict the core findings. For example, dockworkers on the US West Coast receive substantial employer-paid benefits (Talley 2004). In addition to noting this concern, Talley also notes that CPS data do not contain information on employers.

Second, despite the massive sample obtained by pooling survey data from 31 years, the effective sample does not allow us to examine port-logistics jobs in specific places. Instead, the data are pooled by survey years and groups of port cities, thus introducing noise into the results. Pooling data also causes some missing data; for instance, union membership is only reported in the March CPS data for one-quarter of the sample from 1983 (this issue is discussed in further detail below).

Third, respondents in the CPS are surveyed at their place of residence. This is a problem to the extent that some transport workers have inter-metropolitan commutes. This is less likely to be the case with dock and warehouse workers, but may be a source of bias for truckers, since clearly some truckers who work across and between several localities. This analysis is most concerned with local or drayage truckers working in and around major ports, and so this source of potential bias is unlikely to be considerable. While these limitations do introduce noise into the analysis, none of them are insurmountable.

### Comparing earnings of port-logistics workers

Subsequent sections examine the annual earnings of port-logistics workers in major container port cities relative to earnings of comparable workers, first using a difference-in-differences approach and then a

multivariate earnings model. Before presenting these results, this section discusses the three dimensions of comparison which allow isolation of the factors that are the focus of this study. The analytical goal here is to identify how port-logistics workers (the first dimension), in major port cities (the second dimension), have fared relative to comparable workers in the same cities and relative to port-logistics workers not in major port cities, over time (the third dimension). When interpreting the results, it is important to remember that the comparison is not between truckers (or warehouse workers and dockers) in the port industry and those working for non-port employers. Rather, it is between truckers who live and work in city-regions that contain major ports, and truckers who live and work in other city-regions. In other words, the findings relate to the central concern of the paper, namely labour market outcomes for port-logistics workers in city-regions containing major ports.

The first of these dimensions concerns the identification of the various port-logistics jobs, and a comparison occupational group. Port-logistics workers, namely dockers, truckers and warehouse workers, are identified using a combination of occupational and sectoral definitions. As shown in Table 2, these are operators, fabricators and labourers employed in the water, truck and warehouse transportation sectors respectively. A comparison group should indicate economy-wide trends affecting the jobs that port-logistics workers might otherwise seek or choose, but these jobs should be unaffected by the trends in the port and port-related industry that are the focus of the study. Following conventions in the literature (see Hirsch 1988; Talley 2004), the port-logistics workers are compared to those in the same occupational class, namely operators, fabricators and labourers, but not working in any one of the transportation sectors. In the remainder of the paper, the comparison workers are referred to as non-transport operators.

The second dimension of the study is geographic, and seeks to differentiate city-regions around major seaports from all other locations in the country. Eleven ports in the contiguous US states handled 1 million or more TEUs in 2005. Each of these ports were then associated with the Metropolitan Statistical Area(s) (MSA) surrounding the port facility. An MSA is a contiguous and integrated urban area, thus indicating a common local labour market and

**Table 2** Definition of port-logistics jobs: CPS sector and occupation codes

	1976–1982	1983–2002	2003–2006
Water transport sector	419	420	6090
Truck transport sector	417	410	6170
Warehouse sector	418	411	6390
All transport sector	407–429	400–432	6070–6390
Operators/fabricators/labourers occupation	601–796	703–889	7700–9750
<i>Definition</i>			
Water operators (dockers)	Operator occupation in water transport sector		
Truck operators (truckers)	Operator occupation in truck transport sector		
Warehouse workers (warehouseers)	Operator occupation in warehouse sector		
Non-transport operators	Operator occupation not in the transport sector		

commute-shed. The analysis differentiates between the MSA(s) physically containing the port facility—these are defined as the ‘big port cities’, and the wider metropolitan area—these defined as the ‘big port region’. So for example, in the case of the twin ports of Los Angeles-Long Beach, the port city refers to the Los Angeles-Long Beach MSA, while the port region refers to the Los Angeles-Long Beach, Riverside and Ventura MSAs. The former (city) captures only the narrowly defined port-city economy, the latter (region) captures the extended suburban hinterland of the port, including for example the warehousing activity in the so-called ‘inland empire’ of Riverside and San Bernardino Counties. In reality, neither definition perfectly reflects the local port economy; hence, both are examined where appropriate. Table 3 lists the MSAs associated with each port city, and, for contrast, the core-based statistical areas (CBSAs) associated with each port region. From 2005, CPS is reports CBSA instead of MSA of residence; this change is not material in this study. One of the analyses presented below, compares West Coast Port Regions, which are the first five ports listed in Table 3 plus Portland (Oregon) and San Diego, and East & Gulf Coast Port Regions, which are the latter six ports listed in Table 3.

Finally, a time dimension identifies how changes associated with containerization and transportation deregulation unfolded over time. Although March CPS data are readily available from 1971, it is only from 1976 that the number of hours worked per week in the previous year is available. Hence, 1975 annual earnings are the starting time period for the analysis presented there. Transportation deregulations leading

up to 1984 were a multi-year process, but it was only with the enactment of the Shipping Act (of 1984), which allowed service contracts and all-inclusive pricing (Shashikumar and Schatz 2000), that the full effects of surface (i.e. trucking and rail) transport deregulation were felt in and around seaports. These reforms were extended in 1999 by the Ocean Shipping Reform Act (of 1998), which allowed confidential contracts between carriers and shippers (owners). This change was designed to strengthen the bargaining power of shippers over carriers (Levinson 2006; Wang 2006). In the difference-in-differences and regression analyses of annual earnings that follow, 1984 and 1999 define three time periods that correspond to the deregulation timetable and other changes in the port-logistics industry, and that define provide adequate sample sizes. The three time periods are:

1. 1975–1983: This was the period during which deregulation was enacted, starting with the Railroad Revitalization and Regulatory Act (of 1976), the Staggers Act (of 1980) and Motor Carrier Act (of 1980), and ending with the Shipping Act (of 1984). By the end of the period, the transportation industry had undergone a profound regulatory transformation. This period may be cautiously interpreted as the pre-shipping deregulation period; ideally, the initial time period for this study would have ended well before the start of transportation deregulation, but data limitations did not allow this.
2. 1984–1998: During the immediate port-deregulation period, transportation service providers

**Table 3** Definition of major port cities and regions

Big ports	Big port cities (MSA)	Big port regions (CBSA)
<i>West Coast</i>		
Los Angeles and Long Beach	Los Angeles-Long Beach, CA	Los Angeles-Long Beach-Santa Ana, CA Oxnard-Thousand Oaks-Ventura, CA Riverside-San Bernardino, CA
Oakland	Oakland, CA San Francisco, CA	San Francisco-Oakland-Fremont, CA Napa, CA San Jose-Sunnyvale-Santa Clara, CA Santa Rosa-Petaluma, CA Vallejo-Fairfield, CA
Seattle and Tacoma	Seattle-Bellevue-Everett, WA Tacoma, WA	Seattle-Tacoma-Bellevue, WA
<i>East and Gulf Coast</i>		
New York-New Jersey	New York, NY Newark, NJ	New York-Northern New Jersey-Long Island, NY-NJ-PA
Houston-Galveston	Galveston-Texas City, TX Houston, TX	Houston-Baytown-Sugar Land, TX
Miami	Miami, FL	Miami-Fort Lauderdale-Miami Beach, FL
Hampton Roads/Norfolk	Norfolk-Virginia Beach-Newport News, VA-NC	Virginia Beach-Norfolk-Newport News, VA-NC
Charleston	Charleston-North Charleston, SC	Charleston-North Charleston, SC
Savannah	Savannah, GA	Savannah, GA

experimented with and implemented the changes allowed under the new regulatory environment, most especially with extending land-bridge services from West to East coasts. The changes in the port-logistics sector during this period were profound; “by the late 1980s the majority of the container cargo from Asia bound for the US East Coast did not arrive by ship, but rather was discharged on the West Coast” (Talley 2004, p. 213). This period ends with the Ocean Shipping Reform Act (of 1998) that strengthened the hand of shippers in negotiating rates.

- 1999–2005: This was a period of great growth in the port industry, including China’s accession to the WTO in 2001, as well as significant contract agreements in West Coast ports in 1999 and 2002 between the ILWU and PMA.

Table 4 presents key descriptive statistics for truckers, dockers, warehousemen and non-transport operators in the three time periods. Some noteworthy trends are visible. Over time, port-logistics workers have typically become more ethnically diverse, as indicated by the increasing proportion of workers that

are Hispanic, Black and Asian-Pacific Islander. The proportion of women in these jobs also increased dramatically, but still lags well behind the average for non-transport operators. Education levels have risen in all three port-logistics jobs, but most especially among dockers who, on average, had fewer years of education than non-transport operators in 1975–1983, and more by 1999–2005. Dockers and truckers work substantially more hours per week than non-transport operators.

Table 4 also reports a measure of the dispersion of annual earnings, the coefficient of variation (which is the standard deviation divided by the mean). For truckers, dockers and non-transport operators, annual earnings became more dispersed in the period 1984–1998, while they became modestly less dispersed for warehousemen. They continued to become more widely dispersed for dockers from 1999. In the next section, the gross earnings of port-logistics workers are compared to highlight their livelihood circumstances. The final empirical section of the paper examines the relative earnings of port-logistics workers controlling for a variety of characteristics using an earnings model.

**Table 4** Descriptive statistics, truckers, dockers, warehousemen and non-transport operators

Variable	Truckers			Dockers			Warehousemen			Non-transport operators		
	1975–1983	1984–1998	1999–2005	1975–1983	1984–1998	1999–2005	1975–1983	1984–1998	1999–2005	1975–1983	1984–1998	1999–2005
<i>Annual earnings (2006 dollars)</i>												
Mean annual earnings	\$39,540	\$35,414	\$37,616	\$38,841	\$43,115	\$46,841	\$24,595	\$22,509	\$26,454	\$24,730	\$24,707	\$27,653
Coefficient of variation	63.4%	71.5%	65.9%	72.3%	83.9%	87.2%	83.9%	66.2%	85.9%	74.4%	81.9%	75.1%
Mean age (years)	37.00	38.14	41.31	39.01	39.32	38.90	32.06	34.84	36.49	34.57	35.54	38.32
Percent Hispanic	3.7%	8.6%	13.8%	5.9%	7.1%	12.1%	10.0%	22.0%	28.7%	9.1%	13.9%	20.7%
Percent Black	11.7%	14.8%	17.2%	22.6%	21.3%	10.8%	23.1%	19.4%	27.3%	14.6%	15.4%	14.2%
Percent Asian-Pacific Islander	0.7%	2.3%	2.9%	3.0%	2.0%	4.2%	0.7%	4.1%	4.8%	2.0%	3.7%	5.9%
Percent female	1.9%	5.4%	5.2%	1.6%	3.1%	5.8%	10.3%	16.2%	12.0%	31.1%	28.3%	26.3%
Percent married	71.0%	64.5%	59.0%	66.6%	60.6%	52.7%	56.0%	44.7%	40.6%	57.1%	52.3%	49.8%
Mean years of education	11.34	11.97	12.07	10.93	11.97	12.32	11.27	11.43	11.73	11.01	11.48	11.70
Percent working part-year	37.9%	30.3%	20.9%	50.2%	43.0%	34.0%	51.0%	34.8%	26.6%	46.2%	36.1%	26.2%
Mean hours worked per week	44.34	45.70	46.42	44.64	47.64	49.12	39.75	40.11	40.58	38.81	39.20	39.90
<i>Percent of observations by place of residence</i>												
South region	31.9%	37.5%	39.7%	48.8%	52.6%	43.1%	39.0%	30.8%	39.4%	35.5%	35.8%	35.1%
Northeast region	21.8%	17.4%	14.2%	22.2%	17.8%	15.2%	17.8%	15.9%	13.5%	19.8%	17.9%	15.9%
West region	15.5%	17.6%	19.5%	21.4%	19.2%	27.0%	19.7%	26.8%	24.0%	14.8%	18.0%	20.4%
Percent in big port cities	15.6%	10.7%	12.8%	37.1%	24.5%	25.8%	18.9%	16.3%	20.1%	14.9%	11.7%	12.4%
Percent in big port regions	18.0%	17.2%	17.8%	38.5%	30.3%	33.5%	23.4%	21.9%	25.4%	16.8%	16.6%	17.6%
Percent in west coast port regions	9.2%	8.1%	9.7%	19.1%	11.4%	17.4%	12.7%	13.8%	13.6%	9.4%	9.1%	10.6%
Percent in east/gulf coast port regions	10.6%	10.1%	9.6%	21.9%	21.4%	19.6%	12.7%	9.0%	12.9%	8.9%	8.8%	8.4%
Number of observations	3,543	10,106	6,578	360	715	226	311	616	493	75,155	130,149	70,492

*Note:* Analysis includes only those aged 16–70 years, in private sector and self-employment, that worked at least 1 week in the previous year, earned at least \$10 in the previous year and less than the top-coded income, and for whom the Metropolitan Area of residence was known



### Difference-in-differences results

Tables 5 through 7 show the average real annual earnings of truckers, dockers and warehousemen in Big Port Cities and Other Cities across three time periods. These are then compared with the earnings of non-transport operators in the same groups of cities, to generate two first differences. Thus, each first difference represents the extent to which truckers, dockers and warehousemen respectively earn more (or less, if negative) than comparable workers residing in the same group of cities. The second difference is the difference between each of the respective first differences, reflecting the extent to which truckers, dockers and warehousemen in big port cities earn more or less than truckers, dockers and warehousemen in other cities, relative to the earnings level of comparable workers in each group of cities. I illustrate this reasoning for truckers (Table 5) in some detail in the following paragraph.

Note (in Table 5) that truckers in big port cities earned slightly less than truckers in other cities in the period 1975–1983 (about \$1,000 less in 2006 dollars), but by the first years of the 21st century, they were earning about \$4,000 less per year. While truckers in both city groups experienced declining real earnings, the decline was more substantial in Big Port cities, from an average of \$38,600 per year to

just about \$34,200 per year. Since real earnings of non-transport operators rose slightly over the same period, the first difference for truckers in big port cities has almost halved, from \$14,400 per year to just under \$8,000. In other cities, trucker's earnings have declined less sharply, while earnings of non-transport operators have also improved slightly. Hence, the first difference for truckers in these places declined, but by less than in big port cities. The result is that the second difference in earnings for truckers in big port cities has turned more negative, from \$500 to \$2,300 less per year. We may tentatively conclude that, in terms of gross earnings, big port cities have become relatively less desirable locations for truckers.

The relative earnings of dockers in big port cities were considerably higher than those of comparable workers (in different occupations in the same cities or in the same occupation in other cities) during the period before shipping deregulation, and this was still the case in the early part of the 21st century (see Table 6). Dockers in big port cities earned about twice as much as non-transport operators residing in the same cities. In the period following deregulation (1984–1998), dockers in other cities (i.e. in minor and non-container ports) experienced a substantial increase in real annual earnings (from \$34,600 to \$42,700). This could reflect the containerization of

**Table 5** Real and relative earnings of truckers in big port cities

	Big port cities			Other cities			Second difference
	Truckers	Non-transport operators	First difference	Truckers	Non-transport operators	First difference	
1975–1983	\$38,645	\$24,257	\$14,388	\$39,706	\$24,812	\$14,894	–\$506
1984–1998	\$33,120	\$23,729	\$9,391	\$35,690	\$24,837	\$10,853	–\$1,462
1999–2005	\$34,194	\$26,255	\$7,938	\$38,116	\$27,851	\$10,266	–\$2,327

*Note:* For truckers in big port cities, actual sample size ranges between 524 (1975–1983) and 711 (1999–2005)

**Table 6** Real and relative earnings of dockers in big port cities

	Big port cities			Other cities			Second difference
	Dockers	Non-transport operators	First difference	Dockers	Non-transport operators	First difference	
1975–1983	\$45,961	\$24,257	\$21,704	\$34,638	\$24,812	\$9,825	\$11,879
1984–1998	\$44,391	\$23,729	\$20,662	\$42,701	\$24,837	\$17,864	\$2,798
1999–2005	\$53,787	\$26,255	\$27,532	\$44,421	\$27,851	\$16,570	\$10,962

*Note:* For dockers in big port cities, actual sample size ranges between 131 (1975–1983) and 49 (1999–2005)

medium-sized ports following deregulation, but the sharp increase is surprising given that the 1986 contract between the International Longshoremen's Association and employers in East and Gulf Coast ports "abandoned the concept of standardized wages at all ports and allowed for variable wages, typically lower at Gulf ports" (Monaco and Olsson, nd). Further investigation may thus be warranted to explore the jump in earnings of dockers in other cities. Notwithstanding this potentially misleading observation, it is clear that dockers in big port cities enjoy a substantial earnings advantage over dockers in other cities.

The same cannot be said of warehouse workers in big port cities. Warehouse workers in this group of cities experienced a real decline in earnings (from \$26,700 to \$23,100 per year) following deregulation, while those in comparable occupations in big port cities did not (see Table 7). Furthermore, warehouse workers in non-big port cities experienced modest growth in annual earnings over the 31 year period studied here; the real earnings of warehouse workers in non-big port cities increased from \$24,100 to \$27,300 per year. The result is that the job of warehousing in big port cities has changed from being a relatively high-earning one to being a relatively low-earning one.

### Annual earnings model results

The previous section provided information on the changing livelihood circumstances of those working in the port-logistics industry in major port cities. This evidence suggested that while big port cities provided higher earnings for dockers, the same was not the case for truckers and warehouse workers. What this analysis cannot help explain is whether the observed changes are directly related to changes within the transportation industry, or due to other factors such as the

characteristics of the workers employed in the industry. The demographic characteristics of workers in an industry, and the earnings derived from working in that industry are of course intimately related, but it is beyond the scope of this paper to try to untangle them. Instead, this section estimates a model of annual earnings to identify whether port-city status makes a difference to earnings before and after transportation deregulation, after controlling for differences in individual characteristics such as education and ethnicity. The model follows a standard wage equation:

$$\ln \$ = \alpha + \beta_1 Demog + \beta_2 Year + \beta_3 Bigport + \beta_4 Trans-occ + \beta_5 Bigport * Trans-occ + \varepsilon$$

where

- $\ln \$$  is the log of annual earnings in the year prior to the survey in 2006 dollars;
- $Demog$  represents a vector of variables controlling for age in quadratic form, years of education, and hours worked per week, and dummy variables indicating female gender, marital status married, Hispanic ethnicity, black race, Asian or Pacific Island identity, major US region (South, Northeast or West, with the Midwest omitted), and part-year (employed fewer than 50 weeks) employment status;
- $Year$  is a vector of dummy variables for year which control for changes in economic conditions, with 1983, 1998 and 2005 respectively omitted;
- $Bigport$  is a dummy variable indicating residence in the city or region (MSA or MSAs) surrounding one of the major container ports;
- $Trans-occ$  is a dummy variable indicating an individual who is employed in one of the

**Table 7** Real and relative earnings of warehouse workers in big port cities

	Big port cities			Other cities			Second difference
	Warehouse workers	Non-transport operators	First difference	Warehouse workers	Non-transport operators	First difference	
1975–1983	\$26,703	\$24,257	\$2,446	\$24,102	\$24,812	–\$710	\$3,156
1984–1998	\$19,790	\$23,729	–\$3,939	\$23,039	\$24,837	–\$1,798	–\$2,141
1999–2005	\$23,084	\$26,255	–\$3,171	\$27,301	\$27,851	–\$550	–\$2,621

Note: For warehouse workers in big port cities, actual sample size ranges between 51 (1975–1983) and 91 (1999–2005)

**Table 8** Determinants of annual earnings of transport workers in big port cities, with and without union control

	1984–1998				1999–2005			
	Without union control		With union control		Without union control		With union control	
	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.
Member of a union	n/a	n/a	0.326	0.000	n/a	n/a	0.236	0.000
Trucker, docker or warehouse	0.029	0.058	0.021	0.174	0.007	0.705	0.009	0.607
Trucker, docker or warehouse in big port city	0.163	0.001	0.160	0.001	0.079	0.170	0.084	0.140
Big port city	−0.018	0.227	−0.028	0.054	−0.004	0.844	−0.013	0.509
Adjusted $R^2$	0.513		0.533		0.512		0.521	
$N$	27,277		27,277		15,475		15,475	

*Note:* This Table reports results for four separate regressions. Annual earnings are deflated to 2006 dollars using the 1982–1984 All Urban Consumers CPI. Age in the quadratic form, years of education, and hours worked per week, and dummy variables indicating female gender, marital status married, Hispanic ethnicity, black race, Asian or Pacific Island identity, major US region (South, Northeast or West, with Midwest omitted), and part-year employment status were included in all regressions but are not reported here. Analysis includes only those aged 16–70 years, in private sector and self-employment, that worked at least 1 week in the previous year, earned at least \$10 in the previous year and less than the top-coded income, and for whom the Metropolitan Area of residence was known. The comparison group in each regression are operators, fabricators and labourers not in the Transport Sector *Source.* Authors analysis of CPS March Annual Demographic Files

transport jobs of interest (docker, trucker or warehouse);

- *Bigport \* Trans-occ* is a dummy variable indicating an individual who is employed in one of the transport jobs of interest in a big port city or region; and
- $\alpha$  is the intercept capturing what a person would earn with no other productivity-related characteristics, and  $\varepsilon$  is a random error term.

Coefficients  $\beta_3$ ,  $\beta_4$  and  $\beta_5$  are of special interest in this study, respectively indicating the effect that residence near a major container port, employment as a trucker, docker or warehouse, and the interaction of these two characteristics have on annual earnings. Exponentiating these coefficients generate the percentage differential in annual earnings that an individual can expect to receive, other things being equal, if this relevant characteristic is present.<sup>1</sup> For example, the coefficient of 0.121 in the first column in the second row of Table 9 indicates that truckers in big port cities earned on average, 13% more per year in the period 1975–1983 than otherwise identical individuals. While the focus here is on only these three coefficients, the coefficients on the demographic

control variables are all as expected.<sup>2</sup> As with the real and relative earnings analysis reported above, the comparison group for the multivariate analysis are non-transport operators.

One variable that is correlated with higher annual earnings but that is not included in this analysis is union membership. As noted above, this control is only available for a quarter of the March CPS sample (the so-called outgoing rotation group) from 1983. In order to test whether this omission biases the results, Table 8 contains the results of a regression in which truckers, dockers and warehouse are pooled into a single group, and then compared with non-transport operators. By pooling the port-logistics workers in this way it is possible to achieve a sufficiently large sample for Big Port Cities in the period 1975–1983, the ‘cell’ with the smallest sample count ( $n = 354$ ). The results of this regression reveal that including a control for union membership does slightly change the coefficients of interest, but none are changed in sign or significance.

<sup>2</sup> Annual earnings increase at a decreasing rate with age, and are higher for married persons and those who work more hours per week. The premium for each additional year of education increased over the period studied. In contrast, Hispanic, Black, Asian/Pacific Islander, Female, Worked Part-Year, and living outside the Mid-West are all correlated with lower annual earnings. The Black, Asian/Pacific Islander, Female earnings ‘penalties’ decreased over the period studied.

<sup>1</sup> The formula for deriving the percentage differential is  $(e^\beta - 1) * 100$ , where  $\beta$  is the coefficient of interest.

One possible reason why including this variable does not substantially alter the results is that union membership status may itself be affected by the geographic and occupational dynamics that are the focus of this study. For example, regardless of whether a docker in a West Coast port reports being a member of a union, their earnings are directly influenced by the contract between the ILWU and the PMA. While it would be preferable to include a union control variable in the analysis, with cautious interpretation the results that follow do stand.

Table 9 examines the determinants of real annual earnings of truckers, dockers and warehouse workers in Big Port Cities and Regions over the past 31 years. The first point to note is that port cities switched from being higher earnings locations to lower earnings locations for all operators, fabricators and labourers regardless of their sector of employment. In the 1975–1983 period, workers in big port cities enjoyed an earnings premium of about 5% per year. However, by 1999–2005, this had become a penalty of over 2%. In port regions, a premium of about 5% before deregulation evaporated but did not turn negative. The difference between port cities and regions likely indicates the relative affluence of suburban as opposed to traditional core urban areas in port metropolitan regions. This finding supports similar arguments made by Noponen et al. (1997) and de Langen (2007) about the challenges facing US port cities.

Truckers received an annual earnings penalty of between 2.3% and 3.6% relative to non-transport operators that has remained relatively stable across the three time periods. This finding is consistent with previous analyses of hourly and weekly wage data (see Hirsch and Macpherson 1997; Hirsch 1988; Peoples 1998; Talley 2004), which all report that the wage premium for truckers declined following deregulation. It is important to note that these authors were able to begin their analysis in the early 1970s, well before the start of transportation deregulation. Analyzing the wage data available from one-quarter of the CPS March survey sample revealed that truckers received an hourly wage premium over non-transport operators of 16.3% in the period 1979–1984, but this narrowed to 9.0% in the period 1985–2006.<sup>3</sup> In other words,

everything else being equal, truckers are in a relatively low wage occupation.

At the same time, Table 9 also indicates that the truckers in big port cities receive a significant earnings premium of between 11.8% and 16.5%. At first sight, these findings appear to be at odds with those reported in Table 5, which indicated an overall decline in trucker's gross earnings, and an even larger decline in the relative earnings of truckers in big port cities. The difference may be explained in the following ways. First, it is important to emphasise that this study models annual earnings, not wage rates. There may be some tendency for owner-operator drayage truckers in and around major ports to inflate reported annual earnings (Monaco and Grobar 2004), and so we need to interpret annual earnings data for truckers cautiously.

Second, it is important to note that the social characteristics of those working in the trucking industry have changed considerably. Table 4 confirms that truckers are now more likely to be Hispanic, Black, Female, and resident in the South Region, all of which are characteristics correlated with lower earnings. They also became less likely to be married; being married is a characteristic correlated with higher earnings. There are indications that these changes in the social composition of the trucking workforce were more intense in major port cities. For example, the proportion of truckers in big port cities that are Hispanic increased from 13% in 1975–2003, to 40% in 1999–2005. In contrast, the proportion of truckers that are Hispanic in other cities only increased from 2% to 10% over the same time period. These changes in the social structure of the trucking workforce are consistent with qualitative research findings reported by Milkman (2006) and Bonacich and Wilson (2007) in their studies of the greater Los Angeles area. These social changes help explain why the gross earnings of truckers in big port cities declined while their earnings premium did not.

For dockers there was a significant increase in the overall earnings premium for dockers, from being statistically insignificant in the period 1975–1983, to 9.7% in port cities and 7.4% in port regions in the period 1984–1998 (see Table 9). This finding confirms previous studies using weekly and hourly wage data (Talley 2002). However, the geographic analysis indicates that the annual earnings advantage is

<sup>3</sup> Hourly wages are reported for the actual survey year, not for the previous year as in the case of earnings.

**Table 9** Determinants of annual earnings, transport workers in major US container port cities and regions

	Big port city			Big port region							
	1975–1983			1984–1998			1999–2005				
	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.	
Trucker	-0.027	0.062	-0.023	0.006	0.012	-0.033	0.024	-0.037	0.000	-0.027	0.008
Trucker in big port city/region	0.121	0.001	0.118	0.000	0.165	0.140	0.000	0.156	0.000	0.133	0.000
Big port city/region	0.049	0.000	-0.007	0.334	-0.029	0.048	0.000	0.018	0.004	-0.006	0.488
Adjusted $R^2$	0.537		0.535	0.528	0.537	0.537		0.535		0.528	
N	78,697		140,254	77,069	77,069	78,697		140,254		77,069	
Docker	0.038	0.451	0.093	0.003	0.777	0.031	0.543	0.071	0.030	-0.060	0.272
Docker in big port city/region	0.273	0.001	0.320	0.000	0.557	0.286	0.001	0.317	0.000	0.604	0.000
Big port city/region	0.051	0.000	-0.003	0.639	-0.023	0.051	0.000	0.022	0.001	0.001	0.921
Adjusted $R^2$	0.538		0.542	0.539	0.538	0.538		0.542		0.540	
N	75,514		130,863	70,717	70,717	75,514		130,863		70,717	
Warehouser	-0.58	0.219	-0.085	0.011	0.528	-0.075	0.122	-0.073	0.038	0.019	0.595
Warehouser in big port city/region	0.116	0.318	0.037	0.633	-0.098	0.172	0.109	-0.022	0.752	-0.069	0.346
Big port city/region	0.051	0.000	-0.002	0.787	-0.023	0.051	0.000	0.023	0.000	0.001	0.922
Adjusted $R^2$	0.538		0.542	0.540	0.540	0.538		0.542		0.540	
N	75,465		130,764	70,984	70,984	75,465		130,764		70,984	

*Note.* This Table reports results for 18 separate regressions. Annual earnings are deflated to 2006 dollars using the 1982–1984 All Urban Consumers CPI. Age in the quadratic form, years of education, and hours worked per week, and dummy variables indicating female gender, marital status married, Hispanic ethnicity, black race, Asian or Pacific Island identity, major US region (South, Northeast or West, with Midwest omitted), and part-year employment status were included in all regressions but are not reported here. Analysis includes only those aged 16–70 years, in private sector and self-employment, that worked at least 1 week in the previous year, earned at least \$10 in the previous year and less than the top-coded income, and for whom the Metropolitan Area of residence was known. The comparison group in each regression are operators, fabricators and labourers not in the Transport Sector

*Source.* Authors analysis of CPS March Annual Demographic Files

especially concentrated in the largest ports. Before deregulation (1975–1983), dockers in big ports received a statistically significant earnings premium of 31%. This premium widened after 1984 to 38% and accelerated to 75% in the period 1999–2005. In this latter period, the overall earnings premium for dockers was statistically insignificant, adding further support to the notion that docker benefits are increasingly concentrated.

Table 10 shows that the post-deregulation big-port premium only reached dockers in US East & Gulf Coast big ports after 1999, whereas it was visible on US West Coast from 1984. This finding indicates a belated increase in activity in major East and Gulf Coast ports, perhaps as a result of the Ocean Shipping Reform Act (of 1998). The larger, earlier and sustained premium received by dockers in big West Coast ports reflects the variety of factors which contribute to the ability of the ILWU to negotiate and enforce favourable employment contracts; these factors include the coastwise organizing strategy of the union, the particularly intense demand for container handling facilities, and the particular mix of technologies used in these ports (see Talley 2002).

The results for warehouse workers are generally statistically insignificant; in part this is a likely consequence of the small sample sizes. During the period 1984–1999, warehouse workers nationwide earned significantly less than comparable non-transport operators. Although not statistically significant, there are indications that warehouse workers in big port cities and regions experienced a relative deterioration in annual earnings: in 1975–1983, they earned between 12.3% and 18.8% more, but in 1999–2005 they earned between 9.3% and 6.7% less. Further confirmation of this trend is provided in Table 10; warehouse workers in East & Gulf Coast big port regions took a statistically significant earnings penalty of 20.5% in the period 1999–2005. These findings indicate that warehousing has become work that does not provide above-average earnings, and that earnings are lower in major port cities especially on the East & Gulf coast.

## Conclusions

Containerization, and the associated processes of deregulation and the rise of global freight logistics, have profoundly re-shaped the relationship between

ports and the city-regions which play host to them. These processes have real consequences visible in the increased scale of port infrastructure, in road congestion and in the development of suburban warehouses and distribution centers. As waterfront jobs have declined in numbers, and as the economic relations between ports and hinterland locations of consumption and production have become spatially disconnected, questions have been raised about the nature and quality of the jobs created in the port-logistics industry in port city-regions. These processes are visible in the United States, and it is important to recognise that these processes may not be occurring in the same way other parts of the world. For example, functional hinterlands of ports on the eastern seaboard of China do not (yet?) extend far beyond the coast, while some European ports (e.g. Antwerp) have maintained heavy concentrations of warehousing and other value adding activity within the port precinct. These differences are likely to be reflected in different local labour market outcomes in and around ports, and comparative international research is warranted.

It is important to acknowledge that the scope of the analysis presented in this paper is general and synthetic; the goal has been to identify changes in relative annual earnings over a long time period and across a wide geographic area. This kind of analysis cannot tell us how and why labour market processes played out as they did in particular places; other methodological approaches are required to address these questions. This approach does however allow us to identify the significant trends in labour market outcomes for transportation workers in major port cities. In contrast to previous research which addressed weekly and hourly wages, this paper examines the effects of transport deregulation and associated changes in the industry on annual earnings as a more appropriate indicator of the livelihood circumstances of transport workers.

This paper has shown that port-logistics workers in United States big port cities and regions do not achieve higher annual earnings than otherwise comparable workers, with one notable exception. Dockers on all three coasts are net beneficiaries of transportation deregulation and ongoing processes of containerization, and it is especially the case on the US West Coast where residence in one of the big port cities is correlated with additional significantly higher

**Table 10** Determinants of annual earnings, transport workers in west and east & gulf coast container port regions

	West coast big port regions						East & gulf coast big port regions					
	1975–1983		1984–1998		1999–2005		1975–1983		1984–1998		1999–2005	
	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.	B.	Sig.
Trucker	-0.014	0.308	-0.025	0.002	-0.016	0.096	-0.018	0.191	-0.026	0.002	-0.019	0.052
Trucker in west/east & gulf coast big port regions	0.082	0.070	0.161	0.000	0.092	0.005	0.143	0.002	0.128	0.000	0.139	0.000
West/east & gulf coast big port regions	0.087	0.000	0.060	0.000	0.019	0.044	-0.006	0.561	0.005	0.469	-0.032	0.002
Adjusted $R^2$	0.533		0.533		0.527		0.533		0.533		0.527	
N	78,697		140,254		77,069		78,697		140,254		77,069	
Docker	0.081	0.072	0.095	0.001	0.012	0.813	0.086	0.058	0.111	0.000	0.048	0.339
Docker in west/east & gulf coast big port regions	0.206	0.046	0.518	0.000	0.480	0.005	0.201	0.042	0.171	0.016	0.379	0.006
West/east & gulf coast big port regions	0.087	0.000	0.064	0.000	0.027	0.005	-0.005	0.638	0.008	0.299	-0.030	0.004
Adjusted $R^2$	0.534		0.539		0.539		0.534		0.539		0.539	
N	75,514		130,863		70,717		75,514		130,863		70,717	
Warehouser	-0.062	0.183	-0.088	0.007	-0.007	0.834	-0.057	0.211	-0.049	0.131	0.029	0.386
Warehouser in west/east & gulf big coast port regions	0.122	0.353	0.120	0.171	0.067	0.470	0.121	0.401	-0.172	0.061	-0.229	0.022
West/east & gulf coast big port regions	0.087	0.000	0.065	0.000	0.027	0.004	-0.004	0.681	0.009	0.242	-0.029	0.004
Adjusted $R^2$	0.535		0.540		0.539		0.534		0.540		0.539	
N	75,465		130,764		70,984		75,465		130,764		70,984	

*Note.* This Table reports results for 12 separate regressions. Annual earnings are deflated to 2006 dollars using the 1982–1984 All Urban Consumers CPI. Age in the quadratic form, years of education and hours worked per week, and dummy variables indicating female gender, marital status married, Hispanic ethnicity, black race, Asian or Pacific Island identity, and part-year employment status, were included in all regressions but are not reported here. Analysis includes only those aged 16–70 years, in private sector and self-employment, that worked at least 1 week in the previous year and less than the top-coded income, and for whom the Metropolitan Area of residence was known. The comparison group in each regression are operators, fabricators and labourers not in the Transport Sector

*Source:* Authors analysis of CPS March Annual Demographic Files

earnings. These workers benefit from high throughput volumes and aggregate demand, technological and capital intensification, and strong union bargaining power. The findings for dockers stand in strong contrast to those related to warehouse workers, for whom location in a big port city-region on the East and Gulf Coasts turned from being a positive or neutral contributor to earnings, to a significantly negative contributor to earnings. The picture that emerges for truckers is more complex, and concerns about the accuracy of reported earnings indicate that further analysis is warranted. In general however, the gross earnings of truckers did fall following deregulation, and this fall was greater in big port cities. However, after controlling for a variety of factors, it is apparent that truckers in big port cities received an earnings premium. This leads to the conclusion that the relative decline in trucker gross earnings in big port cities is related to the changing social structure and characteristics of workers in the industry.

Overall, these findings highlight the difficult task facing port authorities, managers and tenants as they attempt to convince the residents of communities surrounding major container facilities of the benefits that they confer on those localities. Containerization in United States port cities is implicated in a process of labour market bifurcation which creates winners and losers. High earning positions are to be found in handling cargo on the docks, but these positions have declined in absolute numbers. Instead, the fastest growing port-logistics jobs are medium- and low-earning occupations, and there is no special earnings advantage in these jobs in the city-regions that host major container ports. The potential for a low-wage development trajectory in port economies is all the more troubling, given the intense environmental and infrastructure demands that major container ports place on the cities that host them.

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