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The Local Impact of Containerization

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The Local Impact of Containerization

We investigate how containerization impacts local economic activity. Containerization is premised on a simple insight: packaging goods for waterborne trade into a standardized container makes them cheaper to move. We use a novel cost-shifter instrument – port depth pre-containerization – to contend with the non-random adoption of containerization by ports. Container ships sit much deeper in the water than their predecessors, making initially deep ports cheaper to containerize. We find that counties near containerized ports grew twice as fast as other coastal port counties between 1950 and 2010 because of containerization. Gains are concentrated in areas with initially low land values.

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Underlying the second wave of globalization following World War II is a vast improvement in the ability to transport goods. New York City's Herald Square Macy's now finds it cheaper to source a dress from Malaysia than from the city's own rapidly disappearing garment district (Levinson, 2008, p. 3). This decline in the importance of physical distance owes much to the development and rise of containerization (Bernhofen et al., 2016). Containerization, which took off in the early 1960s, is premised on a simple insight: packaging goods for waterborne trade into a standardized container makes them cheaper to move. Containerization simplifies and speeds packing, transit, pricing, and the transfer from ship to train to truck. It also limits previously routine and lucrative pilferage.

In this paper, we use novel data and a new identification strategy to understand how a drastic decline in transportation cost such as the one brought by containerization impacts local economic activity. To isolate causal effects of containerization, we focus on coastal counties in the United States that are near a port before the advent of containerization. We address the non-random adoption of container technology by ports with a novel cost-shifter instrument: port depth pre-containerization. This variable isolates exogenous cost-driven port containerization from adoption due to local demand. Because container ships sit much deeper in the water than their predecessors, they require deeper ports in which to dock. Dredging a harbor to increase depth is possible, but it is extremely costly.

To undertake the analysis, we combine multiple data sources for the period 1910 to 2010. We use county-level information on population and demographics from the Decennial Census (1910 to 2010) and information on employment and payroll by industry from the County Business Patterns (1956 and 1971 to 2011). We supplement these data with information on the location of ports in 1953 and 2015, containerization adoption by ports, and port-level foreign trade in the pre-containerization era. We use newly digitized highway and rail routes circa 1950 to measure contemporaneous transportation infrastructure.

A broad class of economic geography models (e.g. Redding and Sturm, 2008; Allen and Arkolakis, 2014; Redding, 2016; Coşar and Fajgelbaum, 2016; Donaldson and Hornbeck, 2016) predicts that containerization's reduction in trade costs yields increased population and employment near containerized ports. In these models, agglomeration and dispersion forces account for the spatial distribution of economic activity, and population moves in response to changes in real wages. Containerization's impact on nominal wages is ambiguous, depending on whether the productivity gains from access to a larger market outweigh the greater competition from lower-priced distant firms.

Our findings are consistent with these theoretical predictions. We find that containerization caused population in counties near containerized ports to grow about twice as fast between 1950 and 2010 relative to other coastal port counties. This effect is sizeable: over the same 60-year period, all coastal counties grew about twice as fast as non-coastal counties. The effects on employment growth are slightly larger, and we find no aggregate impact on nominal wages. At the industry level, we find that containerization caused firms in selected industries to increase wages.

We find that containerization-induced population gains are concentrated in areas with initially low land values. This result is consistent with the physical demands of container technology, which require large extensions of land as port activity shifts from water-based finger piers to giant cranes and vast marshalling yards. It is also consistent with the theoretical prediction that containerization has a larger impact on population growth in initially less populous locations because they experience a proportionally larger increase in access to new markets (Donaldson and Hornbeck, 2016).

Our paper adds to several literatures. First, our findings contribute to the debate on the impact of globalization on economic activity. Following Romer and Frankel

(1999), a large literature has emerged to understand how improved access to international markets affects country level outcomes such as GDP (e.g. Pascali, 2017; Feyrer, Forthcoming).[1] Our paper contributes to this literature by looking at how the reduction in trade costs brought by containerization affects the spatial distribution of economic activity within countries. In doing so, our results shed light on the potential uneven impacts of globalization. Our paper is closely related to Storeygard (2016) and Campante and Yanagizawa-Drott (2017) who also estimate the effects of a common shock to transportation costs across regions more or less affected by this shock. In particular, Storeygard (2016) finds that when transportation costs decrease due to variation in oil prices, African cities near international ports grow faster than those further away. Like these two papers, we find large positive effects of access to international markets on local economic activity.[2]

Second, our paper contributes to a growing literature investigating the consequences of improvements in transportation infrastructure on local economic activity (e.g. Baum-Snow, 2007; Michaels, 2008; Duranton and Turner, 2012; Donaldson and Hornbeck, 2016; Donaldson, 2018; Baum-Snow et al., 2018; Alder, 2019; Balboni, 2019). These studies examine how investments in highways and railways have shaped the spatial distribution of economic activity within countries. Our paper is the first to study how large investments in maritime transportation infrastructure, specifically new container terminals, affect the economic conditions of target areas. Methodologically, our paper contributes a

[1]Most papers in this literature find that improved access to international markets has large positive effects on GDP, with the exception of Pascali (2017) who documents mainly negative effects. Pascali (2017) is particularly related to our paper in that he exploits a major improvement in the shipping technology—the advent of the steamship—to examine how a decline in international transportation costs impacts economic activity.

[2]Our paper also complements a growing literature in international trade that looks at the impact of trade shocks on local labour markets (e.g. Topalova, 2010; Autor et al., 2013; Kovak, 2013). These papers compare locations within a country that have similar access to international markets but that, because of initial differences in industry composition, are differentially affected by changes in a trading partner's economic activity (e.g. China). In contrast, we control for initial differences in industry composition and compare locations that experience differential gains in access to international markets.

new instrumental variable strategy to address the non-random allocation of transportation infrastructure. Specifically, we introduce a cost-shifter instrument as a source of quasi-random variation in observed infrastructure. See Redding and Turner (2015) for a recent survey of the literature.

Finally, our work enhances the growing literature on containerization by expanding its focus beyond the shipping and trade industries. In this burgeoning literature, Rua (2014) investigates the global adoption of containerization and Bernhofen et al. (2016) estimate its impact on world trade.[3] Hummels (2007), Bridgman (2018), and Coşar and Demir (2018) analyze containerization's impact on shipping costs. Our work is particularly related to Ducret et al. (2019), who use data on bilateral shipping flows and a general equilibrium model to understand the aggregate consequences of containerization.

The remainder of this paper is organized as follows. The next section provides background on containerization, Section 3 outlines the theoretical motivation, and Section 4 discusses the data. We present empirical methods in Section 5 and results in Section 6. Section 7 concludes.

2 Containerization

Before goods were moved inside containers, shipping was expensive and slow. Vessels spent weeks at ports while gangs of dockworkers handled cargo piece by piece. Port costs accounted for a sizeable share of the total cost of the movement of goods. The American Association of Port Authorities estimated that in-port costs, primarily labor, accounted for half the cost of moving a truckload of medicine from Chicago to Nancy, France in 1960 (Levinson, 2008, p. 9).

[3] The classic book on this topic is Levinson (2008).

In response to these high costs, producers searched for alternatives. Trucker and entrepreneur Malcolm McLean is generally credited with being the first to match vision with reality when he moved 58 truck trailers on a ship from Newark to Houston in 1956 on the maiden container voyage.

Container shipping relies on two key innovations. The first is the mechanization of container movement. Rather than workers with carts, specialized container cranes lift the boxes in and out of ships, around the port, and onto rail cars and trucks. This mechanization substantially decreased per unit labor costs, cut time at port and made ever-larger ships viable. Today's Post-Panamax ship is more than 17 times larger than the first ship that carried container goods in 1956 (see ship sizes in Appendix Figure 1).

The second key innovation of containerization is the development of common standards for container size, stacking techniques, and grip mechanisms. These standards allow a container to be used across modes of transportation—ships, trucks, rail—and across countries. The U.S. standard for containers was adopted in the early 1960s, and the international standard followed in the late 1960s.

To achieve economies of scale, containerization requires physical changes to ports. In breakbulk ports, as cargo ports were known before the rise of containerization, ships pulled into finger piers and workers on- and off-loaded items by hand and cart. Ports were centrally located within cities and used a large amount of labor and a moderate amount of land for warehousing and storage. In contrast, containerized ports require substantially less labor per unit of weight and a much larger amount of land. Land is used both for the large cranes that move containers and for the marshalling of containers and trucks.

Despite containerization's small-scale start, it diffused extremely rapidly across the United States. The bulk of domestic containerization adoption occurred in the 1960s, as shown in Figure 1, which reports the total number of US containerized ports by year. In the early 1960s, the benefits of containerization were perceived as primarily domestic, "a trend far more advanced in domestic waterhauls than in foreign trade" (Chinitz, 1960, p. 85). Containerization adoption in the United States continued at a slower pace throughout the 1970s and 1980s and plateaued thereafter.

Post-containerization, the distribution of dominant ports has shifted. Of the ten largest ports before containerization (in 1955, measured in terms of value of waterborne trade), two never containerized: New York (Manhattan), NY and Newport News, VA. In fact, the Port of Manhattan, the largest in the world in 1956, no longer exists as a freight port. Of today's 25 largest ports, four did not rank in the pre-containerization top 25. Only two of the modern ten largest ports were in the pre-containerization top ten: Norfolk, VA and Los Angeles, CA.[4]

Adoption of containerization in the rest of the world followed a similar pattern, roughly one decade delayed. Similarly, containerized trade was initially primarily domestic (U.S. ports), until at least the mid 1960s. The first international container service did not begin until 1966, nearly a decade after the first US shipment (Rua, 2014).

Containerized trade is now central to the global economy. Bernhofen et al. (2016) estimate that containerization caused international trade to grow by more than 1,000 percent between 1956 and 1981. In 2017, containerized trade accounted for about 75 percent of non-bulk dry cargo shipments worldwide (United Nations Conference on Trade and Development, 2018).[5]

The literature credits containerization with substantially decreasing the cost of waterborne trade. While Hummels (2007) and Bridgman (2018) note only a small decline in shipping rates, Coşar and Demir (2018) find that containerization decreases variable

[4]See Kuby and Reid (1992) on port concentration.

[5]While containers are appropriate for carrying many goods, as diverse as toys and frozen meat, some goods are not yet containerizable. Both "non-dry cargo" and "dry-bulk commodities" such as oil, fertilizers, ore, and grain cannot be shipped inside "the box."

shipping costs by 16 to 22 percent (they use 2013 export transaction data for Turkey). Traditional measures of shipping costs understate the true cost advantage yielded by containerization, especially since containerization cuts the time ships spend at port and thus the total time in transit. Hummels and Schaur (2013) estimate that each day in transit is worth between 0.6 to 2.1 percent of a good's value, highlighting the time benefits of containerized shipping. In addition, containers ease logistics costs by protecting goods from unintentional damage and allowing different kinds of goods, with different destinations, to be shipped together (Holmes and Singer, 2018).

3 Theoretical Motivation

We now turn to the theoretical literature to frame our empirical work and understand containerization's potential impact. Containerization's most important feature is the reduction in waterborne transit costs it generates. Because almost all goods transported by water require additional land-based movement, reductions in trade costs due to containerization are largest, in percentage terms, at the port and decay as distance to the port increases.

We assess the impact of this reduction in trade costs through the lens of standard economic geography models (e.g. Redding and Sturm, 2008; Allen and Arkolakis, 2014; Redding, 2016; Coşar and Fajgelbaum, 2016; Donaldson and Hornbeck, 2016). In these models, agglomeration and dispersion forces explain the uneven distribution of economic activity across space, as people move in response to changes in real wages. Real wages are a function of nominal wages, the price of local goods, and land prices.

Containerization's reduction in trade costs has three main short run effects. First, when firms produce differentiated products and consumers love variety, locations with lower trade costs become more attractive to consumers. These locations offer a greater variety of goods at lower prices, reducing the cost of living and increasing real wages.

Second, if there are increasing returns to scale in production, a reduction in trade costs also increases the profitability of firms because firms can access a larger market for their products. This "home market effect" yields an increase in nominal wages and, therefore, an increase in real wages.

Third, due to increased trade, firms encounter more lower-priced competitors. This heightened competition, known as the "market crowding effect," acts as a dispersion force and causes both nominal and real wages to decline.

If there are gains from trade, as economic geography models typically assume, the cost of living effect and the home market effect should dominate the market crowding effect. Thus, we expect a short run increase in real wages in locations near container ports.[6] Containerization's net effect on nominal wages is theoretically ambiguous; the effect depends on whether the productivity gains associated with access to a larger market offset the intensified competition from distant firms.

In the long run, however, higher real wages should attract people to locations near container ports. As population increases, land prices rise, in turn lowering real wages. Migration ceases when real wages equalize across space.

Since the containerization-induced reduction in trade costs declines with distance from the port, we anticipate that the impact of containerization on population is greatest in places near container ports and declines as distance to the port increases.

The basic economic geography framework outlined above assumes that all places are ex-ante homogeneous. However, an extension to the basic framework would allow the same shock to impact locations unevenly, as a function of initial characteristics. In the empirical section, we consider heterogeneous effects of containerization across locations

[6]Even if there are no gains from trade, the net effect on nominal wages is ambiguous because the home-market effect and the market-crowding effect go in opposite directions.

with different initial population density and land values. Suppose that firms in initially less populous locations rely more heavily on the demand from non-local consumers, a proposition likely to be true. Then containerization's impact in percentage terms should be larger in initially smaller locations.

We also expect containerization to have an uneven effect based on pre-containerization land values. Because container ports require large swaths of land for giant cranes and extensive marshalling yards, rather than the water-based finger piers of the breakbulk era, container ports may be more viable in locations with initially low land value. However, as local productivity shocks are ultimately capitalized into the value of land (Moretti, 2011), low land value cities tend also to be small cities, all else equal. Thus, empirically, the distinction between being initially low population and initially low land value is not empirically visible.

In sum, a wide variety of economic geography models predict that containerization's reduction in trade costs causes population and employment to increase near container ports. This effect diminishes as distance to the container port increases. The net effect of containerization on nominal wages is theoretically ambiguous. In addition, for a given distance to a container port we anticipate greater population growth in initially smaller cities. These smaller cities receive a proportionately larger increase in access to new markets and have relatively cheap land, which is key to container port development.

4 Data

To study the impact of containerization on local economic activity, we construct a county-level panel dataset that includes population, employment, and wage information, as well as proximity to ports and port characteristics. This section gives an overview of the data, and the data appendix adds full details.

Our sample frame is the Decennial Census, for the years 1910 to 2010.[7] We assemble a time invariant panel of counties by aggregating 1950 counties to their 2010 counterparts and by dropping a few counties with large land area changes. We observe population from 1910 to 2010 and demographic characteristics from 1950 to 2010. We also observe total employment, total payroll, and employment and payroll by industry from the County Business Patterns in 1956 and then annually from 1971 to 2011.[8] We omit Alaska from our analysis because its administrative districts in 1950 do not correspond to modern counties. This yields 3,023 counties with complete data.[9]

To this sample frame, we add port attribute data. Our universe of ports is all ports that existed in either 1953 or 2015, as defined by the 1953 and 2015 *World Port Index*. For each port, we observe its location (latitude and longitude), size (in four discrete categories), and depth (in eight discrete categories). We get the year of first containerization from the *Containerisation International Yearbook*, volumes 1968 and 1970 to 2010.[10] We also observe 1948 and 1955 international trade in dollars by port from the Census Bureau's Foreign Trade Statistics. We associate each county with a vector of ports and port characteristics, which include the distance from each county to each port, the number of nearby ports in 1953, the maximal depth of nearby ports in 1953, and the total value of international trade at nearby ports in 1948 and 1955.[11]

We also include variables that characterize the state of the transportation network at the advent of containerization (c. 1957 for highway and c. 1960 for rail). We measure

[7] For the 2010 sample, we use the Decennial Census for population figures and the American Community Survey (years 2008–2012) for other demographic covariates.

[8] We are very appreciative of digitized 1956 County Business Patterns from Matt Turner and Gilles Duranton. See the data appendix for more information about these data.

[9] Estimations using County Business Patterns data use a slightly smaller sample because the provider suppresses data for counties under certain conditions; see data appendix for complete details.

[10] For the purposes of this paper, and consistent with the industry definition, we call a port "containerized" when it has special infrastructure and equipment to handle containers. Specifically, the port has invested in equipment to handle shipping containers which enables their movement in and out of ship and onto a train or a truck.

[11] We calculate all distances from the county centroid.

total rail kilometers, highway kilometers, and waterway kilometers in each county, per square kilometer of each county's area.

5 Empirical Methods

We now turn to our empirical strategy for estimating the causal effect of containerization on local economic activity. We first present a difference-in-difference framework and illustrate its strengths. We then discuss remaining concerns with causality, followed by a motivation for and details about our instrumental variable strategy.

5.1 Difference-in-Differences

Our goal is to understand how local economic activity responds to the advent of containerization. Specifically, we test the theoretical prediction that population and employment increase near containerized ports. We also test whether percentage gains are larger in locations with initially low land values, all else equal. Our empirical specification therefore asks whether proximity to a containerized port is associated with changes in key economic outcomes, conditional on a host of covariates. We estimate

$$\Delta \ln(y_{i,t}) = \beta_0 + \beta_1 \Delta C_{i,t} + \beta_2 X_i + \Delta \epsilon_{i,t} \ , \tag{1}$$

where $i \in I$ indexes counties and $t \in T$ indexes years. Our primary dependent variable, $y_{i,t}$, is population. We also investigate the impact that containerization has on employment, nominal wages, industrial composition, and other demographic outcomes. The operator Δ denotes long run differences, so that $\Delta \ln(y_{i,t}) = \ln(y_{i,t}) - \ln(y_{i,1950})$.[12]

Our key explanatory variable is an indicator for proximity to a containerized port

[12]When we use County Business Patterns data, the initial year is 1956.

at time t, $\Delta C_{i,t}$, which is equivalent to $C_{i,t}$, as no containerized ports existed in 1950 ($C_{i,1950} = 0 \; \forall i \in I$). Specifically, $C_{i,t}$ is equal to one if there is a containerized port within 50 km of county i's centroid at time t and zero otherwise.

To isolate causal effects of containerization, we limit our primary sample to the 272 counties on the Pacific and Atlantic coasts that are within 50 km of a port in 1953.[13] This means that all treated and control observations are coastal port counties and that we limit our comparison group to fast-growing coastal regions (see Rappaport and Sachs (2003)), rather than comparing coastal and non-coastal areas. Later we show that our results are robust to using different distance cut-offs and the full sample of US counties.

To establish the causal effect of containerization on local economic activity, we must contend with the non-random assignment of containerized ports to coastal port counties. The difference-in-difference specification in Equation (1) goes some way to this end by netting out all time-invariant county-specific characteristics correlated with the location of containerized ports. Such characteristics include geography, proximity to population centers, climate, and historical antecedents for the location of particular industries. This method also nets out any national changes that impact all coastal port counties equally between 1950 and 2010.

In the event that containerization is also a function of time-varying county attributes, we also include a vector of baseline covariates, X_i. Including initial covariates in the difference-in-difference model is akin to allowing for differential trends in the dependent variable by the initial covariates. We list these in greater detail in Section 6, but X_i includes regional fixed effects, distance to the ocean and its square, the number of ports within 50 km in 1953 and the square of that measure, length of the initial transportation network, initial industrial mix, and pre-1950 county population. We cluster standard

[13] We also include Los Angeles County and San Diego County in the treatment group. Both counties have prominent container ports but narrowly miss the 50 km cut-off.

errors throughout at the 2010 commuting zone to account for spatial dependence in the error. A commuting zone is a grouping of counties that approximate a local labor market. In our sample, the average commuting zone includes 3.5 counties.

This empirical strategy yields a causal estimate of the effect of containerization on local economic activity when containerization is uncorrelated with the error term. This is equivalent to saying that β_1 is a causal estimate when containerized ports are randomly assigned to coastal port counties, conditional on time-invariant county-level factors and the included initial covariates. Because we include a host of initial period covariates, these estimates cannot be driven by, for example, pre-existing trends in population or employment growth.

To test the theoretical prediction that gains vary by initial conditions, we introduce an interaction term that allows β_1 to vary depending on whether a given county is below the median for a specific attribute. Call this attribute h_i and let $H_i = 1$ when $h_i < \text{median}(h_i)$ and 0 otherwise. We therefore modify Equation (1):

$$\Delta \ln(y_{i,t}) = \gamma_0 + \gamma_1 \Delta C_{i,t} + \gamma_2 \Delta C_{i,t} * H_i + \gamma_3 X_i + \gamma_4 H_i + \Delta \epsilon_{i,t} \ . \tag{2}$$

Now γ_1 reports the average impact of proximity to a container port on population growth, and γ_2 reports whether there is any differential population gain in counties with h_i below the median. We expect containerization induced population growth to be larger, in percentage terms, in locations with low initial population and low initial land values. We therefore anticipate $\gamma_2 > 0$ when h_i is a measure of initial land values or population.

While both equations (1) and (2) net out county-specific time-invariant factors as well as trends by initial conditions – including distance to the ocean and initial share of employment in manufacturing – it may still be the case that an element in the error term

$\Delta\epsilon_{i,t}$ remains correlated with both containerization and the outcome variable of interest.

5.2 Instrumental Variables

To address any remaining non-randomness in the assignment of containerized ports to coastal port counties, we use port depth in 1953, Z_i, as an instrument for whether a county has a containerized port, $\Delta C_{i,t}$. Specifically, we instrument county containerization with 1953 port depth as

$$\Delta C_{i,t} = \alpha_0 + \alpha_1 Z_i + \alpha_2 X_i + \Delta\eta_{i,t} \ . \tag{3}$$

For the interaction specification in Equation (2), we use both 1953 port depth, Z_i, and the interaction between port depth and being below the median of a given covariate, $Z_i * H_i$, as instruments.

There are two requirements for the instrument to yield a causal estimate of containerization on local economic activity. The first is a strong relationship between containerization and port depth in 1953. The second requirement is that, conditional on covariates, port depth in 1953 is uncorrelated with unobserved determinants of changes in local economic activity from 1950 to period t. In other words, 1953 port depth impacts changes in local economic activity only through the creation of a containerized port and the follow-on effects of that decision; mathematically, this is $\text{cov}(z_i, \Delta\epsilon_{i,t}) = 0$. We discuss each of these requirements in turn.

First, we anticipate that county containerization should be strongly related to port depth in 1953 because container ships require deeper ports than their predecessors. As Appendix Figure 1 illustrates, today's container ships carry over 17 times more volume than their predecessors. Larger ships sit deeper in the water and thus require greater depth to navigate and dock.

It is possible, but quite expensive, to drill, blast or dredge an initially shallow port sufficiently deep to accept container ships. Given enough money and sufficiently lax environmental regulation, a harbor can arguably be made arbitrarily deep. However, port depth is only malleable at great cost. Therefore, initially deep ports have a competitive advantage when technology changes to favor deeper ports. This inability of ports to adjust equally is confirmed by Broeze, who notes that while "ship designers [keep] turning out larger and larger vessels," and "the engineering limits of port construction and channel deepening have by no means been reached[, t]his, however, may not be said of the capacity of all port authorities to carry the cost of such ventures" (Broeze, 2002, pp. 175–177). Thus, initial port depth is a key component of the cost of converting a breakbulk port into a containerized port.

Our instrument is therefore analogous to a cost shifter instrument often used in the industrial organization literature (Hausman, 1996; Nevo, 2001). Port depth should affect the supply of ports after the advent of containerization, but have no effect on the demand for ports.

This cost-based argument that 1953 port depth is a key driver of later containerization is consistent with containerization's pattern of adoption. Figure 2a shows the likelihood that a county is containerized (i.e., the county is within 50 km of a containerized port) versus the county's 1953 port depth (the maximum depth of any port within 50 km in 1953). It is immediately clear that port depth in 1953 is strongly associated with county containerization at time t. Among counties within 50 km of a port of more than 40 feet in depth in 1953, roughly 85 percent are containerized by 2010. These counties are the fastest to adopt container technology. More than sixty percent of counties near ports that are 35 to 40 feet deep are containerized by 2010. The relationship between the likelihood of containerization and port depth is nearly monotonic and counties near initially shallow ports—those less than 20 feet deep—never adopt container technology.

An alternative way to view the strength of our instrument is to compare the geographic distribution of port depth in 1953 and containerization, as we do in the top and bottom panels of Figures 3 and 4. In Figure 3, the top panel shows the estimation sample – counties within 50 km of a 1953 port – in blue and red (we include grey counties for reference). Red counties are treated: they are within 50 km of a containerized port in 2010. Control counties, those never within 50 km of a containerized port, are shown in blue.

The bottom panel of Figure 3 shows 1953 port depth (depth of the deepest port within 50 km of a county in 1953). The darkest color indicates counties with ports that are 40 or more feet deep and lighter colors successively less deep ports. Figure 4 repeats this pairing for the East Coast.

Visually, the relationship between containerization and port depth is strong. Statistically, the correlation coefficient for these two variables is 0.6. In a simple cross-sectional regression of depth on containerization, depth explains 30 percent of the variance in containerization. Appendix Table 1 shows first stage estimates. In our most complete specification, an additional foot of depth increases the likelihood of containerization by almost two percentage points. To put this in values that are relevant in our data, the deepest 1953 ports, at roughly 40 feet, are 40 percentage points more likely to containerize than the middle-depth ports at 20 feet.

Port depth in 1953 is an important predictor of containerization, even conditional on the many covariates we use. The lowest F statistic on the instrument in any specification is 17; the highest is 19. Encouragingly, we find that the coefficient on the instrument and its significance little changed by the inclusion of covariates, suggesting that the instrument is not correlated with the observables we include.[14]

[14]Our two-stage least squares estimates tables report the Kleinberg-Paap F statistic, which summarizes the overall strength of the first-stage, as suggested by Sanderson and Windmeijer (2016).

Given this evidence of a strong relationship between the endogenous variable and the instrument, we now turn to the second condition for instrument validity—that port depth in 1953 affects local economic activity only through its impact on containerization and its subsequent economic effects.

A key concern with the instrument is that proximity to deeper ports may explain changes in county economic activity even before containerization. Our framework asserts that port depth should matter for economic activity only after the advent of containerization. To test this claim, we assess whether decadal population changes respond to port depth. Specifically, we regress the change in log population from year $t - 10$ to year t on port depth in 1953 and the full set of covariates from Table 2.

We report results in Figure 2b. Each dot in this figure is from a separate regression and reports the coefficient on 1953 port depth in year t. For example, the 1930 estimate is from a regression of log population change from 1920 to 1930 on 1953 port depth and covariates. Each coefficient's 95 percent confidence interval is in grey whiskers. Only after 1960 – when containerization truly became a world technology – do we see a significant relationship between port depth and decadal changes in population. As container technology matures and its adoption wanes, the relationship between 1953 port depth and population growth levels off. This evidence that port depth in 1953 affects population growth only after the advent of containerization supports the validity of the instrument.

6 Results

With this empirical framework in hand, we now turn to estimation. In the first subsection, we report summary statistics and difference-in-difference results. The second subsection discusses our instrumental variable results and assesses whether the results are robust to alternative specifications. We conclude with a third subsection that tests whether containerization's impact is larger where land values are initially low.

6.1 Difference-in-Differences

We begin with the difference-in-difference specification to test the theoretical prediction that containerization increases local economic activity. Table 1 reports summary statistics: The first column reports means for coastal port counties that are within 50 km of a containerized port in 2010, the second column reports means for coastal port counties that are never within 50 km of a containerized port, and the final column reports means for all other US counties.

The figures on log population in the first rows of this table clearly show that coastal port counties near containerized ports were larger pre-containerization than other coastal port counties, and that coastal port counties in general were more populous than other US counties. From 1910 to 1950—the pre-containerization years—log population in coastal port counties near future containerized ports increased at a faster rate than in non-containerized coastal port counties and other US counties. These pre-treatment differences between counties generate a possible bias that we address with both the difference-in-difference and instrumental variable strategies.

In terms of other covariates, containerized coastal counties are more similar to non-containerized coastal counties than all other US counties. For example, in 1956, containerized coastal counties averaged 43 percent of their workforce in manufacturing; the figure for non-containerized coastal port counties was 38 percent, while all other US counties averaged 33 percent. This pattern holds for employment and payroll per employee as well.

Comparing the population statistics in 1950 to those in 2010, these summary statistics also illustrate our main finding: coastal port counties near containerized ports grow at a faster pace after the advent containerization than the average untreated coastal port county. This relative increase is visible in the employment and payroll per employee data from the County Business Patterns as well.

Moving to a regression framework, Table 2 shows difference-in-difference results, testing the theory's prediction that proximity to a containerized port is associated with greater population growth after the advent of containerization. Column 1 presents estimates conditional on a variety of measures for location and initial maritime importance: region fixed effects; distance to the ocean in kilometers and its square; the number of ports in 1953 within 50 kilometers and its square; and the total dollar value of waterborne international trade in 1955 at ports with 50 kilometers and its square. These results show a 40 log point increase in population for coastal port counties near containerized ports relative to coastal port counties not near containerized ports. This means that population growth in treated counties is about 50 percent ($\exp\{0.397\} - 1$) faster over the entire period than in the control group.[15]

The remaining columns in this table add additional covariates. We know from the summary statistics in Table 1 that pre-treatment population growth varies by treatment. Therefore these specifications condition on pre-containerization covariates that may determine post-containerization outcomes. Column 2 reports results that additionally control for the log of population in 1910, as well as the change in log population from 1920 to 1940. Thus, this specification nets out a forty-year lag in population in levels and a 10-year lag in population growth over 20 years. Interestingly, the coefficient of interest changes little, suggesting that these population measures add little explanatory power to the basic specification in Column 1.

A large literature (Rappaport and Sachs, 2003; Glaeser, 2005; Glaeser and Gyourko,

[15]In this and all estimates in this paper, we cluster standard errors by the 2010 commuting zone to account for spatial dependence across counties.

2005) has documented the movement of US population to warmer climates over the second half of the twentieth century. To ensure that this movement in population is not driving our results, Column 3 presents results controlling for weather, as measured by annual rainfall and its square, the annual maximum temperature, and the annual minimum temperature. Results are virtually identical to those in Column 2, suggesting that changing climate amenities over this time period are not driving our results.

Finally, we address the differential distribution of initial industrial activity and access to other transportation networks across counties in Column 4. We include controls for the share of 1956 manufacturing employment and the late 1950s transportation network. We measure the transportation network with the length of highways, navigable waterways, and railways per square kilometer. Conditional on the previous covariates, our results suggest that these additional controls are not positively correlated with containerization, as their inclusion increases the size of the containerization coefficient. This final coefficient shows a 45 log point increase in population after containerization, which is equivalent to about 55 percent faster population growth over the period.

These OLS results are consistent with the theoretical predictions from standard economic geography models discussed in Section 3: population increases near containerized ports after the adoption of container technology.[16] We defer a detailed discussion on the magnitude of our estimates until the presentation of the instrumental variable results.

6.2 Instrumental Variables

Although the difference-in-difference specification addresses many confounding factors potentially correlated with both proximity to a containerized port and population growth – such as past population, pre-containerization port prominence, and initial in-

[16]Our estimation does not discriminate between growth and reallocation. We explore this issue further when we discuss the instrument variables estimates.

dustrial mix – it is possible that some part of the error term remains correlated with the adoption of container technology. We now turn to our instrumental variable estimates and conclude with robustness tests.

Instrumental Variable Results Consistent with Difference-in-Difference Findings

We present the instrumental variable results in the right panel of Table 2. The four columns repeat the pattern of covariates from the OLS portion of the table (on the left). These coefficient estimates are uniformly larger than the OLS estimates, and, similar to the OLS results, they vary little as we add covariates.

Why are the IV results larger than OLS? As discussed in Section 3, we expect containerization to have a larger impact on population growth in initially smaller counties. When we use the instrument to correct for endogeneity in the proximity to a containerized port, we likely give more weight to initially smaller counties where depth is the main driver of the containerization decision. As a result, coefficients in the IV regression increase.

The most complete model in Column 8 shows that containerization caused a 75 log point increase in population over the 60 years from 1950 to 2010. This means that coastal port counties near containerized ports grew about twice as fast ($\exp(0.75) = 2.1$) as other coastal port counties because of containerization. This effect is sizeable: over the same 60-year period, all coastal counties grew about twice as fast as non-coastal counties.[17]

To further interpret the magnitude of these results, we turn to Duranton and Turner (2012). These authors find that a 100 percent increase in a city's initial stock of highways yields a 13 percent increase in population over a 20 year period, which corresponds

[17]The mean difference in log population between 1950 and 2010 in our main estimation sample is 0.91. For non-coastal counties, the mean difference in log population over the same period is 0.32 (see Table 1). The exponentiated difference between these two is $\exp(0.91 - 0.32) = 1.8$, slightly less than our main effect.

to an annualized increase of about 0.6 percent. Our effects are larger. We find that being within 50 km of a containerized port causes a 100 percent increase in population growth over a 60 year period, implying a growth rate of about 1.15 percent per year. Our containerization effect is thus about twice as large as the effect of doubling a city's initial stock of highways.[18]

Results Robust to Additional Considerations

We now turn to threats to identification. One concern is that the instrument is correlated with initial population level or growth. Our main specification already controls log population in 1910 and the change in log population 1920 to 1940. This is insufficient if prior population has a non-linear in logs impact. Column 2 of Table 3 addresses this concern by adding the square of 1910 log population, in the event that previous population impacts population growth non-linearly (Column 1 repeats our main specification – Table 2, Column 2 – for reference). This inclusion yields a still precise and little changed coefficient (69 vs 75 log points), suggesting that differential population growth by initial population is unlikely to drive our findings.

Similarly, one might be concerned that 1953 port depth is correlated with economic activity at baseline. Our main specification controls for the 1955 value of international trade at ports within 50 km. In Column 3, we add the value of 1948 international trade at ports within 50 km and its square, in the event that pre-containerization time-varying trade patterns impact the relationship between depth and containerization. The coefficient changes very little with this inclusion (75 vs 73 log points) and remains precise. Taken together, the results in Columns 2 and 3 show that if the instrument does remain

[18]Containerization required substantial investments. In the years of peak outlays from 1968 to 1973, the U.S. spent about $2015 8 billion of public and private funds on the required port infrastructure (Kendall, 1986). This is about $2015 1.6 billion per year, one fourth of the annualized cost of the Interstate Highway System from 1956 through 1991 (`https://www.fhwa.dot.gov/interstate/faq.cfm`, assessed on 08/21/2017).

correlated with pre-containerization attributes, the correlation is unlikely to be driven by population growth or trade volumes.

Finally, research in urban economics strongly suggests that growth is associated with an area's education and demographic characteristics (Moretti, 2004). This may bias our estimates inasmuch as these attributes are correlated with instrumented containerization. Column 4 includes additional controls for the share of people 25 or older with a high school degree, the share foreign born, the number of government workers per capita, and the share age 65 and older by county. Our main result is robust to the inclusion of these covariates.

We now turn to more general threats to identification. First, our instrument relies on a linear relationship between port depth and containerization. This relationship may not be appropriate for very shallow ports – where the de facto likelihood of containerization is zero. In Column 5, we drop all counties that are within 50 km of ports with depth below 10 feet. Results are virtually identical to the main specification, suggesting that using the full distribution of depth is not crucial to our identification.

A different concern with our estimation is that, within our sample, treated areas are mostly urban and untreated areas mostly rural. As we know from Table 1, containerized counties were on average larger pre-containerization. If we use the entire United States as our sample, the control group would now include many large metropolitan areas in the control group. Column 6 shows that our results are robust to including all U.S. counties in the sample, and are therefore not driven by the omission of highly urbanized areas in the control group.

In the last column, we show that our results are not driven by a specific distance cut-off for sample inclusion. In this specification, we include all coastal counties within 100 km of a port in 1953, rather than the 50 km cut-off that we use in the main estimation. We re-define the treatment variable to be an indicator for being within 100 km of a containerized port in 2010. In this larger sample, theory predicts that the treatment's affect should be attenuated, given that it combines strongly treated nearby places with lesser treated farther places. We find a 45 log point increase in population near containerized ports relative to other coastal port counties, equivalent to 56 percent faster growth. The smaller coefficient estimate is consistent with the prediction that gains from containerization decline with distance from the port. More generally, results in Appendix Table 2 show that containerization's effect on population declines monotonically with distance from the port. This is consistent with the expected relationship between the gains from containerization and distance from the port. [19]

We conclude this discussion of robustness by considering two additional pre-1956 infrastructure investments plausibly correlated with port depth. The first such infrastructure is naval bases. In the US, large military installations may promote local economic activity. If growth-yielding federal investments were concentrated near very deep ports, this could bias the coefficient on proximity to containerization upward. When we re-estimate Equation (1) using instrumental variables, omitting counties within 50 km of any naval base, the coefficient changes by 0.003 and is statistically indistinguishable from the main specification.[20]

Similarly, if very deep ports were crucial for oil imports, and oil imports caused pop-

[19]Our results cannot discriminate between growth and reallocation. In Appendix Table 2, we consider the spatial pattern beyond 50 km with our instrumental variable strategy. We find a small positive population gain in counties 50 to 100 km of a containerized port, little impact for counties 100 to 200 from a containerized port, and a population decline of 60 log points between 200 and 250 km. However, counties farther from ports have much smaller initial populations. Our estimates suggest that the average county within 50 km of a port gains almost 50,000 residents due to containerization. The average county 200 to 250 km from a containerized port loses about 11,000 residents. Our results are therefore unlikely to be driven exclusively by reallocation. These results are available upon request.

[20]As of the 1950s, the US had four domestic naval bases, at least 10 naval stations, and over 250 total facilities, which includes hospitals, test stations, air stations, and a large variety of other installations (U.S. Department of the Navy, 1952, 1959). Naval bases were Pearl Harbor, HI; San Diego, CA; Norfolk, VA and New London, CT. New London was actually taken out of "base" status between 1952 and 1959, but we include it for completeness. Relative to naval bases, naval stations are smaller, serve more limited purposes, and receive less investment (Coletta, 1985). Naval stations are so numerous that they are indistinguishable from our coastal locations.

ulation growth, our estimate of β_1 would be biased upward. A number of factors argue against this interpretation. First, as of 1948, 90 percent of US oil was produced domestically and the US accounted for 62 percent of the world oil market (Mendershausen, 1950, p. 4). It was not until the 1970s, almost two decades after the advent of containerization, that the US was no longer able to fulfill oil demand with domestic oil.

Furthermore, port depth is not a key determinant in the suitability of a port for oil trade, allaying concerns about the validity of the instrument. During the period of domestic oil hegemony, most oil moved by pipeline, rather than by ship. Even when oil imports increased, port depth was not as crucial, because oil ships connect to offload via a pipeline, which can be quite long. Therefore, ships need not dock directly at the harbor to offload oil. Morevoer, before the Suez Canal was dredged in the mid-1960s, it was a major limiting factor for using larger ships, as vessels with a draft deeper than 37 feet were not allowed to pass (Horn et al., 2010, p. 43).

Containerization's Impact on Other Economic Outcomes and Over Time

Having shown that containerization causes population growth, we test whether containerization also increases employment and nominal wages, and shifts industrial composition. Using the instrumental variables estimation with the full set of covariates from Table 2, the first row of Column 1 in Table 4 shows that, from 1956 to 2011, employment increases more in coastal port counties near containerized ports than in other coastal port counties because of containerization.[21] This change (112 log points) is roughly 80 percent of the mean log employment change over the period (140 log points) and is almost twice as large, in percentage terms, as containerization's impact on population change from 1950 to 2010.[22]

[21] Employment data is from County Business Patterns (see details in Section 4).

[22] Appendix Table 3 presents results for demographic outcomes. We find that the share of people with a college degree increases by about 25 percent, the share over 65 declines by about 10 percent, the share

The first row of the final column shows that these employment gains do not translate into aggregate nominal wage gains. Our estimate suggests that, relative to the control group, payroll per employee in coastal counties within 50 km of a conainer port grows by an additional, statistically insignificant, 9 log points over the period. As we discussed in Section 3, the net effect on nominal wages is theoretically ambiguous because the home market effect and the market crowding effect work in opposite directions.

The remaining rows of Table 4 assess whether containerization changed the industrial composition of counties near containerized ports. Each row in Column 1 of the "by industry" section of the table reports a coefficient from a separate regression where that industry's employment is the dependent variable. The positive coefficients suggest that employment gains are spread across all industries. These results are difficult to interpret, however, since the level of employment varies substantially across industries (see Column 2 for these means).

To more directly test the impact of containerization on industrial composition, we use the change in the employment share of a specific industry (from 1950 to 2010) as a dependent variable. Each row of Table 4 Column 3 reports the coefficient on containerization from a separate regression. Column 4 reports the dependent variable mean and the number of observations. With one exception, we see very little evidence of any substantive shifts in industrial composition associated with the adoption of containerization. Counties near container ports are not significantly more likely to specialize in manufacturing or trucking after the rise of containerization.

Nonetheless, a more narrow focus on transportation does show relative growth. In the final row of the table, the dependent variable is the share of employment in transportation services, which is "services which support transportation," and which includes "air traffic control services, marine cargo handling, and motor vehicle towing".[23]

African American declines substantially, and the share foreign born is little changed.

[23]For 1956, we use SIC 47 for "services incidental to transportation," and for 2011 we use NAICS 488

Our finding that employment shifts towards transportation services is reminiscent of Michaels (2008) who finds that counties connected with highways experience an increase in trade-related activities, such as trucking and retail sales.

The final columns of this table examine containerization's impact on payroll per employee – our best measure of wages – by industry from 1950 to 2010. We find suggestive evidence that containerization caused firms in manufacturing, wholesale trade, services, and trucking and warehousing to become more productive and pay higher wages to their workers. Nominal wages in such industries grew about 50 percent faster in coastal port counties near containerized ports because of containerization.

Containerization's Impact Increases Over Time

We test for changes in the impact of containerization over time by re-estimating Equation (1) using different final years. We report coefficients from these estimations in Appendix Figure 4. Specifically, the value for 1960 is the coefficient on the containerization in estimates parallel to those in Table 2 Column 8, but where the dependent variable is change in log population 1950 to 1960, rather than change in log population from 1950 to 2010. The population growth associated with containerization increases over time, possibly plateauing from 2000 to 2010. The larger increase in the earlier years may reflect the growing size of the containerized port network over this period, as shown in Figure 1. Our largest estimates of containerization's impact on population growth precede the dramatic reduction in the cost of air transportation, making us confident that this effect is separate from that of the twentieth century's other major global transport change.

for "support activities for transportation."

6.3 Where Gains to Containerization Are Largest

In the previous subsections, we showed that proximity to a containerized port causes increases in population and employment. We also hypothesized that gains should be greater in initially low land value areas; we now test this claim.

We use two proxies for land values circa 1956: county population density as of 1950, and the assessed value of land from the 1956 Census of Governments. While this last measure is the closest to a direct measure of the variable of interest, assessed values are notoriously different from market values. Particularly in this period, it was not unusual for assessment practices to vary substantially – and systematically – across jurisdictions (Anderson and Pape, 2010). The intensity of land use should be tightly correlated with the value of land, making population density a useful alternative proxy for land value.

Table 5 reports coefficients from Equation 2, where the dependent variable is the change in log population, 1950 to 2010. The first row reports estimates of γ_2, a measure of any additional population change from 1950 to 2010 in containerized counties that are below the median of variable h_i. The second row reports estimates of γ_1, or the average relationship between containerization and population growth. The third row reports estimates of γ_4, which is the direct effect on population changes of a county being below the median of variable h_i. The first column shows that population growth associated with containerization is concentrated in containerized counties in the bottom half of the population density distribution. Specifically, containerized counties in the bottom half of the 1950 population density distribution grew about 60 percent faster than the average containerized county.

The relationship with 1956 land value is similar and even stronger. Here, containerized counties in the bottom half of the land value distribution experience roughly 75 percent faster growth between 1950 and 2010 than the average containerized county. Thus, we find that 1950s-era land values are an important determinant of later containerization-induced growth.

There are two additional interesting features to this finding. First, in both cases, population gains from containerization are statistically significant only for low land value counties. In other words, gains to containerization are located predominantly in these counties. Second, these population gains occur in counties that – all else equal – are losing population. The third coefficient in the table reports that, on average, counties in the bottom half of the population density or land value distribution have population losses of about 30 log points from 1950 to 2010. Thus, containerization converts these low land value locations from locations of net population loss to net population gain.

In Column 3, we consider the role of initial industrial advantage, as measured by the high tech of the 1950s: the share of county employment in manufacturing in 1956. We find that containerized counties in the bottom half of the manufacturing employment distribution grow more slowly than the average containerized county. However, unlike the results for land value, we see population growth in containerized counties with both high and low manufacturing shares.

Finally, we assess whether population gains to containerization are related to counties' initial transportation infrastructure, measured by highway and rail nework density. Specifically, Column 4 uses the number of 1960 highway kilometers divided by the county's size in square kilometers, and Column 5 uses the same measure but with the number of 1957 railway miles. Surprisingly, containerization-induced population change does not correlate with these measures. These results are not consistent with a prominent role for market access (e.g., Donaldson and Hornbeck, 2016), in which containerization's impact would be larger, in percentage terms, in areas with initially low market access.

Overall, these results paint a picture of containerization exerting the greatest influence not in dominant agglomerations—large, wealthy urban areas—but in second-tier agglomerations where land was cheap. These second-tier agglomerations are initially less dense, but are relatively concentrated in the vanguard technology of the 1950s (manufacturing). This is consistent with containerization's demand for large areas of land and greater suitability for use with manufacturing goods.

7 Conclusion

Containerized shipping is a fundamental engine of the global economy. Containerization simplifies and speeds packing, transit, pricing, and every transfer from ship to train to truck. It eliminates previously profitable pilferage and makes shipping more reliable. Since the advent of containerization in 1956, the cost of moving containerizable goods has plummeted.

In this paper, we analyze how local economic activity responds to the dramatic decline in trade costs brought by containerization. We use a novel cost-shifter instrument based on the historical depth of ports to show that, consistent with the predictions of various economic geography models, containerization caused substantial population and employment growth in counties near containerized ports. Consistent with containerization's need for substantial land for large cranes and vast marshalling yards, gains are located predominantly in counties with initially low population density and low land values.

Whether and how containerization impacts the location of population, employment, and wages has implications for both the agglomerative forces that drive innovation, and for political representation that yields democratic outcomes. For policymakers to mitigate the uneven impacts of globalization, it is useful to first understand its causes.

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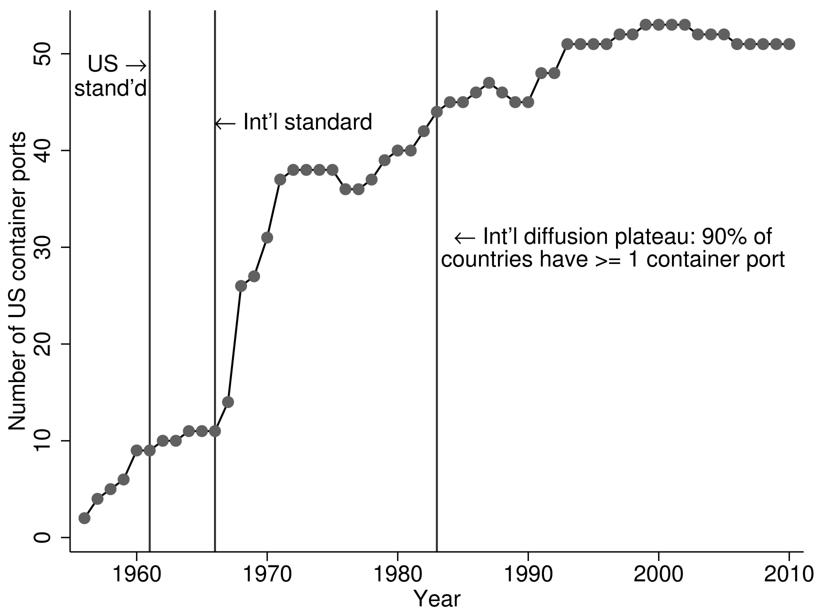
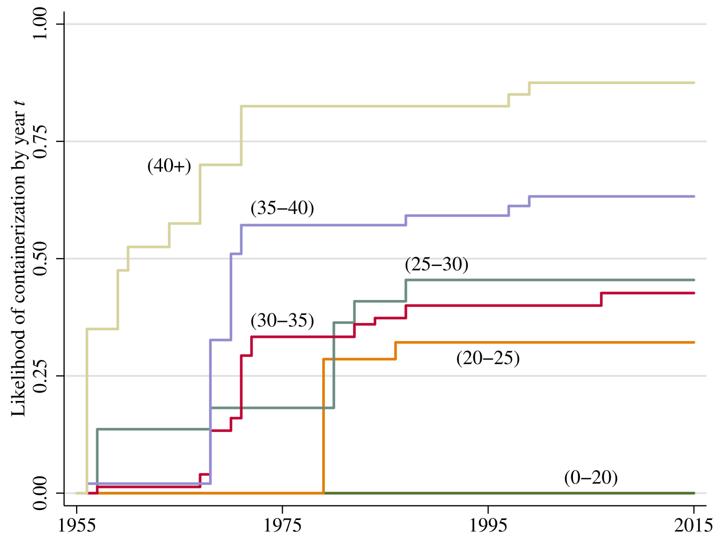
Figure 1: Adoption of Containerization: 1956–2008



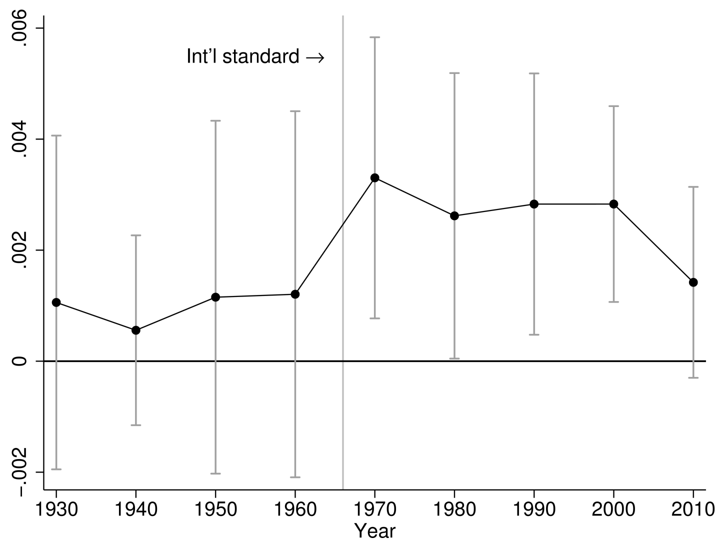
Note: This figure shows the diffusion of containerization across US ports. Source: *Containerisation International Yearbook*, volumes 1968 and 1970–2010.

Figure 2: Graphical Intuition

(a) First Stage: Depth and Likelihood of Containerization



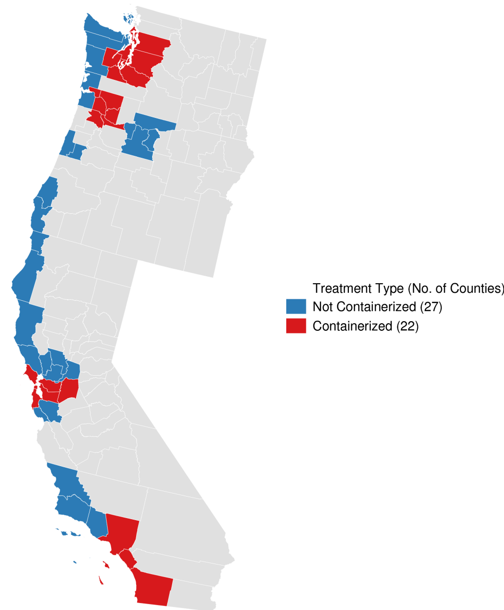
(b) Reduced Form: Depth and Population Changes



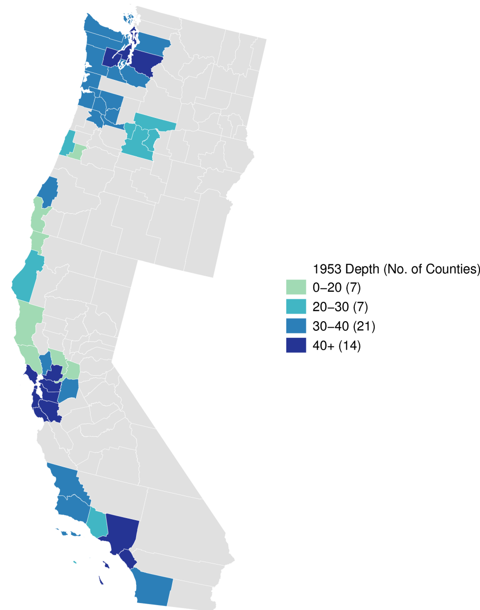
Notes: The top panel shows the likelihood a county is within 50 km of a container port by year t as a function of the depth of the deepest port within 50 km in 1953. Counties near deeper ports are both more likely to be near a container port and more likely to containerize early. Figure 2b plots the reduced form estimate of 1953 port depth on decadal population changes. For example, the 1930 value is the coefficient on depth from a regression where the dependent variable is the change in log population from 1920 to 1930. These estimates include the full set of covariates from Table 2; 95 percent confidence intervals are in grey. We see no significant impact of port depth on decadal population changes until after the widespread adoption of container technology.

Figure 3: Geographic Variation in Treatment and Instrument: West Coast

(a) Treatment: County is Within 50km of a Container Port in 2010



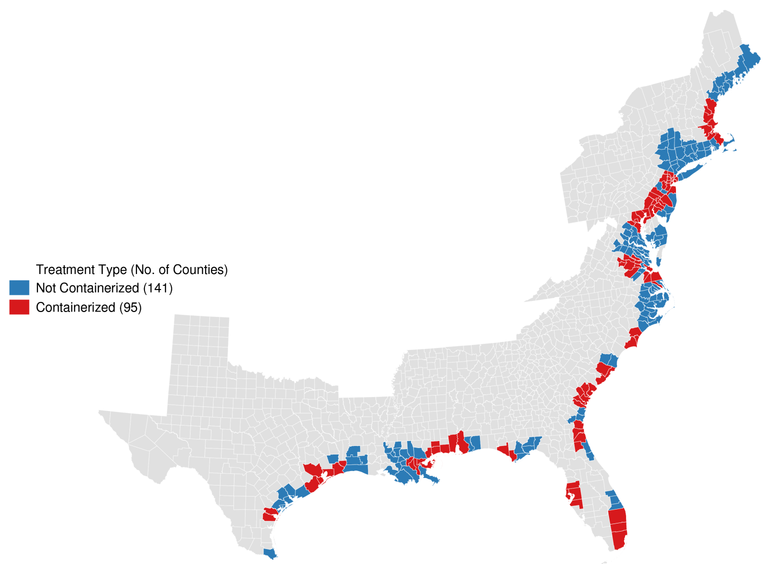
(b) Instrument: Depth of Deepest Port Within 50 km of County in 1953



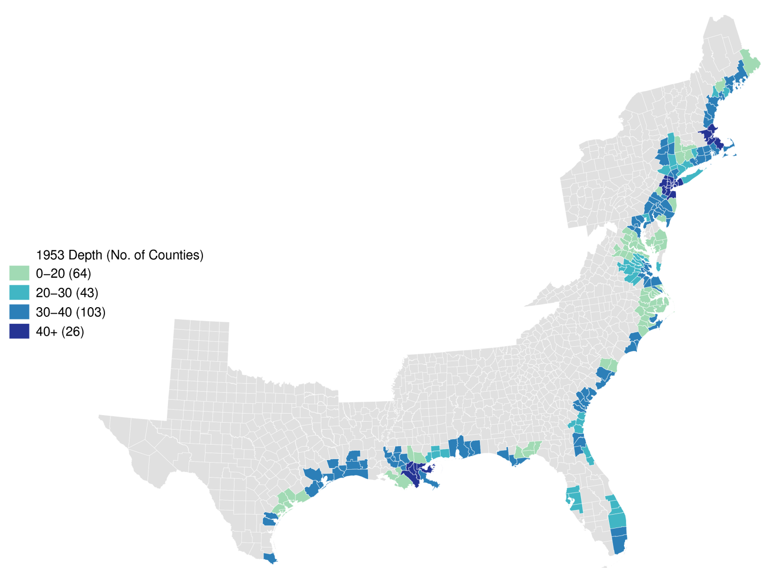
Notes: The upper panel uses red and blue to show counties we classify as "coastal port counties," which are those within 50 km of a port in 1953. Among these coastal port counties, "containerized" counties are in red and are those within 50 km of a container port in 2010. The remainder of coastal port counties – those that are not within 50 km of a container port by the end of the study period – are in blue. Grey counties are not within 50 km of a port in 1953 and therefore are excluded from our primary sample. We include them in this figure for reference. The bottom panel shows the same set of "coastal port counties," now shaded by the depth of the deepest port within 50 km in 1953.

Figure 4: Geographic Variation in Treatment and Instrument: East Coast

(a) Treatment: County is Within 50km of a Container Port in 2010



(b) Instrument: Depth of the Deepest Port Within 50 km of County in 1953



Notes: The upper panel uses red and blue to show counties we classify as "coastal port counties," which are those within 50 km of a port in 1953. Among these coastal port counties, "containerized" counties are in red and are those within 50 km of a container port in 2010. The remainder of coastal port counties – those that are not within 50 km of a container port by the end of the study period – are in blue. Grey counties are not within 50 km of a port in 1953 and therefore are excluded from our primary sample. We include them in this figure for reference. The bottom panel shows the same set of "coastal port counties," now shaded by the depth of the deepest port within 50 km in 1953. We exclude Great Lakes port counties from the analysis.

Table 1: County Characteristics by Distance to Nearest Container Port

	Counties within 50 km of a Port in 1953		
	Within 50 km of a Container Port in 2010:		
	Yes	No	All Other Counties
	(1)	(2)	(3)
Log Population			
1910	10.67	9.96	9.70
	(1.49)	(1.07)	(0.95)
1950	11.45	10.37	9.87
	(1.65)	(1.26)	(1.02)
2010	12.51	11.19	10.19
	(1.46)	(1.44)	(1.34)
Log Employment			
1956	9.83	8.48	7.64
	(2.16)	(1.68)	(1.52)
2011	11.33	9.84	8.78
	(1.76)	(1.71)	(1.57)
Log First Quarter Payroll / Employee, $1000s			
1956	-0.16	-0.35	-0.45
	(0.29)	(0.31)	(0.32)
2011	2.35	2.14	2.00
	(0.32)	(0.29)	(0.21)
Share Employment, Manufacturing			
1956	0.43	0.38	0.33
	(0.18)	(0.19)	(0.22)
2011	0.07	0.08	0.12
	(0.05)	(0.07)	(0.12)
Region			
Northeast	0.27	0.28	0.05
Midwest	0.00	0.00	0.39
South	0.53	0.55	0.44
West	0.20	0.17	0.11
Observations	110	162	2642

Note: This table reports means and standard deviations in parentheses. The number of observations at the bottom of the table applies to all variables except the 1910 population and the payroll and employment variables; each has slightly fewer observations.

Table 2: Containerization Associated with Increased Population Near the Port

	OLS				IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1{Containerized}	0.397***	0.416***	0.410***	0.449***	0.669**	0.699**	0.748***	0.750***
	(0.103)	(0.103)	(0.099)	(0.089)	(0.276)	(0.284)	(0.264)	(0.251)
Covariates								
Region fixed effects	x	x	x	x	x	x	x	x
Distance to the ocean	x	x	x	x	x	x	x	x
Number of 1953 ports	x	x	x	x	x	x	x	x
Value of waterborne trade, 1955	x	x	x	x	x	x	x	x
Log population, 1910		x	x	x		x	x	x
Change in log pop., 1920-1940		x	x	x		x	x	x
Weather			x	x			x	x
Share manufacturing emp., 1956				x				x
Transportation network, late 1950s				x				x
R-squared	0.18	0.31	0.35	0.38	0.16	0.29	0.31	0.35
F Stat, Excluded instrument					19.37	17.18	18.30	19.80

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All regressions use the 272 observations from the sample of coastal counties within 50 km of a port in 1953. We cluster standard errors at the 2010 commuting zone. The dependent variable is the change in log population, 1950-2010, and its mean is 0.91. We report the Kleinberg-Papp F statistic, as discussed in Sanderson and Windmeijer (2016). Region fixed effects are indicators for census regions. "Distance to the ocean" is the shortest distance from the county centroid to the ocean and that distance squared. "Number of 1953 ports" is the number of 1953 ports within 50 km of the county's centroid, and that number squared. "Value of waterborne international trade, 1955" is the total dollar value of international trade in 1955 within 50 km of the county's centroid and that number squared. "Weather" is a vector of the average rainfall in that county and that amount squared, as well as the annual maximum and annual minimum temperatures. "Transportation network, late 1950s" is a vector that measures the kilometers of highways c. 1960, kilometers of navigable waterways, and kilometers of railroads c. 1957 in each county, all per square kilometer of land area. See data appendix for complete details on years and sources.

Table 3: Impact of Containerization Robust to Alternative Specifications

	Table 2, Column 8	1910 Log Pop. Squared	1948 Trade	1950 Demo-graphics	Drop if Depth $\leq$ 10 ft.	All US	100 KM Band-width
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1{Containerized}	0.750***	0.692***	0.738***	0.845***	0.756***	0.627***	0.448***
	(0.251)	(0.234)	(0.286)	(0.264)	(0.288)	(0.230)	(0.156)
R-squared	0.35	0.39	0.36	0.41	0.40	0.26	0.32
Mean dependent variable	0.91	0.91	0.91	0.91	0.91	0.37	0.85
F Stat, Excluded instrument	19.80	20.31	17.24	20.33	15.63	26.91	86.84
Observations	272	272	272	272	252	2914	433

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All specifications are instrumental variable regressions with clustered standard errors at the 2010 commuting zone. The dependent variable is the change in log population from 1950 to 2010. All regressions include the most complete set of covariates from Table 2. Column 1 repeats the most saturated estimation from Table 2 in Column 8. Column 2 additionally controls for the square of 1910 log population. Column 3 controls for the dollar value of 1948 international trade at ports within 50 km of the county centroid. Column 4 additionally controls for county demographics measured in 1950: share of people 25 or older with less than a high school degree, share of people 25 or older with a college degree or more, share age 65 and older, share African American, and share foreign born. Column 5 limits the sample to coastal counties within 50 km of a port that is more than 10 feet deep in 1953. Column 6 includes all US counties for which we have complete data. Column 7 includes all coastal counties within 100 km of a port in 1953 and the treatment variable is an indicator for being within 100 km of a containerized port in 2010.

Table 4: Employment and Nominal Wages Near Containerized Ports, Aggregate and By Industry

	Log Employment		Employment Share		Log Payroll per Employee	
	Coeff. (SD)	Mean [Obs.]	Coeff. (SD)	Mean [Obs.]	Coeff. (SD)	Mean [Obs.]
	(1)	(2)	(3)	(4)	(5)	(6)
All industries	1.123***	1.4			0.093	2.5
	(0.340)	[271]			(0.121)	[271]
By industry						
Construction	1.126***	1.06	0.007	-0.0234	0.119	2.51
	(0.348)	[252]	(0.029)	[271]	(0.125)	[247]
Manufacturing	0.846*	-0.19	-0.007	-0.3207	0.396**	2.68
	(0.444)	[228]	(0.028)	[271]	(0.177)	[225]
Transport and Comm.	1.148**	0.66	0.005	-0.0380	0.038	2.42
	(0.551)	[229]	(0.016)	[271]	(0.146)	[224]
Wholesale Trade	1.592***	1.09	0.007	-0.0236	0.489***	2.72
	(0.538)	[224]	(0.025)	[271]	(0.176)	[220]
Retail Trade	1.109***	1.01	0.016	-0.0773	0.084	2.28
	(0.324)	[269]	(0.030)	[271]	(0.100)	[267]
Finance	0.852**	1.72	-0.019	0.0145	0.071	2.81
	(0.355)	[241]	(0.014)	[271]	(0.213)	[239]
Services	1.169***	3.15	0.027	0.3996	0.362**	2.81
	(0.404)	[267]	(0.038)	[271]	(0.143)	[264]
Trucking and Warehousing	1.131**	0.65	0.016	-0.0031	0.398**	2.51
	(0.549)	[167]	(0.011)	[271]	(0.199)	[166]
Transportation Services	1.384***	0.7	0.017**	0.0003	0.234	2.35
	(0.471)	[154]	(0.008)	[271]	(0.148)	[154]

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All regressions are instrumental variable estimates with standard errors clustered at the 2010 commuting zone. The dependent variable is the change from 1956 to 2011 in the variable noted in the column header. All estimations use the complete set of covariates as discussed in Table 2. See data appendix for complete details on years and sources.

Table 5: Larger Gains in Counties with Initially Low Land Values and Higher Share of Manufacturing Jobs

	Interaction Variable is				
	1950 Population Density	1956 Assessed Land Value	Manuf. Share of Employment	1957 Highway length, km/County km sq.	1960 Railway length, km/County km sq.
	(1)	(2)	(3)	(4)	(5)
1{Containerized} * 1{County $\leq$ median(variable)}	0.483^{*}	0.564^{**}	-0.617^{**}	0.224	-0.038
	(0.282)	(0.266)	(0.296)	(0.318)	(0.379)
1{Containerized}	0.279	0.179	1.040^{***}	0.545	0.788^{**}
	(0.258)	(0.295)	(0.252)	(0.343)	(0.363)
1{County $\leq$ median(variable)}	-0.317^{**}	-0.322^{**}	0.263	-0.169	0.022
	(0.148)	(0.162)	(0.181)	(0.226)	(0.223)
R-squared	0.39	0.39	0.35	0.37	0.35
Share of observations $\leq$ median	0.68	0.66	0.55	0.70	0.68

Note: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All specifications are instrumental variable estimates of Equation (2) with the change in log population from 1950 to 2010 as the dependent variable. All regressions have 272 observations and cluster standard errors at the 2010 commuting zone. The coefficients in each column reports any additional population growth for containerized counties that are below the median of the variable listed in the column header. The second coefficient reports the average impact of containerization on population growth, and the third row reports the average impact of being below the median of the variable listed in the column header on population growth. We use the median of the variable in the treated population only.

FOR ONLINE PUBLICATION

A Data Appendix

A.1 Data Sources

We use data from a variety of sources. This appendix provides source information.

1. County Business Patterns
   These data include total employment, total number of establishments (with some variation in this definition over time), and total payroll.

   - 1956: Courtesy of Gilles Duranton and Matthew Turner. See Duranton et al. (2014) for source details. We collected a small number of additional counties that were missing from the Duranton and Turner data.
     - In these data, payroll is defined as the "amount of taxable wages paid for covered employment [covered by OASI, or almost all "nonfarm industrial and commercial wage and salary employment" (page VII)[24]] during the quarter. Under the law in effect in 1956, taxable wages for covered employment were all payments up to the first $4,200 paid to any one employee by any one employer during the year, including the cash value of payments in kind. In general, all payments for covered employment in the first quarter were taxable unless the employee was paid at the rate of more than $16,800 per year. For the first quarter of 1956, it is estimated that 97.0 percent of total non-agricultural wages and salaries in covered employment was taxable. The taxable proportion of total wages becomes smaller in the later quarter of the year. Data are presented for the first quarter because wages for this quarter are least affected by the provisions of the law limiting taxable wages to $4,200 per year." (page VI, Section III, Definitions in 1956 County Business Patterns report.)
   - 1967 to 1985: U.S. National Archives, identifier 313576.
   - 1986 to 2011: U.S. Census Bureau. Downloaded from `https://www.census.gov/econ/cbp/download/`
     - For comparability, we also use total first quarter payroll from these data.

2. Decennial Census: Population and demographics data by county

   - 1910: ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1950 Census I (County and State)

[24]Data also exclude railroad employment.

- 1920: ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1950 Census I (County and State)
- 1930: ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1950 Census I (County and State)
- 1940: ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1950 Census I (County and State)
- 1950
  - ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1950 Census I (County and State)
  - Census of Population, 1950 Volume II, Part I, Table 32.
- 1960: ICPSR 02896, Historical, Demographic, Economic and Social Data: The United States, 1790-2002, Dataset 38: 1960 Census I (County and State)
- 1970: ICPSR 8107, Census of Population and Housing, 1970: Summary Statistic File 4C – Population [Fourth Count]
- 1980: ICPSR 8071, Census of Population and Housing, 1980: Summary Tape File 3A
- 1990: ICPSR 9782, Census of Population and Housing, 1990: Summary Tape File 3A
- 2000: ICPSR 13342, Census of Population and Housing, 2000: Summary File 3
- 2010: U.S. Census Bureau, 2010 Decennial Census Summary File 1, Downloaded from `http://www2.census.gov/census_2010/04-Summary_File_1/`
- 2010 (2008-2012): U.S. Census Bureau, American Community Survey, 5-Year Summary File, downloaded from `http://www2.census.gov/acs2012_5yr/summaryfile/2008-2012_ACSSF_All_In_2_Giant_Files%28Experienced-Users-Only%29/`

3. Port Universe and Depth
   - We use these documents to establish the population of ports in any given year.
   - 1953: *World Port Index*, National Geospatial-Intelligence Agency (1953)
   - 2015: *World Port Index*, National Geospatial-Intelligence Agency (2015)
4. Port Containerization Adoption Year
   - 1956–2010: *Containerisation International Yearbook* for 1968 and 1970–2010
5. Port Volume: Total imports and exports by port
   - 1948: United States Foreign Trade, January-December 1949: Water-borne Trade by United States Port, 1949, Washington, D.C.: U.S. Department of Commerce, Bureau of the Census. FT 972.

- 1955: United States Waterborne Foreign Trade, 1955, Washington, D.C. : U.S. Dept. of Commerce, Bureau of the Census. FT 985.
- 2008: *Containerisation International* yearbook 2010, pp. 8–11.

6. Highways
   - 2014: 2014 National Transportation Atlas, Office of the Assistant Secretary for Research and Technology, Bureau of Transportation Statistics, United States Department of Transportation. `http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/2014/index.html`.
   - c. 1960: Office of Planning, Bureau of Public Roads, US Department of Commerce, "The National System of Interstate and Defense Highways." Library of Congress Call number G3701.P21 1960.U5. Map reports improvement status as of December 31, 1960.
7. Railways
   - 2014: 2014 National Transportation Atlas, Office of the Assistant Secretary for Research and Technology, Bureau of Transportation Statistics, United States Department of Transportation. `http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/2014/index.html`.
   - c. 1957: Army Map Service, Corps of Engineers, US Army, "Railroad Map of the United States," prepared 1935, revised April 1947 by AMS. 8204 Edition 5-AMS. Library of Congress call number G3701.P3 1957.U48.
8. Waterways
   - 2014: 2014 National Transportation Atlas, Office of the Assistant Secretary for Research and Technology, Bureau of Transportation Statistics, United States Department of Transportation. `http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/2014/index.html`.
9. Property value data
   - 1956: 1957 Census of Governments: Volume 5, *Taxable Property Values in the United States*
   - 1991: 1992 Census of Governments, Volume 2 *Taxable Property Values*, Number 1 *Assessed Valuations for Local General Property Taxation*
   - In both 1957 and 1992, the Census reports a total figure for the New York City, which consists of five separate counties (equivalent to the boroughs). We attribute the total assessed value from the census of governments to each county

(borough) by using each borough's share of total assessed value. For 1956, we rely upon the *Annual Report of the Tax Commission and the Tax Department to the Mayor of the City of New York* as of June 30, 1956, page 23 which reports "Assessed Value of All Real Estate in New York City for 1956-1957." For 1991, we rely upon *Department of Finance Annual Report, 1991-1992*, pages 19-24.

- The District of Columbia is missing an assessed value for 1956 in the Census of Government publication listed above. However, the amount is available in *Trends in Assessed Valuations and Sales Ratios, 1956-1966*, US Department of Commerce, Bureau of the Census, March 1970. We use this value.
- For 2010 value, we use the sum of the value of aggregate owner occupied stock (American Community Survey) and the aggregate value of the rental occupied stock. As the Census only reports aggregate gross rent, we convert aggregate gross rent to aggregate value of the rental stock by multiplying the aggregate value of the rental stock (by 12 to generate a monthly figure) by the average rent-price ratio for years 2008-2012 (corresponding with the ACS years) from Lincoln Institute Rent-price ratio data[25].

10. Temperature and Rainfall
    - Temperature: North America Land Data Assimilation System (NLDAS) Daily Air Temperatures and Heat Index, years 1979-2011 on CDC WONDER Online
    - Rainfall
      - Anthony Arguez, Imke Durre, Scott Applequist, Mike Squires, Russell Vose, Xungang Yin, and Rocky Bilotta (2010). NOAA's U.S. Climate Normals
      - Not all counties have weather stations that measure rain, and not all weather stations have valid measurements. For the roughly 170 counties without rainfall data, we impute rainfall from nearby counties (those within 50 kilometers).

A.2 Data Choices

1. U.S. County Sample

Our unit of analysis is a consistent-border county from 1950 to 2010. We generate these counties by aggregating 1950 counties. Please see the final Appendix Table for the specific details of aggregation.[26]

[25] http://datatoolkits.lincolninst.edu/subcenters/land-values/rent-price-ratio.asp

[26] These groupings relied heavily on the very helpful work of the Applied Population Laboratory group at the University of Wisconsin. See their documentation at http://www.netmigration.wisc.edu/datadictionary.pdf.

The 1956 County Business Patterns allowed for reporting of only 100 jurisdictions per state, leading to the reporting of aggregate values for agglomerations of counties in states with many counties. See Duranton et al. (2014) for the initial collection of these data, and additional details. To resolve the problem of making these 1956 units consistent with the 1950 census units, we disaggregate the 1956 CBP data in the agglomerated reporting into individual counties, attributing economic activity by population weights.

Alaska and Hawaii were not states in 1950. We omit Alaska from our sample, because in 1950 it has only judicial districts, which do not correspond to modern counties. We keep Hawaii, where the 1950 borders are relatively equivalent to modern counties. We also keep Washington, DC, in all years.

We also make a few additional deletions

- Two counties that only appear in the data (1910-1930) before our major period of analysis: Campbell, GA (13/041) and Milton, GA (13/203).
- Two problematic counties. Menominee, WI (55/078) created in 1959 out of an Indian reservation; it has very few people. Broomfield, CO (08/014), created in 2001 from parts of four other counties.
- Two counties where land area changes are greater than 40 percent. These are Denver County, CO (08/031) and Teton County, WY (56/039).

2. County Business Patterns data

   - For some county/industry groupings, there is a disclosure risk in reporting either the total number of employees or the total payroll. In such cases, we convert the disclosure code ("D" in the years before 1974) to 0.
   - "Payroll" is first quarter payroll.

Appendix Figure 1: Evolution of Ship Sizes

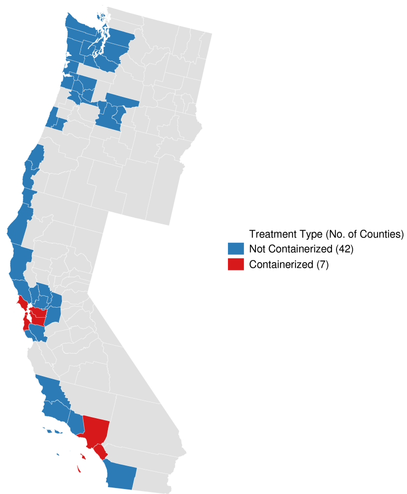
WWII technology

First container ships, 1956 to 1970s

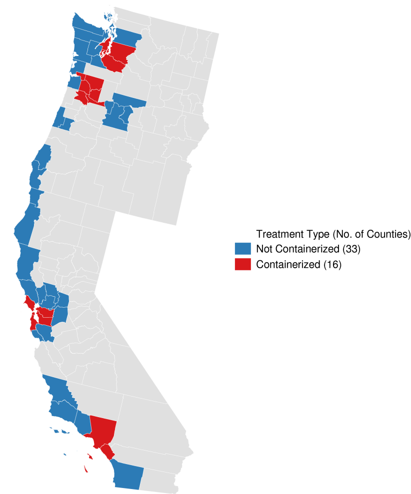
Today, Post-Panamax

Source: WWII, authors; remaining ships, (Rodrigue, 2017).

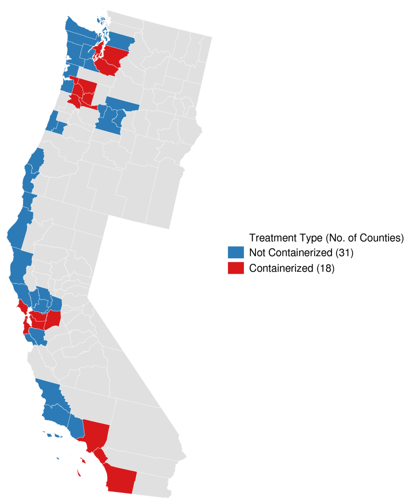
Appendix Figure 2: Adoption Over Time in the West Coast



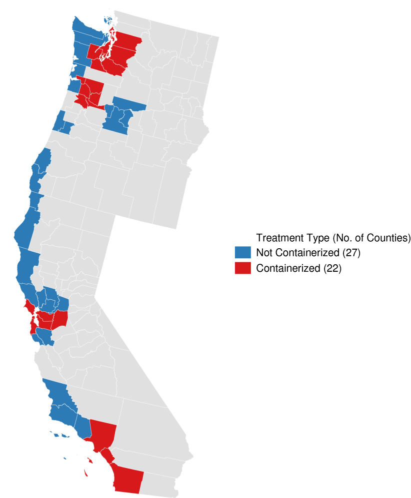
(a) 1960



(b) 1970



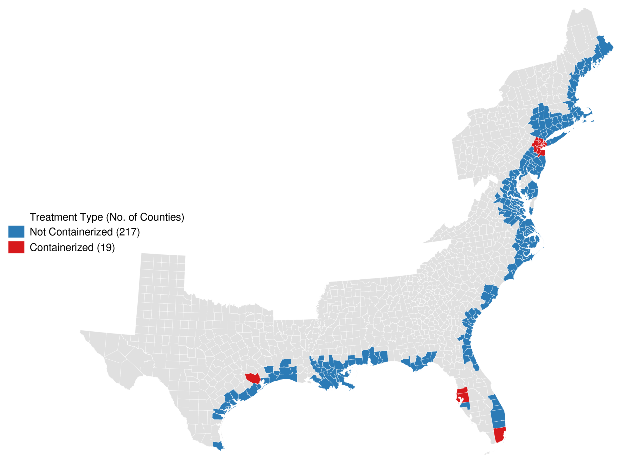
(c) 1990



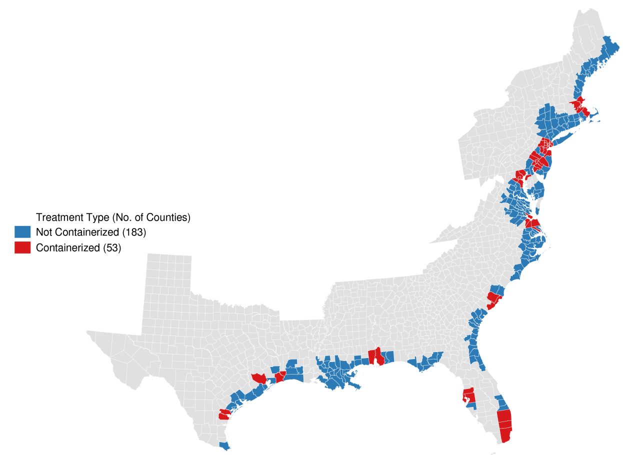
(d) 2010

Notes: These figures show containerization by county from 1960 to 2010. Colors are as in Figures 3 and 4.

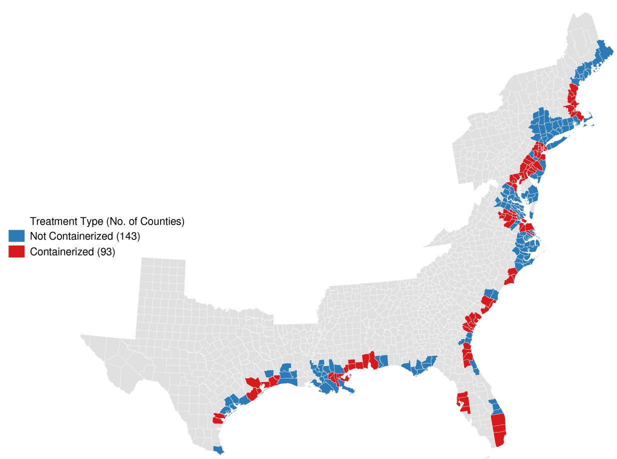
Appendix Figure 3: Adoption Over Time in the East Coast



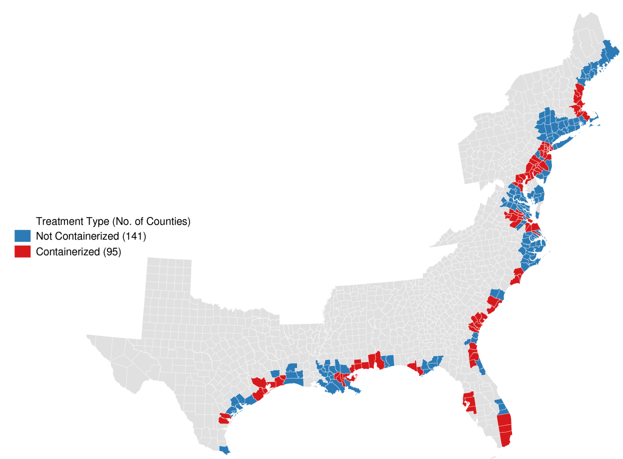
(a) 1960



(b) 1970



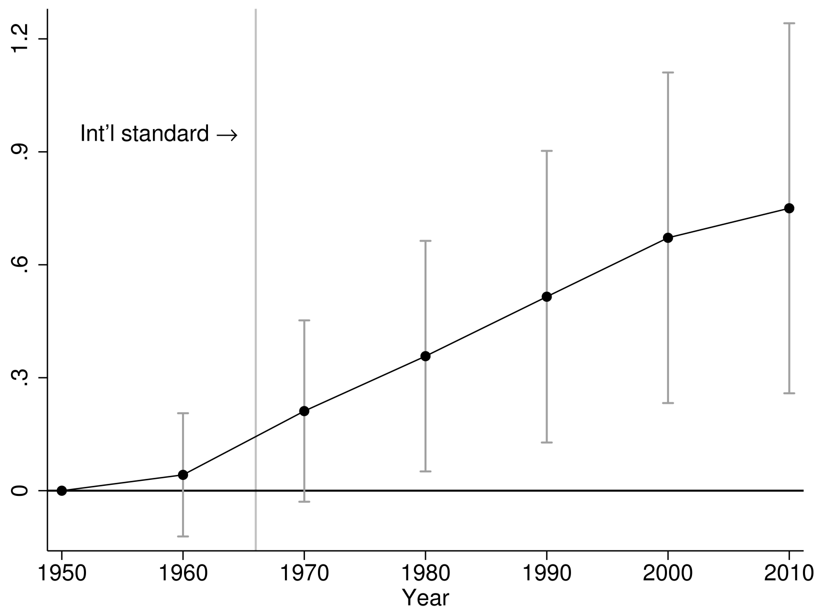
(c) 1990



(d) 2010

Notes: These figures show containerization by county from 1960 to 2010. Colors are as in Figures 3 and 4.

Appendix Figure 4: Containerization Associated with Larger Impact Over Time



Notes: This figure reports coefficients (black dots) and 95 percent confidence intervals (grey whiskers) for instrumental variable estimates of β_1, conditional on the full set of covariates in Table 2. The dependent variable for the final dot ($t = 2010$) is the same as the estimate in Column 8 of Table 2. The dependent variable for the other estimates is the log population change from 1950 to year t.

Appendix Table 1: First Stage and Reduced Form

	First Stage				Reduced Form			
	DV is 1{Containerized}				DV is Change in Log Pop., 1950-2010			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depth of deepest port within 50 km	0.0184***	0.0177***	0.0182***	0.0183***	0.0123**	0.0124**	0.0136***	0.0137***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Covariates								
Region fixed effects	x	x	x	x	x	x	x	x
Distance to the ocean	x	x	x	x	x	x	x	x
Number of 1953 ports	x	x	x	x	x	x	x	x
Value of waterborne trade, 1955	x	x	x	x	x	x	x	x
Log population, 1910		x	x	x		x	x	x
Change in log pop., 1920-1940		x	x	x		x	x	x
Weather			x	x			x	x
Share manufacturing emp., 1956				x				x
Transportation network, late 1950s				x				x
R-squared	0.49	0.50	0.51	0.53	0.15	0.28	0.32	0.35
Mean dependent variable	0.40	0.40	0.40	0.40	0.91	0.91	0.91	0.91
F Stat, Excluded instrument	19.37	17.18	18.30	19.80				

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All regressions use the 272 observations from the sample of coastal counties within 50 km of a port in 1953. We cluster standard errors at the 2010 commuting zone. We report the Kleinberg-Papp F statistic, as discussed in (Sanderson and Windmeijer, 2016). Region fixed effects are indicators for census regions. "Distance to the ocean" is the shortest distance from the county centroid to the ocean and that distance squared. "Number of 1953 ports" is the number of 1953 ports within 50 km of the county's centroid, and that number squared. "Value of waterborne international trade, 1955" is the total dollar value of international trade in 1955 within 50 km of the county's centroid and that number squared. "Weather" is a vector of the average rainfall in that county and that amount squared, as well as the annual maximum and annual minimum temperatures. "Transportation network, late 1950s" is a vector that measures the kilometers of highways c. 1960, kilometers of navigable waterways, and kilometers of railroads c. 1957 in each county, all per square kilometer of land area.

Appendix Table 2: Spatial Decay

	Distance to Nearest Port in 1953 is				
	0-50 km	50-100 km	100-150 km	150-200 km	200-250 km
	(1)	(2)	(3)	(4)	(5)
1{Containerized}	0.773***	0.179	-0.041	-0.073	-0.609*
	(0.258)	(0.154)	(0.173)	(0.196)	(0.326)
R-squared	0.35	0.46	0.43	0.42	0.31
Mean dependent variable	0.91	0.74	0.51	0.44	0.34
Mean log population, 1950	10.81	10.14	10.13	10.08	10.10
F Stat, Excluded instrument	18.55	57.75	91.74	138.00	102.49
Observations	272	161	128	113	104

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All specifications are instrumental variable regressions with clustered standard errors at the 2010 commuting zone. The dependent variable is the change in log population from 1950 to 2010. All regressions include the most complete set of covariates from Table 2. Column 1 repeats the most saturated estimation from Table 2 in Column 8. Column 2 only includes coastal counties that are between 50 and 100 km from a port in 1953. Column 3 only includes coastal counties that are between 100 and 150 km from a port in 1953. Column 4 only includes coastal counties that are between 150 and 200 km from a port in 1953. Column 5 only includes coastal counties that are between 200 and 250 km from a port in 1953.

Appendix Table 3: Demographic Outcomes

	Fraction college degree	Fraction older than 65	Fraction black	Fraction foreign-born
	(1)	(2)	(3)	(4)
1{Containerized}	0.096***	-0.030**	-0.115***	0.007
	(0.036)	(0.015)	(0.035)	(0.014)
R-squared	0.36	0.30	0.52	0.61
Mean dependent variable	0.21	0.06	-0.02	0.04

Notes: Stars denote significance levels: * 0.10, ** 0.05, and *** 0.01. All regressions are instrumental variable estimates with standard errors clustered at the 2010 commuting zone. The dependent variable is the change from 1950 to 2010 in the variable noted in the column header. All estimations use the most complete set of covariates as discussed in Table 2.

Appendix Table 4: Effect of Depth on Containerization Consistent Across Depth Types

	Type of Depth		
	Wharf	Anchorage	Channel
	(1)	(2)	(3)
Port Depth in 1953, in feet			
10 to 15	-0.037	-0.067	-0.063
	(0.072)	(0.072)	(0.083)
15 to 20	-0.032	0.05	0.274
	(0.098)	(0.068)	(0.216)
20 to 25	0.395	-0.068	0.226
	(0.172)	(0.077)	(0.12)
25 to 30	0.473	0.374	0.274
	(0.151)	(0.125)	(0.128)
30 to 35	0.392	0.394	0.359
	(0.109)	(0.131)	(0.136)
35 to 40	0.466	0.426	0.441
	(0.141)	(0.187)	(0.163)
$>$ 40	0.6	0.208	0.22
	(0.206)	(0.159)	(0.156)

Notes: All regressions use the 272 observations from the sample of coastal counties within 50 km of a port in 1953. We cluster standard errors at the 2010 commuting zone. The dependent variable is an indicator variable for being within 50 km of a containerized port in 2010. All regressions include the most complete set of covariates from Table 2. The type of depth is as noted in the column header.

Appendix Table 5: County Groupings for Consistent Counties

State	State FIPS	Grouped County FIPS	Initial Counties: County Name	County FIPS	Notes
Arizona	04	027	La Paz County	012	Used to be part of Yuma County (04/027)
Florida	12	086	Miami Dade	025	Name change, from Dade County to Miami-Dade, yielded a numbering change.
Hawaii	15	010	Kalawao County	005	
Hawaii	15	010	Maui County	009	
Montana	30	067	Yellowstone County	113	Yellowstone County merged is to Park County (30/067)
Nevada	32	510	Ormsby County	025	Becomes Carson City (32/510)
New Mexico	35	061	Cibola County	006	Used to be part of Valencia County (35/061)
South Dakota	46	041	Armstrong County	001	Is merged into Dewey County (46/041)
South Dakota	46	071	Washabaugh County	131	Is merged into Jackson County (46/071)
Virginia	51	900	Albermarle County	003	
Virginia	51	901	Alleghany County	005	
Virginia	51	906	Arlington County	013	
Virginia	51	902	Augusta County	015	
Virginia	51	903	Bedford County	019	
Virginia	51	903	Campbell County	031	
Virginia	51	904	Carroll County	035	
Virginia	51	905	Chesterfield County	041	
Virginia	51	915	Dinwiddie County	053	
Virginia	51	924	Elizabeth City	055	

Virginia	51	906	Fairfax County	059	
Virginia	51	907	Frederick Couty	069	
Virginia	51	904	Grayson County	077	
Virginia	51	908	Greensville County	081	
Virginia	51	909	Halifax County	083	
Virginia	51	905	Henrico County	087	
Virginia	51	910	Henry County	089	
Virginia	51	911	James City County	095	
Virginia	51	912	Montgomery County	121	
Virginia	51	800	Nanasemond City	123	Is later folded into Suffolk County (51/800)
Virginia	51	913	Norfolk County	129	
Virginia	51	914	Pittsylvania County	143	
Virginia	51	915	Prince George County	149	
Virginia	51	913	Princess Anne	151	
Virginia	51	916	Prince William County	153	
Virginia	51	917	Roanoake County	161	
Virginia	51	918	Rockbridge County	163	
Virginia	51	919	Rockingham County	165	
Virginia	51	920	Southhampton County	175	
Virginia	51	921	Spotsylvania County	177	
Virginia	51	924	Warwick County	189	
Virginia	51	922	Washington County	191	
Virginia	51	923	Wise County	195	
Virginia	51	924	York County	199	
Virginia	51	906	Alexandria City	510	
Virginia	51	903	Bedford City	515	
Virginia	51	922	Bristol City	520	
Virginia	51	918	Buena Vista City	530	
Virginia	51	900	Charlottesville City	540	
Virginia	51	913	Chesapeake City	550	
Virginia	51	901	Clifton Forge City	560	
Virginia	51	905	Colonial Heights City	570	
Virginia	51	901	Covington City	580	

Virginia	51	914	Danville City	590	
Virginia	51	908	Emporia City	595	
Virginia	51	906	Fairfax City	600	
Virginia	51	906	Falls Church City	610	
Virginia	51	920	Franklin City	620	
Virginia	51	921	Fredricksburg City	630	
Virginia	51	904	Galax City	640	
Virginia	51	924	Hampton City	650	
Virginia	51	919	Harrisonburg City	660	
Virginia	51	915	Hopewell City	670	
Virginia	51	918	Lexington City	678	
Virginia	51	903	Lynchburg City	680	
Virginia	51	916	Manassas City	683	
Virginia	51	916	Manassas Park City	685	
Virginia	51	910	Martinsville City	690	
Virginia	51	800	Nanasemond County	695	Appears for a few years in County Business Patterns data as a county.
Virginia	51	924	Newport News City	700	
Virginia	51	913	Norfolk City	710	
Virginia	51	913	Portsmouth City	710	
Virginia	51	923	Norton City	720	
Virginia	51	915	Petersburg City	730	
Virginia	51	924	Poquoson City	735	
Virginia	51	912	Radford City	750	
Virginia	51	905	Richmond City	760	
Virginia	51	917	Roanoake City	770	
Virginia	51	917	Salem City	775	
Virginia	51	909	South Boston City	780	
Virginia	51	913	South Norfolk City	785	
Virginia	51	902	Staunton City	790	
Virginia	51	913	Virginia Beach City	810	
Virginia	51	902	Waynesboro City	820	
Virginia	51	911	Williamsburg City	830	

Virginia	51	907	Winchester City	840	
Wyoming	56	039	Yellowstone Park County	047	Is merged into Teton County (56/039)