Why Containerization Did Not Reduce Ocean Trade Shipping Costs

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December 2014

Abstract

Ocean transportation costs did not decrease much despite containerization. Using a previously unused dataset of U.S. import freight costs, I show that flat freight rates are not an artifact of the poor data available. Data from major U.S. ports show that labor costs did not fall much despite enormous labor productivity gains. Market power in ports meant that dramatic productivity gains did not translate into dramatically lower freight rates.

JEL classification: F1, J3, L92, O3.

Keywords: Containerization, Transportation cost, Ports, Trade growth.

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1 Introduction

Ocean transportation costs did not decrease much despite the introduction of containerization, a technique that revolutionized the industry. Hummels (2007) finds little decline in ocean freight rates in the spotty data available. (The title is adapted from a section title in that paper.) I show that flat freight rates are not an artifact of the poor data available. I argue that market power in ports meant that dramatic productivity gains did not translate into dramatically lower freight rates.

Using a previously unused dataset of U.S. import freight costs covering the rise of containerization but prior to the oil shocks, I show that the adoption of containerization did not reduce transportation costs. As part of a study of a proposal to shift from FOB to CIF based tariffs, a joint U.S. Census Bureau/Tariff Commission project gathered data on freight factors of all U.S. imports from 1965 to 1973. These data show that while these factors did decline for bulk goods, they did not for the goods that were containerized.

Examining data for major U.S. ports that were early adopters of containerization, the Pacific Coast ports and the Port of New York/New Jersey, I find that it dramatically and immediately increased U.S. port labor productivity. However, it did not lead to significant reductions in port labor costs. Due to the ability of longshoremen to extract significant concessions from shippers, containerization's productivity gains did not translate into large reductions in labor costs. From 1970 to 1975, real total labor costs per ton in the Port of New York/New Jersey only fell 7 percent despite a doubling of labor productivity. On the Pacific Coast, shippers and longshoremen signed a deal that led to significant increases in labor payments in compensation for removing work rules. The doubling of the share of containerized general cargo and productivity from 1969 to 1973 only led to a 25 percent decline in real labor costs.

2 Did Containers Reduce Transportation Costs? Import Costs 1965-1973

Once regulatory and technical issues were worked out in the mid-1960s, containers were rapidly adopted in U.S. maritime foreign trade. Levinson (2006) estimates that the share of general cargo that was containerized more than doubled between 1967 and 1970, from 14 to 31 percent. The Pacific Coast shows a similar jump, increasing from 17 percent in 1969 to 37 percent in 1973. These port represented more than half of U.S. maritime trade in this period. Global adoption of containers was more rapid than other major transportation innovations, such as air freight (Rua 2014).

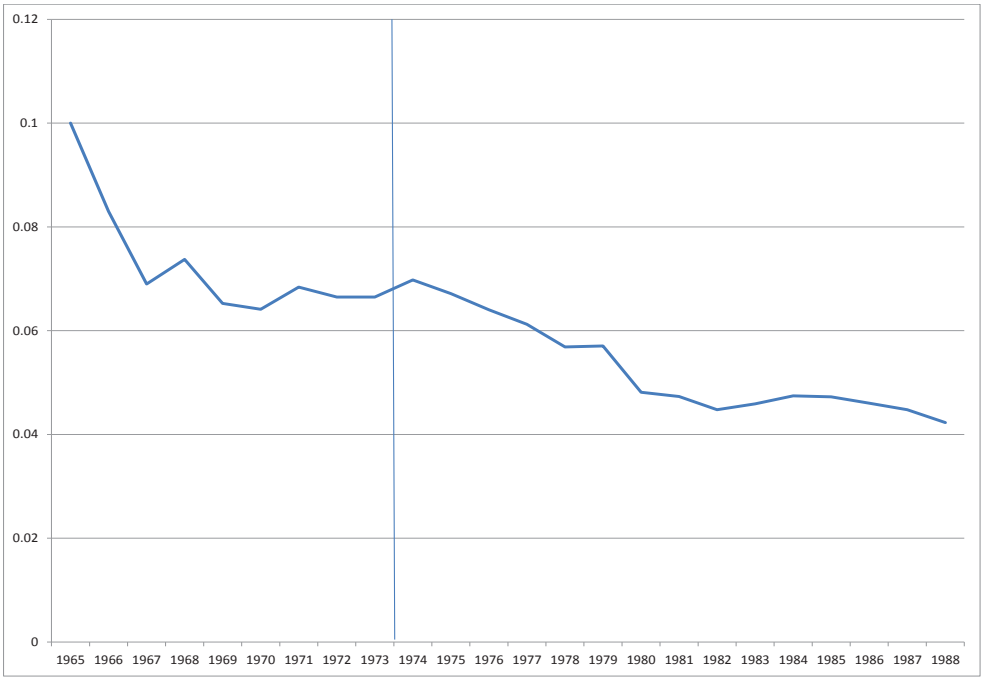
The evidence that this revolution reduced freight rates significantly is surprisingly thin. Hummels (2007) examines the evidence and doesn't find much decline. However, the available sources are mostly idiosyncratic indices that do not cover overall freight costs. Representative official U.S. data only begin in 1974, when Census data began to report both the FAS and CIF values of merchandise imports. By this point, containers were already widely adopted. Therefore, it is difficult to distinguish between poor data and a lack of an effect.

However, there is rarely used data source that covers the container revolution. To study the possibility of moving from FOB to CIF methods of import valuation, the Tariff Commission and Census Bureau began collecting FOB and CIF ratios in 1965. After the initial report for 1965, these data were reported as special articles in the Census Bureau's Highlights of U.S. Export and Import Trade (FT990) publication until they were added to the official trade statistics in 1974[1]. These data are estimated from a sample of U.S. imports and were designed to be representative of all U.S. imports.

As can be seen in Figure 1, the data do show a decline in transportation costs. The trade weighted import cost falls from 10 percent in 1965 to 6.7 percent in 1973. However,

[1]The initial 1965 study has been used, e.g. Finger & Yeats (1976). I know of no instance where the follow up years' data were used.

Figure 1: Trade Weighted Import Cost 1965-1980



these declines are unlikely to have been the result of containers. The timing of the decline does not match the spread of containerization. The decline occurs in the mid-1960s, prior to the adoption of containers on international routes. When containers were adopted after 1967, freight costs were flat.

More disaggregated data do not support the idea that containerization was important during this period. Much of the decline is due to a shift to goods with lower initial freight rates, rather than freight rates falling. The change in trade weighted freight rates can be decomposed

into the change in rates and in trade shares:

$$\frac{\sum_i F_t^i \theta_t^i}{\sum_i F_0^i \theta_0^i} = \frac{\sum_i F_t^i \theta_t^i}{\sum_i F_0^i \theta_t^i} \frac{\sum_i F_0^i \theta_t^i}{\sum_i F_0^i \theta_0^i} \tag{1}$$

where F^i is the freight factor and θ^i is the import share to good i. Examining one digit Schedule A data, 71 percent of the aggregate decline from 1966 to 1972 is due to shifts to low freight rate goods. (Full detailed data are not available for 1965 or 1973.) This shift may reflect the impact of the Kennedy Round and the Canadian-U.S. Auto Pact, which significantly cut tariffs on manufactured goods which tend to have low freight factors.

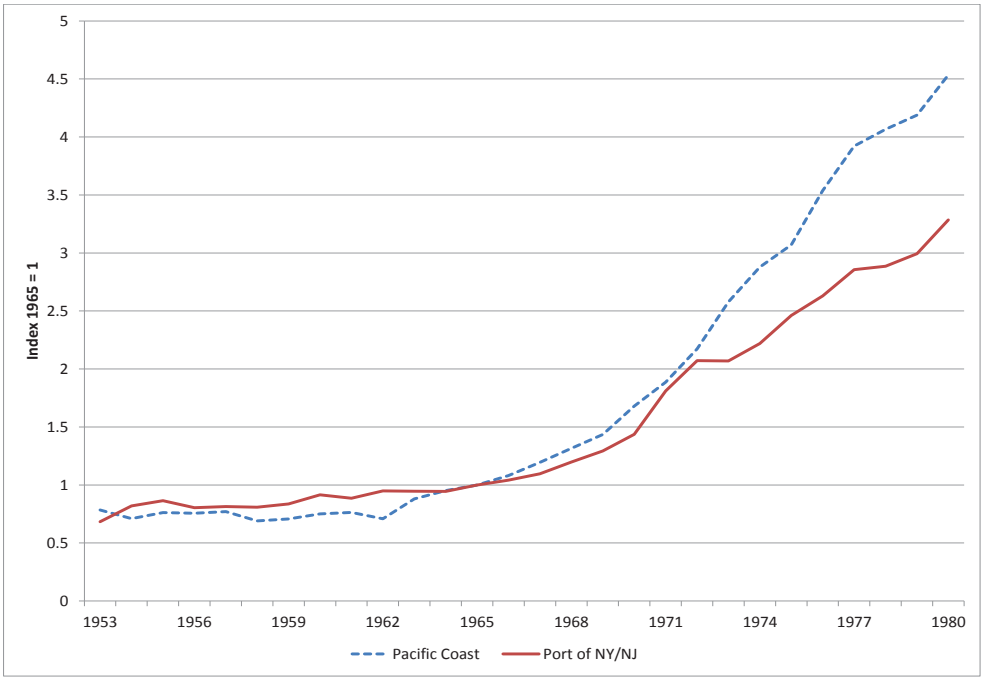
Changes in non-containerized cargo dominates the 29 percent attributable to rate changes. The two categories with major movements were bulk goods: Inedible crude materials and petroleum products. Goods that were most likely to be containerized, such manufactured goods and machinery, show slight increases in freight factors. If there is a transportation revolution during this period, it is in bulk handling. Lundgren (1996) documents significant changes in ocean bulk shipping, including increasing ship size and falling crew sizes, that coincided with falling freight rates.

3 Containers and Port Costs

The previous data may give the impression that the container revolution was not all that revolutionary. However, the adoption of the container is visible in port labor productivity. After over a decade of stagnant productivity, the advent of the container coincides with enormous gains in labor productivity. Figure 2 shows indices of tons handled per hour worked for the Port of New York and New Jersey and U.S. Pacific Coast ports. In New York, the largest single U.S. port accounting for nearly a quarter of U.S. merchandise imports during this period, productivity doubled from 1970 to 1975. The Pacific Coast shows similar gains.

However, this enormous productivity growth did not lead to dramatically lower real labor costs. Figure 3 shows payments to labor per ton deflated by CPI. New York real labor costs per ton only fell 7 percent from 1970 to 1975. Costs in 1976 were at their 1954 levels

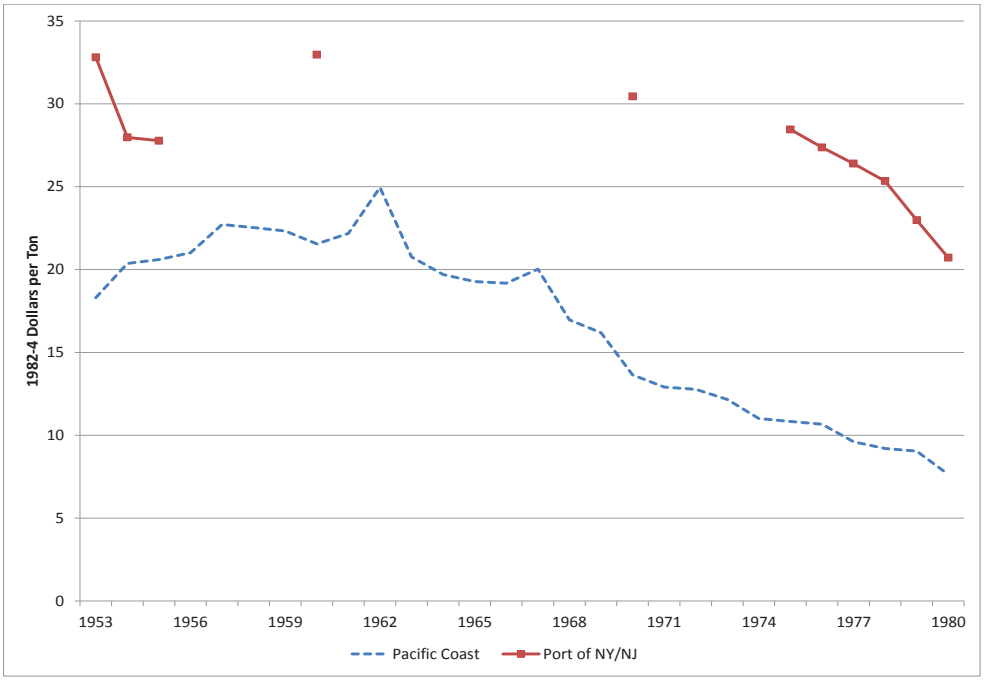
Figure 2: Port Productivity 1953-1980



despite a tripling of productivity. On the Pacific Coast, real labor costs only fell by 25 percent decline from 1969 to 1973 despite a doubling of the share of containerized general cargo and productivity. While labor costs did fall eventually, their decline pales in comparison to the productivity gains. Pacific Coast labor costs fell in half from 1965 to 1980, but productivity increased by 450 percent.

Why is there a disconnect between port productivity and costs? In both cases, port workers were able to negotiate deals that captured a significant portion of the productivity gains. Longshoremen in the Port of New York/New Jersey are represented by the International Longshoremen's Association (ILA). The ILA negotiated payments to compensate longshoremen

Figure 3: Real Port Labor Cost per Ton 1953-1980



for the anticipated loss of work that containers would bring. Beginning in 1966, ILA members received a Guaranteed Annual Income that paid enrolled longshoremen for a minimum of 1,400 hours a year. West Coast longshoremen are represented by the International Longshoremen's and Warehousemen's Union (ILWU). All ports on the West Coast are unionized by the ILWU and are subject to a single contract. The ILWU received compensation through a 1960 agreement that paid its members in exchange for loosening restrictive work rules. Though that agreement was not focussed on containers (it does not mention them at all), it set a precedent for sharing the gains of productivity growth with longshoremen. The 1966 contract increased payments and a guaranteed income plan was added in 1972.

In competitive markets, cost savings translate into price declines. However, ports are not competitive. Due to geography and large capital requirements, it is difficult or impossible to open a competing nearby port (Holmes & Schmitz 2001). Other modes of transportation, such as airplanes, were too costly to be serious competitors except for the most valuable freight. Longshoremen were in a particularly strong position to capture the rents generated by this non-competitive market. Since a single union represented longshoremen in all ports on each coast, shippers could not divert traffic to a neighboring port to avoid the union. On the West Coast, the single contract meant port labor costs were uniform across ports.

4 Did Containers Increase International Trade?

Did containers have an effect on expanding trade? The evidence in this paper is consistent with previous studies that find a relatively small role for transportation costs in post World War Two trade expansion (Baier & Bergstrand 2001, Jacks, Meissner & Novy 2011). Containerization did not reduce freight rates initially. There was little initial impact on port labor costs and it is unlikely that containers drove down the costs in the other parts enough to compensate for flat port labor costs. Containerization required massive capital outlays. Ports needed to be outfitted with cranes to load containers and ships built or refurbished. It is notable that U.S. export share is flat in the late 1960s.

On the other hand, it is difficult to see the enormous and swift reorganization of the ports and suggest containers have a small impact on trade. Labor productivity showed massive increases and containers were rapidly adopted despite the high cost of installing new equipment. Bernhofen, El-Sahli & Kneller (2014) argue containers had a significant impact on trade.

This paper helps square these two views. Costs did fall, but the benefits of the immediate increase in productivity did not show up until later. The costs of payments to longshoremen continued to be an issue for decades after containers were adopted. Containers likely had a major role in the decline in freight rates that began in the late 1970s, when labor costs began

to fall more rapidly. The delay in falling freight rates may help explain the rapid increase in trade in the 1980s despite small declines in tariffs.

In addition, there were other benefits even if port costs did not fall. As Hummels (2007) points out, containers reduced time in port, reducing shipping time and making shipments more reliable. Locking goods in containers reduced pilferage and loss. The data also point out that containers were not the only innovation in ocean shipping. The emphasis on containers obscures other technological improvements in bulk shipping.

5 Conclusion

Transportation is not a conventionally competitive market. In addition to the barriers to entry in ports, cargo companies are able to exercise market power through legal cartels (Hummels, Lugovskyy & Skiba 2009). Therefore, innovations and freight rates do not necessarily have a one for one relationship. The benefits may be captured by producers rather than passed on to consumers. In this paper, I use novel data sources to show that while containers led to massive increases in labor productivity, they had a muted impact on labor costs. Workers were able to capture a significant portion of the benefits of this innovation.

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