Cabotage Sabotage? The Curious Case of the Jones Act*

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Abstract

This paper examines the economic implications of the Jones Act, which is a 1920 U.S. cabotage law that restricts domestic waterborne shipments to American vessels. Since the passage of the Act, there has been a dramatic rise in the Asian maritime industry which has caused American shipbuilding to become uncompetitive. It is now eight times more expensive to build a large merchant ship in the U.S., and as a result most American shipyards have closed and the number of American built ships has plummeted. Thus, the Jones Act requirement that domestic shipments be transported on American built ships has become more onerous over time. The first set of findings show that this has reduced waterborne trade between U.S. states relative to other modes of transport, relative to waterborne exports, and especially in coastal states. Second, there is evidence that this reduction in domestic trade, due to the Jones Act, has increased consumer prices within U.S. states. These findings support common, but to date unverified, claims that the Jones Act impedes domestic trade and drives up prices.

Keywords: Trade Policy, Non-Tariff Barriers, Cabotage, Jones Act, Domestic Trade

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1 Introduction

Unlike typical protectionist trade policies, cabotage laws are unique in that they focus on domestic trade rather than foreign trade. Water transportation in the United States is regulated by the Merchant Marine Act of 1920, commonly know as the Jones Act (JA).[1] This cabotage law requires that all goods transported via water between two U.S. ports be carried on ships that are American built, owned, crewed, and flagged. The U.S. is one of only a dozen countries that fully exclude foreign ships without exception and the U.S. has the most restrictive maritime transport industry among all OECD countries.[2] This paper examines the economic implications of the Jones Act, by focusing on whether it reduces domestic trade between U.S. states and thus in turn increases domestic prices.

The Jones Act was passed in response to World War I, with the goal of ensuring that the United States has a merchant marine fleet that was capable of assisting in times of war or emergency (Frittelli 2003). In additional to national security interests, American shipbuilders and seamen are also proponents of the Act since it limits foreign competition. However, critics argue that the Jones Act restricts domestic trade and drives up prices, especially in regions reliant on water transportation, such as Alaska, Hawaii, and Puerto Rico. For instance, The Grassroot Institute of Hawaii recently said the Jones Act "has become devastating to our economy... Due in part to the Jones Act, Hawaii has one of the highest costs of living in the nation. Alaska, Guam and Puerto Rico also have unnecessarily high costs of living because of the Jones Act."[3] While these concerns are common, there is relatively little empirical evidence that the Jones Act has actually restricted domestic shipments or increased domestic prices.

Criticisms of the Jones Act are more frequent during times of natural disasters. For instance, there were concerns that the Jones Act was hindering Puerto Rico's recovery effort in response to Hurricane Maria by restricting supplies. Senator John McCain said "it is unacceptable to force the people of Puerto Rico to pay at least twice as much for food, clean drinking water, supplies and infrastructure due to Jones Act requirements as they work to recover from this disaster."[4] The U.S. eventually granted a temporary waiver for Puerto Rico as it did in response to Hurricanes Katrina (2005), Sandy (2012), and Harvey (2017). The need for these waivers raise questions about whether the Jones Act has successfully

[1] Senator Wesley Jones, from the state of Washington, was the chairman of the Senate Commerce Committee at the time and introduced this legislation.

[2] The other countries that fully exclude foreign ships are Belgium, Estonia, Greece, Italy, Poland, Sweden, Turkey, China, Colombia, Indonesia, and Lithuania (UNCTAD 2017). Data on the restrictiveness of foreign entry into the maritime transport industry in 2018 comes from the Services Trade Restrictiveness Index at OECD Stat.

[3] "What is the Jones Act?" Joe Kent, Grassroot Institute of Hawaii, March 29, 2016.

[4] "Trump Waives Jones Act for Puerto Rico, Easing Hurricane Aid Shipments," by Niraj Chokshi, New York Times, September 28, 2017.

sustained a domestic fleet capable of assisting in times of emergency, which was the original purpose.

The maritime industry has evolved enormously since the Jones Act was passed a century ago. The most striking change has been the dramatic rise of the Asian shipbuilding industry. Due to streamlined production processes, standardized designs, and improved efficiency it is now much less expensive to build a large merchant ship in Asia than in the U.S. Specifically, it costs eight times more to build a large merchant ship in the U.S. than in Asia (Frittelli 2017). As a result the number of American shipyards has plummeted (only three are left) and 91% of all merchant ships are now built in Japan, Korea, or China. As the American shipbuilding industry has become uncompetitive, due to the exogenous rise of the Asian maritime industry, the U.S. fleet of ships has declined.

The identification strategy used in this analysis exploits two historical features that are appealing for researchers. First, the passage of this Act a century ago means that it was not influenced by current economic conditions, which is typically a concern when examining the economic impacts of policy changes. Second, the decline of the U.S. shipbuilding industry, due to foreign competition, was driven by factors that are unrelated to economic conditions in the U.S. Thus, the empirical strategy utilizes the fact that the Jones Act requirements have become more onerous over time, due to the exogenous decline in the number of American shipyards and ships.

This paper combines data on the fleet of JA-eligible ships, domestic bilateral trade between every U.S. state, and state-level prices to examine the economic effects of the Jones Act over the last quarter century. Bilateral trade data is appealing because it is possible to control for other factors that can influence domestic shipments using a gravity specification, and thus more carefully isolate the effects of the Jones Act. Furthermore, this trade data is available by mode of transport which provides an opportunity to examine the impact of the Jones Act on waterborne shipments between two states relative to shipments via other modes of transport. The analysis then incorporates the price index data to examine whether the decline in shipments, due to the Jones Act, has increased state-level prices. These data sources are well suited to provide the first careful empirical assessment of this cabotage law and the results that emerge contribute to the academic literature and have important policy implications.

The first component of the paper examines whether the Jones Act impedes domestic waterborne trade. This bilateral specification finds that the decline in JA-eligible ships reduces water shipments between two states, relative to other modes of transport. Specifically, a ten percent decline in the number of JA ships reduces water shipments by 7.4% relative to other modes of transport.[5] Air, rail, and truck shipments

[5]Similar results are obtained if the weight of domestic shipments is used rather than the value.

represent a useful counterfactual since these modes of transport are unaffected by the Jones Act, and they do not have cabotage laws of their own. The results also show that shipments are increasing with the economic size of the two states but decreasing with the distance between them, which is consistent with standard gravity equation findings. Overall, these results confirm the intuitive but important point that if water transportation becomes more onerous, shipments will decline.

Is this observed relationship driven by broader declines in water transportation? The fact that waterborne exports to Canada and Mexico have increased quickly indicates that this is unlikely to be the case. A subsequent placebo test finds that while the Jones Act reduces domestic waterborne shipments, it has no impact on exports via water. These results are inconsistent with a general decline in water transportation. The Jones Act only regulates domestic trade, while waterborne exports are free to be transported on less expensive and more numerous foreign-built ships and thus they have increased quickly.

Additional results confirm that the Jones Act disproportionately influences shipments between coastal states. The findings are even stronger when focusing on the non-contiguous states of Hawaii and Alaska, who are most reliant on water transportation. Ultimately, it is reassuring that the Jones Act effects the expected mode of transportation (water relative to other modes), the anticipated type of trade (domestic versus international), and the expected states (coastal rather than landlocked). Furthermore, in a placebo test, domestic shipments are insensitive to the number of *non*-JA eligible American ships or the world-wide fleet of ships.

The second component of the paper examines whether domestic trade influence prices within U.S. states. The empirical analysis examines whether an influx of domestic shipments into a state affects prices after controlling for gross domestic product (GDP), the unemployment rate, and state and year fixed effects.[6] A modest but significant negative relationship between shipments and prices is found. In other words, a decline in the inflow of shipments from other states is associated with higher domestic prices, as expected.

Reverse causality is a potential concern, where higher domestic prices within a state may encourage the inflow of shipments. Note that this should generate a spurious positive bias which will attenuate the observed negative relationship between shipments and prices. Nonetheless, an instrumental variable approach is used which exploits the Jones Act to identify an exogenous source of variation in domestic shipments. The first-stage results show that the Jones Act reduces the total inflow of domestic shipments, not just waterborne shipments, in coastal states. Second-stage results show that this JA-induced decrease

[6]Here the unit of analysis is at the state-level rather than at the bilateral-level, given that state prices are the dependent variable of interest.

in domestic trade in turn increases prices.[7] Using a simple back of the envelope calculation, these findings indicate that the decline in JA ships led to a 1.8% increase in consumer prices over the sample period, which explains 2.7% of the observed increase in prices from 1993 to 2016. Overall, the findings of the paper indicate that the Jones Act has in fact restricted the inflow of domestic shipments and raised domestic consumer prices.[8]

This paper makes a number of contributions to the existing literature. First, papers studying the Jones Act often rely on general equilibrium models to estimate the welfare effects of eliminating the Act (Francois et al. 1996, USITC 2002, Swisher and Wong 2015). For instance, USITC (2002) argue that repealing the Jones Act will generate the largest welfare gain of any current trade liberalization policy.[9] The downside of this approach is that the magnitude of these estimates depend on the assumptions of the model and thus vary substantially, ranging from USITC's (1991) welfare gains of $10 billion, to Francois et al.'s (1996) estimate of $3 billion, to Swisher and Wong's (2015) estimate of $1.9 billion, to USITC (2002) $656 million estimate. Other studies have been critical of this approach (GOA 1998) and these findings (Beason et al. 2015), and argue that "verifiable estimates of the effects of the Act, or its modification, are not available" (GOA 2013). This paper takes a different approach by using a reduced form empirical analysis and detailed data on Jones Act ships, bilateral domestic shipments, and state price indices, to estimate the economic implications of the Jones Act.

A second set of policy papers examine specific issues associated with the Jones Act rather than the overall general equilibrium effects. For instance, MARAD (2011) finds that average daily operating costs are 2.7 times higher for American flagged ships relative to foreign ships. Other studies focus on how the Jones Act effects particular states, like Alaska (GOA 1988) and Puerto Rico (NY Fed 2012, GOA 2013). An overview of the Jones Act and a discussion of its implications is provided in Frittelli (2003, 2014, 2015, and 2017), Grennes (2017), and UNCTAD (2017). Overall, these papers provide interesting case studies, helpful background information, and anecdotal evidence on building costs, shipping rates, and the U.S. fleet of ships. I contribute to this literature by using econometric techniques to provide the first careful assessment of whether the Jones Act has actually reduced domestic trade and increased prices.

Third, this paper contributes to a broader academic literature on transportation costs and trade policies. Existing studies have shown that evolving transportation costs for different modes of transport

[7] This instrumental variable estimate is even more negative than the analogous OLS estimate, which is consistent with a spurious positive endogeneity bias.

[8] Additional results confirm these price findings using different price indices.

[9] The only other trade policy that generated larger welfare gains was liberalizing the textile and apparel industry which occurred with the expiration of the Multi-Fibre Arrangement in 2005 (USITC 2002).

influence trade flows (Hummels 2007, Feyrer 2018), but the source of these changes is typically technological innovation rather than domestic trade policy which is studied here. Consistent with Donaldson (2018) who finds that improvements in transportation infrastructure increases domestic trade and decreases prices, I find that a policy that impedes transportation reduces domestic trade and increases prices. Of course, numerous studies have focused on the implications of trade policies more generally (see Goldberg and Pavcnik 2016 for an overview), but what is unique about the Jones Act is that it regulates domestic trade rather than international trade. To the best of my knowledge, this is the first empirical paper that examines the impact of a cabotage law on domestic trade.[10]

The paper proceeds as follows. The historical background of the Jones Act and the rise of the Asian maritime industry are discussed in section 2. The implications of these changes on the fleet of American ships is documented in section 3. This section also provides a variety of descriptive statistics showing how domestic goods are transported in the U.S., how this has evolved over time, and how this varies across states. In addition, this section documents differences in prices across U.S. states. Section 4 presents the empirical strategy used to estimate the impact of the Jones Act. The first set of results, reported in section 5, show that the decline in JA ships has reduced bilateral trade via water relative to other modes of transportation. This section of the paper also explores how the Jones Act influences waterborne exports and coastal states. The second set of results, in Section 6, find that reductions in domestic shipments, due to the Jones Act, increase prices within a state. Additional results in section 7 explore the sensitivity of the findings to alternate fleet and price measures, while section 8 provides some concluding thoughts.

2 Jones Act and the Global Maritime Industry

Two key historical developments inform the empirical approach used in this paper. First, background on the Jones Act is provided and then second the rapid rise of the Asian maritime industry is discussed.

2.1 Jones Act Background

The Merchant Marine Act of 1920, commonly known as the Jones Act, requires that all goods transported by water between two U.S. ports must be carried on vessels that are American built, owned, flagged, and crewed. The Act is named after Senator Wesley Jones, from the state of Washington, who was the

[10]The findings of this paper also relate to a much larger literature on the winners and losers of globalization. Like trade more generally (Autor, Dorn, and Hanson 2013, Keller and Olney 2018), the Jones Act has distributional implications that benefit some (i.e. those in the U.S. maritime industry) while potentially adversely affecting others (i.e. U.S. producers and consumers).

chairman of the Senate Commerce Committee at the time and introduced the Act.

National defense was a motivating factor for the Jones Act. During World War I there was a lack of domestic ships to both support the war effort and to transport domestic goods (Frittelli 2003). Proponents of the Jones Act argue that a strong domestic maritime industry, including vessels, shipbuilders, and seamen, is crucial to assist in times of war and national emergency.

Another motivation for the Jones Act is that it supports the maritime and shipbuilding industry. The Jones Act shields American shipbuilders, owners, and seamen from foreign competition and thus protects the domestic industry. Some speculate that Senator Jones originally introduced the bill in order to help his maritime constituents in the state of Washington.[11] Furthermore, domestic unions and shipbuilders argue that foreign rivals have an unfair advantage because they face less stringent laws and regulations, lower wages, and they receive production subsidies. According to this view the Jones Act is needed to level the playing field (Frittelli 2003). Of course, the maritime industry is not alone in facing foreign competition, which raises difficult questions about why shipping is protected but other modes of transportation are not. For instance, there are no restrictions requiring the use of American built aircraft, trucks, or trains (Grennes 2017).[12]

Potential national security and maritime benefits need to be weighed against the costs imposed by the Jones Act on other segments of the economy. Without access to cheaper foreign shipping, producers have to pay more to transport goods domestically. For instance, many industries have argued that the Jones Act makes domestic inputs (such as feed grains, scrap metal, and road salt) prohibitively expensive and thus it has stifled domestic trade and led to these goods being sourced from abroad (Frittelli 2003). Furthermore, critics argue that higher shipping costs often are passed along to consumers in the form of higher prices. While the costs to consumers of trade protection are typically diffuse and hard to identify, in the case of the Jones Act the adverse effects are likely concentrated in coastal states that rely more heavily on water transportation (i.e. Hawaii, Alaska, and Puerto Rico).

Critics also contend that the Jones Act protection has not in fact led to a robust maritime industry which can assist in times of war or emergency, but rather led to complacency (Frittelli 2003). Whether commercial vessels are useful for current military operations is open to debate. Furthermore, the Jones Act waivers in response to Hurricanes Katrina (2005), Sandy (2012), and Harvey (2017), suggest that it has

[11] By forcing trade with Alaska to be done on American ships, this helped shipping companies based in Seattle, Washington at the expense of Canadian rivals (see "The Jones Act: A Burden America Can no Longer Bear" Colin Grabow, Inu Manak, and Daniel J Ikenson, CATO Institute, Policy Analysis No. 845, June 28th, 2018.)

[12] For instance, American airline companies are free to buy European Airbus planes or Canadian Bombardier planes.

not been successful in maintaining a domestic fleet that is capable of responding to national emergencies.[13]

The Jones Act has been politically controversial. Senator John McCain said in 2015 "I have long advocated for a full repeal of The Jones Act, an antiquated law that has for too long hindered free trade, made U.S. industry less competitive and raised prices for American consumers."[14] McCain's fourth attempt in 2017 to repeal the Jones Act failed to pass either the U.S. Senate or the House of Representatives. In September 2017 when asked why he did not temporarily waive the Jones Act in response to Hurricane Maria, President Donald Trump said "well, we're thinking about that, but we have a lot of shippers, and a lot of people that work in the shipping industry that don't want the Jones Act lifted."[15] The next day the administration temporarily waived the Jones Act for Puerto Rico. These examples illustrate how politically sensitive and contentious this issue is.

This paper quantifies the potential costs associated with the Jones Act, by examining whether it has reduced domestic shipments and raised consumer prices. This focus is not meant to minimize the possible benefits, but rather is simply an attempt to provide the first empirical assessment of whether there are adverse implications.

2.2 Rise of the Global Maritime Industry

In addition to the Jones Act, the second key development influencing water transportation has been the dramatic rise of the global shipping industry. During the first half of the twentieth century the maritime industry was concentrated in developed countries, where ships were built, owned, operated and flagged in the same country (UNCTAD 2016). The United States historically played an important role in the worldwide maritime industry (Colton and Huntzinger 2002), but globalization has dramatically reshaped this industry. Due to specialization, few ships are built, owned, and flagged in the same country. Today three quarters of the world's fleet of ships are registered in developing countries which differ from the country of ownership. In 2018, the top three countries according to flags of registration were Panama, Marshall Islands, and Liberia, which together accounts for 41% of world tonnage while the U.S. accounts for 0.6% (UNCTAD 2016).

One of the most profound changes in the maritime industry entails the shift in shipbuilding from developed countries, including the U.S., to Asian countries. Japan in particular became a world power in shipbuilding after WWII. Japan developed an impressive shipbuilding industry during the war which

[13] See "The Jones Act, the Obscure 1920 Shipping Regulation Strangling Puerto Rico, Explained" article by Matthew Yglesias, VOX, Oct 9, 2017, for details about these waivers.

[14] "Senator John McCain Files Amendment to Repeal the Jones Act" Press Release, January 13, 2005.

[15] http://transcripts.cnn.com/TRANSCRIPTS/1709/27/wolf.01.html

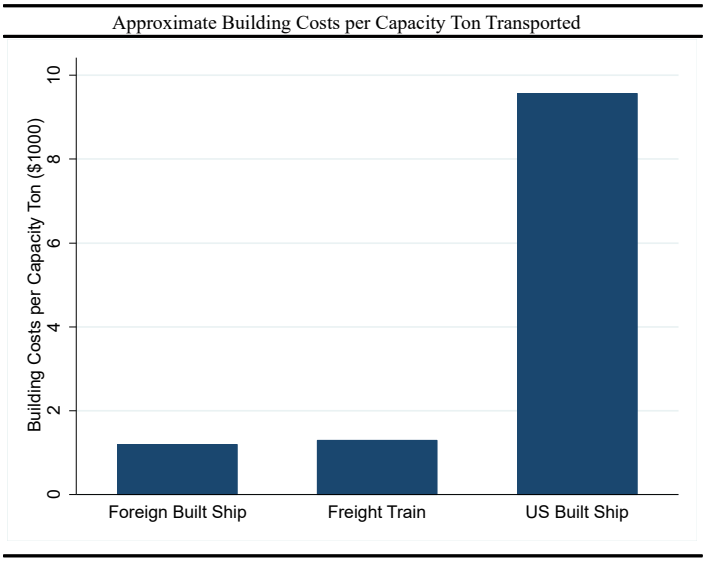
supplied a wide range of ships to the Imperial Japanese Navy, but Japanese shipyards were badly damaged due to allied bombing. However, the newly rebuilt facilities were much more efficient than their predecessors or those in other countries. The production process was streamlined, designs were standardized, and specialization occurred with each shipyard focusing on one or two designs. These investments paid off as Japanese shipyards were twice as productive as their American counterparts and in 1956 Japan became the leading shipbuilding country in the world (Colton and Huntzinger 2002). Beginning in the 1970s, South Korea and China entered the shipbuilding market and replicated many of the Japanese innovations. By the end of the 20th century these three Asian countries dominated shipbuilding worldwide.

As the Asian shipbuilding industry grew quickly, the U.S. maritime industry moved in the opposite direction. The United States had one of the largest shipbuilding industries in the world, which included 64 private-sector shipyards and 8 naval shipyards that were capable of building large merchant ships (Colton and Huntzinger 2002). However, after WWII private U.S. shipyards scaled back production, shifted to ship repair, or closed entirely. The decline in the U.S. shipbuilding industry was striking, to the point that now only three domestic builders of large merchant ships remain (i.e. NASSCO, Philly Shipyard, and VT Halter).[16]

The fundamental issue is that American shipbuilders are unable to compete with their more productive Asian rivals. For instance, it costs approximately $220 million to build a large merchant ship in the United States but only $27.5 million to build a similar ship abroad (Frittelli 2017). Figure 1 compares building costs per capacity ton for U.S. ships, foreign ships, and freight trains. The results show that U.S. ships are eight times more expensive to build than similar foreign ships or freight trains of an analogous size.

[16]All three of these remaining U.S. shipbuilders have agreements with or are owned by foreign companies, which raises questions about what it means to be an American shipbuilder (Grennes 2017). Furthermore, in order to be classified as an American built ship there are complex rules about which components can be sourced from abroad and what must be constructed domestically, such as the hull and superstructure (Beason et al., 2015).

FIGURE 1



Notes: To haul 23k tons of dry cargo two freight trains are needed (including 4 locomotives and 220 rail cars) which costs ~$30m to build. To carry the same load via water, one large coastal U.S. or foreign built vessel is needed which costs ~$220m and ~$27.5m to build respectively. This figure shows the building costs per capacity ton of these three modes of transport. Taking into account the fact that trains are about twice as fast as ships, the building costs per capacity ton would be half as much as shown in this figure (~$650 rather than ~$1300). Calculations from Frittelli 2017 using data from Association of American Railroads and the U.S. Maritime Administration.

This loss of competitiveness has led to a decline not only in the number of U.S. shipyards, but also in the number of American-built ships. In 2000, the U.S. built 0.25% of the worlds new merchant ships, while Japan, Korea, and China together built 82% (Colton and Huntzinger 2002). By 2018 these three Asian countries built 91% of all large merchant ships in the world (UNCTAD 2018). Due to the exogenous rise of the Asian maritime industry, American shipbuilding is uncompetitive, nearly all U.S. shipyards have closed, and the U.S. production of merchant ships has ground to a halt (Section 3 documents this decline). This means that the Jones Act requirement that all goods be transported on American built ships has become more onerous over time.

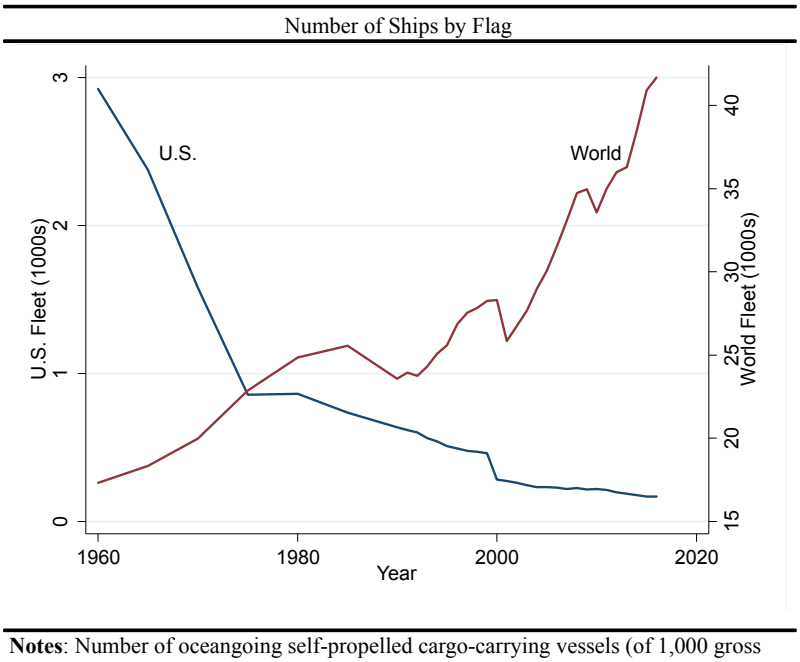
3 Data and Descriptive Statistics

This section describes the data and explores how the passage of the Jones Act and the rise of the Asian maritime industry have influenced the fleet of U.S. ships, domestic water shipments, and domestic prices.

3.1 Fleet of U.S. Ships

Due to the rapid growth of the Asian maritime industry, American shipbuilding has declined. The number of U.S. shipyards has decreased and the U.S.-flagged fleet has experienced a dramatic decline over the last half century too. As shown in Figure 2, there were 2,926 large U.S.-flagged merchant ships in 1960 but only 169 remain in 2016.[17] This does not simply reflect a broader decline in water transportation, because the world-wide fleet increased from 17,317 ships to 41,674 ships over the same period (see Figure 2). As a result, the U.S. share of the worldwide fleet of ships decreased from 16.9% in 1960 to only 0.4% in 2016.

FIGURE 2



Notes: Number of oceangoing self-propelled cargo-carrying vessels (of 1,000 gross tons and above). Data from Table 1-24, Bureau of Transportation Statistics

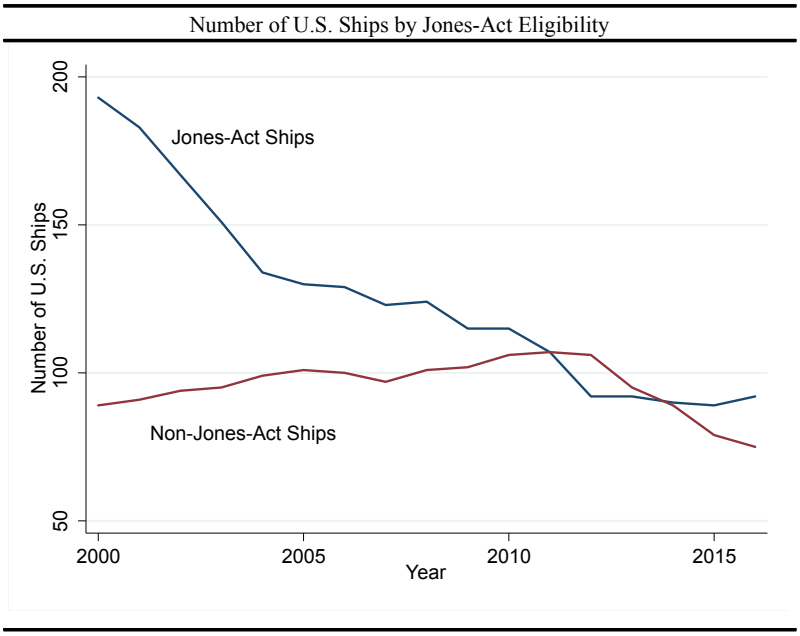
Focusing more specifically on ships built in the U.S., Figure 3 plots the number large U.S.-flagged merchant ships that are Jones Act eligible.[18] The number of JA ships declined from 193 in 2000 to 92 in 2016 (a 52% decline). This is consistent with the rapid decline in the number of U.S. shipyards capable of producing these large merchant ships. Furthermore, given the average lifespan of these large merchant ships is approximately 30 years, this decline also reflects the fact that existing JA eligible ships are being decommissioned. In contrast, the number of non-JA-eligible ships has remained relatively stable over this

[17] This includes oceangoing self-propelled, cargo-carrying vessels of at least 1,000 gross tons of capacity. Data from the Bureau of Transportation Statistics (Table 1-24).

[18] It is possible that some of the U.S.-flagged ships identified in Figure 2 could have been built abroad.

period. It has declined from 89 to 75 ships, which is a 16% reduction (see Figure 3). Given that non-JA ships can be built abroad, but still be American owned and flagged, they do not face the same supply constraints (i.e. lack of U.S. shipbuilders). These ships do not face higher building costs (see Figure 1) and as a result they have remained more competitive with their foreign rivals. Overall, Figure 3 confirms that the rise of the Asian shipbuilding industry is reducing the component of the U.S. fleet that is built domestically but it has little impact on the component that is produced abroad.[19]

FIGURE 3



Notes: Number of Jones-Act eligible and Non-Jones-Act eligible U.S. oceangoing self-propelled cargo-carrying vessels (of 1,000 gross tons and above). Data from Maritime Administration, U.S. Department of Transportation.

The Jones Act prohibits foreign built ships from transporting goods domestically and the rise of the Asian maritime industry has dramatically reduced the number of U.S. shipyards that are capable of building large merchant vessels. Producing ships solely for domestic transportation is not a lucrative enough market to keep U.S. shipyards in business. U.S. shipbuilders require foreign orders to benefit from economies of scale and remain profitable (Frittelli 2017). As foreign demand for American built ships has dried up, due to the growing market share of Asian competitors, domestic shipyards are driven out of business. In fact, one of the last remaining U.S. shipyards, Philly Shipyard, is in danger of closing due to this lack of global demand.[20]

[19] Jones-Act eligible ship data is available from 2000-2016 from the Maritime Administration, U.S. Department of Transportation. In the subsequent analysis, the share of Jones-Act ships in 2000 and the number of total U.S.-flagged ships in a given year are used to interpolate earlier years.

[20] "Building large self-propelled seagoing ships necessarily depends on a worldwide market to ensure a sufficient level of

To summarize, the external rise of the more productive Asian maritime industry, means that it now costs approximately eight times more to build a large merchant ship in the U.S. than in Asia. This has led to a dramatic decline in the number of U.S. shipyards and a decline in the number of U.S. built ships.[21] Thus, over time the Jones-Act requirement that all domestic shipments within the U.S. be transported on American built ships has become more onerous. This paper investigates whether the decline in the number of Jones Act ships has stifled domestic trade, and whether this in turn has increased prices.

3.2 Shipments by Mode of Transport

Data on domestic shipments between U.S. states is obtained from the Freight Analysis Framework (FAF4) and the Commodity Flow Survey (CFS) both produced by the Bureau of Transportation Statistics (BTS). Relying on information from a large number of domestic firms (over 100,000 establishments), this BTS data tracks the movements of goods within the U.S. and measures their value, weight, mode of transport, origin state, and destination state. The CFS data is the building block of the FAF4 data, with seventy percent of the FAF4 shipment flows coming directly from the CFS data set.[22] CFS data is available at approximately five year intervals from 1993 to 2012, while the FAF4 data is available at approximately five year intervals from 1997 to 2016. The empirical analysis will complement the FAF4 data with the CFS data from 1993 to construct a bilateral shipment data set spanning a quarter century.[23]

An appealing feature of the this data is that it tracks domestic trade by mode of transport, including air, parcel, rail, truck, and most importantly water.[24] The left side of Figure 4 reports the relative importance of these modes for domestic shipments. Trucking, not surprisingly, is the most important method of transport according to both the value and weight of domestic shipments. Rail is second according to weight, although third according to value. Both air and parcel transportation are important according to the value of the shipments, but less so according to their weight. Water is the least important method of transporting goods between U.S. locations in terms of value, and less important than rail and trucking according to the weight of the shipments. While this is consistent with the Jones-Act restricting domestic water shipments, it may be that water transportation is simply a less important

work to keep a major shipbuilding yard in operation over time." - Michael Hansen, "Philly Shipyard: Will Major U.S. Commercial Shipbuilding Survive?" Hawai'i Free Press, February 17, 2018.

[21] This decline may have been even more precipitous in the absence of the Jones Act.

[22] FAF4 also incorporates information from agricultural, extraction, utility, construction, and service sectors.

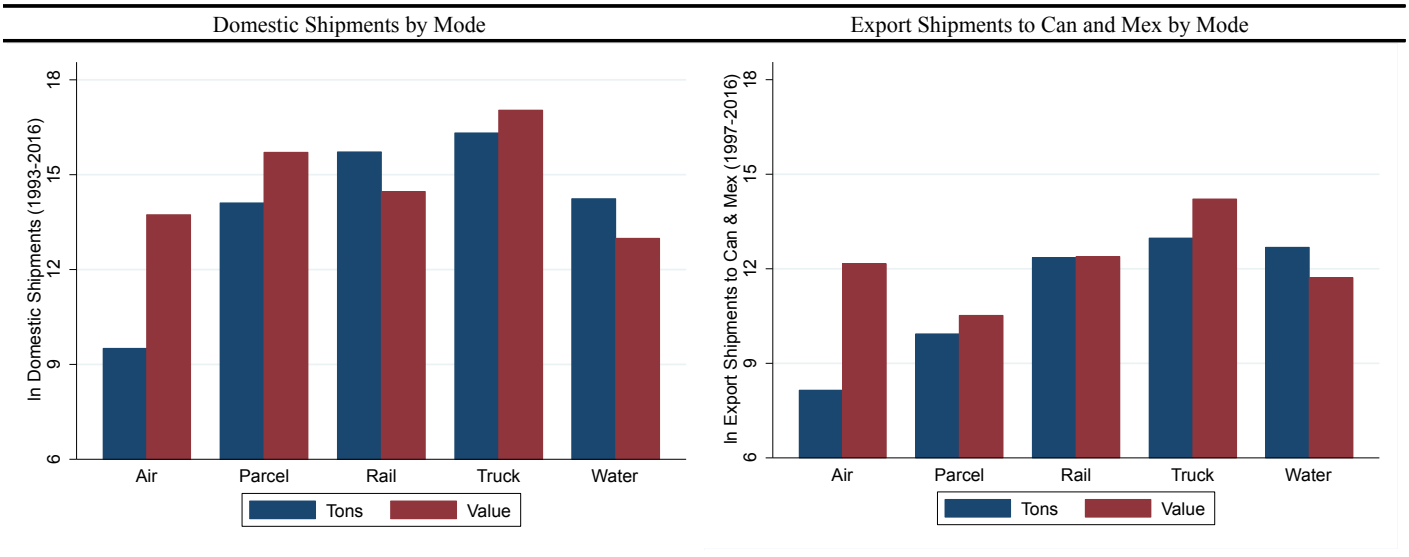
[23] Results are similar if only CFS data is used, only FAF4 data is used, or if CFS data is supplemented with FAF4 2016 values.

[24] The difference between Parcel and Air transportation hinges on the weight of the shipment, with shipments less than 150 pounds classified as a Parcel and heavier shipments classified as Air shipments. Furthermore, the BTS includes multi-mode shipments in the Parcel classification.

mode of transportation in general.

To investigate this latter possibility, I compare domestic shipments to exports. The FAF4 data also provides information on export flows at approximately five year intervals from 1997 to 2016. Water transportation is by far the most important mode of transport according to the weight and the value of exports.[25] However, this is not the most informative comparison given that it is challenging to transport goods via truck or rail to most foreign countries. Thus, the right side of Figure 4 instead shows the relative importance of different transport modes for U.S. exports to Canada and Mexico. Trucking is important for exports to these neighboring countries, but water is now a close second in terms of weight and not far behind in terms of value. The gap between truck and water exports is smaller than the analogous gap for domestic shipments on the left. Thus, Figure 4 shows that water transportation is relatively less important for domestic shipments between U.S. states than for exports to Canada and Mexico. This difference cannot be explained by a general decline in water transportation but it is consistent with the Jones Act limiting domestic but not international waterborne trade. However, maybe geographic characteristics of the United States simply make it more challenging to transport goods domestically via water.

FIGURE 4

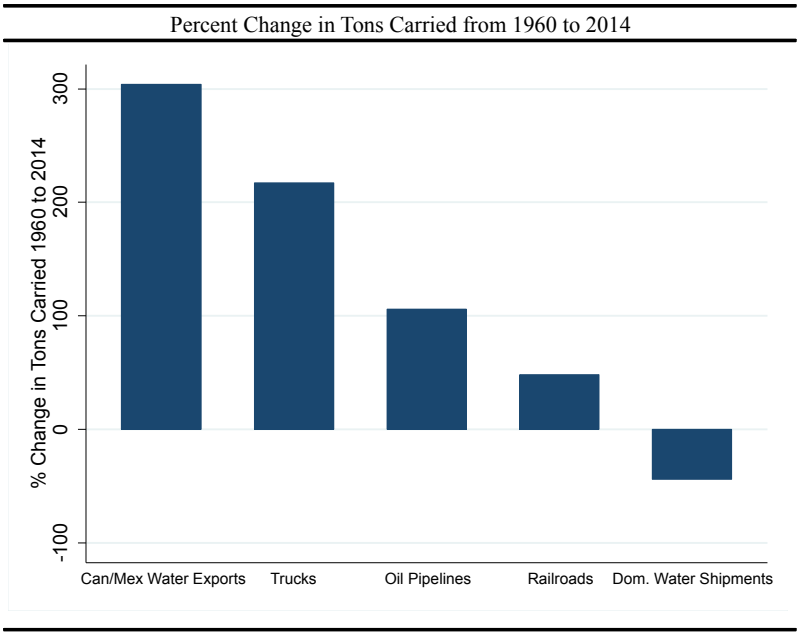


Notes: Log of domestic shipment value and weight (1993-2016) by transportation mode is on the left. Log of export shipment to Canada and Mexico (1997-2016) by value, weight, and transportation mode is on the right. Authors calculation using the Freight Analysis Framework (FAF4) and Commodity Flow Survey (CFS) data from the Bureau of Transportation Statistics.

[25]The transport mode of exports reflects the method used for transporting the good from the U.S. state to the foreign country, and not any potential initial movement of the good between U.S. states.

To examine the role of geography, and other time invariant factors, I look at the evolution of domestic water shipments and water exports over time. Figure 5 shows that the percent change in exports to Canada and Mexico increased 300% from 1960 to 2014. Domestic shipments transported via trucks, pipelines, and railroads have also increased (ranging from 50-200%). In contrast, domestic water shipments have actually decreased 44% over this sample period. Figure 5 illustrates two important points. First, time invariant factors, such as geography, cannot explain the decline in waterborne shipments over the last half century. Second, the decline in domestic water shipments does not represent a broader decline in water transportation more generally, because water exports have increased quickly over this period.

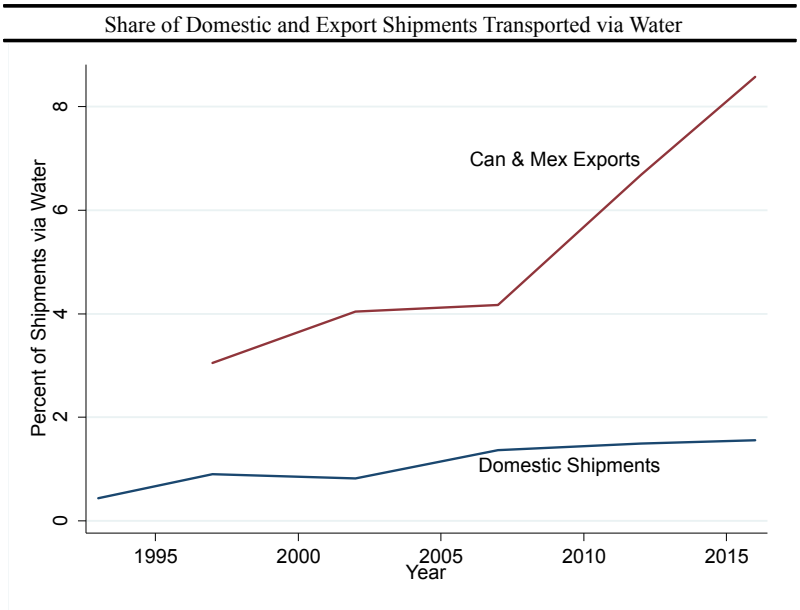
FIGURE 5



Notes: Calculations from Frittelli (2017) based on data from the Association of American Railroads, Eno Transportation Foundation, U.S. Department of Transportation, and the U.S. Army Corps of Engineers.

To further examine this issue, I calculate using the BTS data the share of total domestic shipments that are transported via water and the share of exports to Canada and Mexico that are transported via water. Figure 6 shows the evolution of these variables over the last quarter century. The share of water exports has increased over this period, however the share of domestic water shipments has remained relatively flat. Water transportation is becoming more important for exports but not for domestic trade. This result is consistent with Jones Act regulations that limit domestic water shipments but not water exports.

FIGURE 6



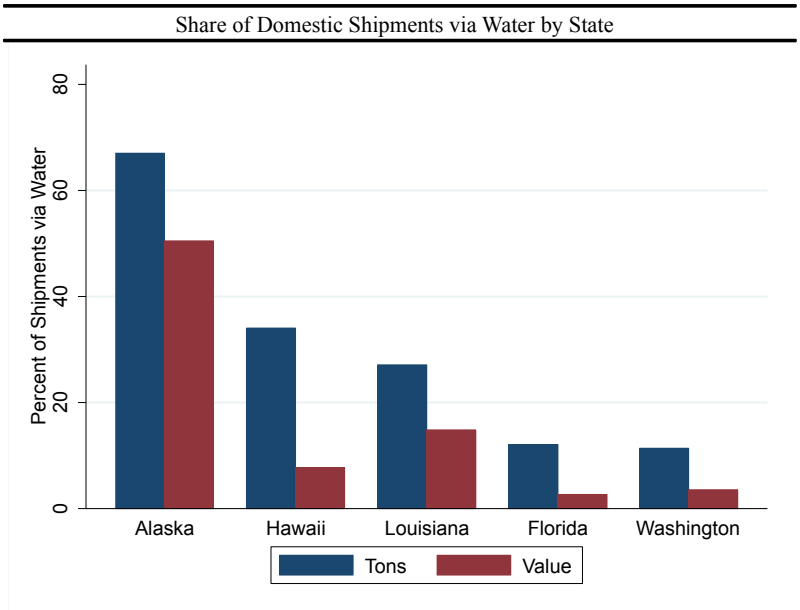
Notes: Share of domestic shipments transported via water and share of exports to Canada and Mexico transported via water. Authors calculation using the Freight Analysis Framework (FAF4) and Commodity Flow Survey (CFS) data from the Bureau of Transportation Statistics.

3.3 Bilateral Shipments between U.S. States

Another appealing characteristics of the BTS data is the availability of bilateral shipments between individual U.S. states. This provides an opportunity to account for other factors that may determine trade between U.S. states, such as the size of the respective economies, as well as the distance between them. Furthermore, it is possible to examine whether the Jones Act has affected some pairs of states (i.e. two coastal states) more than others. Coastal states may be more reliant on water transportation and thus more affected by cabotage laws. Figure 7 confirms that coastal states have the highest shares of water shipments. All of the top five states according to their share of domestic waterborne shipments have extensive coast lines. For instance, this share is especially high for Alaska and Hawaii (67% and 34% according to weight respectively).[26] These two non-contiguous states, are obviously much further from other U.S. states and alternate transportation modes are less viable (i.e. truck or rail). Overall, Figure 7 shows that water transportation is important in coastal regions, and especially in non-contiguous states. This makes these states naturally more exposed to cabotage rules that regulate domestic water transport (which is explored in section 5.3).

[26]These numbers are almost certainly underestimates since they do not include multi-mode water transportation (i.e. truck and water or rail and water).

FIGURE 7



Notes: Top five states according to the share of domestic shipments (inflows plus outflows) transported via water. Authors calculation using the Freight Analysis Framework (FAF4) and Commodity Flow Survey (CFS) data from the Bureau of Transportation Statistics.

3.4 Prices

This paper examines not only how the Jones Act has effected domestic water shipments, but also how this change in shipments influences prices. State-level price index data is constructed by combining information from two common sources. First, Consumer Price Index (CPI) data is obtained for metropolitan areas from the Bureau of Labor Statistics (BLS), and is used to construct price indexes for sixteen states for the full sample period.[27] Second, price indexes for the other states come from Regional Price Parity (RPP) data from the Bureau of Economic Analysis (BEA) and from Fuchs, Michael, and Scott (1979).[28] Combining CPI and RPP data generates a comprehensive price index data set that spans all fifty states and the twenty four years of the sample.[29]

To gain a sense of this price index data, the top five and bottom five states ranked according to their 2016 price level is reported in Figure 8. Northeastern and western states, such as New Jersey, Hawaii, California, New York, and Massachusetts, are relatively expensive, while Kentucky, Mississippi, West

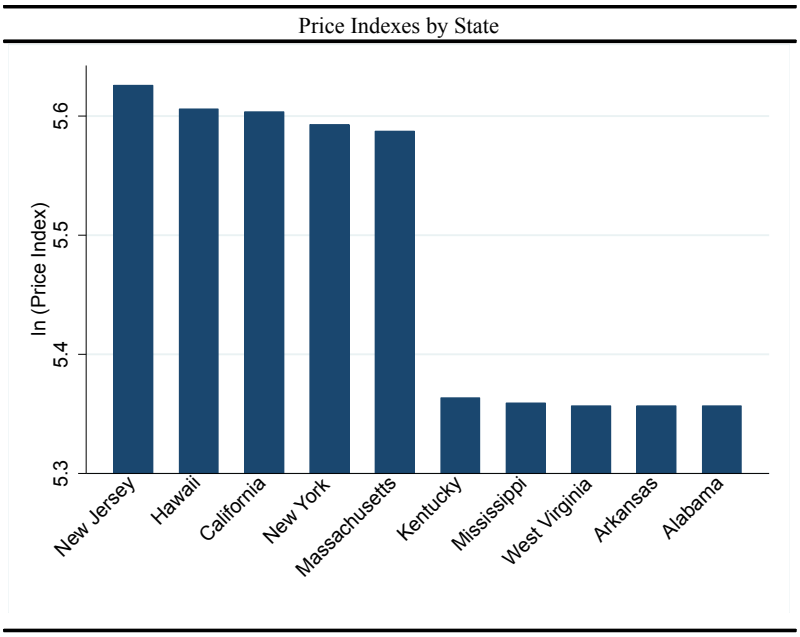
[27]Texas' consumer price index is the average of Dallas and Houston CPIs, while California's consumer price index is the average of Los Angeles, San Diego, and San Francisco CPIs.

[28]The BEA data is available from 2008-2016, the Fuchs et al. data is available for 1972, and the intervening years are calculated using linear interpolation. To be consistent with the CPI data, the RPP values (which are indexed to 100 on average within each year) are multiplied by the national CPI in the given year.

[29]Table 8 shows that the results are similar if only the CPI or RPP data is used.

Virginia, Arkansas, and Alabama are less expensive. This measure appears to be capturing sensible and important geographic differences in prices across states.

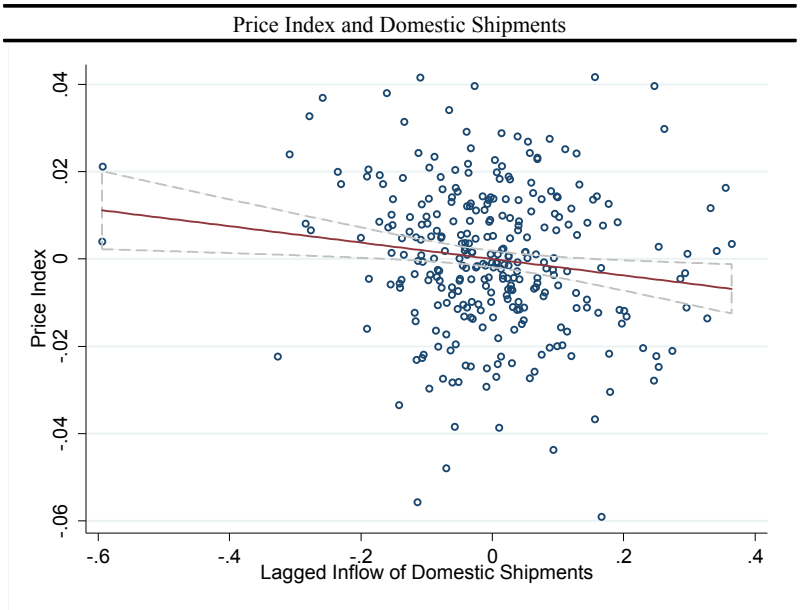
FIGURE 8



Notes: Top five and bottom five states according to 2016 prices. Authors calculation using Consumer Price Index data from the Bureau of Labor Statistics and Regional Price Parity data from the Bureau of Economic Analysis.

Figure 9 provides preliminary evidence on the link between prices and the inflow of domestic shipments into a state, after accounting for state fixed effects, year fixed effects, and time varying economic conditions. A significant negative relationship is evident, which is consistent with the idea that an influx of domestic goods reduces state-level prices. While this does not necessarily indicate a causal relationship, it does suggest that if the Jones-Act restricts domestic shipments this in turn may increase prices within the state. This issue will be explored in section 6.

FIGURE 9



Notes: Price index versus the lagged log inflow of domestic shipments after controlling for state fixed effects, year fixed effects, lagged log state GDP, and lagged log state unemployment rate.

3.5 Descriptive Statistics

Combining information from these various sources generates a data set that spans fifty states and twenty four years (1993-2016) at approximately five year intervals. The top panel of Table 1 reports summary statistics of the variables used in the bilateral specifications, which examine the link between the Jones Act and domestic shipments. Of particular interest is the value and weight of domestic shipments between states (on average e^3.23 = $25m and e^2.76 = 16 thousand tons), the number of Jones Act ships (on average e^4.96 = 143 ships), state GDP (on average e^11.83 = $137 billion), and the distance between states (e^6.83 = 925 miles on average). In addition, the outflow of state-level exports to Canada and Mexico is used in some specification as well.

The bottom panel of Table 1 reports the summary statistics of the variables used in the state-level specifications, which examine the impact of domestic shipments on consumer prices. Variables of interest in these specifications include domestic prices in the state, the inflow of domestic shipments into the state, the Jones Act fleet of ships, and the state's GDP and unemployment rate (on average e^1.65 = 5.2%).

4 Estimation Strategy

The empirical analysis examines whether the Jones Act has reduced water shipments and then whether this lack of domestic trade in turn increases prices. This section outlines the estimation strategies used to tackle these two questions.

4.1 Shipments

To test whether the Jones Act has reduced water shipments, the following equation is estimated:

(1)

$$\ln Shipments_{ijmt} = \beta_1 Water_m * \ln JAShips_t + \beta_2 \ln GDP_{it} + \beta_3 \ln GDP_{jt} + \beta_4 Distance_{ij} + \beta_5 Water_m + \gamma_{ij} + \gamma_t + \varepsilon_{ijmt}$$

where $Shipments$ is the value (or weight) of shipments between state i and state j, transported via mode m, in year t. The transport mode consists of either water shipments or shipments via all other modes (which is the sum of air, parcel, trucking, and rail). The key independent variable, $Water * \ln JAShips$, is the interaction of a binary water variable and the number of Jones Act eligible ships. This interaction term examines whether cabotage restrictions disproportionately reduced water trade relative to trade via other modes of transportation. It is expected that the declining number of JA-eligible ships (Figure 3) will reduce domestic shipments via water relative to other modes of transportation ($\beta_1 > 0$).

This empirical specification controls for other factors that may influence bilateral trade, such as the origin state GDP, the destination state GDP, and the distance between the two states.[30] The gravity equation predicts that bilateral shipments will increase with the size of each state's economy but decrease with the distance between the two states.[31] The uninteracted $Water$ variable is also included, as well as bilateral pair fixed effects (γ_{ij}), which account for all unobserved time-invariant factors related to the two states, and year fixed effects (γ_t).[32] Equation (1) is estimated at five year intervals due to the long-run relationship of interest and the available data. Finally, robust standard errors which are clustered at the state-pair-level are reported throughout.

This empirical strategy exploits a variety of appealing aspects of this policy change. First, the Jones

[30] State GDP data is obtained from the Bureau of Economic Analysis and the great-circle distance between the largest cities within each U.S. state is obtained from the City Distance Database produced by the National Bureau of Economic Research.

[31] Other factors that are often included in a gravity equation, such as language and colonial relationship, are obviously less relevant when looking at internal trade between U.S. states.

[32] The uninteracted $\ln JAShips$ variable is subsumed by the year fixed effects and the $Distance$ variable is subsumed in specifications that include pair fixed effects.

Act passed in 1920 which is 73 years before the start of the sample period studied in this paper. So the passage of the bill was not influenced by current economic conditions, which alleviates concerns of reverse causality. Second, the exogenous rise of the Asia maritime industry has rendered the American shipbuilding industry uncompetitive and substantially decreased the number of U.S. shipyards and American built ships. Third, the Jones Act only applies to water transportation and not other modes of transport. These other methods of transportation do not face cabotage rules and thus can be used as a useful counterfactual (see the interaction term in Equation 1). Fourth, the Jones Act only applies to domestic water shipments and not international water trade. Thus, water exports to Canada and Mexico provide a useful comparison group which is explored in section 5.2. Finally, due to exogenous geographic characteristics, the Jones Act should affect some states (i.e. coastal states) more than others, which is examined in section 5.3. Overall, even though the Jones Act itself is time invariant, the ramifications of this Act have evolved enormously over time due to the exogenous rise of the Asian maritime industry. Furthermore, this cabotage law should effect some modes of transportation (water versus other), some types of shipments (domestic versus exports) and some states (coastal versus landlocked) more than others.

4.2 Prices

The second component of the empirical analysis examines whether domestic shipments influence prices. To investigate this question the following equation is estimated:

$$(2) \qquad \ln Prices_{jt} = \alpha_1 \ln Shipments_{jt-1} + \alpha_2 \ln GDP_{jt-1} + \alpha_3 \ln Unempl_{jt-1} + \gamma_t + \gamma_j + \varepsilon_{jt}$$

where $Prices$ is the price index in state j in year t. Shipments are the inflow of domestic shipments from all other states into state j in year $t-1$. The empirical approach also accounts for the possibility that time-varying economic conditions, such as GDP and the unemployment rate in state j and year $t-1$, may influence prices. Finally, both time fixed effects and state fixed effects are included and robust standard errors are reported. Note that unlike equation (1), which is estimated at the bilateral level by mode, equation (2) aggregates shipments and is estimated at the state-level.

It is expected that an inflow of shipments from other states will decrease domestic prices ($\alpha_1 < 0$). Standard theories of comparative advantage assert that on average the state will import goods that are less expensive to produce elsewhere. Reverse causality is a potential issue, since higher prices within the state

may encourage the inflow of cheaper goods from other states. In addition, unobserved state-level shocks (i.e. a productivity shock) could reduce both prices and the inflow of shipments. Note, however, that these endogeneity concerns will generate a spurious positive bias, which should attenuate the expected negative α_1 coefficient.

To address these, and other, endogeneity concerns, an instrumental-variable analysis is pursued. Specifically, the Jones Act offers an opportunity to identify an exogenous source of variation in shipments between U.S. states. As equation (1) suggests (and subsequent results will confirm) the declining number of Jones-Act eligible ships reduce water shipments, especially between coastal states. Thus, an instrument is constructed which interacts the number of Jones Act ships with a binary variable indicating whether state j is a coastal state ($Coast_j * \ln JAShips_{t-1}$). This empirical approach examines whether the decline in the number of JA-eligible ships has disproportionately reduced total shipments into coastal states (where water transportation is more important) and whether this in turn increases prices ($\alpha_1 < 0$). The exclusion restriction is likely to hold since it is hard to argue that a cabotage law, like the Jones Act, will directly effect prices without operating through domestic trade.

5 Jones Act and Domestic Shipments

This section examines whether 1) the Jones Act reduces domestic trade, 2) whether the Jones Act effects waterborne exports, and 3) whether the impact on domestic shipments is stronger in coastal states.

5.1 Value and Weight

The estimated impact of JA ships on the log value of domestic shipments is reported in column 1 of Table 2. The point estimate on the water-JA interaction term is 0.88 which indicates that a ten percent decline in the number of JA ships reduces domestic waterborne shipments by 8.8% relative to other shipments. As the number of JA ships has declined, it has become more difficult to satisfy the Jones Act requirement that goods be transported on American built vessels, and thus domestic water shipments have declined relative to other modes of shipments. Table 2 also shows that consistent with standard gravity equation findings, shipments are increasing with origin state GDP, increasing with destination state GDP, and decreasing with the distance between the two states. The negative coefficient on the *water* variable in column 1 indicates that water transportation is less important for internal trade between U.S. states than other modes such as truck, rail, and air (consistent with Figure 4).

To account for time invariant factors, such as unobserved geographic conditions, that can influence trade between states, column 2 includes state-pair fixed effects. The coefficient on the interaction term of interest drops slightly to 0.75 but remains statistically significant. The coefficients on both origin and destination state GDP also remain positive and significant.[33] To account for national macroeconomic conditions that may influence domestic shipments for all states, column 3 includes year fixed effects as well. The results show that a ten percent decline in the number of JA ships reduces domestic water shipments by 7.4% relative to shipments via other modes of transportation.

Table 3 replicates the structure of Table 2 but uses as the dependent variable the weight of domestic shipments rather than the value. The results show that the decline in American built JA ships has reduced the weight of domestic shipments as well. This finding holds across all three specifications (column 1-3), which incorporate different combinations of fixed effects. The results in column 3, for instance, show that a ten percent decline in JA ships reduces the weight of domestic waterborne shipments by 5.0% relative to other modes of transport. Shipments are also increasing with origin GDP, increasing with destination GDP, and declining with distance. Overall, the findings in Tables 2 and 3 show compelling evidence that the decline in JA ships has disproportionately decreased domestic water shipments. This finding is robust to different empirical specifications and to alternative measures of shipments.

5.2 Exports

Perhaps this observed decrease in domestic water shipments is not a result of the Jones Act but rather reflects a broader decline in the importance of water transportation. Figures 5 and 6 suggest this is unlikely given that water exports to Canada and Mexico have increased rapidly over time. Nonetheless, this section examines this issue more carefully by incorporating exports into equation (1).

The preferred empirical specification, which includes state-pair fixed effects and year fixed effects, is reported in column 1 of Table 4, after restricting the sample to the years that export data is available (1997-2016). The decline in JA ships still reduces domestic shipments via water relative to other modes. Column 2 then includes exports to Canada and Mexico, which vary by mode (i.e. water versus other). If broader declines in the importance of water transportation were driving the results than the export coefficient would be positive, since both exports and domestic shipment should decrease over time. Instead the results show that exports to Canada and Mexico reduces domestic shipments to other U.S. states, indicating that supply constraints mean that if more goods are shipped abroad than fewer goods are shipped to domestic

[33]Note that distance is absorbed by the pair fixed effects in column 2 because it does not vary over time.

locations. Importantly the impact of JA ships on domestic water shipments is unaffected by the inclusion of this measure of the broader importance of water transportation (the interaction coefficient of interest is 0.18 in both columns 1 and 2).

An alternate empirical approach is to use exports as the dependent variable. Of course, it is not possible to measure bilateral export flows between U.S. states, so this empirical specification is estimated at the state-year level. Column 3 confirms that the decline in JA ships reduces the outflow of domestic water shipments to other U.S. states. However, the decline in JA ships has no impact on exports to Canada and Mexico (column 4). The impact of the JA on the weight of domestic and export shipments is examined in columns 5 and 6. Once again we see the decline in JA ships reduces domestic shipments but has no significant impact on exports to Canada and Mexico. These contrasting results are consistent with the fact that the Jones Act restrictions only apply to domestic shipments and not exports.

Overall, there is little evidence that the observed relationship between the Jones Act and domestic shipping is driven by broader trends in water transportation. The results show that the Jones Act effects domestic water shipments but not exports. This is precisely what we should expect to see given that the Jones Act only regulates domestic trade and not international trade. These findings are supported by subsequent placebo test (section 7.1) that finds that domestic shipments only respond to the number of JA ships and not to the fleet of non-JA eligible ships or the worldwide fleet of ships.

5.3 Coastal States

The Jones Act may disproportionately effect coastal states where water transportation is relatively important. For instance, Alaska and Hawaii may be especially sensitive to cabotage laws given their reliance on water transportation and their distance from their trading partners. In contrast, shipments to and from non-coastal states are likely to be less responsive to the number of JA ships.

Column 1 of Table 5 re-reports the main results (from column 2 of Table 4) for comparison purposes. Column 2 then examines whether the Jones Act has a larger effect on water shipments between pairs of states that both boarder the sea.[34] The decline in JA ships disproportionately effects trade between states that both have access to the sea. The coefficient on the *water*coast*lnJA Ships* interaction term is 0.17 and significant which verifies that the impact of the Jones Act on waterborne shipments in coastal states is especially important.

Column 3 then focuses on the two non-contiguous states of Alaska and Hawaii. The findings show that

[34]There are 23 coastal states that boarder either the Atlantic Ocean, the Pacific Ocean, or the Caribbean Sea. Results are similar if the coastal definition includes the seven additional Great Lake states.

water shipments to these states are heavily influenced by the Jones Act. Specifically, a ten percent decline in the number of JA ships, reduces water shipments by 1.4% overall but decreases water shipments to and from Hawaii and Alaska by 6.6%. The interaction coefficient for Hawaii and Alaska (0.53 in column 3) is three times larger than the interaction coefficient for coastal states (0.17 in column 2). The pair fixed effects capture time-invariant factors, such as the distance, but the time varying impact of the Jones Act interacts with remoteness in an interesting way. The decline in the number of American ships and the higher daily operating costs (MARAD 2011), disproportionately effects those states with longer sea routes to their trading partners. Overall, these results confirm that the Jones Act reduces water shipments between coastal states, and especially shipments to and from Hawaii and Alaska.

6 Jones Act and Domestic Prices

The results show that the Jones Act reduces domestic shipments. Next I investigate whether this decline in domestic trade drives up prices within the state, which is a common criticism of the Jones Act. This section explores whether there is empirical support for this claim.

Results from estimating equation (2) are reported in column 1 of Table 6. The inflow of domestic shipments into a state has a negative impact on domestic prices. A ten percent increases in shipments from other states leads to a significant 0.2% decline in the state wide price index. The results also indicate that prices are increases with GDP and decreasing with the unemployment rate, as expected. This modest effect of shipments on prices may be due to a spurious positive bias associated with higher prices attracting an inflow of shipments.

This endogeneity concern is addressed in columns 2-3 using an instrument variable approach that identifies exogenous variation in shipments driven by the Jones Act disproportionately effecting coastal states. Reduced form results using this instrument are reported in column 2. The results show that as the number of JA ships have declined, prices in coastal states have increased, conditional on time invariant (i.e. state fixed effects) and time-varying economic conditions (i.e. GDP and unemployment). The magnitude of this effect is slightly larger than the findings in column 1 (-0.03 versus -0.02), and is similar to the impact of the unemployment rate on prices.

The two-stage least square results are reported in column 3. The first-stage results (reported in the bottom panel) indicate that a decline in JA ships reduces domestic shipments into coastal states. The magnitude of this effect is smaller than the previous coastal estimates (coefficient of 0.20 now versus 0.31

in column 2 of Table 5), because the dependent variable is now total shipments rather than just water shipments. The first stage f-stat on the excluded instrument (14) indicates a relatively strong first-stage. The second-stage results reported above indicate that as the inflow of domestic shipments declines, due to the Jones Act, domestic prices increase. A ten percent decline in domestic shipments increases prices within the state by 1.4%. The instrumental variable approach addresses the spurious positive endogeneity bias, and thus the IV estimate (-0.14 in column 3) is more negative than the OLS point estimate (-0.02 in column 1)

A simple back of the envelope calculation provides insight into the magnitude of this effect. Multiplying the 63% decline in JA ships from 1993 to 2016 by the estimated first-stage coefficient of 0.197 (column 3) implies that the Jones Act decreased domestic shipments by 12.5% over the sample period. Multiplying this decline in domestic trade by the second stage coefficient of -0.142, means that the Jones Act increased domestic prices by 1.8%. Given that the CPI increased 66% from 1993 to 2016, the Jones Act can explain about 2.7% of the observed increase in consumer prices over the sample period. The magnitude of this effect is plausible and consistent in size to the impact of GDP on prices (0.16 in column 3) and larger than the effect of unemployment on prices (-0.04).

Overall, there is evidence that a decrease in domestic shipments, due to the Jones Act, has increased prices. In other words, in the absence of the Jones Act, domestic waterborne trade would likely benefit from the proliferation of less expensive Asian ships. Domestic trade would no longer be restricted to the declining and expensive fleet of American ships and thus the findings show that domestic trade would increase and domestic prices would decline.

7 Extensions

7.1 Fleet Measures

This section explores how domestic shipments respond to alternate fleet measures. First, I examine whether the results are sensitive to measuring the Jones Act fleet of ships using total ship capacity rather than the number of ships. Second, a placebo test examines whether domestic shipments decline with non-JA eligible U.S. ships or with the fleet of ships worldwide. Since the Jones Act prohibits these other types of ships from transporting goods between U.S. states, there should be no impact of these fleet measures on domestic trade.

The capacity of Jones Act ships can be measured using gross tons or dead-weight tons.[35] Results in columns 2 and 3 of Table 7 show that both measures of capacity reduce domestic shipments via water. The point estimates on the interaction terms of interest in columns 1-3 fall within the narrow and precisely estimate range of 0.18 to 0.23. The similarity of these results indicates that it does not matter whether the Jones Act fleet is measured using the number of ships or the capacity of these ships. If anything, quantifying the Jones Act fleet using the number of ships generates slightly more conservative estimates (0.18 in column versus 0.23 and 0.20 in columns 2 and 3).

Ships that do not satisfy JA restrictions are not eligible to transport goods between U.S. states and thus should not influence domestic shipments. To test this prediction, column 4 includes measures of the world-wide fleet of ships as well as the fleet of non-JA eligible ships. The results show that domestic shipments are unresponsive to the fleet of non-JA ships or the fleet of world-wide ships. In contrast, we still find that the decline in JA ships reduces domestic shipments. The magnitude of this effect is larger (0.24 versus 0.18 in column 1) but it is less precisely estimated. The fact that domestic shipments respond in different ways to the fleet of JA, non-JA ships, and foreign ships shows that the results are not driven by broader trends in the shipping industry but instead are specific to the Jones Act.

7.2 Additional Price Results

Additional evidence on the relationship between the Jones Act and domestic prices is provided in this section. First, I examine whether the price results are sensitive to an alternate definition of shipments. Specifically, Table 8 reports instrumental variable results using the weight of shipments (column 2) rather than the baseline value of shipments (column 1). In the first-stage findings reported in the bottom panel, a decline in the number of JA ships reduces both the inflow of shipments defined by weight (0.30 in column 2) and the inflow of shipments defined by value (0.20 in column 1). The weight of shipments is more reliant on water transportation (Figure 7) and thus slightly more sensitive to Jones Act restrictions. The second-stage results reported in the top panel of Table 8, show that prices within the state increase as both the value and weight of shipments decline due to the Jones Act (a coefficient of -0.14 in column 1 versus -0.09 in column 2).

The sensitivity of the results to the use of alternate measures of prices is explored in the remaining columns of Table 8. Recall, that the preferred price index measure is constructed using state CPI data when available and complementing this with regional price parity (RPP) data for the remaining states.

[35] Gross tons is the volume of the ship's enclosed spaces while dead-weight tons is the total weight that the ship can carry.

Alternatively, columns 3-4 utilize only the CPI data. Instead of relying on RPP data for the states that do not have CPI data, I use the consumer price index reported for the region in which the state resides.[36] This provides continuity in terms of the price measure used but sacrifices some state-level variation in prices. Results using this alternate price index measure as the dependent variable are reported in columns 3 and 4. An exogenous decrease in the inflow of domestic shipments, due to the Jones Act, increases consumer prices defined using only the CPI data. Defining shipments using their value (column 3) or their weight (column 4) generates results that are similar to one another and consistent with the analogous findings in columns 1-2.

An alternate approach is pursued in columns 5-6 which focuses instead on regional price parity data. Specifically, the RPP data is used for all fifty states rather than incorporating the CPI state-level measures when available. The results show that a decline in the value (column 5) and weight (column 6) of domestic shipments, due to the Jones Act, increases domestic RPP prices within the state. Once again these findings are similar to one another and consistent with the findings in columns 1 and 2. Overall, the results in Table 8 show that the impact of the Jones Act on domestic prices is robust to alternate measures of both shipments (value and weight) and prices (CPI and RPP).

8 Conclusion

The Jones Act is a 1920 law that requires that goods shipped between U.S. states be transported on American built, owned, and crewed vessels. Unlike typical protectionist trade policies that limit international trade, cabotage laws like the Jones Act focus on domestic trade. While critics contend that the Jones Act reduces domestic shipments and increases prices, there is relatively little empirical evidence to support these claims. This paper fills this gap in the literature.

The empirical strategy used in this paper exploits two appealing historical features of U.S. domestic trade. First, the passage of the Jones Act a century ago means that it's passage was not influenced by current economic conditions, which is typically a concern when examining the economic impacts of policy changes. Second, due to external forces there was a dramatic rise in the Asian maritime industry over the 20th industry, which left American shipyards uncompetitive. Not surprisingly, the number of American shipyards capable of building large commercial ships plummeted and the number of American built ships decreased too. For instance, the U.S. share of the world fleet declined from 16.9% in 1960 to only 0.4%

[36] In addition, CPI data by select metropolitan areas, the Bureau of Labor Statistics also reports CPI values for more aggregated U.S. regions.

in 2016. The exogenous rise of the Asian shipbuilding industry has decreased the number of American built ships and thus made the Jones Act restrictions more onerous over time.

The first set of empirical results document that the Jones Act has limited domestic bilateral trade between U.S. states. Specifically, a ten percent decline in the number of JA ships reduced domestic water shipments by 7.4% relative to shipments via other modes of transportation. This finding is not due to broader declines in the importance of water transportation, as additional results using water exports show. Furthermore, the Jones Act has a stronger impact on coastal states, and in particular on the non-contiguous states of Hawaii and Alaska, which are most reliant on water transportation.

A second set of results document that a decline in domestic shipments into a state increases consumer prices. Causality is pinned down using an instrumental variable approach which shows that an exogenous decrease in shipments, driven by the Jones Act, increase domestic prices. A simple back of the envelope calculation indicates that the Jones Act can explain 2.7% of the observed rise in prices over the sample period. These results provide evidence that the Jones Act has caused domestic prices to increase, although the magnitude of this effect may not be as large as some fear.

Overall, this paper offers the first empirical evidence on the costs of the Jones Act. The results confirm that the Jones Act has reduced domestic water transportation between U.S. states and this in turn has increased domestic prices. Whether these costs outweigh the potential benefits to the domestic maritime industry is a question that is outside the scope of this paper. However, at the very least these findings indicate that the costs associated with the Jones Act should be taken into account by policy makers.

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TABLE 1

Summary Statistics

Bilateral Variables:	Obs	Mean	Std. Dev.
ln Shipments (m of $)	29,400	3.23	3.43
ln Shipments (k of Tons)	29,400	2.76	3.13
ln Jones Act Fleet	29,400	4.96	0.38
ln Origin GDP	29,400	11.83	1.10
ln Destination GDP	29,400	11.83	1.10
ln Distance	29,400	6.83	0.80
ln Origin Can-Mex Exports	24,500	3.67	3.38

Destination State Variables:	Obs	Mean	Std. Dev.
ln Destination Price Index	300	5.23	0.20
ln Destination Inflow of Shipments (m of $)	300	3.23	0.73
ln Destination Inflow of Shipments (k of Tons)	300	2.76	0.82
ln Jones Act Fleet	300	4.96	0.38
ln Destination GDP	300	11.83	1.10
ln Destination Unemployment Rate	300	1.65	0.30

Notes: The top panel reports summary statistics for the variables used in the bilateral domestic shipment analysis. The bottom panel reports summary statistics for the variables used in the destination state price analysis.

TABLE 2
The Impact of Jones Act on Value of Domestic Shipments

	ln (Shipments)		
	(1)	(2)	(3)
Water * ln (JA Ships)	0.877***	0.746***	0.740***
	[0.023]	[0.028]	[0.028]
ln (Origin GDP)	0.580***	0.689***	0.578***
	[0.012]	[0.045]	[0.064]
ln (Destination GDP)	0.548***	0.302***	0.191***
	[0.012]	[0.045]	[0.060]
ln (Distance)	-0.773***		
	[0.021]		
Water	-10.242***	-9.591***	-9.560***
	[0.115]	[0.142]	[0.141]
Pair FE	No	Yes	Yes
Year FE	No	No	Yes
Observations	29,400	29,400	29,400
R-squared	0.848	0.881	0.884

Notes: The dependent variable is the log value of domestic shipments between two U.S. states via water and all other modes. Estimation by OLS using data at approximately 5 year intervals from 1993-2016. Robust standard errors clustered at the state-pair level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3
The Impact of Jones Act on Weight of Domestic Shipments

	ln (Shipment Weight)		
	(1)	(2)	(3)
Water * ln (JA Ships)	0.717***	0.527***	0.496***
	[0.029]	[0.033]	[0.033]
ln (Origin GDP)	0.408***	0.600***	0.562***
	[0.017]	[0.058]	[0.083]
ln (Destination GDP)	0.560***	0.170***	0.132*
	[0.016]	[0.055]	[0.073]
ln (Distance)	-1.096***		
	[0.030]		
Water	-8.314***	-7.372***	-7.221***
	[0.144]	[0.170]	[0.169]
Pair FE	No	Yes	Yes
Year FE	No	No	Yes
Observations	29,400	29,400	29,400
R-squared	0.730	0.816	0.819

Notes: The dependent variable is the log tons of domestic shipments between two U.S. states via water and all other modes. Estimation by OLS using data at approximately 5 year intervals from 1993-2016. Robust standard errors clustered at the state-pair level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4
The Impact of Jones Act on Domestic Shipments and Exports

	ln (Shipments)		ln (Shipments)	ln (Can-Mex Exports)	ln (Shipments)	ln (Can-Mex Exports)
	Value		Value	Value	Tons	Tons
	(1)	(2)	(3)	(4)	(5)	(6)
Water * ln (JA Ships)	0.184***	0.176***	0.531*	-0.527	0.846**	-0.243
	[0.033]	[0.033]	[0.299]	[0.436]	[0.361]	[0.390]
ln (Origin GDP)	0.688***	0.698***	1.416***	0.674	1.301**	1.491**
	[0.069]	[0.069]	[0.455]	[0.892]	[0.605]	[0.725]
ln (Destination GDP)	0.379***	0.379***				
	[0.061]	[0.061]				
ln (Origin Can-Mex Exports)		-0.014*				
		[0.008]				
Water	-6.941***	-6.936***	-10.129***	0.333	-10.578***	1.183
	[0.165]	[0.165]	[1.668]	[2.215]	[1.927]	[2.105]
Pair FE	Yes	Yes	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE	No	No	Yes	Yes	Yes	Yes
Observations	24,500	24,500	500	500	500	500
R-squared	0.896	0.896	0.875	0.640	0.805	0.592

Notes: Estimation by OLS using data at approximately 5 year intervals from 1997-2016. Regressions in columns 1 and 2 are run at the bilateral level. *Origin Can-Mex Exports* are the origin state's exports to Canada and Mexico which varies by mode of transport (i.e. water and other modes). Regressions in columns 3-6 are run at the origin state level and use the outflow of domestic shipments and the outflow of exports to Canada and Mexico as the dependent variables. Robust standard errors clustered at state pair level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 5
The Impact of Jones Act on Domestic Shipments in Coastal States

	ln (Shipments)		
	Baseline	Coastal	AK & HI
	(1)	(2)	(3)
Water * ln (JA Ships)	0.176***	0.141***	0.135***
	[0.033]	[0.036]	[0.034]
ln (Origin GDP)	0.698***	0.685***	0.685***
	[0.069]	[0.069]	[0.069]
ln (Destination GDP)	0.379***	0.368***	0.367***
	[0.061]	[0.060]	[0.061]
ln (Origin Exports)	-0.014*	-0.013	-0.014*
	[0.008]	[0.008]	[0.008]
Water	-6.936***	-6.759***	-7.009***
	[0.165]	[0.179]	[0.170]
Water*Coast		-0.857*	
		[0.447]	
Coast*ln (JA Ships)		0.096*	
		[0.049]	
Water * Coast*ln (JA Ships)		0.172**	
		[0.087]	
Water*AK&HI			0.925
			[0.660]
AK&HI*ln (JA Ships)			-0.448***
			[0.121]
Water *AK&HI* ln (JA Ships)			0.525***
			[0.133]
Pair FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	24,500	24,500	24,500
R-squared	0.896	0.896	0.914

Notes: The dependent variable is the log value of domestic shipments between two U.S. states via water and all other modes. Estimation by OLS using data at approximately 5 year intervals from 1997-2016. Robust standard errors clustered at state pair level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6
The Impact of Jones Act on State Prices

	ln (Price Index)		
	OLS	Reduced Form	IV
	(1)	(2)	(3)
ln (Shipments)$_{t-1}$	-0.019**		-0.142***
	[0.009]		[0.049]
ln (Coast-JA IV)$_{t-1}$		-0.028***	
		[0.006]	
ln (GDP)$_{t-1}$	0.089***	0.082***	0.163***
	[0.019]	[0.017]	[0.041]
ln (Unempl Rate)$_{t-1}$	-0.030***	-0.025***	-0.038***
	[0.009]	[0.008]	[0.014]
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	300	300	300
R-squared	0.993	0.994	0.987
First-Stage Results:			
ln (Coast-JA IV)$_{t-1}$			0.197***
			[0.052]
SW F-Stat on Instrument			14.04
SW F p-value			0.000

Notes: Estimation at approximately 5 year intervals from 1993-2016. The dependent variable is the log price index (constructed using CPI and RPP data). Shipments are the value of domestic shipments flowing into the state. Column 1 reports OLS results, Column 2 reports the reduced form estimates, and column 3 reports instrumental variable results. The Coast-JA instrument interacts a coastal dummy with the Jones-Act number of ships. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 7
The Impact of Jones Act on Domestic Shipments, Alternate Fleet Measures

	ln (Shipments)			
	(1)	(2)	(3)	(4)
Water * ln (JA Ships)	0.176***			0.242*
	[0.033]			[0.130]
Water * ln (JA GT Capacity)		0.229***		
		[0.039]		
Water * ln (JA DWT Capacity)			0.196***	
			[0.033]	
Water * ln (Non-JA Ships)				-0.105
				[0.110]
Water * ln (World Ships)				0.123
				[0.256]
ln (Origin GDP)	0.698***	0.698***	0.698***	0.698***
	[0.069]	[0.069]	[0.069]	[0.069]
ln (Destination GDP)	0.379***	0.379***	0.379***	0.379***
	[0.061]	[0.061]	[0.061]	[0.061]
ln (Origin Can-Mex Exports)	-0.014*	-0.014*	-0.014*	-0.014*
	[0.008]	[0.008]	[0.008]	[0.008]
Water	-6.936***	-7.988***	-7.784***	-8.057**
	[0.165]	[0.325]	[0.290]	[3.769]
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	24,500	24,500	24,500	24,500
R-squared	0.896	0.896	0.896	0.896

Notes: The dependent variable is the log value of domestic shipments between two U.S. states via water and all other modes. Estimation by OLS using data at approximately 5 year intervals from 1997-2016. Columns 2 and 3 measure the capactiy of Jones Act ships, in Gross Tons and Deadweight Tons respectively . Columns 4 includes measures of the number of non-Jones-Act American ships and the number of ships worldwide. Robust standard errors clustered at state pair level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 8
The Impact of Jones Act on Alternate Measures of Domestic Prices

	ln (Price Index)		ln (CPI)		ln (RPP)	
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Shipments - Value)$_{t-1}$	-0.142***		-0.116***		-0.122***	
	[0.049]		[0.038]		[0.045]	
ln (Shipments - Weight)$_{t-1}$		-0.092***		-0.075***		-0.079***
		[0.032]		[0.027]		[0.030]
ln (GDP)$_{t-1}$	0.163***	0.125***	0.107***	0.076***	0.147***	0.115***
	[0.041]	[0.030]	[0.033]	[0.026]	[0.036]	[0.028]
ln (Unempl Rate)$_{t-1}$	-0.038***	-0.024*	-0.023**	-0.012	-0.027*	-0.015
	[0.014]	[0.013]	[0.010]	[0.011]	[0.014]	[0.012]
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	300	300	300	300	300	300
R-squared	0.987	0.986	0.991	0.989	0.989	0.989
First-Stage Results:						
ln (Coast-JA IV)$_{t-1}$	0.197***	0.304***	0.197***	0.304***	0.197***	0.304***
	[0.052]	[0.082]	[0.052]	[0.082]	[0.052]	[0.082]
SW F-Stat on Instrument	14.04	13.80	14.04	13.80	14.04	13.80
SW F p-value	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Estimation by 2SLS at approximately 5 year intervals from 1993-2016. The dependent variable in columns 1-2 is the log price index (constructed using CPI and RPP data). In columns 3-4 the dependent variable is the log CPI price index. Finally, in columns 5-6 the dependent variable is the log RPP price index. "Shipments - Value"is the value of domestic shipments flowing into the state, while "Shipments -Weight" is the tons of domestic shipments flowing into the state. The Coast-JA instrument interacts a coastal dummy with the Jones-Act number of ships. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.