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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 restricts domestic waterborne shipments to American vessels. Since the passage of this cabotage law a century ago, a plausibly exogenous rise in foreign competition has contributed to the closure of most American shipyards and to a decline in American-built ships. Thus, the Jones Act requirements have become more onerous over time. The results show that domestic shipments are less likely to be transported via water than imports of the same good into the same state. Additional results exploit the decline in Jones-Act-eligible vessels over time and show that this cabotage law has disproportionately decreased domestic water trade especially in coastal states. These findings support common, but to date unverified, claims that the Jones Act impedes domestic trade.

Keywords: Cabotage, Jones Act, Domestic Trade, Shipping, Trade Policy

JEL Codes: F14, F68, R48

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1 Introduction

Water transportation in the United States is regulated by the Merchant Marine Act of 1920, commonly known as the Jones Act (JA).¹ This cabotage law requires that all goods transported via water between two U.S. points be carried on ships that are American built, owned, crewed, and flagged (see section 2.1 for additional details). As a result, the U.S. is ranked as having the most restrictive maritime transport industry among all OECD countries.² This paper examines the impact of the Jones Act on the U.S. economy.

The Jones Act was passed in response to World War I, with the goal of ensuring that the United States had a merchant marine fleet that was capable of assisting in times of war or emergency (Frittelli 2003). Proponents, such as American shipbuilders and seamen, contend that the Jones Act promotes national security, supports domestic employment, and provides safety benefits. However, critics argue that the Jones Act is “one of the most blatant forms of U.S. protectionism” (Rodrik 2018) which restricts domestic trade and drives up prices.³ Anecdotal stories about the effects of the Jones Act include Hawaiian ranchers sending cows to the mainland on airplanes, New Jersey struggling to obtain much needed road salt from Maine, and East Coast lumber coming from Western Canada rather than from Washington and Oregon.⁴ While critiques of the Jones Act are common, there is relatively little empirical evidence supporting these claims.

The global maritime industry has evolved enormously since the passage of the Jones Act 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 much less expensive to build a large merchant ship in Asia than in the U.S. Specifically, it now costs four to five times more to build these vessels in the United States (OECD 2019, Frittelli 2019). This has led to a remarkable reversal of fortune where the number of major U.S. commercial shipyards has plummeted from over sixty post-WWII to now just a few (Colton and Huntzinger 2002) and 91% of all merchant ships are now built in Japan, Korea, or China (UNCTAD 2018). As the U.S. shipbuilding industry has become increasingly uncompetitive, the number of American-built ships has declined. The empirical analysis examines whether the lack of Jones-Act-eligible ships has stifled domestic trade.

¹The bill is named after Senator Wesley Jones from the state of Washington who introduced this legislation.

²See Figure A1 in the online appendix which shows the restrictiveness of foreign entry into the maritime transport industry for each OECD country (2018 Services Trade Restrictiveness Index, OECD Stat).

³“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.” - “Senator John McCain Files Amendment to Repeal the Jones Act” Press Release, January 13, 2015.

⁴Bergstresser and Melitz (2017); Boyd (1983); and “Mr. Jones’ Act,” Planet Money, NPR, Episode 524, August 5, 2016.

This paper weaves together a variety of data to provide new insight into how the U.S. maritime industry has evolved over the last century. Complementing this descriptive evidence is an empirical analysis that utilizes comprehensive data on Jones Act ships, domestic trade by commodity and state, and international trade by commodity and state to examine the economic effects of the Jones Act over the past two decades (1997-2016). The detailed trade data is especially appealing for this analysis because it is available by mode of transport, which provides an opportunity to examine how the Jones Act affects domestic waterborne shipments. Of course any analysis of a 1920 policy faces some inherent data constraints and in this case the lack of domestic trade data from a hundred years ago means that it is not possible to compare the pre- and post-JA periods. Instead the goal of this analysis is to creatively use the available data to investigate a question with important policy implications. To the best of my knowledge, this is the first careful empirical assessment of this cabotage law.

The empirical strategy exploits a few appealing historical features. First, the passage of the Jones Act a century ago means that it was not influenced by current economic conditions, which is typically a concern when examining the impact of a policy change. Second, the subsequent decline of the U.S. shipbuilding industry was driven by a factor (i.e. foreign competition) that was unrelated to American economic conditions. Third, the Jones Act only affects domestic water shipments and not imports or domestic trade via other modes of transportation.

A difference-in-difference approach compares domestic water shipments to shipments via other modes and to imports from abroad. Shipments via other modes of transport are not covered by the Jones Act and they do not have American-built restrictions of their own. Imports are also a useful comparison group because the Jones Act only applies to shipments between U.S. points and not to shipments between the U.S. and foreign countries. The cross-sectional results show that domestic inflows are less likely to be transported via water than imports of the same commodity into the same state.⁵ This is consistent with the lack of JA-ships impeding domestic water trade between states. The results are stronger in coastal states which can more easily substitute toward water imports from abroad. These findings confirm an intuitive but important point that as U.S. trade becomes more onerous, due to the Jones Act, domestic water shipments decrease.

An additional analysis exploits the 50% decline in JA-eligible ships over the sample period. The results show that a ten percent decrease in the capacity of Jones Act ships decreases domestic water inflows

⁵The findings are similar using either the value or the weight of shipments. A placebo exercise shows that domestic shipments are insensitive to *non*-JA-eligible ships (Table A4). Furthermore, the findings are not driven by advances in other modes of transportation, such as improvements in air technology (Table A5).

by 8.5%, after accounting for unobserved time-invariant and time-varying factors that could influence domestic water trade. As domestic water transportation has become more difficult, states acquire similar goods from abroad or via other modes of transport. The decline in JA-eligible vessels does not significantly affect water shipments into non-coastal states but reduces domestic water shipments into coastal states by 18%. Overall, the Jones Act disproportionately affects the expected mode of transportation (water relative to other modes), the anticipated type of trade (domestic versus international), and the expected location (coastal states). This provides compelling evidence that the Jones Act does indeed limit domestic water trade.

Causality is pinned down by instrumenting Jones Act ships with shipbuilding in the U.K.⁶ This identifies the common response to foreign competition and discards variation that is driven by idiosyncratic conditions in the U.S., such as domestic demand for water transportation.⁷ The instrumental variable results show that the exogenous decline in Jones Act ships has caused domestic waterborne trade to decrease. Another extension finds that a decline in shipments from other states, due to the Jones Act, causes consumer prices to rise. Using a simple back of the envelope calculation, these results indicate that the decline in the capacity of JA ships led to a 1.35% increase in consumer prices in coastal states over the sample period, which explains 2.6% of the observed increase in prices from 1997 to 2016. Overall, the findings of the paper provide the first empirical evidence that the Jones Act has restricted domestic trade and raised consumer prices.

This paper makes a number of contributions to the existing literature. First, Jones Act studies 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).⁸ The downside of this approach is that the magnitude of these estimates depend heavily 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 (GAO 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” (GAO 2013). This paper takes a different approach by using a reduced form empirical analysis and detailed data on Jones Act ships and

⁶This identification strategy, which uses conditions in another developed country to identify an exogenous source of variation in the U.S., is a common approach in the international literature (see for example Autor, Dorn, and Hanson 2013)

⁷Focusing on U.K. shipbuilding is appealing because the U.S. and the U.K. were the preeminent shipbuilders after WWII, they both faced the same Asian competition, but in other respects (i.e. size and geographically) they are quite different.

⁸For instance, USITC (2002) argue that repealing the Jones Act will generate the largest welfare gain of any current trade liberalization policy. The only other trade policy that generated larger gains was liberalizing the textile and apparel industry which occurred with the expiration of the Multi-Fibre Arrangement in 2005 (USITC 2002).

domestic and international trade to estimate the economic implications of the Jones Act.

Second, a wide variety of policy papers have discussed the effects of the Jones Act. For instance, some studies focus on how the Jones Act affects particular locations, like Alaska (GAO 1988) and Puerto Rico (NY Fed 2012, GAO 2013). An overview of the Jones Act and a discussion of its implications is provided in Frittelli (2003, 2014, 2015, 2017 and 2019), Grennes (2017), and UNCTAD (2017). These papers offer interesting case studies, helpful background information, and a variety of anecdotal evidence. I contribute to this literature by using econometric techniques to provide a careful assessment of whether the Jones Act has adversely affected the U.S. economy.

Third, this paper contributes to a broader academic literature on transportation costs and trade. Existing empirical studies have shown that evolving transportation costs influence trade flows, but the source of these changes is typically infrastructure improvements (Michaels 2008, Duranton, Morrow, and Turner 2014, Redding and Turner 2015, and Donaldson and Hornbeck 2016) or technological change (Hummels 2007, Pascali 2017, and Feyrer 2019) rather than a domestic trade policy like the Jones Act.⁹ Consistent with Donaldson (2018) who finds that improvements in transportation infrastructure increase domestic trade and decrease prices, I find that a policy that impedes transportation reduces domestic trade and increases prices. Numerous studies focus 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 affects domestic trade rather than international trade. To the best of my knowledge, this is the first empirical analysis that examines the economic impact of this cabotage law.¹⁰

The paper proceeds as follows. The historical details of the Jones Act and the rise of the Asian shipbuilding 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 American goods are transported and how this varies across states. A cross-sectional analysis examining the impact of the Jones Act on domestic water trade is pursued in section 4, while a panel analysis exploiting the decline in Jones Act ships over the sample period is the focus of section 5. Both empirical strategies show that the Jones Act has disproportionately reduced domestic waterborne trade. Extensions in section 6 identify a causal effect using an instrumental variable approach and explore how the JA-induced decline in domestic trade has influenced state-level prices. Finally, section 7 provides some concluding thoughts.

⁹On the theoretical side, Allen and Arkolakis (2014 and 2019) use a general equilibrium geographic framework to examine the impact of infrastructure improvements on trade and welfare.

¹⁰The 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 may benefit some (i.e. those in the U.S. maritime industry) while potentially adversely affecting others (i.e. U.S. producers and consumers).

2 The Jones Act and the Global Maritime Industry

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

2.1 History of the Jones Act

The Merchant Marine Act, commonly known as the Jones Act, is a U.S. cabotage law passed in 1920. There were a number of precursors to the Jones Act including a 1817 U.S. law prohibiting foreign-owned ships from transporting cargo between U.S. ports. In 1912 Congress specified that the American-built requirement only applied to vessels making domestic and not international voyages (Frittelli 2019). After a temporary suspension of cabotage laws during WWI, the Jones Act of 1920 required that all goods transported by water between any two U.S. points must be carried on vessels that are American built, owned, flagged, and crewed.¹¹ The U.S. Customs and Border Protection agency is primarily responsible for the enforcement of the Jones Act and their creation of a special unit called the Jones Act Division of Enforcement (JADE) indicates that this is a priority (Grennes 2017). Penalties for violating the act are severe and can include seizure of the cargo or fines equal to the value of the cargo.

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 still 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 domestic maritime industry. By shielding American shipbuilders, owners, and seamen from foreign competition, the Jones Act may protect domestic employment and allow the U.S. to more carefully monitor safety standards. In fact, Senator Wesley Jones originally introduced the bill in part to help his maritime constituents in Seattle, WA.¹² Furthermore, domestic unions and shipbuilders argue that foreign rivals have an unfair advantage because they face less stringent laws and regulations, pay lower wages, and 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

¹¹In order to be classified as American built the hull and superstructure of the ship must be produced in the U.S. and all assembly must occur in the U.S. American ownership is defined as U.S. citizens holding at least a 75% controlling interest in the business entity. The ship must be flagged (i.e. registered) in the U.S. and is thus subject to U.S. laws. Finally, the crew is required to be U.S. citizens or permanent residents, but no more than 25% of the crew can be permanent residents and all officers and engineers must be U.S. citizens (Beason et al. 2015).

¹²Shipments from Seattle to Alaska were often routed through Vancouver, Canada so that foreign ships could be used. Shipments also traveled by rail from Seattle to Vancouver and then proceeded to Alaska on foreign ships. Senator Jones attempted to close these loopholes by introducing language into the bill that covered shipments by “land and water” and by replacing “U.S. ports” with “U.S. points” (Frittelli 2019).

foreign competition, which raises difficult questions about why the shipping industry is protected but other modes of transportation are not.¹³

Potential national security and maritime benefits need to be weighed against the possible adverse effects of the Jones Act on other segments of the economy. It is more expensive to both build large merchant ships in the U.S. and to operate these ships with an American crew.¹⁴ These higher fixed and variable costs can lead to higher domestic shipping rates and to a lack of available JA-eligible vessels, both of which may limit domestic water trade. Many industries argue, for instance, that the Jones Act has led them to source inputs (such as feed grains, scrap metal, and road salt) from abroad rather than from domestic producers (Frittelli 2003).

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). Given the nature of current military operations, commercial merchant ships may be less useful. The Jones Act has also been controversial during natural disasters. For instance, after Hurricane Maria 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.”¹⁵ 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.”¹⁶ The next day the U.S. temporarily waived the Jones Act for Puerto Rico as it had done 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 maintained a domestic fleet capable of assisting in times of emergency, which was the original purpose.

The goal of this paper is to provide the first careful empirical assessment of the costs associated with the Jones Act. This focus is not meant to minimize the potential benefits of the Jones Act, which may be important but are hard to quantify and are outside the scope of this analysis. Thus, this paper does not attempt to provide a full cost-benefit analysis of the Jones Act, but rather simply investigates whether there is empirical support for common critiques.

¹³While foreign owned air carriers are not allow to transport passengers between U.S. points, there are no restrictions requiring the use of American built planes, trucks, or trains (Grennes 2017).

¹⁴It is 4-5 times more expensive to build a large merchant ship in the U.S. (Frittelli 2019) and the average daily operating costs are approximately 2.7 times higher for an American ship (MARAD 2011).

¹⁵“Trump Waives Jones Act for Puerto Rico, Easing Hurricane Aid Shipments,” by Niraj Chokshi, New York Times, September 28, 2017.

¹⁶<http://transcripts.cnn.com/TRANSCRIPTS/1709/27/wolf.01.html>

2.2 Rise of the Global Maritime Industry

The second key development influencing water transportation has been increasing global competition. During the first half of the twentieth century the maritime industry was concentrated in developed countries, where ships were typically built, owned, operated and flagged in the same country (UNCTAD 2016). Specifically, the U.S. and the U.K. played a key role in the worldwide maritime industry during this period (Hanlon 2019, Colton and Huntzinger 2002). However, globalization has dramatically reshaped this sector. For instance, today three quarters of the worldwide fleet of ships are registered in developing countries which differ from the country of ownership. The top three countries according to flags of registration are Panama, Marshall Islands, and Liberia, which together accounts for 41% of world tonnage while the U.S. accounts for 0.6% (UNCTAD 2018).¹⁷

One of the most profound changes in the maritime industry entails the shift in shipbuilding from developed countries, including the U.S. and the U.K., to Asian countries. Japan in particular became a world power in shipbuilding after WWII. While they had developed an impressive shipbuilding industry during the war, which supplied a wide range of ships to the Imperial Japanese Navy, Japanese shipyards were badly damaged in WWII. During the rebuilding process Japan constructed new shipyards that 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 became twice as productive as their American counterparts and in 1956 Japan was the leading shipbuilder in the world (Colton and Huntzinger 2002). Beginning in the 1970s, South Korea and China entered the shipbuilding industry and replicated many of the Japanese innovations. By the end of the 20th century these three Asian countries dominated shipbuilding worldwide.

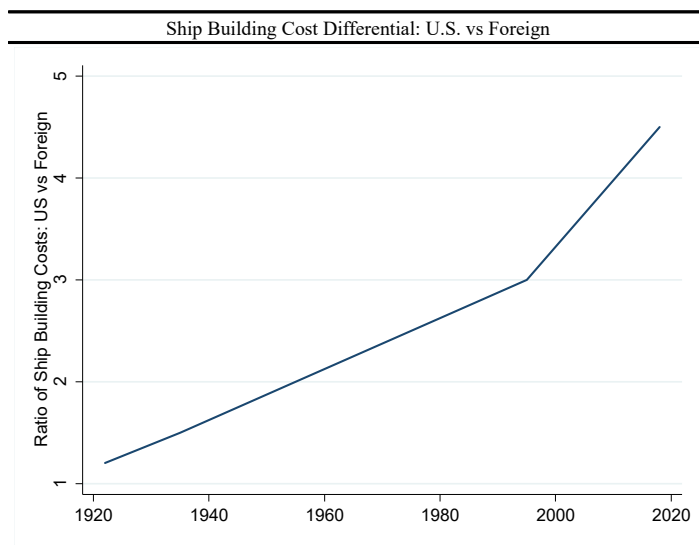
As Asian shipbuilding grew quickly, the U.S. maritime industry moved in the opposite direction. The United States had one of the largest shipbuilding industries in the world after WWII, which consisted of 64 private-sector shipyards and 8 naval shipyards that were capable of building large merchant ships (Colton and Huntzinger 2002). However, after the war private U.S. shipyards scaled back production, shifted to ship repair, or closed entirely. The decline in the number of U.S. shipyards has been striking, and now only a handful of domestic builders of large merchant ships remain (i.e. NASSCO, Philly Shipyard, VT Halter, and Keppel AmFELS).¹⁸

¹⁷The rise of “flags of convenience” allow foreign owners to register their ships in these developing countries, which often have more favorable laws and regulations (Grennes 2017).

¹⁸These remaining U.S. shipbuilders often have agreements with or are owned by foreign companies, which raise questions

This reversal of fortune was driven by the inability of American shipbuilders to compete with their more productive Asian rivals.¹⁹ It cost approximately 20% more to build a ship in the U.S. than in a foreign shipyard in the 1920s.²⁰ However, this difference has grown rapidly over the subsequent century (see Figure 1).²¹ The cost of building a tanker in the U.S. is now four times the cost of building the same vessel abroad and the cost of building a container ship in the U.S. is five times foreign costs. American shipyards have failed to keep pace with foreign rivals, due to the rapid productivity advances in Asia and the insulation from foreign competition provided by the Jones Act.

FIGURE 1



Notes: Figure shows approximately how much more expensive it is to build a ship in an American shipyard versus a foreign shipyard. Data from Frittelli (2019).

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 world's 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). To summarize, American shipbuilding is increasingly uncompetitive, most large U.S. shipyards have closed, and as a result the number of large American merchant ships has declined (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.

about what it means to be an American shipbuilder (Grennes 2017).

¹⁹In addition, the U.S. government defunded the Construction Differential Subsidies (CDS) program in 1982, which was designed to equalize the difference between U.S. and foreign shipbuilding costs (Moyer 1977).

²⁰U.S. Shipping Board, "Government Aid to Merchant Shipping," 1922.

²¹Figure 1 relies on estimates from the 1920s, 1930s, 1950s, 1990s, and 2018 from Frittelli (2019).

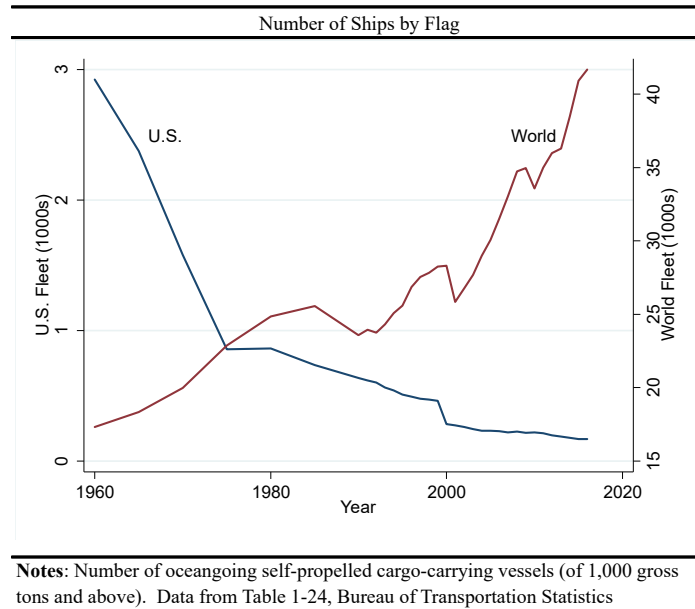
3 Data and Descriptive Statistics

This section describes the data used in this analysis and presents a variety of descriptive statistics that document changes in the U.S. maritime industry and the patterns of domestic trade.

3.1 Fleet of U.S. Ships

As the number of U.S. shipyards has decreased, the U.S. fleet of ships has experienced a rapid decline. As shown in Figure 2, there were 2,926 large U.S.-flagged merchant ships in 1960 but only 169 remain in 2016 (a 94% decrease).²² This does not simply reflect a global decline in water transportation, because the world-wide fleet increased from 17,317 ships to 41,674 ships over the same period (a 141% increase). 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



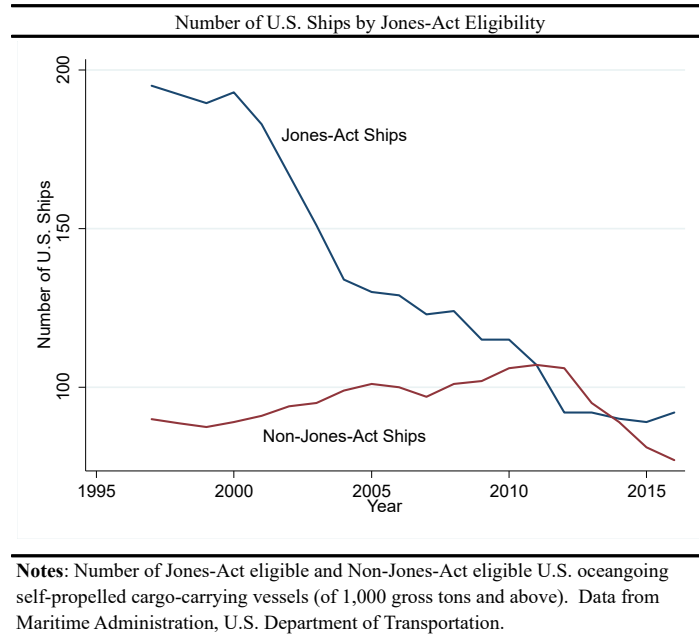
Not all U.S.-flagged ships (Figure 2) are built domestically. To focus more specifically on ships built in the U.S., Figure 3 plots U.S.-flagged merchant ships that are JA-eligible. The number of JA ships declined from 195 in 1997 to 92 in 2016 (a 53% decline). This is consistent with the decline in the number of U.S. shipyards capable of producing these large ships.²³ In contrast, the number of non-JA-eligible ships has remained more stable over this period, declining from 90 to 77 ships (a 14% reduction). Given

²²This includes privately-owned, 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).

²³JA vessels are typically decommissioned after twenty to thirty years.

that non-JA ships can be built abroad, they are not constrained by a lack of U.S. shipbuilders, they do not face higher building costs, and as a result they have remained more competitive. Overall, Figure 3 shows that it is a decrease in American-built JA ships that is responsible for the rapid decline in the U.S. fleet.²⁴

FIGURE 3



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).²⁵ As foreign demand for American-built ships has declined, due to the growth of Asian competitors, domestic shipyards have been driven out of business. In fact, one of the last remaining U.S. shipyards, Philly Shipyard, is in danger of closing.²⁶

While detailed data on domestic shipping rates is unavailable, there is anecdotal evidence that higher costs associated with the Jones Act have led to higher rates. For example, Figure 4 compares the shipping rates associated with transporting a barrel of oil to the Northeast region of the U.S. It costs \$1.20 per barrel to ship oil from nearby Eastern Canada, \$1.45-1.70 to ship oil from Nigeria (which is 4,800 nautical miles away), and \$1.90 to ship oil from Saudi Arabia (which is 5,800 nautical miles away). However,

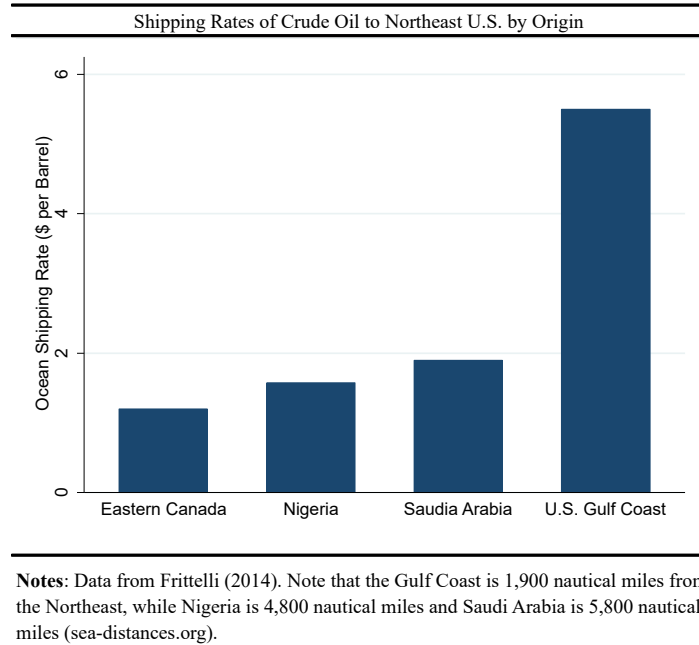
²⁴ JA-eligible ship data is available from 2000-2016 from the Maritime Administration, U.S. Department of Transportation. The share of JA ships in 2000 and the number of total U.S.-flagged ships in a given year are used to conservatively interpolate earlier years.

²⁵ “Building large self-propelled seagoing ships necessarily depends on a worldwide market to ensure a sufficient level of 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.

²⁶ “Philadelphia Shipyard Fights Again for Its Life,” By Costas Paris, *The Wall Street Journal*, April 17, 2019.

shipping oil from the U.S. Gulf Coast (which is only 1,900 nautical miles away) on a Jones Act vessel costs approximately three times more (\$5-6 per barrel). Other evidence shows that shipping a container from the East Coast to Puerto Rico costs about \$3,000 on a Jones-Act ship, but shipping it to the nearby Dominican Republic on a non-JA ship costs half as much (NY Fed 2012).

FIGURE 4



In sum, it has become increasingly more expensive to build large merchant ships in the U.S., the number of U.S. shipyards has declined, and thus the number of U.S. built ships has decreased. Over time the Jones-Act requirement that all domestic water shipments travel on American-built vessels has become more onerous. This paper investigates whether this decline in Jones Act ships has stifled domestic trade.

3.2 Shipments by Mode of Transport

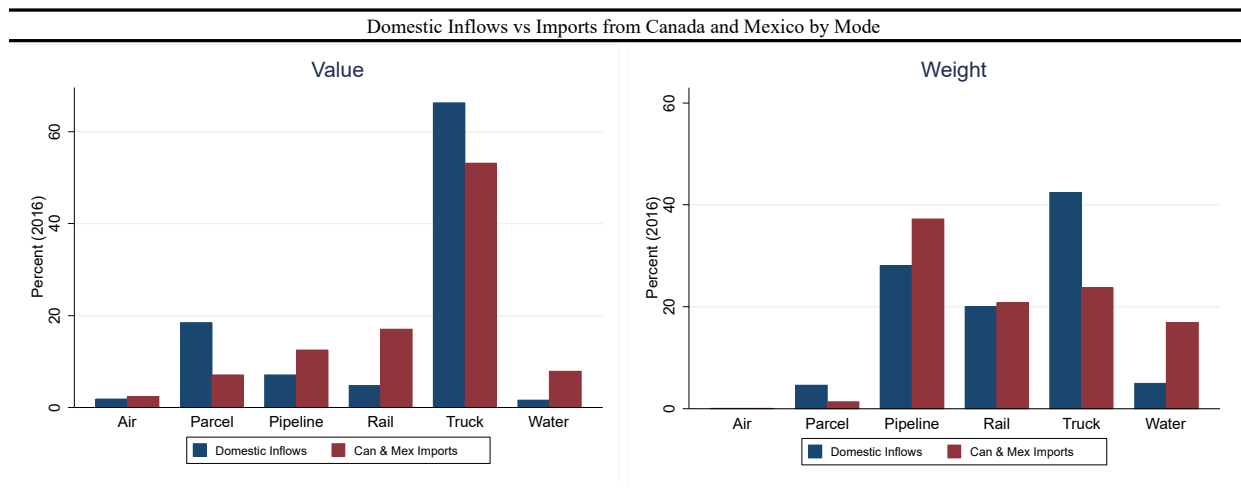
How are goods transported in the U.S.? Data on domestic shipments between U.S. states from the Freight Analysis Framework (FAF4) produced by the Bureau of Transportation Statistics (BTS) provides insights. Relying on information from a large number of domestic firms, this BTS data tracks the movement of 43 different commodities between all fifty U.S. states, at approximately five-year intervals from 1997 to 2016.²⁷

²⁷Puerto Rico is not included in this data set.

An appealing feature of this data is that it measures domestic trade by mode of transport, including air, parcel, pipeline, rail, truck, and water.²⁸ Figure 5 reports the percent of domestic shipments transported via each of these modes in 2016. Trucking is the most important method of transport according to both the value (left side) and the weight (right side) of U.S. shipments. In contrast, water transportation is one of the least important modes of domestic transportation. While this is consistent with a lack of JA-ships impeding domestic water trade, it may be that water transportation is simply a less important mode of transportation in general.

To investigate this possibility, domestic shipments are compared to imports using data provided by FAF4. Water transportation is by far the most important method of transportation for imports according to both the value and weight of shipments. However, land transportation is impossible for many U.S. trading partners. Thus, Figure 5 compares domestic shipments to imports from Canada and Mexico.²⁹ Water transportation is much more important for international trade with these neighboring countries than for domestic trade (according to both value or weight), which is consistent with the Jones Act restricting domestic waterborne shipments.

FIGURE 5



Notes: The percent of domestic inflows and imports by mode (according to value in 2016) is on the left. The percent of domestic inflows and imports by mode (according to weight in 2016) is on the right. Author's calculation using the Freight Analysis Framework (FAF4) data from the Bureau of Transportation Statistics.

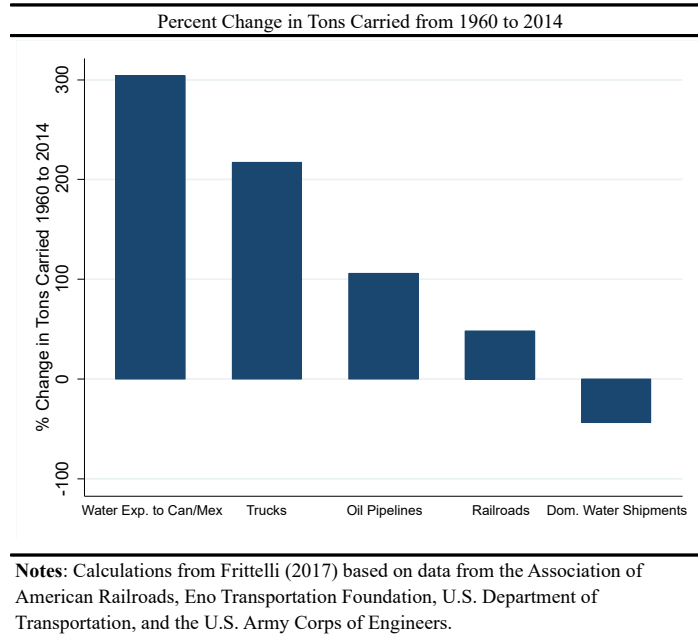
To account for the possibility that these differences are due to geography, or other time-invariant factors, Figure 6 looks at the evolution of domestic and international shipments over time. Water exports

²⁸The 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.

²⁹The transport mode of imports reflects the method used for transporting the good from the foreign country to the initial U.S. state, and not any potential subsequent movement of the good.

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 between contiguous coastal states has actually decreased 44%. These changes over time are not well explained by time-invariant geographical differences, but they are consistent with the decline in Jones Act ships.

FIGURE 6



These figures illustrate a few important points. First, water transportation is less important domestically than other modes of transport (Figure 5). Second, this is not due to water transportation being less relevant in general, because it is found to be more important for imports (Figure 5). Third, time-invariant factors, like geography, are unlikely to explain these differences, because water transportation is becoming more important internationally but less important domestically over time (Figure 6). The subsequent analysis will investigate to what extent these observations in the data can be explained by the Jones Act.

3.3 Shipments by State and Commodity

The importance of water transportation likely varies by state. For coastal states with deep ports that are able to accommodate large merchant ships of over a 1,000 gross tons, waterborne trade is likely to be more important.³⁰ The FAF4 data set provides an opportunity to explore this geographic variation.

³⁰See Table A1 in the online appendix for a list of major U.S. ports with an authorized channel depth of at least 35 feet.

FIGURE 7

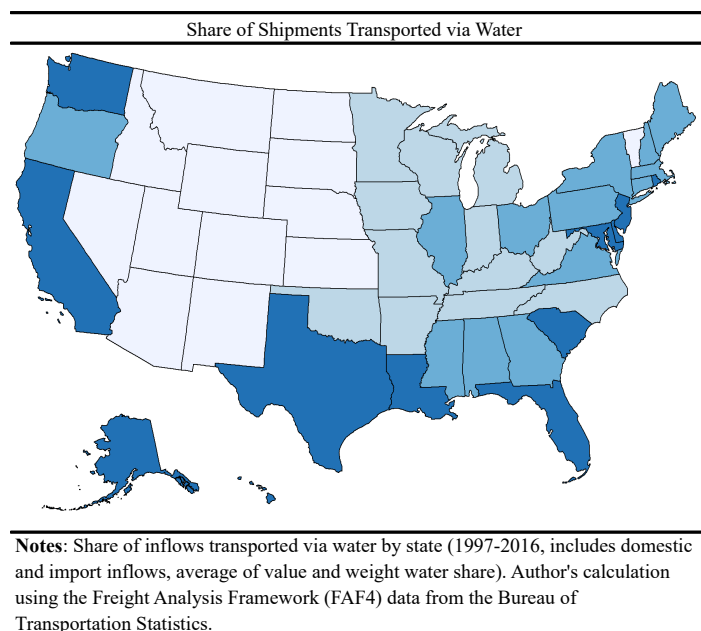


Figure 7 shows the states with the highest share of domestic and import inflows that are transported via water over the sample period.³¹ As expected, water transportation is most important for coastal states. For example, Hawaii, Louisiana, and California are the top states according to the share of inflows being transported via water. These coastal regions should be more sensitive to cabotage rules that regulate domestic water transport. Their deep ports allow them to accommodate large international ships which means that they can more easily substitute towards waterborne imports in response to the Jones Act.

FAF4 also has shipment data by forty three commodities (see Table A2 in the online appendix). Calculating the share of shipments transported via water indicates that bulky and heaving commodities, such as crude petroleum, gasoline, minerals, and ores are disproportionately transported via water. Interestingly, Figure A3 shows that the decline in Jones Act ships coincides with a decrease in domestic waterborne gasoline inflows into California, while waterborne gasoline imports have increased. The subsequent analysis will explore whether this type of substitution towards different source locations or different modes of transport occurs across a broad spectrum of states and commodities.

³¹The share of shipments transported by water is calculated for each state (1997-2016, average of value and weight water share).

4 Cross-Sectional Analysis

4.1 Estimation Strategy

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

$$(1) \quad \ln Shipments_{csml} = \beta_1 Water_m * Domestic_l + \gamma_{csm} + \gamma_{csl} + \varepsilon_{csml}$$

where $Shipments_{csml}$ is the value or weight of domestic shipments of commodity c , into state s , transported via mode m , from source location l , over the 1997-2016 period. The transport mode consists of either water shipments or shipments via all other modes (which is the sum of air, parcel, pipeline, trucking, and rail) and the source location is either other U.S. states or foreign countries. The independent variable of interest, $Water_m * Domestic_l$, is the interaction of a binary variable indicating the transport mode is water and a binary variable indicating domestic shipments. Commodity*state*mode fixed effects (γ_{csm}) and commodity*state*location fixed effects (γ_{csl}) are also included.³² Finally, robust standard errors, which are two-way clustered at the commodity-level and state-level, are reported throughout.

The key interaction term examines whether domestic shipments are less likely to be transported via water than international shipments of the same good into the same state. The lack of JA-eligible ships should disproportionately impede domestic water inflows and thus the difference-in-difference coefficient will be negative ($\beta_1 < 0$). The rigorous set of fixed effects, control for a wide variety of potentially confounding factors. For instance, if state s is acquiring less of commodity c via water due to general improvements in air technology (Hummels 2007), this will be captured by the γ_{csm} fixed effects. If globalization is leading state s to acquire more of commodity c from abroad (Autor, Dorn, and Hanson 2013), this will be captured by the γ_{csl} fixed effects.

The empirical strategy exploits a few appealing historical features. The Jones Act was passed in 1920 which is 73 years before the start of the sample period studied in this paper and addresses typical concerns about an endogenous policy change. The Jones Act only applies to domestic water transportation. Other domestic modes of transportation are not covered by the Jones Act and they do not have their own cabotage rules requiring domestic construction. Furthermore, the Jones Act only applies to water trade between two U.S. points and not water transportation between the U.S. and foreign countries. Finally, the decline of the U.S. shipbuilding industry was driven by a factor (i.e. foreign competition) that was

³²The uninteracted $Water_m$ and $Domestic_l$ terms are absorbed by these fixed effects.

unrelated to American economic conditions.³³

The analysis also examines whether the Jones Act has a heterogeneous impact across U.S. states. Coastal states with deep ports likely have an easier time substituting towards water imports from abroad and thus will be more sensitive to domestic cabotage rules. To test for this possibility, equation (1) is re-estimated with the following triple interaction term: $Water_m * Domestic_l * Coast_s$.³⁴ Water transportation on rivers, canals, and the Great Lakes is of course important too, but these shipments are less affected by the Jones Act. American production of smaller ships and barges, which transport goods on these inland waterways, is more competitive (USITC 1999).³⁵

4.2 Results

The cross-sectional results are reported in Table 1. The first column shows that domestic shipments are less likely to be transported via water than international shipments of the same good into the same state. The point estimate on the interaction term of interest is -6.7 and is statistically significant. The fixed effects account for a wide variety of potentially confounding factors, such as the possibility that the inflow of a commodity into a given state typically arrives via a particular mode of transportation or from a particular source location. This first result is consistent with the Jones Act impeding domestic water trade.

The results in column 2 show that the Jones Act has a heterogeneous impact across U.S. states. The coefficient on the triple interaction term confirms that coastal states are more affected by the Jones Act. Specifically, the negative effect on domestic water shipments is 60% larger in coastal states (-8.61) than in non-coastal states (-5.38). Domestic inflows of commodity c into coastal state s are less likely to arrive via water than international inflows of the same commodity into the same state.

The findings are similar when shipments are measured using their weight rather than their value. Domestic inflows are less likely to be transported via water than international inflows (column 3). Since transporting goods domestically via water is more difficult, due to the JA, states acquire the same goods via other modes or via waterborne imports. Furthermore, the negative impact of the Jones Act on the weight of domestic water shipments is found to be larger in coastal states (column 4).

³³This is confirmed in the instrumental variable analysis in section 6.1.

³⁴Coastal states are defined as those with a major port with an authorized channel depth of at least 35 feet (BTS 2017). A major port is ranked in the top 25 according to either total tonnage, twenty-foot equivalent units (TEU), or dry bulk tonnage. See Table A1 in the online appendix for a list of U.S. ports that satisfy this criteria. Results are robust to alternate definitions.

³⁵Furthermore, other U.S. laws and regulations make it challenging for foreign ships to operate on inland waterways (USITC 1999).

TABLE 1
The Impact of Jones Act on Domestic Water Inflows

	ln (Shipment Value)		ln (Shipment Weight)	
	(1)	(2)	(3)	(4)
Water * Domestic	-6.673*** [0.480]	-5.380*** [0.435]	-7.135*** [0.506]	-5.651*** [0.477]
Water * Domestic * Coastal		-3.231*** [0.838]		-3.712*** [0.856]
Commodity*State*Mode FE	Yes	Yes	Yes	Yes
Commodity*State*Source FE	Yes	Yes	Yes	Yes
Observations	8,600	8,600	8,600	8,600
R-squared	0.930	0.941	0.917	0.932

Notes: The dependent variable is the log value or weight of domestic shipments of a commodity into a U.S. state by mode and by source location. The shipments are summed over the years 1997-2016 and span 43 commodities, 50 states, 2 modes (water and all other modes), and 2 source locations (domestic and foreign). Coastal states are those with a major port with an authorized channel depth of at least 35 feet. Robust standard errors two-way clustered at the commodity and state level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Overall, the results in Table 1 are consistent with the Jones Act impeding domestic water shipments. While the fixed effects rule out most confounding factors, it is still possible that an unobserved characteristic specific to a state, commodity, mode, and source location could influence these estimates. The next section addresses this concern by exploiting changes in the capacity of Jones Act ships over time.

5 Panel Analysis

5.1 Estimation Strategy

The following specification is used to test the time-varying effects of the Jones Act:

$$(2) \quad \ln Shipments_{csmlt} = \beta_1 Water_m * Domestic_l * \ln JAShips_t + \gamma_{csml} + \gamma_{csmt} + \gamma_{cslt} + \varepsilon_{csmlt}$$

where $Shipments_{csmlt}$ is the value or weight of domestic shipments of commodity c , into state s , transported via mode m , from source location l , in a given year t . The transport mode consists of either water shipments or shipments via all other modes and the source location is either other U.S. states or foreign countries. The key independent variable is now $Water_m * Domestic_l * \ln JAShips_t$. As before the first two terms are binary variables indicating the transport mode is water and that the shipments are domestic.

The third term is the gross ton capacity of Jones Act ships.³⁶ Commodity*state*mode*location fixed effects ($\gamma_{csm\ell}$), commodity*state*mode*year fixed effects (γ_{csmt}), and commodity*state*location*year fixed effects ($\gamma_{cs\ell t}$) are included as well.³⁷ Equation (2) is estimated at approximately five-year intervals over the period 1997-2016 due to the long-run relationship of interest and the available FAF4 data. Finally, robust standard errors, which are two-way clustered at the commodity-level and state-level, are reported throughout.

The capacity of JA-eligible ships has fallen by 50% over the sample period (Figure A2) due to exogenous foreign competition. Given that the Jones Act only regulates domestic water transportation, imports and non-water domestic trade should not be directly affected by this decline. The triple interaction term in equation (2) tests whether the decrease in JA-eligible ships has disproportionately decreased domestic water shipments between states ($\beta_1 > 0$). The comprehensive set of fixed effects account for time-invariant factors at the commodity*state*mode*location level and time-varying factors at the commodity*state*mode and the commodity*state*location level. The analysis also examines whether this effect is stronger in coastal states, by re-estimating equation 2 with the following quadruple interaction term included: $Water_m * Domestic_\ell * \ln JAShips_t * Coast_s$.

5.2 Results

The panel results indicate that as the capacity of JA ships has declined, domestic water shipments have decreased (Table 2). The point estimate (0.848) on the interaction term in column 1 indicates that a ten percent decrease in the capacity of JA ships is associated with an 8.5% decrease in domestic water inflows relative to other shipments. As the Jones Act restrictions have become more onerous over time, due to a decline in eligible vessels, domestic water inflows have decreased.³⁸

Coastal states with deep ports have an easier time switching to waterborne imports when domestic water transportation becomes more difficult. Furthermore, inland states should be less affected by the Jones Act because American production of smaller ships and barges used to transport goods on inland

³⁶Gross ton capacity is the volume of the ship's enclosed spaces and is the preferred measure of the U.S. Bureau of Transportation (i.e. it is how they define large JA ships). Capacity is preferable to the number of JA ships, if the size of ships is changing over time. However, Figure A2 in the online appendix shows that the capacity and number of Jones Act ships are correlated over time. Furthermore, Table A4 in the online appendix shows that the results are robust to using the gross ton capacity, the number, or the dead-weight ton capacity of Jones Act ships.

³⁷The uninteracted $Water_m$, $Domestic_\ell$, and $\ln JAShips_t$ terms are absorbed by these fixed effects.

³⁸The results are not driven by advances in other modes of transportation such as the U.S. railroad system (Donaldson and Hornbeck 2016), the U.S. interstate highway system (Michaels 2008), or air transportation (Hummels 2007). Not only do these developments predate the sample period studied in this analysis, but Table A5 reports similar findings when each domestic mode of non-water transportation is excluded from the comparison group.

waterways has remained more competitive (USITC 1999).³⁹ The findings confirm that the decrease in JA ships is associated with a decline in domestic water shipments exclusively in coastal states (column 2). A ten percent decline in the capacity of JA ships has no significant impact on domestic water shipments into non-coastal states but reduces domestic water shipments into coastal states by 18.1%.⁴⁰

TABLE 2
The Impact of Jones Act on Domestic Water Inflows Over Time

	ln (Shipment Value)		ln (Shipment Weight)	
	(1)	(2)	(3)	(4)
Water * Domestic * ln(JA Ships)	0.848** [0.406]	0.204 [0.380]	0.872** [0.375]	0.315 [0.347]
Water * Domestic * ln(JA Ships) * Coastal		1.609*** [0.448]		1.393*** [0.402]
Commodity*State*Mode*Source FE	Yes	Yes	Yes	Yes
Commodity*State*Mode*Year FE	Yes	Yes	Yes	Yes
Commodity*State*Source*Year FE	Yes	Yes	Yes	Yes
Observations	43,000	43,000	43,000	43,000
R-squared	0.987	0.987	0.984	0.984

Notes: The dependent variable is the log value or weight of domestic shipments of a commodity into a U.S. state in a given year by mode and by source location. *JA Ships* is the gross ton capacity of Jones-Act eligible ships. The shipments span 43 commodities, 50 states, 2 modes (water and all other modes), 2 source locations (domestic and foreign), and is available at approximately 5 year intervals from 1997-2016. Coastal states are those with a major port with an authorized channel depth of at least 35 feet. Robust standard errors two-way clustered at the commodity and state level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Finally, the results are similar when using the weight of the shipments rather than the value. The decline in the capacity of Jones Act ships reduces the weight of domestic water inflows (column 3) relative to other domestic and international shipments. This effect is driven exclusively by coastal states (see column 4).

Overall, these findings show that the Jones Act disproportionately affects the expected mode of transportation (water relative to other modes), the anticipated type of trade (domestic versus international), and the expected locations (coastal states). Furthermore, qualitatively similar results emerge using a cross-section analysis (section 4) or a panel analysis (section 5) that exploits changes in the number of Jones Act ships over the sample period. Together these findings provide compelling evidence that the

³⁹Smaller ships and barges are not included in the Jones Act measures provided by MARAD, which focuses on large oceangoing vessels.

⁴⁰The γ_{cslt} fixed effects will capture an increase in Chinese imports (Autor, Dorn, and Hanson 2013) of commodity c into state s in year t . The results are qualitatively similar if the analysis only includes imports from Canada and Mexico, which alleviates concerns that the 'China Shock' may disproportionately increase water imports.

Jones Act has limited domestic water trade.⁴¹

6 Extensions

6.1 Instrumental Variable Approach

This section pursues an instrumental variable analysis that addresses endogeneity concerns by identifying an exogenous source of variation in Jones Act ships that is due to the rise of Asian shipbuilding.⁴² Specifically, Jones Act ships are instrumented using shipbuilding in the U.K. This strategy builds on the common approach in the literature of using conditions in other developed countries to identify an exogenous source of variation in the U.S. (Autor, Dorn, and Hanson 2013). Both the U.S. and the U.K. emerged from WWII with large shipbuilding industries and commercial fleets (Colton and Huntzinger 2002). However, the maritime industries in both countries faced the same foreign competition from Asian shipbuilders over the latter half of the twentieth century.

Specifically, the triple interaction term in equation (2) is instrumented using the gross ton capacity of newly built ships in the U.K. in a given year (i.e. $Water_m * Domestic_l * \ln UKShips_t$).⁴³ This approach captures variation in American shipbuilding that is due to common factors affecting both the U.S. and the U.K., such as the rise of Asian shipbuilding, and it discards idiosyncratic U.S. variation, such as changes in the demand for domestic water transportation.

The most obvious violation of the exclusion restriction is not possible because U.K. built ships are prohibited from transporting goods domestically within the U.S. due to the Jones Act. One threat to this identification strategy is if the similar decrease in shipbuilding in the two countries is due to common declines in the demand for domestic water transportation. However, domestic water trade has actually evolved quite differently in the two countries. The share of domestic freight transported via water in the U.K was 20% in 1960 and was still 16% in 2015. In the U.S. the share fell much more dramatically from 17% to 5% over a similar period.⁴⁴ This is inconsistent with common trends in demand for domestic

⁴¹Additional results show that coastal states are more likely to switch from domestic water inflows to imports (Table 2) than from domestic water outflows to exports (Table A3). A ten percent decline in JA ships is associated with a 18.1% decrease in domestic water inflows relative to imports (column 2 of Table 2) but only a 10.2% decrease in domestic water outflows relative to exports (column 2 of Table A3).

⁴²For instance, one concern would be if a decline in domestic demand for water transportation is leading to a reduction in JA-eligible ships. However, this reverse causality story lacks a clear explanation for why the demand for domestic water transportation should decline, especially given the growth of the worldwide fleet of ships (Figure 2), the stability of the non-JA fleet of ships (Figure 3), and the importance of water trade internationally (Figures 5 and 6).

⁴³Data on non-warship vessels over a 100 gross tons built in the U.K. was graciously provided by Ian Buxton, Marine Technology Special Collection, Newcastle University, U.K. While the U.S. measure is a stock and the U.K. measure is a flow, the two are correlated.

⁴⁴See Table TSGB0401 produced by the U.K. Department of Transport, Chapter Q of the “Historical Statistics of the

water transportation, but it is consistent with the decline in domestic ships decreasing water trade in the U.S. by more (due to the Jones Act) than in the U.K. (which does not have a cabotage law).

The instrumental variable results are shown in Table 3. The first-stage coefficient of 0.12 reported in the bottom panel of column 1 confirms that U.K shipbuilding is a useful predictor of Jones Act ships. The Sanderson-Windmeijer (SW) F-statistic on the excluded instrument is 10.0, which indicates a relatively strong first-stage. The second-stage results reported above show that a ten percent decline in the capacity of JA ships reduces domestic waterborne inflows by 10%. This estimate carries a causal interpretation by identify an exogenous source of variation in Jones Act ships driven by the rise of Asian shipbuilding. These IV estimates and the previous OLS estimates (column 1 of Table 2) are the same sign, similar in magnitude, and both statistically significant. Finally, similar results are obtained using the weight of shipments in column 2 of Table 3. Overall, these findings confirm that the decline in Jones Act ships has caused domestic water shipments to decrease.

TABLE 3
The Impact of Jones Act on Domestic Water Shipments Over Time (IV)

	ln (Shipment Value)	ln (Shipment Weight)
	(1)	(2)
Water * Domestic * ln(JA Ships)	1.008*** [0.162]	0.919** [0.286]
Commodity*State*Mode*Source FE	Yes	Yes
Commodity*State*Mode*Year FE	Yes	Yes
Commodity*State*Source*Year FE	Yes	Yes
Observations	43,000	43,000
R-squared	0.987	0.984
First-Stage Results		
Water * Domestic * ln (U.K Ships) IV	0.118** [0.037]	0.118** [0.037]
SW F-Stat on Instrument	9.962	9.963

Notes: The dependent variable is the log value or weight of domestic shipments of a commodity into a U.S. state in a given year by mode and by source location. *JA Ships* is the gross ton capacity of Jones-Act eligible ships. *U.K. Ships* is the gross ton capacity of ships built in the U.K. The shipments span 43 commodities, 50 states, 2 modes (water and all other modes), 2 source locations (domestic and foreign), and is available at approximately 5 year intervals from 1997-2016. IV estimation with robust standard errors two-way clustered at the mode*year and source*year level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

United States, Colonial Times to 1957" (U.S. Census), and FAF4 data.

6.2 Consumer Prices

Does the decline in domestic water trade, due to the Jones Act, increase prices within a state?⁴⁵ State prices are measured using metropolitan and regional Consumer Price Index (CPI) data from the Bureau of Labor Statistics (BLS), which generates a data set spanning all fifty states and the twenty years of the sample.⁴⁶ Not surprisingly, western and northeastern states, such as Hawaii, California, New York, and Massachusetts are relatively expensive.

To investigate the impact of domestic shipments on prices, the following equation is estimated:

$$(3) \quad \ln Prices_{st} = \alpha_1 \ln Shipments_{st-1} + \alpha_2 \ln GDP_{st-1} + \alpha_3 \ln Unempl_{st-1} + \gamma_s + \gamma_t + \varepsilon_{st}$$

where $Prices_{st}$ is the price index in state s in year t . $Shipments_{st-1}$ is the value of all domestic shipments (regardless of mode) flowing into state s 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 s and year $t - 1$ may influence prices. The independent variables are lagged one year to account for the possibility that it takes time for these economic factors to influence prices. State fixed effects (γ_s) and year fixed effects (γ_t) are included, estimation is at approximately five year intervals over the period 1997-2016, and robust standard errors are reported throughout.

Standard theories of comparative advantage assert that on average the state will import goods that are less expensive to produce elsewhere. Therefore, an inflow of shipments from other states should decrease domestic prices ($\alpha_1 < 0$). One potential concern is that higher prices within the state may encourage the inflow of goods from other states. Or unobserved state-level shocks (i.e. a positive productivity shock) could reduce both prices and the inflow of shipments. However, both of these possibilities will generate a spurious positive bias, which will attenuate the expected negative α_1 coefficient.

To address these endogeneity concerns, an instrumental-variable analysis is pursued that uses the Jones Act to identify an exogenous source of variation in shipments into a state. As previous results showed, the Jones Act disproportionately affects domestic trade in coastal states. Thus, an instrument

⁴⁵Even if the decline in domestic water shipments is offset to some extent by an increase in imports or shipments via other modes, it is still the case that domestic water transportation was initially preferable (as the theory of revealed preference would predict) and thus the decline in domestic water shipments should increase prices.

⁴⁶CPI data is obtained for metropolitan areas and is used to construct price indexes for sixteen states for the full sample period. Texas' consumer price index is the average of Dallas and Houston's CPI, while California's consumer price index is the average of Los Angeles, San Diego, and San Francisco's CPI. For states that do not have metropolitan CPI data, regional CPI data is used instead.

is constructed which interacts the capacity of Jones Act ships with a binary variable indicating whether state s is a coastal state with a large port ($Coast_s * \ln JAShips_{t-1}$). This empirical approach examines whether the decline in JA-eligible ships has reduced total shipments into coastal states and whether this in turn increases prices ($\alpha_1 < 0$). The exclusion restriction should hold since it is hard to argue that a cabotage law, like the Jones Act, will directly affect prices without operating through domestic trade.

The OLS results show that a ten percent increase in the value of shipments from other states is associated with a 0.3% decline in prices within the state (column 1 of Table 4). Prices are also increasing with GDP and decreasing with the unemployment rate, as expected. Endogeneity concerns are addressed in column 2. The first-stage results (reported in the bottom panel) indicate that the decline in JA ships reduces domestic shipments into coastal states. The SW F-statistic on the excluded instrument is 16.1 which indicates a relatively strong first-stage. The second-stage results show 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 1.2%. The instrumental variable approach accounts for the spurious positive endogeneity bias and thus the IV point estimate (-0.12 in column 2) is more negative than the OLS point estimate (-0.03 in column 1).⁴⁷ Using shipment weight rather than the value generates similar results (columns 3 and 4).

⁴⁷Impediments to trade should have a larger impact on the price of tradeable goods. Additional results confirm that the JA increases gasoline prices by even more (coefficient of -0.19 versus -0.12). See Gius (2013) for additional insight into the impact of the Jones Act on gasoline prices.

TABLE 4
The Impact of Jones Act on State Prices

	ln (CPI)			
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
ln (Shipment Value) _{t-1}	-0.031** [0.012]	-0.124*** [0.043]		
ln (Shipment Weight) _{t-1}			-0.015** [0.007]	-0.095** [0.038]
ln (GDP) _{t-1}	0.049** [0.020]	0.119*** [0.038]	0.035* [0.020]	0.084** [0.032]
ln (Unempl Rate) _{t-1}	-0.014* [0.008]	-0.022** [0.011]	-0.011 [0.008]	-0.008 [0.012]
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	250	250	250	250
R-squared	0.993	0.990	0.993	0.988
First-Stage Results:				
Coast * ln (JA Ships _{t-1}) IV		0.230*** [0.057]		0.298*** [0.079]
SW F-Stat on Instrument		16.14		14.23

Notes: The dependent variable is the log of the Consumer Price Index. *Shipments* are the value or weight of domestic shipments flowing into a state. OLS and IV estimation using data spanning 50 states at approximately 5 year intervals from 1997-2016. The *Coast * JA* instrument interacts the gross ton capacity of all Jones Act ships with the coastal dummy. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A simple back of the envelope calculation provides insight into the magnitude of this effect. Multiplying the 47.3% decline in the capacity of JA ships from 1997 to 2016 by the estimated first-stage coefficient of 0.23 (column 2) implies that the Jones Act decreased domestic shipments into coastal states by 10.88% over the sample period. Multiplying this decline in domestic trade by the second stage coefficient of -0.124, means that the Jones Act increased domestic consumer prices by 1.35% in coastal states. Given that the CPI in coastal states increased 52.6% from 1997 to 2016, the Jones Act can explain about 2.6% of the observed increase in consumer prices in coastal states over the sample period.

7 Conclusion

The Jones Act is a 1920 law that requires that goods shipped between U.S. points be transported on American built, owned, crewed, and flagged vessels. Unlike typical trade policies that target international trade, cabotage laws like the Jones Act affect domestic trade. While critics contend that the Jones Act

adversely effects the economy, to date there has been relatively little empirical evidence to support these claims.

Since the passage of the Jones Act a century ago, American shipbuilding has become increasingly uncompetitive. With the exogenous rise of Asian shipbuilding, the number of American shipyards capable of building large commercial ships declined and the number of American built JA-eligible ships decreased too. As a result, the Jones Act stipulation that goods must be transported on American built ships has become more onerous over time.

Cross-sectional results show that domestic shipments are less likely to be transported via water than imports of the same commodity into the same state. Additional results show that the 50% decline in JA-eligible ships over the past two decades has negatively affected domestic water shipments. A ten percent decline in the capacity of Jones Act ships reduces domestic water shipments by 8.5% relative to other shipments, and this effect is even larger in coastal states. Additional results indicate this is a causal effect which in turn has increased domestic prices.

These findings have important policy implications. The Jones Act discourages domestic water transportation, which may place an added burden on the congested highway and rail systems and shift domestic trade towards more polluting means of transportation (i.e. truck and air).⁴⁸ Furthermore, the Jones Act may cause states to import goods from abroad rather than acquire the same products from other U.S. states.

Overall, this paper offers the first empirical evidence on the economic costs of the Jones Act. Whether these drawbacks 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 are empirically important and should be taken into account by policy makers.

⁴⁸Greenhouse gas emissions (per ton-mile) are much lower when transporting freight via water than via other modes of transport (“U.S. Freight GHG Emissions by Consuming Industry Segment,” ICF International Paper No. 12-4191).

References

- [1] Allen, Treb and Costas Arkolakis. 2014. "Trade and the Topography of the Spatial Economy." *The Quarterly Journal of Economics*, 129(3): 1085-1140.
- [2] Allen, Treb and Costas Arkolakis. 2019. "The Welfare Effects of Transportation Infrastructure Improvements." NBER Working Paper No. 25487.
- [3] Autor, David H., David Dorn, and Gordon H. Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review*, 103(6): 2121-68.
- [4] Beason, Sarah, Darrell Conner, Nickolas Milonas, and Mark Ruge. 2015. "Myth and Conjecture? The "Cost" of the Jones Act." *Journal of Maritime Law & Commerce*, 46(1): 23-50.
- [5] Bergstresser, Daniel and Marc Melitz. 2017. "The Jones Act and the Cost of Shipping Between U.S. Ports." *Econofact*, October 19, 2017.
- [6] Boyd, Roy. 1983. "Lumber Transport and the Jones Act: A Multicommodity Spatial Equilibrium Analysis." *The Bell Journal of Economics*, 14(1): p. 202-12.
- [7] Colton, Tim and LaVar Huntzinger. 2002. "A Brief History of Shipbuilding in Recent Times." Center for Naval Analyses, Alexandria, Virginia, September 2002.
- [8] "Comparison of U.S. and Foreign-Flag Operating Costs." Maritime Administration (MARAD), U.S. Department of Transportation, September 2011.
- [9] Donaldson, Dave. 2018. "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure." *American Economic Review*, 108(4-5): 899-934.
- [10] Donaldson, Dave and Richard Hornbeck. 2016. "Railroads and American Economic Growth: A "Market Access" Approach." *The Quarterly Journal of Economics*, 131(2): 799-858.
- [11] Duranton, Gilles, Peter M. Morrow, and Matthew A. Turner. 2014. "Roads and Trade: Evidence from the US." *The Review of Economic Studies*, 81(2): 681-724.
- [12] Feyer, James. 2019. "Trade and Income - Exploiting Time Series in Geography." *American Economic Journal: Applied Economics*, 11(4): 1-35.
- [13] Francois, Joseph F., Hugh M. Arce, Kenneth A. Reinert, and Joseph E. Flynn. 1996. "Commercial Policy and the Domestic Carrying Trade." *The Canadian Journal of Economics*, 29(1): 181-198.
- [14] Frittelli, John F. 2003. "The Jones Act: An Overview." Congressional Research Service Report for Congress, July 8, 2003.
- [15] Frittelli, John F. 2014. "Shipping U.S. Crude Oil by Water: Vessel Flag Requirements and Safety Issues." Congressional Research Service Report for Congress, July 21, 2014.
- [16] Frittelli, John F. 2015. "Cargo Preferences for U.S.-Flag Shipping." Congressional Research Service Report for Congress, October 29, 2015.
- [17] Frittelli, John. 2017. "Revitalizing Coastal Shipping for Domestic Commerce." Congressional Research Service Report for Congress, May 2, 2017.

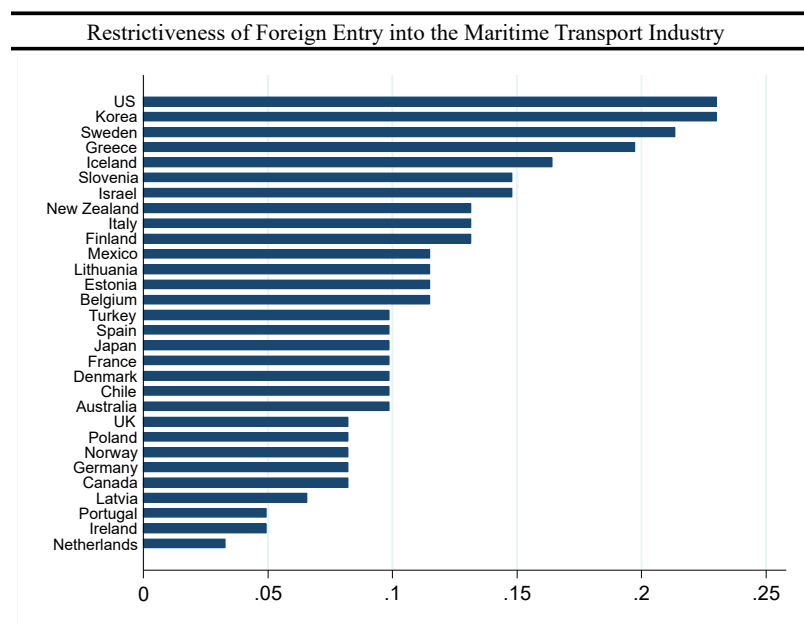
- [18] Frittelli, John. 2019. "Shipping Under the Jones Act: Legislative and Regulatory Background." Congressional Research Service Report for Congress, May 17, 2019.
- [19] Gius, Mark. 2013. "Regulatory Restrictions and Energy: The Impact of the Jones Act on Spot Gasoline Prices." *Energy Policy*, 62: 1058-1063.
- [20] Goldberg, Pinelopi K., and Nina Pavcnik. 2016. "The Effects of Trade Policy." *The Handbook of Commercial Policy*, Edited by K. Bagwell and R. Staiger, 1(A): 161-206.
- [21] Grennes, Thomas. 2017. "An Economic Analysis of the Jones Act." Mercatus Research, Mercatus Center at George Mason University, Arlington, VA.
- [22] Hanlon, W. Walker. 2019. "The Persistent Effect of Temporary Input Cost Advantages in Shipbuilding, 1850-1911." NYU Working Paper.
- [23] Hummels, David. 2007. "Transportation Costs and International Trade in the Second Era of Globalization." *Journal of Economic Perspectives*, 21(3): 131-154.
- [24] Hummels, David L. and Georg Schaur. 2013. "Time as a Trade Barrier." *American Economic Review*, 103(7): p. 2935-2959.
- [25] Keller, Wolfgang and William W. Olney. 2018. "Globalization and Executive Compensation." NBER Working Paper No. 23384.
- [26] "Local Content Requirements and Their Economic Effect on Shipbuilding." OECD Science, Technology, and Industry Policy Paper, No. 69, April 2019.
- [27] Michaels, Guy. 2008. "The Effect of Trade on the Demand for Skill: Evidence from the Interstate Highway System." *Review of Economics and Statistics*, 90(4): p. 683-701.
- [28] Moyer, R. Charles. "Maritime Subsidies: Problems, Alternatives and Tradeoffs." *The Journal of Industrial Economics*, 26(1): 53-68.
- [29] Pascali, Luigi. 2017. "The Wind of Change: Maritime Technology, Trade, and Economic Development." *American Economic Review*, 107(9): 2821-54.
- [30] "Port Performance Freight Statistics Program: Annual Report to Congress." 2017. U.S. Department of Transportation, Bureau of Transportation Statistics (BTS).
- [31] Redding, Stephen J. and Matthew A. Turner. 2015. "Transportation Costs and the Spatial Organization of Economic Activity." *Handbook of Urban and Regional Economics*, edited by Gilles Duranton, J. Vernon Henderson and William Strange, Chapter 20, pages 1339-1398.
- [32] "Report on the Competitiveness of Puerto Rico's Economy." Federal Reserve Bank of New York (NY Fed), June 29, 2012.
- [33] "Review of Maritime Transport 2016." United Nations Conference on Trade and Development (UNCTAD). United Nations, Geneva, 2016.
- [34] "Review of Maritime Transport 2018." United Nations Conference on Trade and Development (UNCTAD). United Nations, Geneva, 2018.

- [35] “Rethinking Maritime Cabotage for Improved Connectivity.” United Nations Conference on Trade and Development (UNCTAD). United Nations, Geneva, 2017.
- [36] “The Economic Effects of Significant U.S. Import Restraint: Second Update.” United States International Trade Commission (USITC), Publication 3519, May 1999.
- [37] “The Economic Effects of Significant U.S. Import Restraint: Third Update.” United States International Trade Commission (USITC), Publication 3519, June 2002.
- [38] “The Jones Act: Impact on Alaska Transportation and U.S. Military Sealift Capability.” U.S. Government Accountability Office (GAO). September 30, 1988.
- [39] “Maritime Issues: Assessment of the International Trade Commission’s 1995 Analysis of the Economic Impact of the Jones Act.” U.S. Government Accountability Office (GAO). March 6, 1998.
- [40] “Puerto Rico: Characteristics of the Island’s Maritime Trade and Potential Effects of Modifying the Jones Act.” U.S. Government Accountability Office (GAO). March 2013.
- [41] Rodrik, Dani. 2018. “What Do Trade Agreements Really Do?” *Journal of Economic Perspectives*, 32(2): p. 73-90.
- [42] Swisher IV, Scott N. and Woan Foong Wong. 2015. “Transport Networks and Internal Trade Costs: Quantifying the Gains from Repealing the Jones Act.” Slides from December 2, 2015.

ONLINE APPENDIX

A Maritime Transport Industry by OECD Country

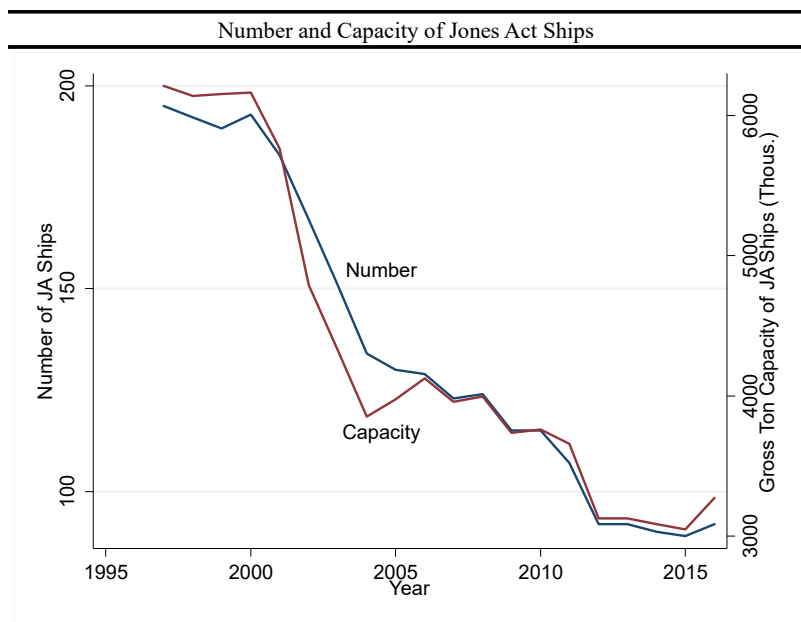
FIGURE A1



Notes: Restrictiveness of foreign entry into the maritime transport industry for OECD countries. Index ranges from 0 to 1 with 1 being the most restrictive. Data from OECD Stat.

B Number and Capacity of Jones Act Ships

FIGURE A2



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

C Major U.S. Ports

TABLE A1
Channel Depth of Major U.S. Ports

Port	Channel Depth (ft)	Port	Channel Depth (ft)
Anchorage, AK	35	New York and New Jersey	50
Baltimore, MD	50	Oakland, CA	50
Baton Rouge, LA	45	Pascagoula, MS	42
Beaumont, TX	40	Philadelphia, PA	40
Boston, MA	40	Plaquemines, LA	45
Charleston, SC	47	Port Arthur, TX	42
Corpus Christi, TX	52	Port Everglades, FL	45
Honolulu, HI	45	Portland, OR	55
Houston, TX	45	San Juan, PR	56
Jacksonville, FL	47	Savannah, GA	44
Kahului, HI	35	Seattle, WA	51
Kalama, WA	55	South Louisiana, LA	45
Lake Charles, LA	42	Tacoma, WA	51
Long Beach, CA	76	Tampa, FL	43
Longview, WA	55	Texas City, TX	50
Los Angeles, CA	81	Port of Virginia, VA	55
Miami, FL	50	Wilmington, DE	38
Mobile, AL	57	Wilmington, NC	42
New Orleans, LA	55		

Notes: Major U.S. ports with an authorized channel depth of at least 35 feet. A major port is ranked in the top 25 according to either total tonnage, twenty-foot equivalent units (TEU), or dry bulk tonnage (BTS 2017).

D Commodities

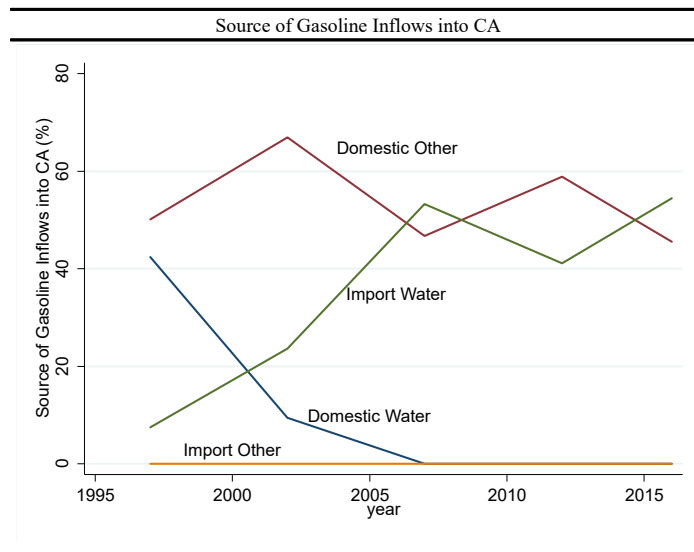
TABLE A2
List of Commodities

Alcoholic beverages	Milled grain prods.
Animal feed	Misc. mfg. prods.
Articles-base metal	Mixed freight
Base metals	Motorized vehicles
Basic chemicals	Natural sands
Building stone	Newsprint/paper
Cereal grains	Nonmetal min. prods.
Chemical prods.	Nonmetallic minerals
Coal	Other ag prods.
Coal-n.e.c.	Other foodstuffs
Crude petroleum	Paper articles
Electronics	Pharmaceuticals
Fertilizers	Plastics/rubber
Fuel oils	Precision instruments
Furniture	Printed prods.
Gasoline	Textiles/leather
Gravel	Tobacco prods.
Live animals/fish	Transport equip.
Logs	Unknown
Machinery	Waste/scrap
Meat/seafood	Wood prods.
Metallic ores	

Notes: List of commodities reported in the Freight Analysis Framework (FAF4) data from the Bureau of Transportation Statistics.

E Gasoline Inflows into California

FIGURE A3



Notes: Share of total inflows of gasoline into California coming from other U.S. states via water, coming from other U.S. states via other modes of transportation, imported from abroad via water, and imported via other modes. Author's calculation using the Freight Analysis Framework (FAF4) data from the Bureau of Transportation Statistics.

F Outflows and Exports

TABLE A3
The Impact of Jones Act on Domestic Water Outflows Over Time

	ln (Shipment Value)		ln (Shipment Weight)	
	(1)	(2)	(3)	(4)
Water * Domestic * ln(JA Ships)	0.211 [0.362]	-0.329 [0.310]	-0.052 [0.376]	-0.710* [0.353]
Water * Domestic * ln(JA Ships) * Coastal		1.350*** [0.457]		1.645*** [0.433]
Commodity*State*Mode*Dest FE	Yes	Yes	Yes	Yes
Commodity*State*Mode*Year FE	Yes	Yes	Yes	Yes
Commodity*State*Dest*Year FE	Yes	Yes	Yes	Yes
Observations	43,000	43,000	43,000	43,000
R-squared	0.987	0.987	0.983	0.984

Notes: The dependent variable is the log value or weight of domestic shipments of a commodity out of a U.S. state in a given year by mode and by destination location. *JA Ships* is the gross ton capacity of Jones-Act eligible ships. The shipments span 43 commodities, 50 states, 2 modes (water and all other modes), 2 destination locations (domestic and foreign), and is available at approximately 5 year intervals from 1997-2016. Robust standard errors two-way clustered at the commodity and state level in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

G Fleet Measures

TABLE A4
The Impact of Jones Act on Domestic Water versus Other Shipments, using Alternate Fleet Measures

	ln (Shipment Value)					
	(1)	(2)	(3)	(4)	(5)	(6)
Water * Domestic * ln (JA GT Capacity)	0.848** [0.406]					
Water * Domestic * ln (JA Number)		0.712** [0.346]				
Water * Domestic * ln (JA DWT Capacity)			0.729** [0.348]			
Water * Domestic * ln (Non-JA GT Capacity)				-1.217* [0.643]		
Water * Domestic * ln (Non-JA Number)					-0.018 [0.201]	
Water * Domestic * ln (World Ships)						-1.232** [0.608]
Commodity*State*Mode*Source FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity*State*Mode*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity*State*Source*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43,000	43,000	43,000	43,000	43,000	43,000
R-squared	0.987	0.987	0.987	0.987	0.987	0.987

Notes: The dependent variable is the log value of domestic shipments of a commodity into a U.S. state in a given year by mode and by source location. JA Ships is the gross ton capacity of Jones-Act eligible ships. The shipment data spans 43 commodities, 50 states, 2 modes (water vs all other modes), 2 source locations (domestic and foreign), and is available at approximately 5 year intervals from 1997-2016. Columns 1-3 use the gross ton capacity, the number, and the deadweight capacity of Jones Act ships. As a placebo test, non-Jones-Act American-flagged ships and the fleet of worldwide ships are used in columns 4-6. Robust standard errors two-way clustered at the commodity and state level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

H Counterfactual Mode of Transport

TABLE A5
The Impact of Jones Act on Domestic Water Inflows, using Alternate Counterfactual Modes

	ln (Shipment Value)					
	All	Excl. Air	Excl. Parcel	Excl. Pipeline	Excl. Rail	Excl. Truck
	(1)	(2)	(3)	(4)	(5)	(6)
Water * Domestic * ln(JA Ships)	0.848** [0.406]	1.076*** [0.375]	0.840** [0.394]	0.864** [0.412]	0.888** [0.409]	0.692* [0.397]
Commodity*State*Mode*Source FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity*State*Mode*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Commodity*State*Source*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43,000	43,000	43,000	43,000	43,000	43,000
R-squared	0.987	0.988	0.987	0.987	0.987	0.980

Notes: The dependent variable is the log value or weight of domestic shipments of a commodity into a U.S. state in a given year by mode and by source location. JA Ships is the gross ton capacity of Jones-Act eligible ships. The shipment data spans 43 commodities, 50 states, 2 modes (water vs all other modes), 2 source locations (domestic and foreign), and is available at approximately 5 year intervals from 1997-2016. Columns 2-6 exclude particular modes of transportation. Robust standard errors two-way clustered at the commodity and state level in brackets. *** p<0.01, ** p<0.05, * p<0.1.