Expanding Competition, Expanding Ports

Competition in U.S. Hopper Dredging

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Ariel Collis and Robert N. Fenili

Introduction

The U.S. markets for dredging are protected by laws and contracting policies that effectively prohibit vessels built overseas from competing in the United States. This is particularly true for projects that require hopper dredges, the dredge that performs much of the work needed in ports, harbors, and access channels exposed to the ocean. The Jones Act and the Dredging Act restrict competition in U.S. hopper dredging markets and result in higher prices for removal of dredged material. Since the Army Corps of Engineers is the primary consumer of hopper dredging services, the U.S. taxpayer ultimately bears the burden of the restricted competition. Opening hopper dredging contracts to foreign competition would increase the number of bidders for each contract, significantly lowering the cost of dredging. Over the past decade, European and Asian dredging companies have invested heavily to modernize their hopper dredge fleets. U.S. dredging companies have not invested at the same rate as their international counterparts in modernizing their fleets. Allowing foreign competition would have the added benefit of drawing more modern and cost-effective vessels to perform dredging along the U.S.'s coasts.

Legal Context Restricting Competition

Since the earliest days of our nation, a series of laws have restricted coastwise trade to domestic vessels. After a controversy surrounding the use of foreign-built dredges in repairing damage from the hurricane of 1900 in Galveston, Texas, Congress expressly applied such restrictions to dredges via the Foreign Dredge Act of 1906 (“Dredging Act”). The Dredging Act specifically prohibits any foreign-built vessel from dredging in U.S. waters, whether or not domestically documented, based on its legislative history. Congress amended the act in 1992 to generally provide that a chartered vessel may engage in dredging operations in the navigable waters of the United States only if U.S. citizens own at least 75% of the charterer.

The Merchant Marine Act of 1920 included cabotage provisions in Section 27 (referred to as the “Jones Act”) that are more expansive than those of the Dredging Act, and the Jones Act now constitutes the primary law in the United States regarding the type of, and manner in which, vessels may engage in coastwise trade. It was seen as a strategic policy to support a strong U.S. Merchant Marine.

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1 Foreign Dredge Act of 1906, ch. 2566, § 1, 34 Stat. 204.
2 See 46 U.S.C. § 55109. The government has interpreted the Foreign Dredge Act to prohibit any foreign-built vessel from dredging in U.S. waters, whether or not domestically documented, based on its legislative history. See, e.g., U.S. Customs and Border Protection, Customs Rulings Online Search System Ruling 112074 (May 14, 1992).
Marine in case of war and to promote the growth of domestic commerce. It requires that any vessel transporting merchandise between points in the United States be domestically registered and wholly owned by U.S. citizens. It also requires at least 75% of crew members on a documented vessel to be U.S. citizens, with certain exceptions. Although the Jones Act remains largely unchanged since its implementation, amendments in 1988 expressly applied its provisions to the transportation of dredged material regardless of whether that material has commercial value.

The Bureau of Customs and Border Protection ("CBP") is the federal agency charged with regulating limitations on the use of foreign vessels in U.S. waters. However, the U.S. Army Corps of Engineers (USACE) and, to a lesser extent, the Environmental Protection Agency share responsibility for managing the operations and disposal of dredged sediment under the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act. The Corps manages each such dredging project in U.S. waters by soliciting bids and entering into contracts with eligible operators. The government then further regulates dredging activities beyond the Dredging Act and Jones Act provisions through the provisions of these contracts. Such contracts are subject to complex rules under the Federal Acquisition Regulation ("FAR"). The FAR and other laws regarding government contracts further restrict foreign competition from the domestic dredge markets through provisions including, for example, set-asides for qualifying small businesses that exclude foreign companies by definition.

The result of this regulatory landscape is that foreign shipbuilding and ship operating firms have been effectively excluded from operating in U.S. coastwise trade. Although other nations typically do not have protectionist cabotage laws, the U.S. is allowed to retain them under international trade agreements due to an exemption granted by the World Trade Organization in 1994. While there have been occasional congressional efforts to repeal Jones Act provisions, all have been unsuccessful. Current legislation will likely face a similar outcome.

Background and Industry Structure

The U.S. dredging industry consists of over 250 firms operating more than 850 dredges. Most of the 250 firms and 850 dredges operate in inland waterways and do not service coastal areas.

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7 See 46 U.S.C. §8103. The Secretary may waive citizenship requirements if he or she determines that qualified U.S. seamen are unavailable. However, the master, chief engineer, radio officer, or officer in charge of a deck watch or engineering watch must be a U.S. citizen, which is not waivable.
9 33 U.S.C. §§ 1251 et seq.
10 33 U.S.C. §§ 1401 et seq.
11 48 C.F.R. Ch. 1.
14 See Open America’s Waters Act of 2017, S. 1561, 115th Cong. (2017). The Senate read the bill twice and referred it to the Commerce Committee in July 2017; it has taken no further action since.
While there are a variety of dredge types, the hopper dredge "performs much of the dredging needed in ports, harbors, and access channels exposed to the ocean, where traffic and operation conditions render the use of other dredges inefficient or impractical."\(^{16}\) An increase in the size of cargo ships has resulted in increased demand for deeper ports. To the extent that the trend in shipping with mega-cargo freighters continues, there is an expectation of increased demand for hopper dredging in U.S. deep water ports. There are only five U.S. firms that have hopper dredge capabilities, as shown in Table 1 below:

<table>
<thead>
<tr>
<th>Firm</th>
<th>Hopper Dredge</th>
<th>Capacity Per Hopper (Cubic Yards)</th>
<th>Capacity Per Firm (Cubic Yards)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cashman Dredging and Marine</td>
<td>Atchafalaya</td>
<td>1,300</td>
<td>1,300</td>
<td>1.4</td>
</tr>
<tr>
<td>Dutra Group</td>
<td>Columbia</td>
<td>4,350</td>
<td>14,220</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Stuyvesant</td>
<td>9,870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Lakes Dredge &amp; Dock</td>
<td>Dodge Island</td>
<td>3,600</td>
<td>35,140</td>
<td>38.5</td>
</tr>
<tr>
<td></td>
<td>Liberty Island</td>
<td>6,540</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Padre Island</td>
<td>3,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terrapin Island</td>
<td>6,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ellis Island</td>
<td>15,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manson Construction Company</td>
<td>Bayport</td>
<td>4,855</td>
<td>24,155</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>Newport</td>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Westport</td>
<td>1,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glenn Edwards</td>
<td>13,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weeks Marine</td>
<td>B.E. Lindholm</td>
<td>4,000</td>
<td>16,500</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>R.N. Weeks</td>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magdalen</td>
<td>8,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15 ships</strong></td>
<td><strong>91,315</strong></td>
<td><strong>91,315</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


The U.S. Army Corps of Engineers is the primary customer for deep water hopper dredging. Until 1978, the Corps performed all hopper dredging. After Congress enacted legislation in 1976 encouraging the Corps to use private firms for its dredging projects, it reduced its own fleet of hopper dredges from 14 to only four between 1978 and 2003. Further legislation restricted the use of the remaining Corps of Engineers hopper dredges, drastically changing the structure of the U.S. hopper industry. The industry now consists of the privately-owned hopper dredges listed in Table 1, in addition to the four owned and operated by the Corps. Of the Corps-owned dredges, for fiscal years 2006–2015, the McFarland was stationed in the Philadelphia district; the Wheeler was stationed in the New Orleans district; and the Essayons and Yaquina were each stationed in the Portland, Oregon district. Each of these Corps-owned hoppers operate under a restricted schedule. In fiscal year 2015, private hoppers dredged 32.9 million cubic yards, and Corps hoppers dredged 11.8 million cubic yards, 73.7% and 26.3% of total yards dredged by hoppers, respectively. Over the fiscal years 2006–2015, private hopper dredging accounted for 75.5% of the total cubic yards dredged, on average.

Currently, most hopper dredging projects are awarded by the Corps of Engineers through a solicitation of bids from private U.S. dredging companies. The Corps selects the winning proposal based on the terms of the solicitation. It typically cannot award contracts if the bid exceeds 125% of the government’s estimate.

Barriers to Entry

There are significant barriers to entry in the large scale coastal U.S. hopper dredging markets. Foremost among these, foreign dredgers are prevented from dredging in U.S. waters by the Dredging Act and the Jones Act. As discussed above, these two laws bar foreign built, chartered, or operated vessels from competing in the United States.

Purchasing or commissioning a ship built in the United States that can efficiently handle large scale hopper dredging contracts is expensive. For example, the Great Lakes Dredge and Dock Company (“GLDD”) spent $150 million over three years to purchase its new hopper dredge, the Ellis Island. Large hopper dredges have a greater capacity to dredge, store, and unload more materials in fewer trips, greatly cutting down on the time and expense of dredging. The cost of a new U.S.-built ship,

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18 The Corps of Engineers (or any other customer of hopper dredging services in U.S. waters) must use one of these of the hoppers listed in Table 1 or one of the Corps hoppers (which we understand are not for hire to private non-government customers) or forego the project.
19 Estimated from Corps of Engineers data.
20 GAO-14-290, p. 10.
21 If the Corps does not receive any bids or any bids lower than 125% of its project estimate, it has several options, including: a) negotiating with the bidders to bring the bid down to an acceptable price, b) revising its project cost estimate, or c) performing the dredging using Corps’ vessels. GAO-14-290, p. 11.
22 See Legal Context Restricting Competition section for a detailed description of the legal background for these acts.
23 See Legal Context Restricting Competition section above. See also Great Lakes Dredge and Dock Corp, 10-K for fiscal year ending December 31, 2017 (GLDD 2018 10-K), p. 7.
while a significant hurdle, is not an unscalable entry barrier—new ships have been built in the United States.

The same laws that prohibit foreign entry into the U.S. hopper dredging industry also impact the entry and expansion of new U.S. firms into the industry. By law, in order for a hopper to be used in U.S. waters, it must be built by a U.S. shipbuilder. However, for a variety of reasons, "...the price of a ship built in the U.S. [is] roughly three times higher than that of a similar ship built in South Korea."25 If the cost of a hopper dredge built in the United States is three times the cost of a foreign-built one, then entry and expansion in U.S. hopper markets by U.S. firms only will take place if firms are certain that the laws that restrict foreign entrants and non-U.S.-built hoppers from operating in the United States remain in effect. To the extent they are less certain that this will be true, U.S. firms will be less likely to make the necessary investments to either enter into hopper dredging markets or expand their existing U.S. hopper operations.

Auction Theory

Auctions, and particularly first-price sealed-bid auctions, under which dredging work is awarded, have been well-studied in economics. Economic models of auctions predict that when bidders are acting rationally and taking the actions of other bidders into consideration, the bidder with the lowest cost will win the auction. The winning bidder will bid higher than their cost to take advantage of the possibility that other bidders may bid higher than they do. This bidding premium decreases as the number of bidders increases.26

In sum, the winning bid in a first-price sealed-bid auction decreases as (i) bidders with lower costs enter the auction and (ii) more bidders participate in the auction. Opening dredging to foreign competition fulfills both conditions for achieving lower-priced dredging services.

Corps of Engineers Contract Data

Corps data confirm these auction theory results, showing that the price paid for hopper dredging, on average, decreases as more participants compete for each contract. The Corps publicly shares data regarding all proposed, active and completed dredging work that it offered for bid from 1990 to 2017.27 Within this dataset is information on the date, location, number of bidders, value of the winning bid, cubic yardage dredged, and actual cost of each contract. All dollar figures presented in this analysis are denominated in 2016 dollars.

We reviewed contract data for fiscal years 1997-2015 and focused our analysis on contracts for maintenance hopper dredging on ports and harbors along the Gulf of Mexico for two reasons: (1) because they were the largest recipients of Corps contracts over this period; and (2) focusing on a limited area controls for regional differences. This comprised the Corps-defined districts of

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An analysis of the relationship between bid prices and the number of bidders shows that as the number of bidders increases, the winning bid price (expressed as the bid per cubic yard) decreases. The correlation coefficient between the bid price and the number of bidders is -0.50. In other words, as predicted by auction theory, there is a negative correlation between bid prices and the number of bidders.

Controlling for the size of the contract increases the magnitude of the relationship between the number of bidders and price per cubic yard of the winning bid. One would expect that larger jobs (i.e., contracts bidding for more cubic yards of dredge removal) would have a lower per unit bid price. The data confirm this expectation. We found that controlling for the size of the contract, the average winning per cubic yard bid was $4.60 when there was only one bidder. In comparison to this $4.60 bid with only one bidder, we estimated the winning bid was $0.28 lower when there were two bidders, or $4.32 cents per cubic yard. Compared to the one-bidder scenario, the winning bid was $1.68 lower when there were three bidders. Finally, when there were four or more bidders, the winning bid was $3.39 lower. Figure 1 shows the average winning bid when there were 2, 3, and 4 or more bidders. In the 1997-2015 period, nearly 60% of contracts in the Galveston and Mobile districts had only one bidder (38%) or two bidders (21.5%).

We also performed an analysis of the average actual cost of dredging versus the number of bidders in each auction. Corps of Engineers data provides the actual cost and actual cubic yardage removed for completed contracts. Again, controlling for the size of the job, we found that the actual cost per cubic yard of material removed was inversely related to the number of bidders. That is, the actual cost per cubic yard of material removed was lower for projects with a greater number of bidders. The correlation coefficient between the number of bidders and the cost per cubic yard of material removed was -0.60. Using regression analysis to control for the size of the contract, in terms of cubic yards dredged, we found that the actual costs to the Corps of the removal of one cubic yard of material was $5.32 when there was only one bidder for the project. When there were two bidders, the actual costs fell by $1.71, to $3.61 per cubic yard; when there were three bidders the project costs fell by $2.30, to $3.02 per cubic yard; and, for four or more bidders the project costs fell by $3.45, to $1.87 per cubic yard (see Figure 1). The actual cost analysis shows that lower bid prices translate into lower dredging contract costs. These results confirm the value (to the Corps, and indirectly to taxpayers) of introducing more bidders into hopper dredging auctions.

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28 The district of New Orleans was excluded from the analysis because there were only two contracts for hopper dredging in New Orleans in the 19-year period. This lack of private hopper dredging was likely because the Corps uses its own hopper in the New Orleans district.
The Corps data also show that price per cubic yard dredged by hopper has been increasing over the past two decades. A review of the trends in winning bids and actual costs over that time period, in 2016 dollars, shows that there is significant year-over-year variation in price. The data also show that there was a significant shift in bid prices and actual payments in the 2007-2015 period as compared to 1997-2005. The average winning bid over the 1997-2005 period was $1.52 per cubic yard of material removed compared to the average winning bid of $5.34 per cubic yard in 2007-2015. Similar trends are observed for average actual contract costs, which increased from $1.57 per cubic yard in 1997-2005 to $3.85 in 2007-2015 (see Table 2 below). In its 2014 report, the U.S. Government Accountability Office (“GAO”) noted a similar trend: “spending on hopper dredging has more than doubled since fiscal year 2003, while the amount of material removed by hopper dredges has increased only slightly over that period.”

Notes:
1. All prices were calculated in 2016 dollars, controlling for the size of the contract.
2. The data includes maintenance contracts but excludes set-aside contracts.

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29 There were no contracts for maintenance hopper dredging in 2005 in either the Galveston or Mobile districts.
30 GAO-14-290. p. 6.
The GAO stated that it was unclear whether the rising prices of material removal were due to decreased competition from Corps hoppers because of restrictions placed on its captive fleet by Congress, or rather to other factors. GAO noted that the “. . . growth in spending reflects costs for hopper dredging that, according to USACE documents, have increased because of rising costs for fuel and steel, among other factors.” In addition, the GAO indicated that:

Corps officials and industry representatives also told us that demand for hopper dredging work from states, private sources, and foreign governments has reduced the number of industry hopper dredges available for Corps projects. For instance, following the Deepwater Horizon oil spill in 2010, there was an increase in private

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Table 2
Trends in Average Winning Bid Prices and Average Actual Removal Costs, 1997-2015
($ per Cubic Yard of Material Removed)

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Average Winning Bid*</th>
<th>Average Actual Cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>$2.05</td>
<td>$2.00</td>
</tr>
<tr>
<td>1998</td>
<td>$1.53</td>
<td>$1.33</td>
</tr>
<tr>
<td>1999</td>
<td>$2.33</td>
<td>$2.03</td>
</tr>
<tr>
<td>2000</td>
<td>$1.71</td>
<td>$2.63</td>
</tr>
<tr>
<td>2001</td>
<td>$1.13</td>
<td>$1.33</td>
</tr>
<tr>
<td>2002</td>
<td>$1.13</td>
<td>$1.09</td>
</tr>
<tr>
<td>2003</td>
<td>$1.67</td>
<td>$1.60</td>
</tr>
<tr>
<td>2004</td>
<td>$1.39</td>
<td>$1.40</td>
</tr>
<tr>
<td>2005</td>
<td>$0.75</td>
<td>$0.73</td>
</tr>
<tr>
<td>2006**</td>
<td>** Incomplete data.</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>$5.05</td>
<td>$4.81</td>
</tr>
<tr>
<td>2008</td>
<td>$5.80</td>
<td>$2.77</td>
</tr>
<tr>
<td>2009</td>
<td>$7.95</td>
<td>$5.90</td>
</tr>
<tr>
<td>2010</td>
<td>$3.33</td>
<td>$2.75</td>
</tr>
<tr>
<td>2011</td>
<td>$4.47</td>
<td>$3.35</td>
</tr>
<tr>
<td>2012</td>
<td>$7.73</td>
<td>$4.43</td>
</tr>
<tr>
<td>2013</td>
<td>$5.75</td>
<td>$3.46</td>
</tr>
<tr>
<td>2014</td>
<td>$3.54</td>
<td>$2.62</td>
</tr>
<tr>
<td>2015</td>
<td>$4.40</td>
<td>$4.55</td>
</tr>
</tbody>
</table>

* Includes maintenance contracts and excludes set-a-side contracts. All prices were calculated in 2016 dollars.
** Incomplete data.

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31 GAO-14-290. p. 22.
32 GAO-14-290. pp. 6-7.
Interest in international projects is further decreasing the availability of hopper dredges in the U.S. market. In its recent 10-K filing, GLDD confirms that “[c]ompeting for international dredging projects requires a substantial investment of resources, skilled personnel and capital investment in equipment and technology, and may adversely affect our ability to deploy resources for domestic dredging projects.”

**Dredging Within and Outside of the U.S.**

The U.S. dredging industry is dominated by four companies: GLDD, Weeks Marine Inc., Manson Construction Co., and Dutra Dredging Co. Together these four companies have realized approximately $1.2 billion of the approximate $1.3 billion spent on all U.S. hopper dredging work by the Corps of Engineers in the 2006-2015 period. 98.3% of private sector hopper dredge capacity is controlled by these four firms (see Table 1 above for U.S. firm capacity shares).

The fleets of these companies are aging and have small carrying capacities relative to vessels of the top international dredging companies. According to GLDD’s most recent 10-K, the average age of its hopper dredges is 25 years. Because only GLDD is public, the ages of the vessels in the other companies’ fleets are not known. However, a 2014 GAO study on dredging estimated, using data from GLDD, Weeks, Manson, and Dutra, that the average age of an industry hopper dredge at the time was 27 years. At the present time, the largest hopper dredge in the U.S. is the *Ellis Island*, a dredge with a capacity of 15,000 cubic yards and a dredging depth of 37.2 meters.

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Outside of the United States, the five largest companies providing dredging are CHEC of China, Jan De Nul of Belgium, DEME of Belgium, Boskalis of the Netherlands, and Van Oord of the Netherlands. In contrast to the U.S. companies, many of these top foreign companies have invested heavily to modernize their fleets. A 2017 Rabobank Study showed that 65% of Jan De Nul’s hopper fleet was less than 10 years old, as was 45% of Boskalis’ fleet, 60% of CHEC’s fleet, 40% of DEME’s fleet, and 20% Van Oord’s fleet. These new ships are larger and more technically advanced than U.S. vessels. For example, Jan De Nul’s hopper fleet includes the Cristóbal Colón and Leiv Eiriksson, the world’s largest trailing suction hopper dredgers. Each of these ships have a hopper capacity of 60,000 cubic yards and the capability to dredge to a depth of 155 meters. Using process automation and more efficient design, these ships can dredge at significantly lower unit costs than older dredge vessels. Many of these vessels are also environmentally friendly, with NOx filters to reduce emission levels below international standards.

Conclusion

Our analysis of two decades of hopper dredge data confirms the prediction made by auction theory that prices for hopper dredging decrease as the number of bidders in each contract auction increases. Because open competition would increase the number of competitors in each dredging auction as well bring in companies with more modern fleets and thus lower per unit costs, opening competition for U.S. dredging contracts to foreign companies would reduce the amount paid by the Corps of Engineers for dredging. Less expensive dredging means that more dredging projects can be completed at the same cost, expanding the benefits for ports and surrounding communities.

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39 Rabobank 2017, p. 35.
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