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Where Has the Rum Gone? Firms' Choice of Transport Mode under the Threat of Maritime Piracy*

Abstract

Despite a general agreement that piracy poses a significant threat to maritime shipping, empirical evidence regarding its economic consequences remains scarce. This paper takes a step towards filling the gap by combining firm-level Chinese customs data with information on pirate attacks to investigate how exporting firms respond to maritime piracy. It finds that overall exports along a particular shipping route fall following an increase in pirate activity. In addition, piracy induces firms to switch from ocean to air shipping, while the remaining ocean shipments become larger.

JEL code: F14, F19, N70, R41
Keywords: Trade, transport, China, piracy

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1 Introduction

With 180 incidents in 2017 which lead to 166 crew members being taken hostage or kidnapped and three killed, maritime piracy remains a real threat to international merchant shipping (ICC IMB, 2018).[1] Beyond the risk faced by the crew, piracy increases the cost carried by shipping companies, including higher wage premia, a rise in insurance payments due to a lower expected value of a shipment (since it may be damaged or sunk with a higher probability), ransom payments, as well as the actual cost of protecting the ship through military escorts, armed guards, electric fencing, razor wire, water cannons, non-lethal laser or acoustic devices (Towergate Insurance, 2018; Gilpin, 2009). Increased fuel and time cost of altering routes can also be substantial. For example, routing around the Strait of Malacca - one of the world's busiest sea lanes and frequently prone to pirate attacks - would mean a detour of about 1,000 nautical miles (Berg et al., 2006). Estimates for the direct costs of piracy due to such measures range from 7 billion USD to 12 billion USD in 2010 (Bowden et al., 2010).[2]

This paper combines Chinese firm-level customs data with data on maritime piracy to investigate how exporting firms respond to such piracy induced costs. They cannot be modelled as iceberg transport costs because they are transport mode specific - goods shipped by air are not subject to pirate attacks - and accrue per journey, as one military escort or security staff is required per ship, no matter whether the latter runs at full capacity. The paper shows that overall exports from China decline on routes affected by piracy. At the firm level, pirate activity on a certain trade route induces exporters to change transportation mode, shipping some of their goods by plane rather than by ship. The remaining average shipments per firm however become larger and average producer prices fall, indicating that exporters absorb parts of the costs.

The paper relates to two strands of literature. The first strand concerns the effects of piracy on trade in general and firms' choice of transport mode in particular. A good overview is provided by Endler et al. (2012), who show that most studies are either descriptive or focus on a particular region. Fu et al. (2010) construct a model of the container liner shipping market in order to investigate the impact of piracy on trade volumes. The authors find that Somali pirates have reduced traffic between Europe and

[1]The reasons for piracy are manifold and include traffic along particular trade routes, economic conditions (Percy and Shortland, 2009; Cariou and Wolff, 2011), inadequate government action against piracy (Hastings, 2009; Chalk, 2008), geographic position, weak judicial systems and political instability (Murphy, 2007). For an overview, definitions and historical context the reader is referred to Mejia et al. (2012).

[2]Indirect costs of piracy range from threatening the participation of neighbouring states in maritime trade, tourism and fishery (Mbekeani and Ncube, 2011) to an increase in corruption and thus weakening of the legitimacy of governments and even potentially environmental disasters as pirates attack oil tankers or ships carrying toxic chemicals (Chalk, 2008).

the Far East through the Suez Canal by about 30%. As only some of this traffic is rerouted via the Cape of Good Hope, the annual loss is estimated to be around 30 billion USD. Bensassi and Martínez-Zarzoso (2012) estimate a gravity model, finding that 10 additional vessels being hijacked reduce exports by 11%. Both studies focus on trade between Europe and Asia. This paper extends the scope by considering the universe of Chinese exports to all destination countries to empirically investigate the effects of piracy on trade. Moreover, it separately investigates effects on ocean and air trade.

Bendall (2010) specifically calculates the costs of re-routing ships from the Suez Canal to the Cape of Good Hope using a model of shipping costs. Using OECD data on maritime transport costs, Bensassi and Martínez-Zarzoso (2013) estimate the effects of piracy on transport cost. The authors find that the hijacking of one additional ship between Europe and Asia increases transport costs between the two continents by 1.2%. However, the authors do not discuss the implications of such increases in costs on prices and the choice of transport mode. This paper shows how piracy affects producer prices, the choice of shipment mode as well as the size of shipments.

The second strand of literature this paper relates to concerns the determinants of firms' choice of transportation mode and has already attracted significant research attention. At the macro level, Hummels (2007) discusses how declining transport costs such as the spread of containerization have contributed to an increase in international trade. Correspondingly, this paper shows that an increase in transportation costs on specific ocean routes due to pirate activity reduces bilateral trade flows along affected routes.

Harrigan (2010) develops a Ricardian model to investigate the interaction between trade, transport cost and the choice of transport mode and tests its predictions using US import data. Beyond the finding that goods with high unit values are more likely to be shipped by air, the author demonstrates that countries more distant from the destination market have a comparative advantage in lightweight goods. Related to that, Hummels and Schaur (2013) model a firm's choice between air and ocean transportation, showing that more time sensitive goods are more likely to be shipped by air. Ge et al. (2014) use Chinese customs data to investigate the choice of transport mode at the firm-level, finding that high productivity firms are more likely to ship goods by air, indicating that they specialise in time sensitive high value products.

Part of the cost of piracy comes from additional shipping time due to re-routing of vessels to avoid areas with pirate activity. For example, a round voyage of a container ship from Singapore to Rotterdam takes on average 33 days if travelling via the Suez Canal and 42 days if travelling around the Cape of Good Hope (Bendall, 2010). Such an increase in shipping time constitutes one explanation for the decision of exporting firms to switch from ocean to air transport.

This paper also relates to the work of Kropf and Sauré (2014). The authors construct and empirically test a model of the relationship between fixed costs per shipment and a firm's choice regarding the size and frequency of shipments. In line with their results, this paper finds that a piracy induced increase in fixed costs per shipment reduces shipment frequency and increases shipment size.[3] An alternative channel through which pirate activity may affect trade and the choice of shipment mode is through uncertainty. Békés et al. (2017) show that firms tend to send less frequent but larger shipments to more uncertain markets. Piracy increases uncertainty by increasing the probability of losing a ship at sea. In line with Békés et al. (2017), it is hence not surprising to see exporters responding to piracy by reducing the number of shipments while increasing their size.

The remainder of this paper is structured as follows. Section 2 presents the data used, while Section 3 discusses the empirical strategy. Section 4 presents the results, followed by some robustness checks in Section 5. Section 6 concludes.

2 Data

To investigate the impact of piracy on trade and the choice of transport mode, this paper uses Chinese customs data, which provides information on monthly export transactions at the firm-product(8 digit)-destination-country level for the period 2000 to 2006. Crucially, for every transaction it also reports the main transport mode employed. While value in USD and quantity are reported directly, unit values are imputed by dividing value by quantity. Since export values are reported free on board, unit values can be interpreted as producer prices.

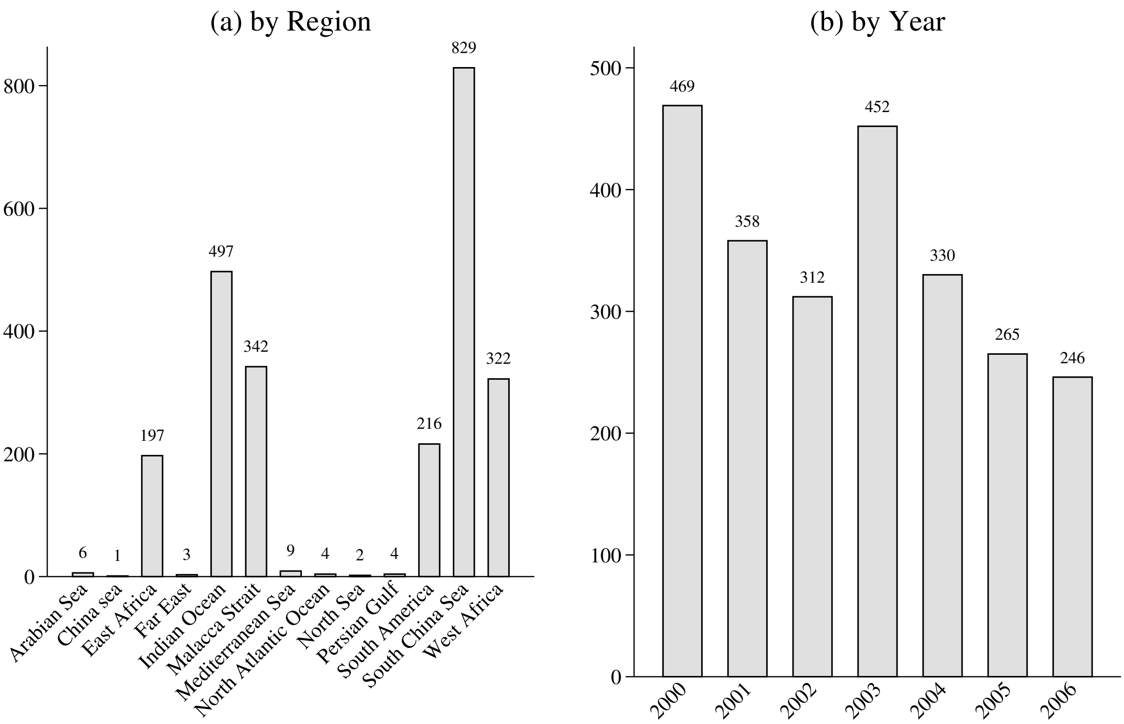
Overall, the Chinese customs data differentiates between six different modes of transport of which we use "sea and river" and "air". We abstain from using "rail" and "road" for two reasons. First, transportation by land is restricted primarily to Asia. Second, it may also be subject to armed robberies that may or may not correlate with pirate activity. For the final two modes "mail" and "other", it is not clear how they are transported, which is why they are excluded from the analysis.

Data on piracy is taken from the International Maritime Organisation which provides monthly reports on piracy incidents (allegedly committed and attempted attacks) in 13 different geographical areas. Panel (a) of Figure 1 shows the total number of pirate incidents between 2000 and 2006 by region. With only one observed case in the China

[3] The term "shipment size" in this paper refers to the size of the transaction reported in the customs data. It is not the same as the amount of goods carried by a ship. Costs for military escorts or higher wages for the crew increase the cost of a ship's journey. If these additional costs are divided across containers, the costs of shipping an additional container increases from the perspective of the exporter, thus providing her with an incentive to use its entire capacity.

Sea and 497 in the Indian Ocean, the figure indicates substantial cross sectional variation.

Figure 1: The Number of Piracy Incidents by Region and Year



Note: Panel (a) shows the total number of piracy incidents from 2000 - 2006 by region. Panel (b) shows the total number of piracy incidents over all regions by year. *Source:* Data from International Maritime Organisation.

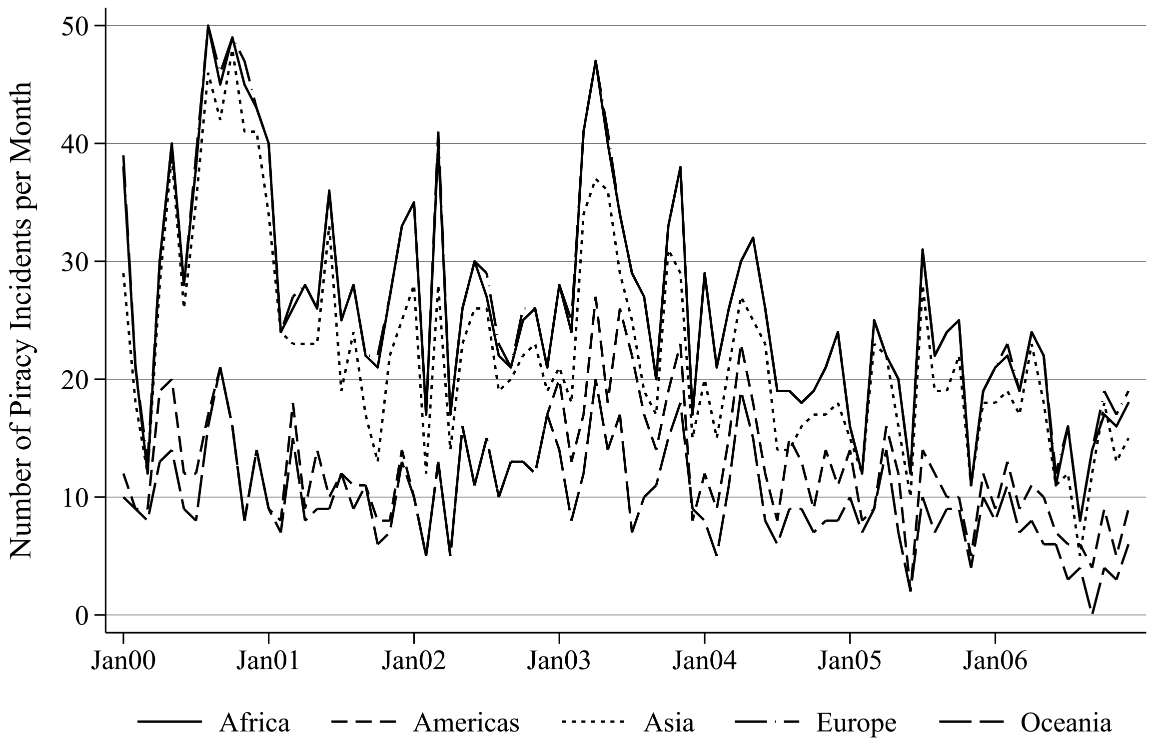
The three regions most affected by piracy in the period under investigation are the South China Sea with an average of 118 incidents per year, the Indian Ocean (71 incidents per annum) and the Strait of Malacca (49 incidents per annum). Piracy along the Coast of Somalia (East Africa, 29 incidents per year) is not among the top three affected regions, as pirate activity there only increased dramatically in 2008 and 2009. We choose not to extend our analysis to these years for two reasons. First, export data for the years 2007 to 2009 are available only at the annual level. However, aggregating to the annual level would substantially reduce variation over time. In addition, it is possible that the financial crisis affected different trade routes differently, which could bias our estimated treatment effect.

The number of pirate incidents by year is reported in Panel (b) of Figure 1. It indicates a declining trend which is however interrupted by sudden increases. A more detailed breakdown of pirate incidents by region and year is provided by Figure A.1 in the Appendix. It shows that while piracy declined in some regions such as the South China

Sea, it actually increased in others such as East Africa. Since not all piracy incidents are reported (Berg et al., 2006; Murphy, 2007), all numbers constitute a lower bound for piracy activity.

Matching the Chinese customs data with the piracy data is a challenge because the former does only report the destination country, not the exact route taken. For example, goods can be shipped from China to France either through the Suez Canal or by going around Africa along the Cape of Good Hope. The choice of route depends on several factors, including distance, weather conditions, duties, whether or not the ship calls at certain ports for loading and unloading of additional freight and of course the risk of piracy. It is thus not evident which route a ship takes.

Figure 2: The Number of Piracy Incidents over Time by Destination Continent



Note: The graph shows the total number of reported piracy incidents per month, covering all possible routes from China to each of the five destination continents. *Source:* Data from International Maritime Organisation.

This paper applies a conservative approach, considering all possible ocean routes between China and the continent to which the destination country belongs. The number of piracy cases on the route between China and the destination continent is taken to be the sum of all piracy incidents in all areas covered by the possible ocean routes. Information on the exact matching between areas affected by piracy and destination continent is provided in Table A.1 in the Appendix. Even though this reduces the cross sectional variation in piracy incidents to five continents, Figure 2 nevertheless shows that there remains significant variation both across continents and over time. The average number of piracy incidents per month between 2000 and 2006 was 26 along all routes to Africa, 12 for America, 22 for Asia, 26 for Europe and 10 for Oceania.

There are two obvious drawbacks to this approach. First, it is possible that all or most piracy incidents are observed at a route which is not the preferred route anyway. In this case, the choice of shipment mode should be independent of the piracy incidents, leading to an underestimation of the treatment effect. The results presented in this paper should thus be seen as a lower bound of the effect and a first step towards estimating the impact of piracy on trade and the choice of transport mode.

Second, it is impossible to observe a switch in shipping routes, which also constitutes a plausible response to piracy. A switch from one route to another due to increased pirate activity along the first one would not be picked up by the regressions, as the variation takes place at a more disaggregated level than the one observed in the data. However, a switch from one ocean route to another ocean route would affect neither air travel nor the overall value of goods shipped by ocean. While the effect of piracy on the choice of ocean routes is an interesting research question in itself, the fact that it cannot be observed in the data should not lead to an underestimation of the treatment effect when evaluating the effect of piracy on overall trade as well as the choice of transport mode. However, this is only true as long as diversion to different routes does not increase demand for shipping services and thus transport costs along that alternative route, thus affecting the amount of goods shipped.

3 Estimation Strategy

The effect of piracy on exports is estimated by regressing total export quantity at the destination country-product-time-level (thus aggregating over all firms) on the number of piracy incidents according to the following equation:

$$\ln Y_{cpt} = \beta_1 Piracy_{(t-3)c} + \nu_{cp} + \nu_{cy} + \nu_{cm} + \nu_{pt} + \epsilon_{cpt}, \tag{1}$$

where $\ln Y_{cpt}$ is the natural logarithm of total quantity shipped of product p to destination country c at time t. Since we are using monthly data, a time-unit equals a particular month in a particular year. Since such an estimation may be subject to simultaneity if more popular trade routes are more likely to attract piracy, the number of piracy incidents on a route to country c at time t ($Piracy_{tc}$) is lagged by three months. By using country-product fixed effects ν_{cp}, the estimated coefficient β_1 tells us how total exports of a particular product p to a particular country c change at a point in time t if the number of piracy incidents has changed three months ago.

Country-product fixed effects also control for all unobserved time invariant variables that may correlate with both the dependent variable and the number of piracy incidents, thus ruling out one possible source of omitted variable bias. In particular, some routes are more likely to experience piracy than others. One reason for this could be geography - natural harbours provide a good basis for piracy operations. Another is the popularity of the route as those with a lot of traffic might either attract piracy (greater likelihood of capturing a ship) or deter it (ships in distress may quickly call for help).

Global economic conditions might constitute another source of omitted variable bias. In particular, a strong global economy might be associated with an increase in shipping activity as well as a decline in pirate activity under the assumption that the latter is correlated with economic hardship. Product-time fixed effects ν_{pt} control for global as well as product specific time trends. Country specific time trends are accounted for through country-year fixed effects ν_{cy}. Finally, seasonality might play a role as seasonal weather conditions simultaneously affect shipping and piracy activity. It is controlled for using country-month fixed effects ν_{cm}.[4] ϵ_{cpt} is an error term.

At the firm-level, the effect of piracy on the choice of transport mode is estimated as follows:

$$Y_{cpft} = \beta_1 Piracy_{tc} + \beta_2 ln\ p_{cpft} + \nu_{cpf} + \nu_{pft} + \epsilon_{cpft}, \qquad (2)$$

where Y_{cpft} is a dummy (henceforth "ocean dummy") that equals one if a shipment to country c from firm f of good p at time t is carried out by ship and zero otherwise. In an alternative specification, Y_{cpft} is the natural logarithm of the size of the transaction. $Piracy_{tc}$ is the number of piracy incidents on the route to country c at time t, $\ln p_{cpft}$ is the natural logarithm of the unit value of the transaction, ν_{cpf} and ν_{pft} are destination country-product-firm and product-firm-time fixed effects respectively and ϵ_{cpft} is an error term.

Using the natural logarithm of transaction size as dependent variable and controlling for country-product-firm fixed effects ensures that the piracy coefficient β_1 identifies how the average quantity of product p shipped by firm f to country c changes with every additional piracy incident along a route connecting China to destination country c. Using the ocean dummy as dependent variable, β_1 informs about the effect of piracy on the choice of shipment mode.

[4]"Month" in this context means January - December, whereas "time" is a year-month combination.

While popular routes with large trade values may or may not cause increased pirate activity, this relationship is less likely to hold at the firm-transaction-level. Average shipment size and value (per container) should not affect piracy on the route. Nevertheless, any remaining correlation is controlled for by using country-product-firm fixed effects. Global economic conditions are controlled for by using product-firm-time fixed effects, which also account for unobserved product-firm specific time trends.

4 Results

4.1 Product-level Regressions

Table 1 presents regression results at the product-level. The significantly negative coefficient of -0.0009 reported in Column (1) means that one additional case of piracy along a particular route is associated with a 0.1% fall in exports to all countries on that route. Looking at Column (2), it can be seen that this aggregate trade effect is driven by a reduction in ocean trade. While ocean trade declines by 0.11% following an additional pirate incident, the respective coefficient for air trade (Column (3)) is, while identical in magnitude, not significantly different from zero. Looking at Figure 2, that means that in an average month with 26 piracy cases along the route to Europe, trade is around 2.3% lower than in the absence of piracy.

Table 1: The Effects of Piracy on Chinese Exports

	(1)	(2)	(3)
Dependent Variable	ln quantity Aggregate	ln quantity Ocean	ln quantity Air
Piracy cases (lagged)	-0.0009**	-0.0011***	-0.0011
	(0.0004)	(0.0003)	(0.0008)
Observations	4,896,465	3,770,565	1,019,446
R^2	0.6346	0.8071	0.7852
Clusters	211881	194934	70184

Note: OLS regressions with piracy cases lagged by 3 months, country-product, country-year, country-month and product-time fixed effects. Robust standard errors clustered by country-product in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

4.2 Firm-level Regressions

The baseline results of the firm-level regressions are reported in Table 2. The first column shows results from regressing the ocean dummy, which identifies whether a transaction has been carried out by ship as opposed to air, on the number of piracy incidents as well as controls. The coefficient of $\ln price$ is negative and significant at the 1% level, indicating that a one percent increase in unit values is a associated with a reduction in the likelihood of the transaction being carried out by sea by 4.5%. Qualitatively, this result is in line with the finding of Harrigan (2010).

Table 2: The Effects of Piracy on the Choice of Transport Mode

Dependent Variable	(1) Ocean Dummy	(2) ln quantity All	(3) ln quantity Ocean	(4) ln quantity Air	(5) ln price All	(6) ln price Ocean	(7) ln price Air
Piracy cases	-0.0002***	0.0007***	0.0014***	-0.0001	-0.0002*	-0.0002*	-0.0001
	(0.0000)	(0.0003)	(0.0003)	(0.0009)	(0.0001)	(0.0001)	(0.0004)
ln price	-0.0453***	-0.6740***	-0.6851***	-0.5159***			
	(0.0008)	(0.0041)	(0.0039)	(0.0079)			
Observations	10,650,883	10,614,099	8,127,057	1,437,225	10,650,883	8,136,755	1,461,519
R^2	0.5799	0.8025	0.8597	0.8592	0.9585	0.9673	0.9558
Clusters	978225	975291	820381	152990	978225	821182	155136

Note: OLS regressions with country-product-firm and product-firm-time fixed effects. Robust standard errors clustered by country-product-firm in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

The negative piracy coefficient of -0.0002 is significant at the 1% level and indicates that one additional pirate incident on a particular route reduces the probability that a given firm ships a given product to a particular country by ship by 0.02%. This result provides evidence that increased pirate activity induces firms to reduce the number of transactions carried out by ship relative to those by plane.

Column 2 of Table 2 presents the effects of piracy on average shipment size across both ocean and air shipments. The statistically significant coefficient of 0.0007 means that the average quantity shipped increases by 0.07% for each pirate incident on a route. This coefficient is twice as large when only looking at goods shipped by sea (Column 3), while it turns insignificant when only considering air shipments (Column 4). Together with results in Column 1, this implies that piracy induces firms to reduce the number of shipments by sea relative to air and to increase the size of the remaining shipments. As stated in Section 1, one explanation for this observation is the fact that the additional costs of piracy accrue per journey and are thus not ad-valorem. In order to minimise costs per ton shipped, ships have an increased incentive to run at full capacity. If they charge more per container, firms have an increased incentive to fill them, thus explaining increased average shipment size.

Column 5 of Table 2 shows regression results from regressing $\ln price$ on the number of pirate incidents. The coefficient of -0.0002 is significant at the 10% level and indicates that average unit values per shipment fall in the presence of piracy on a given route. This observation may also be explained through the costs associated with piracy. Depending on the elasticity of demand, the increase in transport costs will only partially be passed through to consumers, so that exporters reduce producer prices. As shown by Column (6), this effect is driven by goods shipped by sea. There is no evidence for a change in unit values of goods shipped by air (Column 7).

5 Robustness Checks

In our baseline regression, we use Chinese export data to investigate effects of piracy on firms' choice of transport mode. In a robustness check, we run the same regressions using import data. The results are summarized in Table 3 below. The significantly negative coefficient of piracy in Column (1) reveals that Chinese importers also react to piracy by switching to air transportation. The coefficient is twice as large as its equivalent in Table 2, suggesting that importers may react more sensitively than exporters. The coefficient of $\ln price$ is similar to the baseline.

However, Column (2) of Table 3 does not provide evidence for increased shipment size following an increase in pirate activity. This is true for both, trade carried out by ocean (Column (3)) and air (Column (4)). Finally, Column (5) indicates no effect of piracy on prices. This result is, however, not directly comparable to the baseline because import values - and thus imputed unit values - are reported at cost insurance freight. They can be interpreted as consumer prices and provide evidence that producers do not pass on the piracy induced increase in transportation cost to consumers. The result is hence in line with falling producer prices indicated by Column (5) of Table 2. Interestingly, the price coefficient for ocean shipments (Column 6) is significantly negative while that for air shipments (Column 7) remains insignificant. There is no evidence that piracy negatively affects import quantity at the product-level (Table A.2 in the Appendix).

Table 3: The Effects of Piracy on the Choice of Transport Mode, Imports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Ocean Dummy	ln quantity All	ln quantity Ocean	ln quantity Air	ln price All	ln price Ocean	ln price Air
Piracy cases	-0.0004***	-0.0009	-0.0015	-0.0004	-0.0006	-0.0009**	-0.0006
	(0.0001)	(0.0007)	(0.0010)	(0.0009)	(0.0004)	(0.0005)	(0.0006)
ln price	-0.0455***	-0.6441***	-0.6439***	-0.5265***			
	(0.0007)	(0.0037)	(0.0073)	(0.0048)			
Observations	7,155,017	6,854,297	2,959,643	2,385,407	7,155,017	3,020,738	2,565,631
R^2	0.6206	0.8560	0.9010	0.8618	0.9210	0.9515	0.9190
Clusters	548448	529845	283530	205965	548448	288199	220062

Note: OLS regressions with country-product-firm and product-firm-time fixed effects. Robust standard errors clustered by country-product-firm in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Product-firm-time fixed effects are used in the baseline to control - among other things - for seasonal variation. However, when it comes to the choice of transport mode, weather conditions can be very different across different routes at the same point in time. As an additional robustness check, we hence perform the firm-level regression, controlling for country-month fixed effects. The results are reported in Table A.3 in the Appendix. All coefficients remain similar to the baseline results in both magnitude and significance. The only exception are the estimated effects of piracy on prices presented in Columns (5) and (6) of Table A.3, which turn insignificant.

6 Conclusion

This paper combines Chinese customs data with detailed information on pirate activity to investigate the effects of piracy on firms' choice of transport mode as well as aggregate trade flows. It is shown that overall trade declines along routes affected by piracy. More specifically, 26 piracy incidents per month on a particular route (the average number for Europe) reduce Chinese exports on average by 2.3%. Given the sources of measurement error due to data availability, this estimate is likely to constitute a lower bound of the true treatment effect.

In line with theoretical considerations, an increase in piracy along a trade route induces exporters to switch from ocean to air transport, while the remaining ocean shipments become larger. This is accompanied by a fall in average producer prices, indicating that a piracy induced increase in transport costs is not fully passed on to consumers.

Overall, the results show that piracy does have a small but significant dampening impact on trade. Beyond obvious humanitarian reasons, this constitutes an additional motive for governments to act. Moreover, the switch from ocean to air travel along routes affected by piracy may have second order effects for other industries that have not yet been considered.

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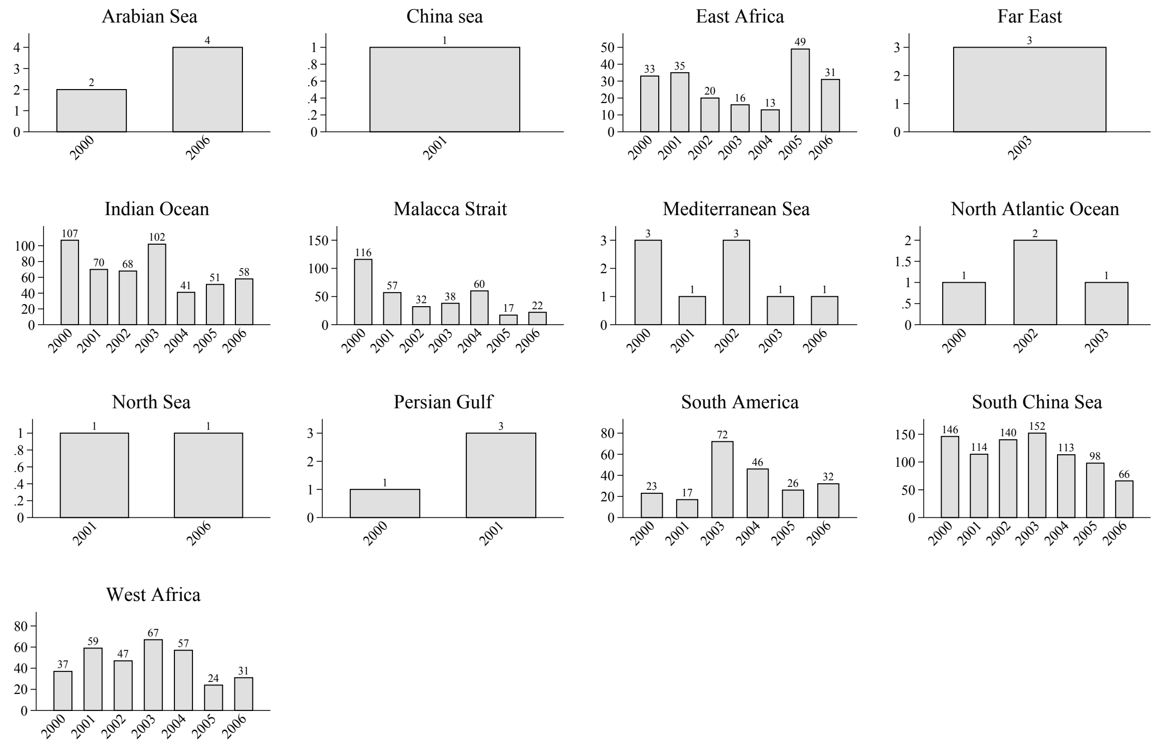
Appendix

Figure A.1: The Number of Piracy Incidents over Time by Region



Note: The graph reports the total number of piracy incidents from 2000 - 2006 by region. *Source:* Data from International Maritime Organisation.

Table A.1: Matching of Regions to Continents

Continent	**Region**	**Continent**	**Region**	**Continent**	**Region**
Africa	East Africa China Sea South China Sea Malacca Strait Far East Indian Ocean West Africa	Europe	China Sea South China Sea Malacca Strait Far East Indian Ocean Arabian Sea Mediterranean Sea West Africa North Atlantic Ocean North Sea East Africa	Asia	China Sea South China Sea Malacca Strait Far East Indian Ocean Arabian Sea Persian Gulf East Africa
Americas	China Sea South China Sea South America	Oceania	China Sea South China Sea Far East		

Note: Authors' own allocation

Table A.2: The Effects of Piracy on Chinese Imports

	(1)	(2)	(3)
Dependent Variable	ln quantity Aggregate	ln quantity Ocean	ln quantity Air
Piracy cases (lagged)	0.0004 (0.0006)	0.0001 (0.0008)	0.0014 (0.0008)
Observations	2,814,960	1,599,758	1,104,302
R^2	0.7210	0.8622	0.7807
Clusters	88113	67523	54258

Note: OLS regressions with piracy cases lagged by 3 months, country-product, country-year, country-month and product-time fixed effects. Robust standard errors clustered by country-product in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A.3: The Effects of Piracy on the Choice of Transport Mode, Seasonality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Ocean Dummy	ln quantity All	ln quantity Ocean	ln quantity Air	ln price All	ln price Ocean	ln price Air
Piracy cases	-0.0002***	0.0006**	0.0013***	-0.0001	-0.0002	-0.0001	-0.0001
	(0.0000)	(0.0003)	(0.0003)	(0.0010)	(0.0001)	(0.0001)	(0.0004)
ln price	-0.0453***	-0.6738***	-0.6849***	-0.5159***			
	(0.0008)	(0.0041)	(0.0039)	(0.0079)			
Observations	10,650,819	10,614,035	8,126,992	1,436,978	10,650,819	8,136,690	1,461,273
R^2	0.5800	0.8026	0.8598	0.8594	0.9586	0.9673	0.9559
Clusters	978206	975272	820360	152924	978206	821161	155072

Note: OLS regressions with country-product-firm, product-firm-time and country-month fixed effects. Robust standard errors clustered by country-product-firm in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

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