Motivation In some areas the threat of sea piracy is still real in modern times. Due to their location next to the Gulf of Aden and because of their capability of hijacking ships, Somali pirates are the only ones who still have a measurable impact on international trade today.[1] The locations of Somali pirate attacks between 2000 and 2012 are shown on a map in Figure 1. When it comes to quantifying this impact, the current literature is incomplete. On one hand, Besley et al. [2] find an 8% to 12% increase of ship charter prices (in the dry bulk cargo segment) due to increased pirate activity and calculate a resulting 630 million $ welfare loss in the year 2010 alone. But they find no significant effect of piracy on the amount of cargo shipped. On the other hand, Burlando et al. [3] observe a 1.9%, or 25 billion $, annual reduction in trade volumes between 2000 and 2010, but only a 0.45% annual increase in trading costs for bulk cargo.

Table 1: Effect of Piracy on Trade Volumes Building upon Burlando et al. [3], I analyse yearly data on bilateral international trade volumes in thousand USD in the period 2000 to 2019. I use linear least square regression to estimate the coefficients of the model:

\[
\ln(X_{ijt}) = \beta_1 \cdot A\text{d}en_{ij} + \ln(\text{attacks}_{ij}) + \beta_2 \cdot I0_{ij} + \ln(\text{attacks}_{ij}) + \beta_3 \cdot \text{RTA}_{ij} + \beta_4 \cdot \text{bothWTO}_{ij} + \beta_5 \cdot \text{E}\text{U}_\text{toACP}_{ij} + \delta_t + \delta_{ij} + \epsilon_{ijt},
\]

where \(X_{ijt}\) is the amount goods imported from country \(i\) into country \(j\) in year \(t\), \(\text{attacks}_{ij}\) is the number of pirate attacks in the respective year, and the other variables are dummies indicating whether \(i\) and \(j\) are connected through the Gulf of Aden or the Indian Ocean, taking part in a common regional trade agreement, or members of the WTO, EU or ACP (African, Caribbean, and Pacific Group of States), \(\delta_{ij}\) are the error terms or residuals. To not erroneously assign effects of countries and time to piracy, a dummy variable for each combination of exporter and year is included: \(\delta_t = \beta_6 \cdot 2000\text{ExpChn} + \beta_7 \cdot 2001\text{ExpChn} + \cdots + \beta_{17} \cdot 2000\text{ExpInd} + \cdots\), \(\delta_{ij}\) is defined analogously for importer-time trends, and \(\delta_{ij}\) for exporter-importer fixed effects, like the typically intense trade from China to Germany through the Gulf of Aden.

The results of the parameter estimation of this model are shown in column (1) of Table 1. We get \(\beta_1 = 0.012 \pm 0.007\), i.e. countries connected by a shipping route through the Gulf of Aden decrease by 0.012% when the number of pirate attacks increases by 1%. This results in an average annual trade loss of 0.28%, or 3.44 billion $, from 2000 to 2019. Burlando et al. [3] found a threefold stronger effect but did not take country-pair trends into account and analysed only data from 2000 to 2010.

Figure 2 shows the coefficients \(\beta_1\) to \(\beta_{20}\) of the equation \(\ln(X_{ijt}) = \beta_1 \cdot A\text{d}en_{ij} + 2000\text{dummy} + \cdots + \beta_{20} \cdot A\text{den}_{ij} \cdot 2019\text{dummy} + \ln(\text{dist}_{ij}) + \beta_22 \cdot \text{comlang} + \beta_{23} \cdot \text{colony} + \beta_{24} \cdot \text{concol} + \beta_{25} \cdot \text{RTA} + \beta_{26} \cdot \text{bothWTO} + \beta_{27} \cdot \text{EUtoACP} + \delta_t + \delta_{ij} + \epsilon_{ijt}\), where the distance between countries, a common official language, and colonial ties, or a common colonizer are included, because it is not possible to include \(\delta_{ij}\) in this model.

We can see that in years of intense piracy the positive effect of the Gulf of Aden route on trade disappears. The correlation coefficient between the number of pirate attacks and the estimated trade volumes is -0.612. This is strong evidence for the existence of a measurable effect of piracy on the quantity of international trade flows.

Effect of Piracy on Shipping Cost With the gravity model of international trade, the effect \(\alpha_t\) of piracy on the trade costs \(\tau_{ij}\) can be deduced from \(\beta_t\), the effect on trade volumes \(X_{ijt}\), see [3]. \(Y\) is the GDP, \(\kappa\) means "world", \(\tau_{ijt}\) is the trade cost in percentage of the price of the traded goods, \(P\) is the CES price index, and \(\sigma = 7.5 \pm 2.5\) is the elasticity of substitution across products. We get \(\alpha_t = \beta_t \cdot 1 - \sigma\). This would result in a piracy induced increase of trade cost of only 0.04% on average per year. Besley et al. [2] estimate the effect of piracy on shipping cost with a regression model and find an 8-12% increase. But if the trends \(\delta_t\) and \(\delta_{ij}\) are taken into account, the effect vanishes.

Conclusion Using statistical tools of modern empirical economics I find strong evidence that piracy adversely affects trade through the Gulf of Aden, but the effect appears to be smaller than assumed in the literature. This research was conducted as part of my Master’s thesis and is of relevance due to the long ongoing issue of taking appropriate anti-piracy measures.

References: