Autarky and the Rise and Fall of Piracy in Ming China*

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Abstract

We examine the impact of rigorous trade suppression during 1550-1567 on the sharp rise of piracy in this period of Ming China. By analyzing a uniquely constructed historical dataset, we find that the enforcement of a "sea (trade) ban" policy led to a rise in pirate attacks that was 1.3 times greater among the coastal prefectures more suitable for silk manufactures—which we interpret as a proxy for greater trade potential. Our study illuminates the conflicts in which China subsequently engaged with the Western powers, conflicts that eventually resulted in the forced abandonment of its long upheld autarkic principle.

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Piracy was rampant in China between 1550 and 1567, during which time the number of pirate attacks topped 30 each year. This followed nearly two centuries when piracy had been rare with about one incident a year.[1] In these two difficult decades, the Chinese pirates stationed mainly on islands off the southeast coasts raided more than two-thirds of all coastal prefectures and occupied a third of them.[2] Chinese pirates plundered silk and other popular export items, in the process kidnapping, and even killing were common affairs (Kwan-wai So 1975; James Geiss 1978; and John E. Wills 1979).[3] The attacks were severe; they produced massive casualties, and local populations seemingly devoted large resources to defend themselves; for example, by erecting walls.[4]

The great wave of piracy has two intriguing features. First, the majority of the pirates had actually been Chinese *merchants* before turning outlaws (So 1975; Wills 1979). Second, it waned after 1567 just as suddenly as it had arisen in 1550; henceforth attacks returned to the same low levels that had prevailed before (Figure 1). Local officials and historians have been aware of the fluid boundary between merchants and pirates. Merchants had long carried out trade despite a "sea ban" (*haijin*) policy enacted by the Ming in 1368. Trade, although technically illegal, was widely tolerated until 1550 when the *Jiajing* emperor decided to enforce the ban. While hundreds of "smugglers" were killed, others were prevented from making landfall by Ming's coastal defense force; at the same time, coastal inhabitants found to engage in foreign trade were executed. This harsh enforcement thus pushed merchants into becoming pirates (So 1975; Geiss 1978; Wills 1979; C. R. Boxer 1980; Timothy Brook 1998).[5] But as soon as the imperial authorities legalized private foreign trade in 1567, the pirates reverted to their previous roles as merchants.

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[1] Numbers are obtained from the *Ming shilu* (Veritable Records of the Ming Emperors) to be introduced in the section "Data".

[2] More than 80 percent of the pirates were ethnic Chinese; the Japanese and Southeast Asians accounted for the remainder (*Ming shilu*). The frequently raided areas included seven prosperous prefectures in the lower Yangzi region—a region that spans the provinces of southern Jiangsu and northern Zhejiang, and Fujian province (See Li (2000) for the geography of the lower Yangzi region).

[3] While many of these attacks were believed to be modest in scale, involving as they were fewer than one hundred pirates, there were incidences where several thousands of them were found to have been involved in outright military confrontations with the imperial troops.

[4] Nearly 80 percent (77) of the counties in coastal Jiangsu and Zhejiang provinces had allegedly built walls, collectively nicknamed "the Southern Great Wall of China", during this period to keep out the pirates (*Jiangnan Gazetteer* 1736; *Provincial Gazetteer of Zhejiang* 1735).

[5] The dual identity of a merchant pirate cannot be better illustrated by Xu Fuyuan, the governor of Fujian Province at the time: "when the (foreign trade) market is open pirates become merchants, and when the market is closed merchants become pirates" (Chao 2005, p. 203).

[Figure 1 about here]

We use a unique panel data set of pirate attacks that covers all 33 coastal prefectures from 1371 to 1640 and examine the effect of this "sea ban" policy on the rise (and fall) of piracy. In particular, as merchant pirates were primarily concerned with maximizing profits, we examine whether prefectures with greater trade (raid) potential actually suffered from greater pirate attacks after 1550 as a result of the Ming authorities' crackdown on foreign trade. Our primary measure of a prefecture's trade (raid) potential is whether a coastal prefecture in China was a major silk-producing area (*silk center*). As alternative proxies we also measures what prefectures had already developed a port for conducting foreign trade prior to the Ming dynasty, as well as their urbanization rate around 1390.

The analysis shows that the rise in pirate attacks in mid-sixteenth-century China was due to the rigorous enforcement of the "sea ban". Indeed pirate attacks on a silk producing prefecture after 1550 were 1.3 times more likely than on a non-silk center, but not before 1550 or after the policy's abolishment in 1567. These results remain robust to controlling for a number of covariates that may also determine the incidence of pirate attacks; these include the number of famines, population pressure, coastal defense (measured by the number of naval garrisons stationed at the coastline), and the number of islands off a prefecture's coastline. Our results are also robust to the use of a restricted sample that limits the time window to only the same emperor, which helps to avoid the confounding effect caused by the possible heterogeneous preferences regarding foreign trade among the different emperors.

However, our key explanatory variable—a prefecture's trade (raid) potential—is clearly endogenous to possible omitted variables that may be correlated with both pirate attacks and trade (raid) potential, such as knowledge of navigation and ships that would facilitate piracy, and economic prosperity more generally given that the pirates may have been aiming at the treasures of the wealthy (e.g., gold, silver, or even stored grains) rather than the products earmarked for trade. To address this concern, we exploit the exogenous variation in trade potential among China's coastal prefectures as our instrumental variable. Premised on the fact that mulberry leaves were a critical input in the upstream production process of sericulture in the historical context of China, we employ the share of land with loamy soil—the texture of which is most suitable for cultivating mulberry trees—to proxy for the suitability of planting this crop to instrument the silk center variable. But since loamy soil is also suitable for planting other staple crops (such as wheat), which were likely closely correlated with the level of income in an agricultural society, it may impact piracy via the channel of economic prosperity rather than trade potential. To allay this particular concern, we control for the percentage of land suitable for planting the major staple crops (wheat, rice, sorghum, soybean, millet, and other minor cereal crops) and the amount of grain tax levied on each prefecture to proxy for the output of staple crops in the Ming dynasty. Our instrumented results remain robust.

Another concern is that the periods selected for our difference-in-differences analysis might be contaminated by the "spillovers" of European trade expansion with China after the Voyages of Discovery (in the late 1490s) and Japanese political turmoil during 1467-1590 (the Warring States period when the lack of centralized political control may have predisposed warlords to prey along the China coast). While our restricted sample which limits the time window to 1522-1572 (that is, within the period of European trade expansion as well as Japan's Warring State period) can address this concern, for robustness we also include two interaction terms—one between trade potential and the number of European ships to Asia, and the other between trade potential and Japan's Warring States period, respectively, as additional controls. The results after adding all these covariates as controls remain robust as well.

Our study has implications for Chinese economic history. If pirate attacks were the unwitting outcome of an autarkic ideology and policy of China's late imperial regimes, their episodic spike foreshadowed a crisis that culminated in the first Opium War of 1839-1842, when China was defeated by Britain and forced to open up to trade.[6] Our study of early pirate attacks thus contributes to the literature that sees autarky as explaining why China's growth trajectory was so different from those of the West (e.g., Mark Elvin 1973; John A. Hall 1986; David S. Landes 2006).[7]

HISTORICAL BACKGROUND

Most people who lived on the southeastern coast of China depended heavily on maritime commerce for their livelihood (So 1975). China's maritime trade with Japan, Korea, Southeast Asia, India and Arabian countries had prospered as early as the seventh century. Historians have noted that China's maritime commerce was already flourishing by the Song dynasty (960-1279) (Elvin 1973). This prosperity seems to have persisted into the early Ming period as Chinese merchants visited ports in Japan, Southeast Asia, and India frequently (Brook 1998; Ronald Findlay and Kevin H.

[6] By forcing China to open up five treaty ports on the coast beyond Guangzhou, the Opium War effectively ended China's long-standing autarky (see, e.g., Spence 1990).

[7] A natural extension of our study is to examine if there are any long-term effects of pirate attacks on economic development, as history is replete with anecdotal evidence that many coastal towns and cities that were once prosperous hardly ever revived after having been dealt a blow by the pirates (Geiss 1978; Lin 1987; von Glahn 1996; Zheng 2001). Such endeavor, however, is beyond the scope of this study.

O'Rourke 2007). Moreover, China's commercial prosperity is also borne out by the three hundred or so tributary trips made to the Ming court by ambassadors from about sixty different Asian countries between 1400 and 1500 (*Daming huidian* (Collected Statutes of the Ming Dynasty) 1502).

After 1500, Europe's trade with China began to rise. Thanks to Vasco da Gama's discovery of the Cape of Good Hope route to Asia in the late 1490s Europeans expanded their trade into China, whose products—particularly silk— enjoyed immense demand in Europe at the time (Elvin 1973; Debin Ma 1998; Brook 1998; Kevin H. O'Rourke and Jeffrey G. Williamson 2002). As a result the China coast witnessed a notable influx of European merchant explorers between 1517 and 1550.[8]

Lured by the growing demand for Chinese goods and the greater profitability of foreign trade, many merchants on the China coast began to trade with both Europeans and other Asians.[9] By the 1540s, maritime trade in China had become very active. Altogether more than one hundred and thirty Chinese merchant groups coexisted at the time, quite a few of them allegedly had a crew of several thousands and were armed (Maoheng Chen 1934). These groups formed a powerful alliance under the leadership of Wang Zhi—the most powerful merchant pirate at the time who allegedly had a fleet that numbered several hundreds and a crew of more than one hundred thousand at his command (Wills 1979; Zhongchen Chao 2005).[10] To facilitate trade and to escape surveillance, these Chinese merchants established trading bases on the islands off the southeastern coast of China and west of Japan (Figure 2).[11] These illicit traders would acquire goods along the coast and ship them from their bases to the foreign traders (Wills 1979; Chao 2005). Historians regard such trading between Chinese and foreign merchants as "regular" (Brook 1998, p. 124). As a result, some islands off the coastal provinces of Fujian and Zhejiang, which prior to 1517 had been nothing more than sleepy towns, had become bustling metropolises by the 1540s.[12]

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[8] Before the Voyages of Discovery very few European traders travelled to China by sea. Since the 1500s, approximately one hundred and eighty Europeans (mainly Portuguese) were found to have stationed on the islands off the Chinese coast in the 1520s, and by the 1550s the number had increased to over six hundred, and to about one thousand by the 1620s (Chao 2005; Ljungstedt 1832; Ptak 1982).

[9] The lucrative profitability of trading is well illustrated by the evidence that, whereas one *dan* (approximately 50 kg) of raw silk was sold for 100 *silver liang* (approximately US$20 today) in China's lower Yangzi region, it could be sold for 500 *silver liang* in the Philippines in the 1580s (Quan 1986). See also Findlay and O'Rourke (2007).

[10] The other well-known merchant pirates were Xu Hai, Xu Dong, Li Guangtou, Mao Haifeng, and Peng Lao, most of whom were from southeast China (Chen 1934; Chao 2005).

[11] Wang Zhi, for instance, lived in western Japan for the most part.

[12] According to one estimate (Lin 1987), there were at least fourteen major trading bases off the China coast during the mid-sixteenth century, of which Shuangyu Island (near Ningbo Prefecture, Zhejiang Province) was the largest and most prosperous (Figure 2). According to some Ming

[Figure 2 about here]

Unfortunately, China's expanding foreign trade was hindered by the Ming dynasty's 1368 "sea ban." This policy prohibited the Chinese people from engaging in foreign or specifically maritime trade. The so-called trade in Ming China was confined to primarily "tributary trade"—a form of limited "commerce" in which China asserted itself as the hegemonic power, with the vassal states making periodic trips of homage to the imperial court to offer gifts to the emperor in exchange for a limited amount of goods (John K. Fairbank 1968). There are different views regarding the imposition of the "sea ban". Some suggest the emperor banned trade to avoid coastal unrest due to interactions between the Chinese and the foreigners (Fairbank 1968; Chao 2005). Others see the ban as reflecting an imperial preference for an autarkic economy and a policy that followed the Confucian ideology of "putting agriculture before business (*zhongnong qingshang*)" (Boxer 1980; Brook 1998; Landes 1998).

Until the 1550s, the imperial authorities tolerated the budding trade along the China coast.[13] But then a crackdown began and the Ming armies scuttled more than 1,200 illicit boats and killed hundreds of smugglers in 1548 and 1549 (Wills 1979; Chao 2005). To further curtail smuggling, coastal defense forces now effectively prevented merchants from making landfall, let alone doing business as they had been allowed.[14] At the same time, the imperial authorities relied on neighborhood *pai jia* to discourage coastal inhabitants from trafficking with merchants. Every ten households were organized into a single unit of *pai*; if someone in a *pai* was caught committing the pertinent crime then all ten households in that *pai* would be executed (Zongxian Hu 1987; Brook 2005).[15]

An unwitting outcome of these draconian measures adopted by the Ming authorities was that they created incentives for the merchants who had settled on the nearby

officials, in 1548 coastal prefectures in Zhejiang and Fujian provinces saw fleets of commercial vessels commuting back and forth up to thirty times a day (*Huangming jingshi wenbian* (Writings on Statecrafts in the Ming Empire) 1643).

[13] However, some attribute this tolerance to the Chinese merchants' bribery of the the corrupt coastal officials in exchange for their acquiescence and protection (Skinner 1985; Brook 1998).

[14] The ban did not lead to a complete stoppage of production (in particularly for silk), because they faced sustained demand both in the domestic market and from the imperial authorities (Fan and Jin 1995).

[15] The primary goals of the scheme (enacted around 1550) were to curtail smuggling in the coastal provinces in the southeast and banditry in the inland provinces. We know from available evidence that this scheme was widely adopted in the coastal provinces of Fujian, Zhejiang, and Guangdong after 1550, and later extended to most other provinces (Brook 2005). We have however no systematic information on the number of people who were punished because of trade violations.

islands to raid China's coastal cities and towns.[16] They turned to piracy because it was the only way to get access to trade goods and re-capture the profits they lost from the ban. As Wang Zhi—the head of the merchant pirate alliance, once declared: "...if [the authorities] resume the customs in the ports of Zhejiang, and permit the people to trade with Japan, the pirates would not come again...." (Chao 2005, p. 196). The rise of pirate attacks along the China coast is demonstrated in Figures 1 and 2. After nearly two centuries of isolated pirate attack, they jumped to 30 a year starting in 1550 and the manufacturing centers of the lower Yangzi region and Fujian Province were their primary targets.

But the imperial authorities' attempt to suppress piracy "backfired"—to borrow Charles C. Mann's (2011) word—when pirate attacks surged. After a decade and a half, the imperial authorities softened its stance regarding the legitimacy of maritime trade as it became aware of the pirates' raids and the consequent sharp deterioration in living standard in the distressed coastal communities (Richard von Glahn 1996; Brook 1998).[17] *Longqing* assumed the imperial throne in 1567 and quickly legalized foreign trade by issuing licenses to Chinese junks.[18] As Figure 1 shows, pirate activities plunged and remained low until the end of the Ming dynasty in 1644.

DATA

To test the hypothesis that the sharp rise in pirate attacks in China in the 1550s was caused by the prohibitions on foreign trade by the Ming authorities, we construct an annual panel data set that ranges over all 33 coastal prefectures from 1371 to 1640.[19] We begin our analysis from 1371—two years after the founding of the Ming dynasty and end our analysis in 1640—four years before the end of the Ming dynasty. In both cases the censoring is designed to avoid the unrest associated with dynastic transitions.

[16] Note that the merchant pirates seldom attacked their own hometowns but raided other places with high trade potential. This is evident from the fact that pirates originating from Fujian Province raided the provinces of Zhejiang and Jiangsu (*Ming shilu*).

[17] The majority of coastal inhabitants relied heavily on maritime commerce, and many local officials repeatedly petitioned the emperor to relax the "sea ban" policy to reduce the economic cost to their communities (So 1975; Chao 2005).

[18] Trade with any country, except Japan, became legal. However, the licensing system broke down by the 1620s as the Ming dynasty went into decline. See von Glahn (1996, p. 118) for details on China's licensed foreign trade after 1567.

[19] A prefecture was an administrative unit ranking below a province and above a county in Ming China's administrative structure which has remained valid to this day. We use the longer period of 1371-1640 for our baseline regression to reflect the change in piracy in the entire Ming period. We also use the shorter period of 1522-1572 to check the robustness of our main results (Table 4).

Pirate Attacks

Our dependent variable is measured by the annual number of attacks made on a coastal prefecture. An attack occurred when pirates used violence in order to secure goods in the coastal towns and cities of China. The data come from the *Ming shilu* (Veritable Records of the Ming Emperors), the official record of imperial edicts and official memorials about events of national significance. It provides the time and place of each attack but it only provides further details irregularly.[20] To curtail smuggling and piracy, the Ming authorities had already set up a vigorous coastal defense system of 450 naval garrisons (*weisuo*) manned by 100,000 soldiers in the 1380s. In any case pirate attacks were violent: plundering, looting, and even murder, they were thus hard to miss.

We compared the lists of attacks drawn from the *Ming shilu* with the *Mingdai wokou kaolue* (Investigation into Piracy in the Ming Dynasty; Chen 1934). The author of this highly specialized publication carefully documented the time and place of each pirate attack based on historical sources different from the *Ming shilu.*[21] The two sources are very consistent; the correlation is strong between the two sets of data (0.82, significant at the 1% level). The advantage of Chen's (1934) work derives from its reliance on a variety of historical sources; this allows the omission by some authors to be amended by others, and thus provides useful cross referencing. However, Chen's relied heavily on local gazetteers. Since only the more affluent prefectures/counties had the wherewithal to compile local gazetteers, selection bias may be a problem. In the light of these considerations we base our empirical analysis on the *Ming shilu* and use Chen's (1934) data for robustness checks.

Trade Potential

Silk center. Silk was in high demand abroad during the sixteenth century (Brook 1998; Ma 1998). Our empirical analysis exploits the regional variation in the potential for silk trade (or raid in the case of pirate attacks). We do so because silk was the

[20] Two examples of pirate attacks as they were documented in the *Ming shilu*: Case 1: "The fifth year of *Hongwu* emperor (1372), August: Pirates attacked Funing County of Fuzhou Prefecture (in Fujian Province), plundering and killing over three hundred and fifty local inhabitants, and burning more than one thousand houses" (*Ming shilu*, volume 75 of the *Taizong* emperor reign). Case 2: "The thirty-third year of *Jiajing* emperor (1554), March: More than two thousand pirates landed in Nansha and plundered the prefectures of Suzhou and Songjiang (in Jiangsu Province). The General Tang Kekuan led the imperial army to counter the pirates at Caitaogang, killing over one hundred and eighty pirates" (*Ming shilu*, volume 408 of the *Shizong* emperor reign).

[21] These sources included *Huangming yuwo lu* (Records on the Resistance Against Piracy in Imperial Ming) (1596), *Chouhai tubian* (The Atlas of Coastal Defense) (1562), *Yanhai woluan benmo* (The Causes of Pirate Unrests on the Coast) (1658), *Ming shi* (History of the Ming Dynasty) (1739), *Wobian shilue* (A Brief Account of Pirate Unrest) (1558), *Jinghai jilue* (A brief Record of Eradicating Piracy) (1630), as well as a rich array of local gazetteers.

most sought-after good among the pirates: "...the treasure that pirates sought was silk. When they found the workshops of silk production, they jumped for excitement...they even kidnapped Chinese women to secret spots and forced them to weave silk" (Chao 2005, p. 192).[22] We thus employ a dummy variable indicating whether the imperial authorities had set up a silk bureau in that prefecture (as reported by Jinmin Fan and Wen Jin 1993). Analogous in status to state-owned enterprises in contemporary times, these bureaus produced a variety of silk products for use by royal personnel and government officials and located in centers of local production. Of the 33 coastal prefectures in Ming China, 11 were silk centers. This variable is time-invariant because the geographic distribution of silk production rarely changed over time.

However, since China also exported many other commodities such as porcelain, tea, paper, and sugar (Brook 1998), the silk center variable does not fully capture the trade potential of China's coastal prefectures. To address this inadequacy we employ two additional measures to proxy for trade potential.

Historical port. Our first alternative measure is a dummy variable that is coded 1 if prefecture had developed a port for conducting foreign trade during the Song and Yuan dynasties (906-1368)—a time when China's maritime commerce began to prosper. Given that China's pre-Ming overseas trade was concentrated in ports like Quanzhou and Ningbo (in the southeastern region), the potential for foreign trade was likely greater in prefectures with such facilities. In fact, the bulk of trading activities that occurred prior to the advent of the great wave of pirate attacks took place near the ports in Quanzhou (the island of Yuegang, for instance) and Ningbo (the island of Shuangyu). Of the 33 coastal prefectures in total in Ming China, 12 had a historical port.

Urbanization. Another proxy for trade potential is the urbanization rate. As Paul Bairoch (1988) and Jan de Vries (1976) have pointed out, prior to the industrial revolution only prosperous areas were able to support dense urban populations. In the absence of reliable GDP figures, urbanization rate is thus a reasonable proxy for the economic prosperity of pre-industrial societies. China is no exception: historians of China have indeed found that the urbanization rates were closely correlated not only with the level of commercialization but also with exports (G. William Skinner 1977; Dixin Xu and Chengming Wu 2000).[23] We draw the share of the population living in

[22] The strong demand for Chinese silk is further evidenced by the fact that in the 1580s, after the "sea ban" policy was removed, the import of Chinese silk contributed over 90 percent of customs revenue in Manila—the major port for transpacific trade in Asia (Quan 1986).

[23] Li (2000), has found that regions specialized in producing silk, porcelain, and other exports in late imperial China were also more developed in their off-farm sectors, and were more urbanized. Fu (1989), also attributes the growth of the lower Yangzi region (particularly the prefectures of

settlements larger than 1000 inhabitants by prefecture in the 1390s from Shuji Cao (2000). The mean urbanization rate among the coastal prefectures of Ming China is 11.3, with a maximum of 28.3.

Figure 2 shows how many pirate attacks each coastal prefecture suffered between 1550 and 1567 and the locations of silk centers. As one can readily see, pirate attacks were concentrated in silk centers. In sharp contrast, few attacks were observed in north China, where the potential for trade was limited. Note that few pirate attacks occurred on the coast of Guangdong Province or more specifically the Pearl River Delta region. While the capital, Guangzhou, had been an important trading port since the seventh century, the coast of the Province produced much less silk than either the lower Yangzi region or coastal Fujian Province in the Ming and early Qing period and it was less urbanized. So it is not so surprising that attacks in the Pearl River Delta region were less frequent.

Controls

Famine. There are several social forces that might spur pirate attacks. The first pertains to famine or negative economic shocks, which have been documented to trigger conflict (Edward Miguel *et al.* 2004; Ying Bai and James Kai-sing Kung 2011). Historians of China have indeed made the case that famine led to piracy in Ming China (So 1975; Brook 1998). To control for its possible effect on pirate attacks we control for the number of famines that had occurred in a prefecture on an annual basis.[24]

Population density. Population pressure is another potential source of conflict (T. Robert Malthus 1798; Markus Bruckner 2010). Chinese historians have documented a rapid increase in population in the latter half of the Ming dynasty (Ping-ti Ho 1959; Cao 2000). Faced with land scarcity, coastal populations could turn to maritime trade, but were likely compelled to resort to pirate attacks when trade was banned. We thus need to control for China's growing population. The data here are scarcer and we are only able to produce provincial population density for the periods of 1370s-1460s, 1470s-1550s, and 1560s-1640s.[25]

Islands. Pirates used off-shore islands to launch attacks on the coasts and to sell the raided goods for export. In fact, the intensity of pirate attacks on Zhejiang and

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Suzhou, Huzhou, Shengze, and Puyuan) during the Ming and Qing dynasties to the rise of a silk industry and a flourishing commerce.

[24] Those suffering from famine likely raided neighboring prefectures, so we employ the number of famines in adjacent, coastal prefectures as an alternative measure and obtain similar results (not reported).

[25] As with the case of famine, those in provinces where population pressure was greatest were more likely to raid provinces other than their own. We thus also use mean population density in neighboring coastal provinces as an alternative measure and obtain similar results.

Fujian is partly due to the vast number of uninhabited islands off the coasts of these two provinces.[26] But islands should not play a decisive role in the rise and fall of piracy, based on the fact that over time pirate attacks had shifted from the eastern and southeastern coasts—for instance from the coasts of Zhejiang and Fujian Provinces during the sixteenth century—to the Pearl River Delta region in the south in the late eighteenth and early nineteenth centuries (Robert J. Antony 2003). To control for the possible influence of islands and their varying effects over time we employ an interaction term between the number of islands off a prefecture's coastline (*islands* hereafter) and the pertinent time dummies.[27]

Naval deterrence. Last but not least, we control the number of naval garrisons per prefecture, as they were the most direct deterrent of pirate activities.

The definition, sources, and descriptive statistics (mean and standard deviation) of the main variables employed in this analysis are summarized in Table 1.

[Table 1 about here]

EMPIRICAL STRATEGY AND RESULTS

We start with some simple tests of our hypothesis that pirate attacks on prefectures with greater trade potential rose rapidly after the 1550 imperial suppression of export trade, and declined sharply after 1567 upon the removal of the "sea ban" policy. To provide a benchmark, we estimate a fully flexible equation that assumes the following form:

$$piracy_{it} = TP_i \times year_t + X'_{it} + prefecture_i + year_t + e_{it} \qquad (1)$$

where $piracy_{it}$ stands for the number of pirate attacks on a prefecture in each year, and TP_i refers to whether a prefecture was a *silk center*. X'_{it} is a vector of other covariates (*famine*, *population density*, *naval deterrence*, and the interaction terms between *islands* and a full set of year dummies); $prefecture_i$ denotes the prefecture fixed-effects capturing all time-invariant and prefecture-specific characteristics (such as geography, culture, and historical background); $year_t$ denotes the time fixed-effects

[26] The islands of Zhoushan off the coast of Zhejiang Province and the Islands of Penghu off the coast of Fujian Province are among some prominent examples.

[27] The map of the islands in 1391 is based on Harvard-Yenching's (2007) CHGIS (China Historical Geographic Information System). At that time, the islands identified in the CHGIS were located within 1572.50 kilometers from the Ming coastline (the farthest being a group of islands in Nansha, near Southeast Asia). For each island, we calculate the distance between its central point and the midpoint of the coastline of each prefecture, and choose the shortest distance to identify the particular prefecture to which an outlying island correspondingly belonged.

controlling for the common shocks to piracy in all the prefectures; and e_{it} is the disturbance term. The set of interaction terms between *silk center* and a full set of year dummies, viz. $TP_i \times year_t$, are the key estimates. These interaction terms are intended to capture the differential intensity of pirate attacks between prefectures that were designated silk centers and those that were not on an annual basis. To the extent that the surge in piracy was caused by the intensified suppression of trade, we expect the coefficients of TP_i to be significantly greater in magnitude between 1550 and 1567 but constant before 1550 and after 1567.

The flexible estimation results are reported in Figure 3, in which we plot the coefficients of the interaction term $TP_i \times year_t$ using *silk center* as the proxy for TP_i. The results using *historical port* or *urbanization* are extremely similar. It is striking that, regardless of how trade potential is measured, prefectures with greater trade potential did not experience more pirate attacks until 1551. After 1551, the coefficient of the pertinent interaction term jumps up consistent with the idea the Emperor's suppression of foreign trade had forced the merchants into piracy. Equally striking is the differential intensity in pirate attacks between prefectures with varying trade potential disappears at the end of the 1560s.

[Figure 3 about here]

Next we estimate the same set of relationships with a structured specification:

$$piracy_{it} = TP_i \times Post1550 + TP_i \times Post1567 + X'_{it} + prefecture_i + year_t + e_{it} \quad (2)$$

where all variables are defined in the same way as in Equation (1). The only difference between Equation (1) and Equation (2) is that in (2) we interact TP_i with only the two pertinent time dummies of *Post*1550 and *Post*1567 (instead of each year). The main results of Equation (2) are reported in Table 2. In Panel A, trade potential is measured by *silk center*, and in Panels B and C by *historical port* and *urbanization*, respectively. In all cases we control for the prefecture fixed-effects and year fixed-effects, and use robust standard errors clustered by prefecture to control for possible correlation within a prefecture. Reported in column (1), our benchmark OLS estimate shows that pirate attacks on silk centers rose significantly from 1550 to 1567. In terms of magnitude, the size of the pertinent coefficient (of 1.308) indicates that the average number of pirate attacks on the silk centers increased by 1.3 times more than the non-silk centers after the Ming cracked down on foreign trade (i.e., *Silk center* × *Post*1550). Conversely, the significantly negative coefficient of -1.307 for the *Post*1567 period suggests that after maritime trade was sanctioned pirate attacks on the silk centers returned to the common low prior level.

[Table 2 about here]

In column (2) of Table 2 we include in the regression all other covariates, namely *famine*, *population density*, *naval deterrence*, and the interaction terms between *islands* and the two policy dummies. Estimates on the two interaction terms are strikingly similar to those reported in column (1) in terms of both level of significance and magnitude. In addition, given that the dependent variable is left censored (nearly 90 percent of the values are zero), we use a Tobit estimation. Reported in column (3), the results are strikingly similar; this lends greater credence to our baseline results. We also aggregate the data into decades and perform the same estimations in columns (4) and (5) (instead of 1567, 1570 is thus used as the cut-off date of the removal of the "sea ban" policy). To ensure that data obtained from *Ming shilu* are reliable, we employ Chen's (1934) data on piracy as a robustness check. Reported in column (6), the coefficients match those based on the *Ming shilu* (columns (1) and (2)).

Panels B and C of Table 2 report the estimates using *historical port* and *urbanization* as the alternative measures of trade potential, the results of which are also strikingly similar. For example, the coefficients of *historical port* are very close to those of silk center in terms of both magnitude and level of significance.[28] Regarding the effect of *urbanization*, the estimates in column (2) suggest that after 1550, an additional percentage point of the urbanization rate increases the number of pirate attacks by a 13 percentage points each year, and *decreases* the number of pirate attacks at the same rate after 1567.[29] These results lend further support for the finding that the rising incidence of piracy in mid-sixteenth-century China was caused to a much larger extent by the imperial authorities' crackdown on foreign trade.

ROBUSTNESS CHECKS

Instrumented Evidence

Our key explanatory variable—a prefecture's trade potential (TP_i)—is the outcome of a complex social process. One might well worry that our estimations is biased by some omitted variables that are correlated with both *pirate attacks* and trade po-

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[28] We also employ the number of years a historical port had acquired its status as an alternative measure of trade potential and obtain similar results.

[29] To fully measure the variations in trade potential, we also aggregate the three variables into a single index by taking their first principal components. The results are similar to those using a single measure and thus are not reported separately.

tential. For instance, it is likely that those living in regions with more maritime trade would more likely possess skills—such as knowledge of navigation and ships—that would facilitate piracy. Another possible omitted variable is level of income. Prefectures with greater trade potential were usually richer. The pirates may have been aiming at the treasures of the wealthy (e.g., gold, silver, or even stored grains) rather than the products earmarked for trade. Should that be the case, our hypothesis of pirate attacks being triggered by the authorities' suppression of trade would have violated the exclusion restrictions condition. There is also a concern about measurement error. Despite our effort in constructing three measures to proxy for a prefecture's trade potential, it would be unrealistic to expect them to fully capture the variable in question. Hence the estimates will remain attenuated.

To address these concerns, we exploit the exogenous variation in trade potential among China's coastal prefectures using the suitability of soil for growing mulberry leaves as the instrumental variable for silk center. Until the early 1920s, mulberry plantation was an integral part of sericulture. Silkworms, whose cocoons produce the raw silk fiber, grow by eating mulberry leaves. Thus prior to any extensive production of raw silk mulberry trees must be planted. Then during the intensive feeding periods, the leaves must be stripped from the trees so that the worms can get fresh food five or six times a day (Lynda S. Bell 1999). Because mulberry leaves are highly perishable they were difficult to transport over any distance, most raw silk production facilities were thus located in sites where it was feasible to plant mulberry on a large scale (Fan and Jin 1993). This depends crucially on the soil.

Mulberry trees need well drained soils. On the China coast, loamy soil is thus the most suitable for large-scale mulberry plantations (Licheng Dai 1934). Soil texture is exogenously determined and, although its spatial distribution is likely correlated with mulberry plantation and silk production, it should have no direct correlation with pirate attacks, and hence is a plausible instrumental variable for silk center. We calculate the percentage of loamy land in a prefecture (*loamy land* hereafter) based on the Food and Agriculture Organization's Harmonized World Soil Database (HWSD). The texture of soil does not change over time (David L. Rowell 1994), so contemporary data on soil texture is thus a valid proxy for soil texture in Ming times.[30]

A drawback of using *loamy land* as instrument is that this type of land is suitable for cultivating much more than just mulberry trees; including many other (non-exported) staple crops such as wheat, rice, and millet. In an agricultural society like

[30] In addition, mulberry also grows better when the soil pH-value lies somewhere between 6.5-7.5 (in a range of approximately 4.5-8.5 in China). Our results (not reported) change little when we use the percentage of loamy land and the percentage of land with a pH-value of 6.5-7.5 as instruments. However, this result should be interpreted with caution since soil pH-value can be affected by human intervention.

Ming China, the output of these staple crops was closely correlated with the level of income or economic prosperity. As a result, the areas dominated by loamy land may experience more pirate attacks because of their economic prosperity (grains, not merely silk, were there to be plundered). To address this concern, we use two proxies that are likely to control for the impact of loamy soils on prosperity to some extent. The first is land suitability for planting the major staple crops, which is calculated based on the combination of climate, soil, and slope characteristics (Food and Agriculture Organization, 2002 Global Agro-Ecological Zones (GAEZ) database). The GAEZ data base provides from 0 (very unsuitable) to 9 (very suitable) index of land suitability for all the major staple crops grown in the Ming dynasty: wheat, rice, sorghum, soybean, millet, and other minor cereal crops such as broomcorn millet.[31] For each prefecture, we take the average of the indices of the six major staple crops outlined above to be our measure of land suitability for these crops.

The advantage of using land suitability for staple crops is that it is exogenously determined (Nathan Nunn and Nancy Qian 2011), yet it reveals nothing about the actual output of these crops. As an alternative, we use the volume of the grain tax levied on each prefecture. Indeed taxes were likely correlated with agricultural output. Specifically, we use the amount of grain tax (measured in *shi*, a volume measure in imperial China; one *shi* is equivalent to 100 liters) per km^2 collected from each prefecture in the 1460s as the pertinent measure. The tax data are obtained from *Daming yitongzhi* (Comprehensive Records of the Great Ming Dynasty), which was compiled in the 1460s.

We report the instrumented results in Table 3. Because the endogenous variable is an interaction term between *silk center* and the time dummies, the instrumental variable should also be an interaction term between *loamy land* and the same set of time dummies accordingly. We begin our regressions without including any covariates in column (1), and in column (2) we add back all the controls, including land suitability for cultivating the staple crops, amount of grain tax, and their interactions with the specific time dummies. The 2SLS results are consistent with those of the OLS (Table 2) in terms of both direction and level of significance. Moreover, the magnitudes of the instrumented estimates of the two interaction terms are greater than those of the OLS results by about two times, suggesting that the OLS estimates of the effect of *silk center* on *pirate attacks* were likely attenuated by omitted variables and measurement error.

[31] As for *loamy land*, we calculate the approximate percentage of land in a prefecture suitable for cultivating these staple crops after matching the land suitability map with the map of the Ming's prefecture-boundary.

[Table 3 about here]

Restricted Reference Period

Another concern is that the reference period (1371-1550) in our difference-in-differences analysis is very long. Indeed a total of 12 emperors ruled over China over that time, and each may have had different approaches to foreign trade, and the enforcement of the "sea ban." We shorten our reference period to 1522-1549 so that it is contained in the same single imperial reign (that of *Jiajing*) as the treatment period (1550-1567). Likewise, we also exclude the years after 1572, as it was *Longqing* emperor who abolished the ban in 1567. For robustness reason we also arbitrarily restrict the sample period to 1530-1587, i.e., only 20 years before the "sea ban" became intensified and 20 years after its eventual abolition. Reported in Table 4, the results based on these two restricted periods do not differ from the main findings—the effect of the "sea ban" policy remains positive and significant.

[Table 4 about here]

Europe and Japan's Role in Policy Change

Our difference-in-differences estimation requires that there were no other shocks—especially shocks that are correlated with *pirate attacks* around 1550 or 1567. A possible omitted factor relevant to this period is the unprecedented growth in European demand for Chinese goods. Indeed the number of Europeans arriving in China (stationing near the coast) rose steadily after 1517, and the volume of illicit trade between the Chinese and the Europeans grew even faster. As a result, we cannot assume that the rise in the number of pirate attacks after 1550 was triggered by an intensified "sea ban" policy alone; Europe's insatiable hunger for Chinese goods may also have played a part.

The rise of European trade does not pose a serious threat to our results, however, because the results of our regressions based on the restricted period of 1522-1572 (or 1530-1587) are fully consistent with those of the full sample. These shorter periods fall within the period of Europe's trade expansion to China. Furthermore, we include the total *tonnage* of European commercial ships that arrived in Asia after 1490s (*European ships*) as a proxy in our regressions for a further check of robustness, assuming that the share of Chinese goods in Europe's Asian imports did not decrease over time.[32] Decadal data on *European ships* are obtained from de Vries (2003).[33]

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[32] Our assumption is premised on the fact that maritime trading routes connecting China to other parts of Asia were already well developed by the early sixteenth century, around which time the

Including this proxy for increasing export demand in the regressions has no effect on the coefficients of interest (see column (1) of Table 5). Not only does the effect of the "sea ban" policy (*Silk center* × *Post*1550 and *Silk center* × *Post*1567) remain significant, its coefficient also hardly changes (compare with the result in column (4) of Table 2, where Europe's trade demand is not controlled for). These results squarely suggest that the upsurge in pirate attacks between 1550 and 1567 was caused primarily by the intensification of the "sea ban" policy rather than due to Europe's rising trade demand for Chinese goods.

[Table 5 about here]

The regression could also be contaminated by the "spillovers" of the political instability in Japan during 1467-1590 (i.e., during the Sengoku or Warring States period). The lack of centralized political control then may have predisposed Japanese warlords and traders to turn to preying along the China coast (George Sansom 1962). Again, this should not pose a serious problem because our regression based on the restricted period of 1522-1572 (or 1530-1587) also falls within Japan's Warring States period and that the results of this robustness check are consistent with those of the full sample. To fully address this hypothesis we add two interaction terms to identify the effect (if any) of this possible Japanese influence. To capture the possible effect of the Japanese political turmoil, we interact *silk center* with the *Post*1467 time dummy. By the same token, to capture the effect of Japan's reunification we interact *silk center* with the *Post*1590 time dummy.[34] Reported in column (2) of Table 5 inclusion of Japan's political influence does not change our main results.[35]

CONCLUSION

This article has examined the link between a rigorous suppression of illicit international trade and a spike in piracy in China in the mid-sixteenth century. To do so, we constructed a unique data set based on rich and reliable historical materials to

Chinese merchants were found to have been actively trading in many Asian ports such as Malacca and India (Findlay and O'Rourke 2007).

[33] We do not employ the number of European commercial ships to measure trade volume because vessel size varied considerably during this period of trade expansion.

[34] Japanese pirates' activities were effectively halted by Toyotomi Hideyoshi's reunification of Japan in 1590, when he initiated the *Sword Hunt* and confiscated all weaponry from the peasantry. In particular, the Daimyo were required to swear by the oaths to ensure that no seafarer would engage in piracy; those who failed to comply would be deprived of their fiefdoms (Berry 1989).

[35] To save space we report only the results obtained using the yearly data.

trace both pirate attacks and to proxy a locality's trade (raid) potential. By employing a difference-in-differences regression framework, we show that the geography of pirate attacks was indeed determined by the returns that a coastal prefecture could potentially offer to such violent undertakings.

While a natural extension of our work would be to study the possible long-term effects (if any) of the pirate attacks on economic development, for the time being our finding leads curiously to the larger questions of why various emperors of late imperial China (beginning with the Ming dynasty) were so hostile toward international trade, and what implications this has had for both world and Chinese economic history in the ensuing centuries—especially at the juncture where the growth trajectories of China and Europe began to diverge. This brief episode of Chinese history is important, for it illuminates the conflicts in which China subsequently engaged with the Western powers, conflicts that culminated eventually in the forced abandonment of its long upheld autarkic principle.

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Table 1

SOURCE OF VARIABLES AND DESCRIPTIVE STATISTICS

Variable	Source	Mean	S.D.	Min	Max
Pirate attacks	*Ming shilu* (Veritable Records of the Ming Emperors)	0.09	0.81	0	25
Silk center	Fan and Jin (1993)	0.33	0.47	0	1
Historical port	Sun (1989)	0.36	0.48	0	1
Urbanization	Cao (2000)	11.30	5.90	0	28.30
Famine	Meng (1999)	0.67	1.02	0	5
Naval deterrence	*Chouhai tubian* (The Atlas of Coastal Defense)	2.27	1.00	0	4.08
Population density	Liang (1980)	3.49	0.95	2.22	6.04
Islands	CHGIS, Version 4, Harvard Yenching Institute (2007)	5.79	13.13	0	72
Loamy land	Harmonized World Soil Database (HWSD), FAO and IIASA (2007)	0.40	0.41	0	1
Suitability for staple crops	Global AgroEcological Zones (GAEZ), FAO (2002)	3.12	1.21	1.76	5.76
Grain tax (in *shi*)	*Daming yitongzhi* (Comprehensive Records of the Great Ming Dynasty)	452.94	840.94	5.20	3960.64
European ships (in 1,000 tons)	Van de Vries (2003)	29.78	3.62	0	120.94

TABLE 2

CAUSE OF PIRATE ATTACKS: MAIN RESULTS

	The dependent variable is *pirate attacks*					
	Yearly data (*Ming shilu*)	Yearly data (*Ming shilu*)	Yearly data (*Ming shilu*)	Decadal data (*Ming shilu*)	Decadal data (*Ming shilu*)	Yearly data (Chen 1934)
	OLS	OLS	Tobit	OLS	Tobit	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Silk center × *Post*1550	1.308***	1.288***	2.275***	10.895***	12.178***	1.486***
	(0.366)	(0.368)	(0.092)	(3.132)	(2.616)	(0.401)
Silk center × *Post*1567	-1.307***	-1.306***	-2.501***	-11.056***	-13.351***	-1.512***
	(0.367)	(0.369)	(0.169)	(3.149)	(2.784)	(0.403)
R-squared	0.23	0.23	0.34	0.47	0.23	0.24
Panel B						
Historical port × *Post*1550	1.410***	1.400***	2.421***	11.854***	13.275***	1.277***
	(0.393)	(0.390)	(0.092)	(3.321)	(2.829)	(0.424)
Historical port × *Post*1567	-1.409***	-1.416***	-2.867***	-12.008***	-14.951***	-1.299***
	(0.395)	(0.393)	(0.171)	(3.348)	(3.007)	(0.427)
R-squared	0.24	0.23	0.34	0.49	0.23	0.23
Panel C						
Urbanization × *Post*1550	0.127***	0.126***	0.282***	1.072***	1.429***	0.131***
	(0.026)	(0.027)	(0.005)	(0.226)	(0.224)	(0.021)
Urbanization × *Post*1567	-0.126***	-0.127***	-0.158***	-1.073***	-1.225***	-0.131***
	(0.027)	(0.027)	(0.010)	(0.234)	(0.226)	(0.022)
R-squared	0.25	0.24	0.34	0.51	0.24	0.25
Controls in each panel:						
Famines	No	Yes	Yes	Yes	Yes	Yes
Population density	No	Yes	Yes	Yes	Yes	Yes
Naval deterrence	No	Yes	Yes	Yes	Yes	Yes
Islands × *Post*1550	No	Yes	Yes	Yes	Yes	Yes
Islands × *Post*1567	No	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8910	8910	8910	891	891	8910

*** = Significant at the 1% level.

Notes: Robust standard errors are clustered by prefecture and reported in parentheses. In columns (4) and (5) 1570 (instead of 1567) is employed as the year in which the "sea ban" policy was removed.

Table 3

CAUSE OF PIRATE ATTACKS: INSTRUMENTED RESULTS

	The dependent variable is *pirate attacks*	
	(1)	(2)
Silk center × *Post1550*	2.567***	3.087***
	(0.421)	(0.907)
Silk center × *Post1567*	-2.516***	-3.122***
	(0.447)	(0.899)
Famines	No	Yes
Population density	No	Yes
Naval deterrence	No	Yes
Islands × *Post1550*	No	Yes
Islands × *Post1567*	No	Yes
Suitability for staple crops × *Post1550*	No	Yes
Suitability for staple crops × *Post1567*	No	Yes
Grain tax × *Post1550*	No	Yes
Grain tax × *Post1567*	No	Yes
Year fixed-effects	Yes	Yes
Prefecture fixed-effects	Yes	Yes
Observations	8910	8640

** = Significant at the 5% level.
*** = Significant at the 1% level.
Notes: Robust standard errors clustered by prefecture are reported in parentheses. The table reports the second stage results of the 2SLS estimations in which *silk center* is instrumented by *loamy land*.

TABLE 4
ROBUSTNESS CHECKS USING RESTRICTED SAMPLES

	The dependent variable is *pirate attacks*	
	1522-1572	1530-1587
	(1)	(2)
Panel A		
Silk center × *Post1550*	1.348***	1.336***
	(0.405)	(0.399)
Silk center × *Post1567*	-1.410***	-1.326***
	(0.373)	(0.358)
Panel B		
Historical port × *Post1550*	1.586***	1.511***
	(0.397)	(0.398)
Historical port × *Post1567*	-1.430***	-1.413***
	(0.413)	(0.388)
Panel C		
Urbanization × *Post1550*	0.136***	0.133***
	(0.028)	(0.029)
Urbanization × *Post1567*	-0.135***	-0.127***
	(0.027)	(0.026)
Controls in each panel:		
Famine	Yes	Yes
Population density	Yes	Yes
Naval deterrence	Yes	Yes
Islands × *Post1550*	Yes	Yes
Islands × *Post1567*	Yes	Yes
Year fixed-effects	Yes	Yes
Prefecture fixed-effects	Yes	Yes
Observations	1683	1848

*** = Significant at the 1% level.
Notes: Robust standard errors clustered by prefecture are reported in parentheses.

TABLE 5

CAUSE OF PIRATE ATTACKS: EUROPEAN AND JAPANESE IMPACTS

	The dependent variable is *pirate attacks*	
	(1)	(2)
Silk center × *Post1550*	10.807***	1.304***
	(3.142)	(0.368)
Silk center × *Post1567*	-11.235***	-1.331***
	(3.140)	(0.370)
European ships × *silk center*	3.815	
	(3.196)	
Silk center × *Post1467*		-0.033
		(0.024)
Silk center × *Post1590*		0.037
		(0.021)*
Controls	Yes	Yes
Year fixed-effects	Yes	Yes
Prefecture fixed-effects	Yes	Yes
Observations	891	8910

* = Significant at the 10%.
*** = Significant at the 1% level.
Notes: Robust standard errors are clustered by prefecture and reported in parentheses. In all columns we have controlled for *famine*, *population density*, *naval deterrence*, and *islands*. *European ships* × *silk center* is included to examine the effect of Europe's changing demand for trade with China on piracy. *Silk center* × *Post1467* and *Silk center* × *Post1590* are included to capture the possible effects of the Japanese political turmoil and the reunification, respectively, on piracy.

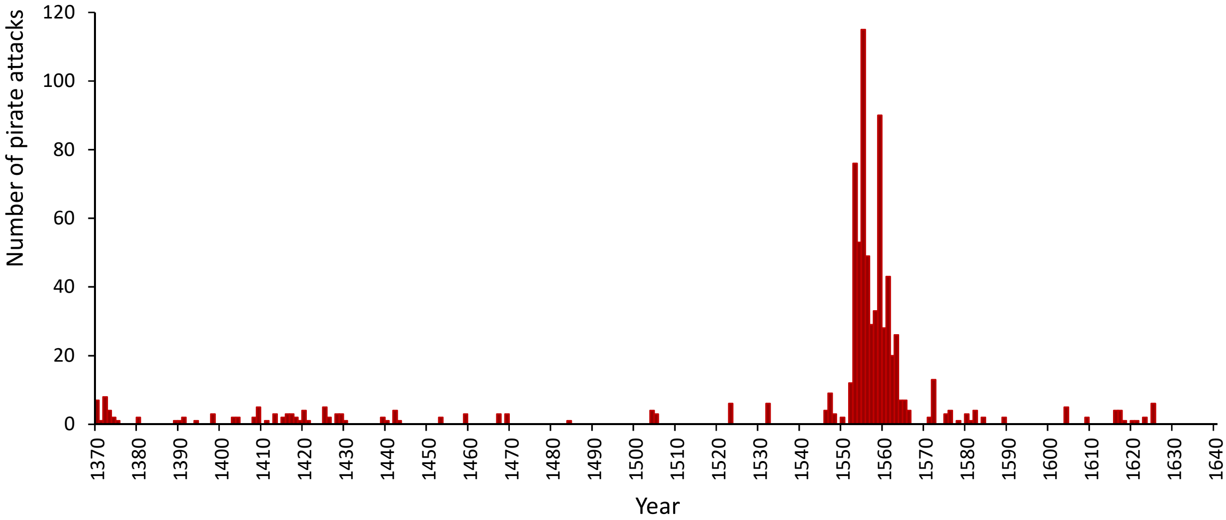

FIGURE 1
NUMBER OF PIRATE ATTACKS ON COASTAL CHINA BY YEAR

Note: Data on pirate attacks are from the *Ming shilu* (1368-1644).

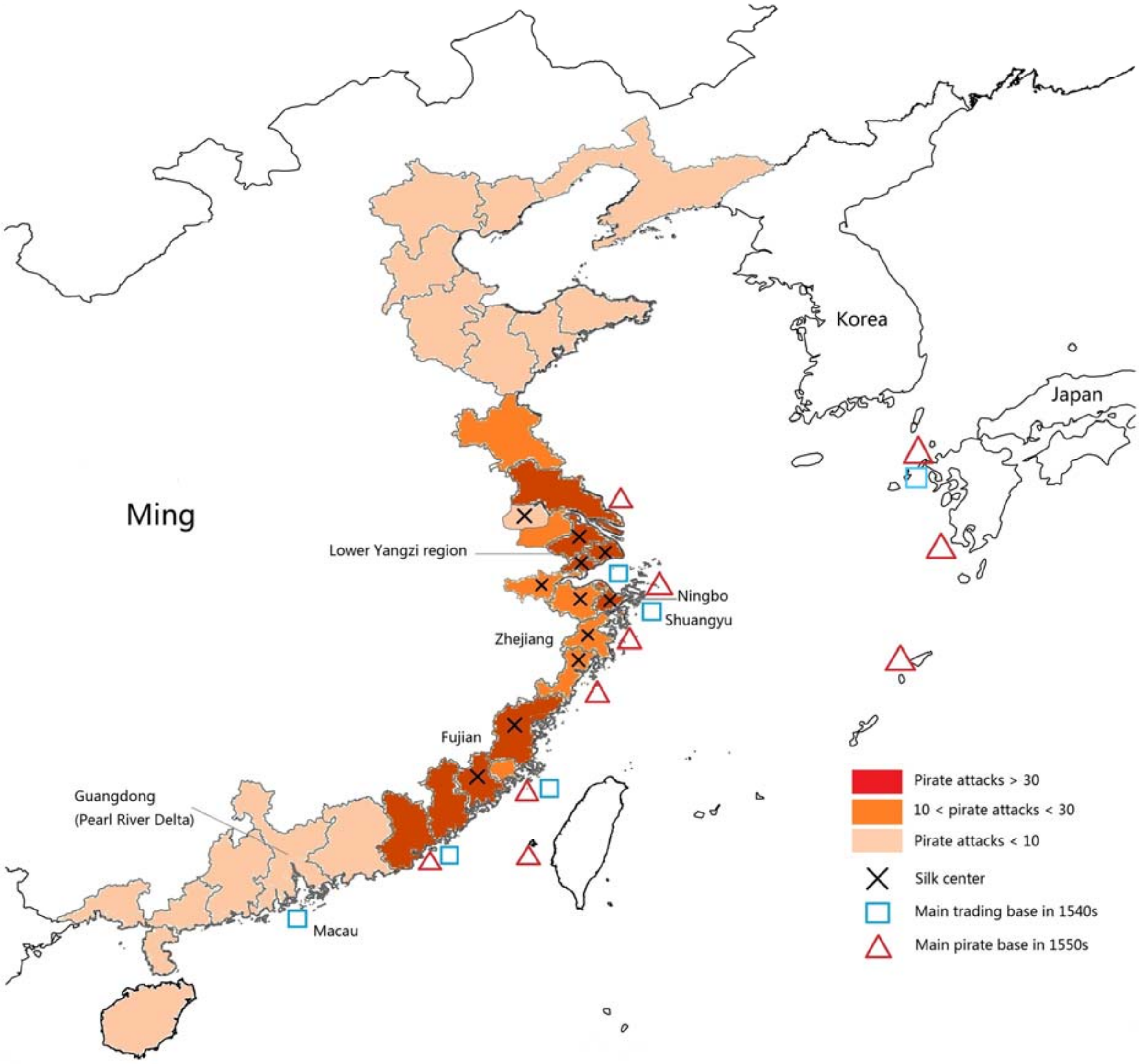

FIGURE 2
PIRACY IN MID-SIXTEENTH CENTURY CHINA

Notes: Pirate attack refers to the total number of pirate attacks between 1550 and 1567, enumerated based on the *Ming shilu*. The location of a silk center is based on Fan and Jin (1993). The locations of trading bases and pirate bases are based on Wills (1979) and Chao (2005). The map of Ming China (of the year 1391) is based on CHGIS, Version 4, Harvard Yenching Institute (2007).

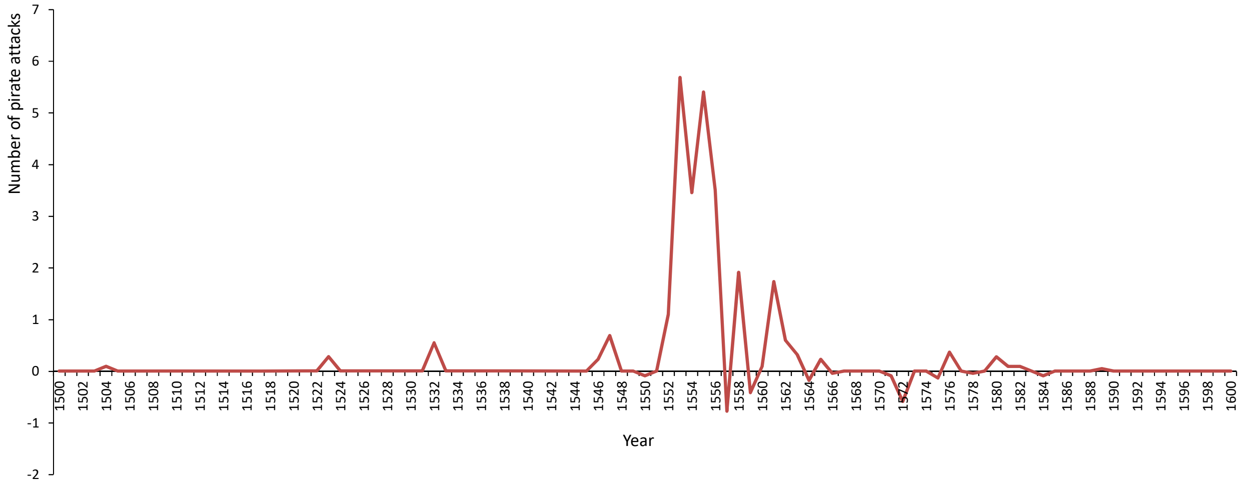

Figure 3

COMPARISON OF PIRATE ATTACKS ON THE SILK CENTERS AND NON-SILK CENTERS, BY YEAR

Notes: To highlight the difference in pirate attacks between the silk and non-silk centers we focus on the shorter window of 1500-1600. The same results are obtained using the full period of 1371-1640.