How do Firms Respond to Long-term Political Tensions? Evidence from Chinese Food Importers

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Abstract
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Keywords
International trade, International political economy, Norway, Nobel Peace Prize, Political sanctions, Event study approach, Agricultural trade

Disciplines
Economic Policy | International Economics | International Relations | Political Economy

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How do Firms Respond to Long-term Political Tensions?
Evidence from Chinese Food Importers

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Abstract: Political and economic tensions, which often jeopardize trade, are rising among the world’s major powers, and countries like China are more frequently using food-related trade actions to deal with deteriorating political relations. Previous literature largely focuses on how brief, short-lived political tensions affect bilateral trade; however, little is known about firm-level trade responses to long-term political tensions. This paper investigates how importers respond to long-term political tensions by examining the six-year Norway-China political tensions that ended in 2016. In particular, we use an event study approach to examine China’s seafood importers’ responses to China’s 2010 sanction on Norwegian fresh salmon imports after Norway awarded Liu Xiaobo, a Chinese political dissident, a Nobel Peace Prize. Our results reveal firm-level responses at both the extensive and intensive margins. At the intensive margin, firms that imported Norwegian fresh salmon before the sanction saw a 20% persistent decline in their fresh salmon import value and an 80% decrease in import share of Norwegian fresh salmon products over our study period. At the extensive margin, we not only find a trade diversion effect on firms importing from other countries and less firms importing fresh salmon from Norway, but also a permanent "political hedging" effect with a 20% decline in the maximum import share from any particular country, even if not Norway. We also provide evidence of persistent sanction effects even after China-Norway relations unfroze. Our findings emphasize the need to consider the long-term sanction consequences in foreign policy using food-related trade sanctions.

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JEL Codes: F51, F14, P33, Q17, Q18
Rising nationalist sentiments are raising political tensions across the world—former U.S. President Donald Trump sought to “make America great again,” China’s President Xi Jinping calls for “the great rejuvenation of the Chinese nation,” and France’s Emmanuel Macron is trying to restore France’s glory through his “Jupiterian” presidency, all while a majority of Britain’s citizens voted to leave the European Union to take back control. In a more globalized world, political tensions do not necessarily evolve into wars, but rather manifest as a trade dispute. In fact, the widespread use of economic sanctions nowadays constitutes one paradox of major global powers’ foreign policies. As such, nationalist and strong-state narratives create risks for political tensions internationally, which creates significant uncertainty for global trade. The International Money Fund’s World Trade Uncertainty Index shows that these political tensions contributed to a recent sharp rise in trade uncertainty over the past few years after two decades of stability, threatening global trade and economic growth (Ahir et al., 2019).

As the world’s largest food importing country and a major world power, China has been increasingly utilizing food-related trade sanctions to punish other countries. For example, in December 2010, China implemented more stringent sanitation and veterinary testing of imports of Norwegian chilled farmed salmon as a response to Norway awarding a Nobel Peace Prize to Chinese political dissident Liu Xiaobo (Reuters, 2010). As shown in Figure 1, Norway’s salmon exports to China quickly shrank 60% one year after the salmon sanction (Godfrey, 2012). Chinese importers then moved their importing sources away from Norway, and Norway’s import share declined from 90% to nearly 5% six years after the sanction. The Norwegian sanction is not an isolated event—food-related trade actions have become a systematic practice that China relies on when dealing with deteriorating political relations. In July 2012, China tightened quality controls and effectively imposed import restrictions on Philippine fruit, such as bananas, due to the dispute in the South China Sea (Reuters, 2016). The trade war between the United States and China that started in 2018 has lasted for over two years with no sign that it will end soon—soybeans and other agricultural products are the key targets of that particular retaliation (Li et al., 2018). More recently, China banned
Canadian canola products over the arrest of Huawei executive Meng Wanzhou in 2019, and the quarrel between Australia and China over Hong Kong and the origin of COVID-19 led to China banning Australian barley and wine exports over the past few months (Zhang, 2020). Furthermore, China recently imposed anti-dumping tariffs on Australian wine and suspended imports of Australian beef as relations continue to deteriorate. For the purpose of studying the comprehensive impacts of long-term political tension on trade, we specifically focus on the six-year Norway-China tension. A rich collection of data from China Customs Bureau, which includes firm-level transactions from 2007 to 2015, allows us to examine the post effects of the Norway-China tension.

Many previous studies analyze the relationship between trade and political tensions (Berger et al., 2013; Che et al., 2015; Davis and Meunier, 2011; Head et al., 2010; Long, 2008; Michaels and Zhi, 2010). However, there are two critical gaps in the current literature. First, most previous studies focus on short-term political tensions that last for days or months, such as consumer boycotts (Heilmann, 2016; Pandya and Venkatesan, 2016). Except for the four-year ongoing sanction in Haidar (2017), the periods of political tensions examined in recent studies are mostly limited to two years at most (Crozet and Hinz, 2020). As a result, many existing studies find trade responses to short-term political tensions are short-lived and sometimes driven solely by firms with stronger governmental ties. Second, most previous research relies on aggregate trade data to analyze the impact of political tensions, which masks firm-level trading behavior under political tensions. Recent papers (Ahn and Ludema, 2020; Crozet and Hinz, 2020; Haidar, 2017) utilize firm-level data to shed light on the effect of political tensions on individual firm’s behaviors in sanctioned countries, such as Iran and Russia; however, how political tensions affect firms’ trade practices and importing portfolios involving products from sanctioned countries remains unclear.

The objective of this paper is to examine how lasting political tensions impact firms’ trading behaviors at both the extensive and intensive margins and the post effects of lasting political tensions. In particular, we leverage detailed data on all Chinese seafood importers and importing trips against China’s six-year sanction of Norwegian salmon products due to bilateral political tensions that started in 2010. The sanction lasted until 2016, when
China negotiated a new health certificate for Norway’s exports of fish products. Firms’ responses to this sanction provide a unique opportunity to observe how political sanctions change firms’ trading strategies over a long period. In particular, we explore three main research hypotheses. First, we hypothesize the sanctions had significant negative impacts on imports of fresh salmon for firms that imported these products before the sanction, which provides an estimate of the magnitude of the intensive-margin impacts of political sanctions on fresh salmon importers. Second, we hypothesize that long-lasting political sanctions reshape firms’ trading strategies permanently resulting in persistent post effects of lasting political tensions. In our case, impacted firms possibly looked for fresh salmon from other countries or shifted to other seafood products, depending on whether the benefit of transition outweighed the costs of not doing so. Furthermore, once firms began outsourcing from multiple countries, they permanently diversified their import portfolio for profits. Lastly, we hypothesize these intensive- and extensive-margin responses could vary by firm characteristics, with greater responses for firms with better resources and existing alternative trade routes.

Our main identification strategy is the widely used event study approach (Allcott and Rogers, 2014; Gallagher, 2014; Markevich and Zhuravskaya, 2018; Sun and Abraham, 2020) in which we leverage China’s prompt sanctions following the 2010 Nobel Peace Prize announcement. We combine this with firm-level data from China Customs Bureau, which provides price, value, and source country information for all 74,221 import observations for China’s seafood importers from 2007 to 2015. Using firms importing aquatic seafood as the control group, we first quantify the salmon sanction’s intensive-margin impacts and their persistence over time on the import outcomes of fresh salmon for most affected firms that imported these products before 2010. Second, we examine three extensive-margin outcomes due to the political sanction—the maximum import share of fresh salmon from any country, the import share of fresh salmon from any source country, and the number of countries a firm imports fresh salmon from. We expect to see trade diversion effects as firms actively seek other importing source countries and non-sanctioned substitute products. In addition, the maximum fresh salmon import share also captures a strategic
diversification effect where political sanctions make firms less likely to solely depend on any particular country. Finally, we employ a generalized triple difference design to examine the heterogeneous response across firm characteristics such as firm type, firm size, and existing trading routes.

Our results reveal that China’s importing firms responded to the salmon sanction at both the intensive and extensive margins. Previous literature (Du et al. 2017; Fuchs and Klann 2013) mainly focuses on the intensive margin at the national level. In our paper, by utilizing firm-level data, we are able to perform a deeper analysis on the optimal importing behavior of agents under political tensions. At the intensive margin, firms that only imported Norwegian fresh salmon before the sanction saw a 20% persistent decline in their total fresh salmon import value and an 80% decrease in the import share of Norwegian fresh salmon products. Furthermore, the declines were not short-lived, but instead remained persistent throughout the six-year political sanction and even after China-Norway relations unfroze. At the extensive margin, we not only find a trade diversion effect where firms import from other countries and fewer firms import fresh salmon from Norway, but also a permanent "political hedging" effect with a decline in the maximum import share from any particular country, even if not Norway. In particular, we find that the maximum share of seafood a firm imports from any country decreased by 20% on average, especially for firms with a pre-existing trade route with Norway. Furthermore, we find a shift from Norway dominating import market shares to other countries, especially the Faroe Islands and the United Kingdom, accounting for more import market share. The firm-level analysis reveals that long-term political tensions between China and Norway made China’s importers adopt the strategy of import diversification in order to compromise the negative impacts from a poor long-term bilateral relationship.

Our paper makes three contributions to the literature on the interplay between trade and political tensions. First, while notably scarcer, there is increasing evidence of the impact of economic sanctions on firms’ decisions and trade practices (Ahn and Ludema 2020; Baker et al. 2016; Bloom 2009; Crozet and Hinz 2020; Haidar 2017; Handley and Limao 2017; Jia 2008). Recent studies use firm-level data to quantify the effect of sanctions on
sanctioned firms using various economic outcomes and find evidence that sanctioned firms would divert exports to non-sanctioning countries and the sanctions have a spillover effect on non-sanctioned products. However, almost no research explores the behaviors of importing firms in sanctioning countries. In our paper, we identify political hedging strategies of importing firms—firms persistently reduce the maximum import share from any country even if their main importing source country is not affected by the sanction. This is consistent with the findings of our partial-equilibrium model of firms’ importing diversification behaviors where some firms continue to import from new trading partners even after China-Norway relations unfroze in 2016. In other words, the lasting political tensions have fundamentally changed importers’ diversification strategies and permanently changed trade patterns—Norway now plays a diminished role. We provide some evidence that Norwegian fresh salmon imports didn’t fully recover two years after normalization of the bilateral relationship.

Second, our work contributes to the extensive literature that examines the impact of custom restrictions on trade and economic growth outcomes (Besedes et al., 2017; Che et al., 2015; Du et al., 2017; Frankel, 1982; Fuchs and Klann, 2013; Heilmann, 2016; Hufbauer et al., 2003; Irwin, 2005; O’rourke, 2007; Pandya and Venkatesan, 2016). One strand of literature focuses on examining the impact of food safety regulations on agri-food trade (Anders and Caswell, 2009; Baylis et al., 2011; Beestermöller et al., 2018; Grant and Anders, 2011) and suggests that border rejections amplify the turnover among exporting firms at the extensive margin of trade. Another strand uses datasets aggregated at the national level to investigate the effects of deteriorating political relations. These studies mainly focus on short-lived political tensions and conclude that political tensions only have temporary effects on trade (Crozet and Hinz, 2020; Fuchs and Klann, 2013; Heilmann, 2016; Michaels and Zhi, 2010; Pandya and Venkatesan, 2016). In contrast to the existing literature, our work looks at the settled six-year China-Norway political dispute and leverages China’s firm-level customs data to examine the effect of the lasting political tension on bilateral trade outcomes. We show that the long-term political sanction had lasting and substantial impacts on both the intensive and extensive margin of trade, as opposed to the short-lived
or muted responses documented in previous literature.

Third, this paper relates to a strand of literature that investigates the heterogeneous responses of firms under political tensions (Du et al., 2017; Heilmann, 2016; Lin et al., 2019). These studies examine the impact of political tensions on politically influenced firms and find those firms’ imports display higher sensitivity to political relations relative to other types of firms. In our context, our heterogeneity analysis reveals that not only politically influenced firms, such as China’s state-owned enterprises, adjusted their trading behavior, but, rather, privately owned firms also became more precautionary and intentionally diversified their trading portfolios.

The rest of this paper proceeds as follows. In section 2, we provide some background on China’s 2010 decision to impose sanctions on the imports of Norwegian fresh salmon, as well as China’s fresh salmon trade in general from 2007 to 2015. Section 3 provides details on China’s firm-level customs data we use in this study. Section 4 presents the event study approach that we employ to causally identify firm-level responses to the 2010 fresh salmon sanction at both the intensive and extensive margins. Section 5 provides results on firm-level responses at the extensive and intensive margin. Finally, we discuss how our results differ from and improve previous findings and explore the possible mechanisms using a partial-equilibrium model of firm importing decisions in section 6. Section 7 concludes.

2 BACKGROUND ON CHINA’S 2010 SANCTION ON NORWEGIAN FRESH SALMON

A six-year political dispute between China and Norway began with the nomination and awarding of the 2010 Nobel Peace Prize (Figure 1). In January, it was leaked that Mr. Liu Xiaobo, a famous imprisoned Chinese political dissident, was nominated for the Nobel Peace Prize. China’s Ministry of Foreign Affairs (MFA) spokesman Ma Xiaoxu quickly responded in February 2020 that awarding Liu would be a "grave mistake." Similarly, in a visit to Norway in June 2010, China’s Vice Foreign Minister Fu Ying warned Norway’s government that awarding the prize to Liu would be viewed as "an unfriendly move towards Beijing" and could deteriorate relations between Oslo and Beijing (Moskwa, 2010). On September 28, 2010, MFA spokesman Jiang Yu explicitly warned that awarding Liu would
"send a wrong message" because Liu is imprisoned for breaking China’s laws. However, Norway’s Nobel Committee still awarded the prize to Mr. Liu in October 2010, which immediately angered China’s government. Within days, China summoned Norway’s ambassador and declared the decision a "blasphemy" and insult to China’s people (Reuters, 2010), and then cancelled the meeting with Norway’s fisheries minister (Guardian, 2010).

The political tensions quickly spread to the arena of commerce and trade. As Chen and Garcia (2016) documents, on December 8, 2010, the Beijing Capital Airport Entry–Exit Inspection and Quarantine Bureau (IQB) issued a regional order that required stricter and more thorough inspection of Norwegian fresh aquaculture products. The Central Office of Quality Supervision, Inspection and Quarantine of China issued document No. 9, on January 28, 2011, which called for more stringent sanitation and veterinary testing of imports of chilled farmed salmon. The majority of stakeholders interviewed by Chen and Garcia (2016) claim that shipments of Norwegian salmon were always checked and that testing and inspection took longer—at the time, it could take up to 20 days for Norwegian salmon to clear customs. Salmon from other producing countries were only randomly checked; and when checked, complete sanitation tests and veterinary inspections only took three to four days. Norway’s salmon exports to China quickly reflected the effects of these measures, shrinking 60% in a year in which China’s salmon market quickly grew (Godfrey, 2012).

The China-Norway bilateral relationship was not normalized again until 2016, though it did go through some ups and downs from 2012 to 2016. In February 2012, Norway supported China having an observer role as a non-Arctic state in the Arctic Council (BBC, 2012), to which China responded positively by calling for further "concrete measures" from Norway to improve bilateral relations. Despite these thawing signs, in December 2012, China offered visa-free visits to Beijing for visitors from many European countries other than Norway (Anderlini and MacCarthy, 2012). Starting in 2013, Norway made other friendly gestures toward China when a new government was elected and Borge Brende, who reportedly had direct contact with China’s prime minister, was made Norway’s foreign minister. In May 2014, Norway’s government declined to meet the Dalai Lama (Gladstone, 2012).
which received praise from China. However, in 2015, Norway’s national security and intelligence departments accused China of massive cyberattacks and illegal intelligence collection, rated China as a "threat" alongside Russia, and also expelled a Chinese graduate student due to national security concerns (Reuters, 2015). All these actions led to slowly improving, yet stagnant, bilateral political relations.

In September 2014 and March 2015, China banned the imports of whole salmon from certain regions of Norway over concerns of infectious salmon anaemia (Wright, 2015). In April 2015, almost one year after Norway’s decision to not meet with the Dalai Lama, China agreed to accept new proof that Norwegian salmon met international health and safety standards, and thus, exports from Norway’s three affected counties could resume using a new health certificate for fish products (Berglund, 2015). It was not until December 2016 when Norway and China finally resumed and normalized diplomatic and political ties following a surprise visit by Norway’s foreign minister Brende (Jacobsen and Blanchard, 2016). In April 2017, Norway’s Prime Minister visited China for the first time since 2010 and resumed bilateral trade talks on a free trade agreement. One month later, China formally agreed to reopen to Norwegian salmon exports, more than six years after bilateral relations froze (Jing, 2017; Sina, 2017).

3 DATA
We use data from China Customs Bureau that include individual firm’s trade records and information on imports and exports for each firm, recorded according to the eight-digit classification (a refined version of the Harmonized Commodity Description and Coding System (HS) six-digit classification). Data also contain information about import arrival port, shipment, mode of transport, routing countries, as well as firm characteristics such as firm type and location. Our analysis includes approximately 99% of all observations. We define the value for every product that China imports from other countries as the value of imports China reports arriving from other countries. We present all price and value data in nominal Chinese yuan (CNY), and we present quantity data in metric tons, megawatt-hours, or discrete units (e.g., widgets, vehicles, etc.), as noted. Unless otherwise noted, we source data in the text and figures from China Customs Bureau.
The treatment sample is a balanced panel with 3,564 observations from 66 firms at the firm-year-country level of fresh salmon imports from 2007 to 2015. Between 2007 and 2015, these firms mainly imported fresh salmon products from six countries—Norway, the United Kingdom, Chile, the Faroe Islands, Australia, and Canada. From this set, we have two mutually exclusive subsets—31 firms that only imported Norwegian fresh salmon before 2010, and 35 firms that imported Norwegian fresh salmon and/or imported fresh salmon from other countries during the pre-sanction period.

We focus on the impact of the salmon sanctions on the 66 firms that imported fresh salmon before 2010 (see Table 1 panel A for summary statistics). During the 2007–2010 period, 39 firms only imported fresh salmon in one year, 14 firms imported fresh salmon in two of the years, and 13 firms imported fresh salmon in at least three of the years. Before 2010, each firm had, on average, 5.36 seafood trading routes, 1.31 import source countries and a 98% maximum import share for any source country. However, after the salmon sanction, firms’ average number of importing source countries rose to 2.43 and the maximum import share of any one country dropped to 83%. These 66 firms differ from one another in ways that are potentially relevant to other seafood import outcomes. The average seafood share of all imports among these firms is about 37%, while there are about 19 firms in our study with a seafood share below 50% of all imports. Moreover, 47% of firms import higher than the average market level and 55% of the firms import fresh salmon from Norway and/or other countries.

To identify the causal effects of the salmon sanction accurately, we examine a counterfactual situation in which firms in the seafood industry were unaffected by China’s sanction of Norwegian fresh salmon. We start with non-fresh seafood firms that did not import any seafood products from Norway before 2010. Figure A1 presents the 2007–2010 import trends of countries that were and were not affected by the salmon sanction across different seafood products. We restrict our sample to the top seven frozen- or aquatic-product importing source countries and look for those that have import trends similar to fresh salmon in the years preceding the 2010 salmon sanctions.
As shown in Figure A1b, most of the frozen-product importing source countries have a relatively higher importing trend from 2007 to 2010, especially for frozen product imports from Russia. As opposed to frozen product imports, aquatic product imports have the same pattern across the top-seven aquatic-product importing source countries (Figure A1c). Considering Japanese, American, and Indonesian aquatic imports share a similar trend with average fresh salmon imports, we restrict our sample to these countries and break the aquatic imports down to shrimp, crab, squid, and other aquatic seafood for further comparisons. Figure A1d shows that, among these aquatic groups, American shrimp, Indonesian squid, and Japanese other aquatics help reduce the magnitude of the pre-trend import differences.

We then compare how treated firms and the sub-sample control groups differ across the differences in firm characteristics between 2007 and 2010. Appendix Table A1 columns (1), (3), and (5) show the mean of firm characteristics in 2007 among treated firms and control firms, and columns (2), (4), and (6) show the mean of firm characteristics in the pre-sanction period among treated firms and control firms. We find all three sub-sample control groups have insignificant differences in each firm characteristic, thus, we keep all 199 firms as our control group. In section 5, we use other types of firms within our sub-sample to check the robustness of the estimated coefficients.

All 199 firms in our control group were in the aquatic seafood market before China’s sanction. By 2015, the number of firms decreased to 67. Similar to firms importing fresh salmon, these firms had similar average seafood shares (73%) and seafood trading routes (5.02). After the salmon sanction, the number of import source countries changed from 2.50 to 2.16, and the maximum import share changed from 83% to 85%. More detailed information about these categories is available in Table 1.

4 EMPIRICAL STRATEGY

4.1 Intensive-margin impacts on fresh salmon imports

In our main empirical analysis, we first study the direct, or intensive-margin, impact of China’s 2010 salmon sanction on fresh salmon imports for the treated firms, which we
define as firms importing fresh salmon before the sanction. To use all firms in our dataset, we construct a balanced panel by assigning a negligible amount of import value for the years when a firm did not import.\footnote{Mechanically, this means we add 0.01 to the import value of fresh salmon and certain aquatic products to avoid the log of zero.} Between 2007 and 2015, China’s fresh salmon importers made 3,564 import observations of fresh salmon products and the control firms made 1,935 import observations of certain aquatic products. For the treated firms, we explore two measures of fresh-salmon import decisions for China’s firms: (a) the value of firm-level imports of fresh salmon; and, (b) the quantity of firm-level imports of fresh salmon. We use firms that imported certain aquatic products from three countries as the main control group and estimate the following event study specification:

\[
y_{ijct} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_\tau [D_{ijt,\tau} \times FS_i] + \gamma_i + \sigma_{pt} + \eta_c + \epsilon_{ijt}
\]  

(1)

where \(i\) indexes China’s import firm; \(t\) indexes the year; \(y_{ijct}\) is a log of import value or import quantity for import good \(j\) from country \(c\) to port \(p\) by firm \(i\) in year \(t\); and, \(FS_i\) is an indicator equal to 1 if firm \(i\) imported fresh salmon before 2010. For \(\tau > 0\), \(D_{ijt,\tau}\) equals 1 if it is the \(\tau\)th year after China’s salmon sanction. For \(\tau < 0\), \(D_{ijt,\tau}\) equals 1 if it is the \(-\tau\)th year before the salmon sanction. We include the firm fixed effect \(\gamma_i\) to absorb time-invariant differences and allow consistent estimation even in the presence of differences between treated and untreated firms. We further include the country fixed effect \(\eta_c\) and port-by-year fixed effects \(\sigma_{pt}\) to control for unobserved common shocks. In our setting, \(D_{it,\tau}\) is highly serially correlated and the default standard errors are likely to be downwards-biased \((\text{Arellano et al., 1987}, \text{Bertrand et al., 2004}, \text{Cameron and Miller, 2015})\). To address this issue, we use cluster-robust standard errors, which allows us to assume errors in different years for a given firm are correlated but errors for different individuals are uncorrelated.

Our main coefficient of interest, \(\alpha_\tau\), represents the average annual percentage changes in fresh salmon imports \(\tau\) years following China’s decision to impose sanctions relative to the event year 0, conditional on all the covariates and fixed effects included in the regression. These coefficients provide two important pieces of information. First, they provide a check of Granger causality between the salmon sanction and fresh salmon imports. If
the pre-period coefficients are statistically indistinguishable from zero and have no clear trend, this would provide some reassurance for the identification assumption. Second, the specification allows us to investigate the dynamic impact of the salmon sanction over the study period.

The main concern for identification is whether the parallel trends assumption is valid in our event study design. In the absence of treatment, treated units should experience the same trends in average outcomes as control units. In our context, we want the three-subsample group to form a credible counterfactual for the treated firms (Blundell and Dias, 2009) after accounting for time-invariant (observed and unobserved) differences between firms and common port-by-year shocks. To check the validity of the identification assumption, we provide suggestive evidence of no differential pre-trends in import value of fresh salmon relative to the import value of certain aquatic seafood from these three countries before 2010.

Lastly, we also explore how firms only importing Norwegian fresh salmon before 2010 responded to the salmon sanction differently than firms that imported fresh salmon from Norway and/or other countries before 2010. Our hypothesis is that firms that only importing Norwegian fresh salmon before 2010 were more likely affected by the sanction because those firms needed to afford an additional cost before importing fresh salmon from other source countries. Thus, we expect that firms that only import fresh salmon from Norway before 2010 would have a larger decline in fresh salmon import value than other treated firms.

4.2 Extensive-margin impacts

We also investigate the extensive-margin impacts of the salmon sanction. We ask whether firms would reshape their trading strategies in terms of three measures: (a) the maximum import share for any source country; (b) the fresh salmon import share of main source countries (Norway, the Faroe Islands, the United Kingdom, and Chile); and, (c) the number of countries importing fresh salmon. Similar to intensive-margin impacts, we also investigate the heterogeneity effect of the salmon sanction on extensive-margin outcomes.
according to whether firms only import Norwegian fresh salmon before 2010.

To understand how importers change trading strategies in the short and long run, we first explore the changes of the maximum import share for any source country due to the salmon sanction. We define \( Share_{it}^{c,max} \) as the maximum import share for any source country for firm \( i \) in year \( t \) and calculate the maximum share by using the ratio of the largest fresh-salmon imports from a specific source country in terms of the total fresh salmon import by firm and year. We then use the following specification to estimate the sanction impacts:

\[
Share_{it}^{c,max} = \sum_{ \tau \in [-3,5], \tau \neq 0 } \alpha_\tau [D_{it,\tau} \times FS_i] + \gamma_i + \sigma_t + \epsilon_{it} \tag{2}
\]

where \( i \) indexes China’s import firm and \( t \) indexes year. We include the firm fixed effect \( \gamma_i \) and year fixed effects \( \sigma_t \). We cluster the estimated standard errors at firm level and all other variables are defined the same as in equation (1).

A closer examination of the import share of fresh salmon for each source country provides some details on how firms change their importing sources over the study period. We focus on the main fresh-salmon importing source countries (Norway, the Faroe Islands, the United Kingdom, and Chile) and calculate the import shares by firm and year. We then examine the change of import share for each country by estimating the event study specification as follows:

\[
Share_{it}^c = \sum_{ \tau \in [-3,5], \tau \neq 0 } \alpha_\tau [D_{it,\tau} \times FS_i] + \gamma_i + \sigma_t + \epsilon_{it} \tag{3}
\]

where \( i \) indexes China’s import firm; \( t \) indexes the year; \( c \) indexes the main importing source countries (Norway, the Faroe Islands, the United Kingdom, and Chile); and, \( Share_{it}^c \) is the import share for firm \( i \) in year \( t \) from country \( c \). For instance, \( Share_{it}^{Norway} \) represents Norway’s import share for firm \( i \) in year \( t \). We cluster the estimated robust standard errors at firm level and all other variables are defined the same as for equation (2).

Lastly, we investigate the impact of China’s salmon sanction on the number of countries importing fresh salmon after 2010. We calculate the number of importing source countries
by summing the number of countries that a firm imported fresh salmon from by firm and year. We then use treated firms as the treatment group and aquatic seafood firms as the control group and estimate the event study specification as follows:

$$\text{Countries}_{it} = \sum_{\tau \in [-3, 5], \tau \neq 0} \alpha_{\tau} [D_{it, \tau} \times FS_i] + \gamma_i + \sigma_t + \epsilon_{it}$$ (4)

where $i$ indexes China’s importing firm; $t$ indexes the year; and, Countries$_{it}$ is the number of importing source countries for firm $i$ in year $t$. The estimate robust standard errors are clustered at firm level and all other variables are defined the same as in equation (2).

5 RESULTS

We first present the intensive-margin results by examining the changes in fresh salmon import value relative to import value of our control groups. We then estimate the extensive-margin impact by testing how the maximum import share, import shares of individual main source countries, and the number of importing source countries differ among treated firms relative to our control groups. Lastly, we explore how the heterogeneous impact of the salmon sanction differed according to firm size, firm ownership structure, and previous trading history.

5.1 Intensive-margin impacts on fresh salmon imports

Figure 2 shows some suggestive evidence of how treated firms responded to the sanction. As shown in Figure 2a, between 2007 and 2010, Norwegian fresh salmon imports grew at an average annual rate of 32%, from 28 million CNY in 2007 to 86 million CNY in 2010. Over the same period, the little-to-no fresh salmon imports from other countries suggests that Norway dominated the fresh salmon market before 2010. After Norway awarded Liu Xiabo a Nobel Peace Prize in 2010, China’s IQB called for more stringent sanitation and veterinary testing of imports of chilled farmed salmon, leading to a dramatic drop in Norwegian salmon imports in 2011. However, the Norwegian fresh salmon imports readjusted to 2010 levels in 2012. One explanation for this is the price of Norwegian fresh salmon decreasing in 2012, leading to an increase in Norwegian fresh salmon imports even with stricter inspections. Inconsistent with this hypothesis, Figure A2 in the appendix shows that the Norwegian fresh salmon price in 2012 was actually comparable to 2011
levels and the main fresh-salmon importing source countries also experienced a drop in fresh salmon price. This suggests that a drop in price might not explain the import increase in 2012.

Another possible reason could be the early 2012 gesture made by Norway’s government to support China’s application to become a permanent observer of the Arctic Council provided a positive signal for China’s fresh salmon importers. Anticipating trade relations would unfreeze, China’s firms increased their salmon import share from Norway in 2012. However, when China offered visa-free visits to Beijing for Europeans from every country except Norway in December 2012, China’s firms decreased fresh salmon imports from Norway and increased fresh salmon imports from other countries, such as the Faroe Islands, the United Kingdom, and Chile.

China’s firms may also have shifted from importing fresh salmon to importing frozen salmon, as the sanction only affected fresh salmon products from Norway. Figure 2b shows the change in China’s frozen salmon import value by country from 2007 and 2015. We find no evidence of a spillover effect on Norwegian frozen salmon imports after 2010. Frozen salmon imports from other countries did not respond to the sanction, except for Chile, whose import value increased from 10 million CNY in 2012 to 70 million CNY in 2014. We find suggestive evidence that Chile’s increase in frozen salmon imports is highly associated with their efforts to control salmon diseases from 2007 to 2010.

We then implement the event study specification shown in equation (1) to estimate the intensive-margin impact of the 2010 sanction on fresh salmon import value and quantity for treated firms (see Figures 3a and 3b). In the years before the salmon sanction, the coefficients are all statistically indistinguishable from zero, have modest magnitude, and have no clear trend. Following the salmon sanction, the import value fell sharply and the average import deceased by $22.7\% \ (=e^{-0.258}-1)$ in value in the first year, relative to the import value of control groups. In contrast with previous studies that find political tensions only have temporary effects on trade (Crozet and Hinz, 2020; Fuchs and Klann, 2013; Heilmann, 2016; Michaels and Zhi, 2010; Pandya and Venkatesan, 2016), the magnitude and long-run
nature of the sanction’s effects are noteworthy. These effects fluctuate and persist over the next few years to an almost 23.2% reduction in fresh salmon import value by the end of 2015. The results are similar in the case of import quantity. Figure 3b shows little evidence of the sanction’s impact on import quantity over the study period. In the first year after the sanction, the import quantity decreased by 9%, but is statistically insignificant; and, starting in the second year, the quantity decreased 19%, which persists the rest of the period. Table 2 provides additional details.

Figures 3c and 3d also present results using subsets of treated firms. When we restrict the sample to firms that only imported fresh salmon from Norway before 2010, Changes in value of fresh salmon imports are significantly larger (23%) in in the first year and show a persistent sanction impact over our study period relative to the value of control groups. The estimated coefficient in the last year of our study period, roughly -23.7%, is slightly larger in magnitude than for the difference-in-differences estimates of the whole sample. However, when we restrict the sample to other treated firms, we find little-to-no evidence of sanction impact on the log of fresh salmon import value. The fresh salmon import value starts to decrease relative to control groups in the second year, but is statistically insignificant over most of our study period.

5.2 Extensive-margin impacts

We then examine how firms changed their long-term import strategies after the 2010 salmon sanction by testing the maximum import share changes due to the sanction across treated firms and present the results in Figure 4. The economic sanction uncertainty might have an impact on firms’ decisions and lead to more diversified trading portfolios. Consistent with this hypothesis, we observe a dramatic drop one year after the sanction and a gradual decrease over the longer period. A closer examination of firms that only import fresh salmon from Norway suggests that firms that only imported Norwegian fresh salmon before 2010 significantly switched their importing source country away from Norway until the third year (see Figure 4b), which can be explained by the fact that these firms needed time to find new potential import sources. The steady decrease in the maximum import share in the last two years might suggest these firms completely transitioned away from
Norway as a source country. In contrast, in Figure 4c, we observe that firms that import fresh salmon from Norway and/or other countries responded to the sanction in both the short and long run. In the first year after the sanction, the maximum import share of fresh salmon products decreased 17.9% relative to the control groups. The maximum share readjusted to pre-sanction levels in the second year, while in the fifth year, these firms readjusted their import strategies and decreased their maximum import share 24.8% from any source country to reduce the potential risks.

To further understand how firms switched their source countries, we examine how the import share of main source countries changed due to the salmon sanction (see Figure 5 for results). We find some evidence of both negative short-run and long-run relationships between the sanction and China’s imports of fresh salmon. Figure 5a suggests that Norway experienced a 30% drop in China’s import share in the first year after the sanction. The import share readjusted to pre-sanction levels in the second year due to a positive signal from Norway’s government; however, import share then continued decreasing over the rest of the period, such that Norway’s import share decreased to 80% in the fifth year. The decreasing Norway import share suggests that China’s importers decided to change their trading strategies and shift their main import source to other countries. Conversely, we find that the Faroe Islands are the biggest winner of the salmon sanction (see Figure 5c). In the first year after the sanction, the Faroe Islands’ share of China’s fresh salmon imports increased 60%, and the impact persists over the rest of the period. The relationship between sanction and import share of other countries is also evident (see Figure 5d). We find the United Kingdom experienced a 30% increase in China’s fresh salmon import share in the first year. In the second year, the United Kingdom’s share dropped, then gradually increased later. Five years later, the United Kingdom’s share of China’s imports had increased by around 25%. We find little-to-no evidence that the sanction increased the import share of fresh salmon from Chile in the first three years (see Figure 5b).

Finally, we examine the effect of the salmon sanction on the number of fresh-salmon importing source countries and present the results in Figure 5a. We do not find a differential number of importing source countries in the years preceding the sanction except for 2007.
Similar to a previous study (Haidar, 2017) that suggests sanctions divert trade to non-sanctioning countries, following the sanction, sanctioned firms exhibited large increases in the number of countries they import from. In the first year after the sanction, the number of fresh-salmon importing source countries increased by 0.73, versus those for control groups, relative to the years before sanction. The sanction effects continued to expand and stayed stable at 1.12 five years after the sanction.

We also find a heterogeneous response to the sanction in terms of the number of fresh-salmon importing source countries across firms with different trading histories. When we restrict the sample to firms that imported only Norwegian fresh salmon before 2010 (see Figure 4b), the sanction shows a long-term effect on the number of fresh-salmon importing source countries. The number of importing countries is 1.37 in the fourth year, which is larger relative to years before the sanction and consistent with the evidence that these firms needed time to search for potential import sources. For firms that imported fresh salmon from Norway and/or other countries before 2010, the sanction shows both short- and long-run impacts on the number of importing source countries over the study period. In the first year after the sanction, the number increases almost 1 relative to control groups. The number quickly fell back to pre-sanction levels in the second year but increased 0.7–0.9 in the following years, which also suggests these firms switched their importing sources as China-Norway relations stayed frozen.

5.3 Heterogeneous impact of China’s 2010 salmon sanction

We present evidence on the methods by which treated firms adjusted in response to the sanction. We test how sanction impacts differ according to firm size, seafood share of total imports, and firm type.

We use a generalized triple-difference design to examine heterogeneous responses to the salmon sanction across different firm characteristics. For ease of interpretation, we implement these tests by interacting the first term in equation (1) with indicators for firm
characteristics. Our main specification is:

\[ y_{ijt} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{ijt,\tau} \times FS_i] + \sum_{\tau \in [-3,5], \tau \neq 0} \eta_{\tau} [D_{ijt,\tau} \times FS_i \times Z_j] \]

\[ + \gamma_i + \sigma_{pt} + \eta_c + \epsilon_{ijt} \]

where \( Z_j \) is an indicator function that equals 1 if firm \( j \) belongs to a specific group where the import value of firm \( j \) is above the average industry value, or the seafood share of all imports is above 50%, or it is a state-owned enterprise. All other variables are defined the same as in equation (1).

One hypothesis is that the sanction would have larger impacts on firms with larger seafood import share. Firms with higher seafood import share are more likely to be affected by the salmon sanction, hence they would import less fresh salmon than firms with smaller seafood import share. We split firms depending on whether their seafood import share is above 50%. Table 3 column (2) present our results. We find that, in the first two years, firms with higher seafood share decreased fresh salmon imports by 23% more relative to firms with low seafood share. The effect continued expanding—five years later, firms with a higher seafood share imported 26% less fresh salmon.

We then test whether the salmon sanction had a larger impact on relatively larger fresh salmon firms or relatively smaller firms. One might think that firms with larger import value could bear the switching costs and import fresh salmon from other countries, and therefore, the sanction would be associated with a larger decrease in import value for large firms relative to small firms. Consistent with this hypothesis, Table 3 column (1) confirms that these firms are more likely to decrease their imports of fresh salmon after 2010. \( Z_j \) is defined in equation (5) as an indicator that equals 1 if the import value of firm \( j \) is above the average industry value. We find evidence that firms importing higher-than-average volumes decreased their fresh salmon imports by 28% more relative to firms with lower import volumes in the second year and by 31% more five years after the sanction.

Finally, we test whether state-owned firms are more likely to adjust their trading behavior relative to privately owned firms. In contrast with previous literature (Du et al., 2017; Lin...
et al., 2019), we find evidence of little-to-no differential response to China’s salmon sanction across state-owned and private-owned firms (see Table 3 column (4)). This result suggests that not only politically influenced firms, such as China’s state-owned enterprises, adjusted their trading behavior, but, rather, privately owned firms also became more precautionary and intentionally diversified their trading portfolios. Taken together, we conclude that the sanction had dramatic impacts on firms with large import values, higher seafood import share, and more fresh salmon trading routes, but no differential impact across different firm types. Notably, we find significant importing responses for both private and state-owned enterprises, which is in contrast to previous findings of responses only from politically influenced firms such as state-owned enterprises.

6 DISCUSSIONS AND A PARTIAL-EQUILIBRIUM EXPLANATION

6.1 Threats to identification and robustness checks

We test the robustness of our event study results presented in section 5. We first discuss whether the treatment effect varies across different timing, and we then run placebo tests to examine any potential unobserved shocks in 2010. Lastly, we test whether the estimated coefficients would be biased if we used alternative control groups.

First, recent papers by Roth (2018) and Goodman-Bacon (2018) discuss the potential biases of estimating the average treatment effects when the effects change over time. In our case, there are two orders issued by China’s IQB (December 2010 and January 2011) calling for more stringent sanitation and veterinary testing of Norwegian fresh salmon imports. However, given that importing firms knew about the nomination in January 2010, and both IQB actions happened around the end of 2010, the chances that the treatment effect would vary much are pretty small; therefore, we treat these two events as one policy treatment to examine its impact on fresh salmon imports.

Second, another potential threat to the internal validity of the study is that there might be other shocks that both affect the seafood imports and occur concurrently with, or just after, China’s salmon sanction began. To investigate this, we estimate regressions similar to equation (1) but replace the dependent variable with other seafood product import
values from unaffected firms that never imported any type of salmon before 2010. If there are any shocks that affect the seafood imports, then we would expect some evidence of import changes after 2010. Figures B1a and B1b present the event study results for other seafood imports from unaffected firms. Overall, we find little-to-no evidence that the salmon sanction had any impact on other seafood imports from unaffected firms. These results suggest there were no other factors influencing the seafood import values at the time of the salmon sanction. In addition, we also construct several alternative control groups by exploiting different firm configurations among seafood importers, including firms that import American shrimp, Indonesian squid, Japanese other aquatic products. The estimated coefficients are similar to those in our baseline results.

Lastly, one might be concerned that the maximum import share for treated firms could mechanically decrease due to the increasing demand for fresh salmon in China. China’s fresh salmon importers might look for other country sources since Norwegian fresh salmon exports might not meet demand. We find some evidence that China’s fresh salmon imports only account for 3%-10% of the total Norwegian fresh salmon exports and 2%-5% of global fresh salmon exports, which suggests that the decline in maximum import share was mainly driven by the "political hedging" effect of the 2010 salmon sanction.

6.2 Import diversification and emerging explanation

We develop a partial-equilibrium model of firms’ importing behavior to rationalize our empirical findings. As suggested in Haveman and Hummels (2004), countries tend to import from few exporters—58% of importers purchase from around 10% of available exporters. We do find that China’s salmon importers decreased their purchases from Norway and expanded their sourcing countries under the long-term bilateral political tension. China’s importers chose to take an import diversification strategy when facing political risks. As Wolak and Kolstad (1991) and Muhammad (2012) argue, one reason that firms do diversify imports is to control price uncertainty of the sourcing countries. In the spirit of Antras et al. (2017)—firms pay a fixed cost to improve their efficiency—we build a simplified model to understand firms’ behavior under political tensions. Firms can add a new import country by paying a one-time fixed cost, which can potentially improve
their efficiency of production by importing from multiple sources. Thus, firms face trading higher efficiency for a higher fixed cost of importing.

In our simplified model, firms face a declining demand curve for salmon, and salmon from Norway and other countries are perfect substitutes. Because of the growing season of salmon, it is reasonable to assume the production process is not evenly distributed throughout the year, and we assume the cost function $C$ is convex (Ahn and McQuoid, 2017). Similar to Antras et al. (2017), the demand curve takes the form of $Q^d = BP^{-\sigma}$ or $P = B(Q^d)^{-1/\sigma}$ with $\sigma$ being greater than 1 because of the elastic demand for salmon in China (Chen and Garcia, 2016; Zhuang and Abbott, 2007).

Prior to the political tension, China imported virtually all of its salmon from Norway. The present value of profit of a represented firm importing only from Norway before the political tension is:

$$\pi_1 = \max \{S_{n,t}\}_{t=1}^{\infty} \sum_{t=1}^{\infty} \frac{1}{(1 + r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,l}C(S_{n,t})]$$

where $S_{n,t}$ represents salmon imported from Norway; $P$ is the price function; and, $\tau_{n,l}$ represents the normal tariff equivalent of trade barriers on imports from Norway before the political tension.

Firms can still choose to expand their sourcing countries by paying a fixed cost of $F_o$:

$$\pi_2 = \max \{S_{n,t}, S_{o,t}\}_{t=1}^{\infty} \sum_{t=1}^{\infty} \frac{1}{(1 + r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_o) - \tau_{n,l}C(S_{n,t}) - \tau_oC(S_{o,t})] - F_o$$

where $S_{o,t}$ represents salmon from other countries; $P$ is the price function; and, $\tau_o$ represents the tariff equivalent of trade barriers on imports from other countries.

However, because of the political tensions, firms realize there will be a higher trade barrier importing from Norway that lasts for $T$ periods; thus, the profit of importing only from Norway and multiple outsourcing is:

$$\pi_1^* = \max \{S_{n,t}\}_{t=1}^{\infty} \sum_{t=1}^{T} \frac{1}{(1 + r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,h}C(S_{n,t})] + \sum_{t=T+1}^{\infty} \frac{1}{(1 + r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,l}C(S_{n,t})]$$

---

5 $B$ here is a constant that governs the scale of demand.
\[ \pi_2^* = \max_{\{S_{n,t}, S_{o,t}\}_{t=1}^{\infty}} \left\{ \sum_{t=1}^{T} \frac{1}{(1+r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_o) - \tau_{n,h} C(S_{n,t}) - \tau_o C(S_{o,t})] + \sum_{t=T+1}^{\infty} \frac{1}{(1+r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_o) - \tau_{n,l} C(S_{n,t}) - \tau_o C(S_{o,t})] - F_o \right\} \]  

(14)

where \(\tau_{n,h}\) represents the higher trade barriers for Norway that last for \(T\) periods because of the political tensions.

For simplicity, assuming firms are facing exactly the same demand function each period, we can get the optimal Norwegian salmon importing quantity under these two trade strategies:

\[ S_{n,t}^1 = \begin{cases} 
S_{n,h}^1 & \text{if } t \leq T \\
S_{n,l}^1 & \text{if } t > T 
\end{cases} \]  

(15)

\[ S_{n,t}^2 = \begin{cases} 
S_{n,h}^2 & \text{if } t \leq T \\
S_{n,l}^2 & \text{if } t > T 
\end{cases} \]  

(16)

Using the envelop theorem, we can get the following first-order conditions that explain the additional profit gain from sourcing from multiple exporters under political tension:

\[ \frac{\partial \pi_2^* - \pi_1^*}{\partial F_o} = -1 \]  

(17)

\[ \frac{\partial \pi_2^* - \pi_1^*}{\partial \tau_{n,h}} = \frac{1 - (1+r)^{-T}}{r} [C(S_{n,h}^1) - C(S_{n,h}^2)] \]  

(18)

\[ \frac{\partial \pi_2^* - \pi_1^*}{\partial T} = \frac{\ln(1+r)(1+r)^{-T}}{r} [C(S_{n,h}^1) - C(S_{n,h}^2)] \]  

(19)

Obviously, the first condition with respect to \(F_o\) is negative, meaning that higher fixed cost to find another supplier would erode the profit gain from sourcing from another exporter. The signs of the remaining two conditions depend on the sign of the cost differential \(C(S_{n,h}^1) - C(S_{n,h}^2)\). We could show that this cost differential is positive and prove that \(S_{n,h}^1 > S_{n,h}^2\) using proof by contradiction, since firms will choose to expand sourcing.
countries if $\pi^*_2 > \pi^*_1$. Because firms maximize profit, we know that, in equilibrium, the marginal cost of importing an additional unit of salmon must always equal the marginal revenue of doing so. Assume that $S^1_{n,h} \leq S^2_{n,h}$, which suggests that under the multiple sourcing scenario the firm imports more quantity from Norway and buys from another country. Because of the convexity of cost function, the marginal cost of the multiple sourcing scenario with higher import quantity would be higher than that of importing only from Norway. This implies the marginal revenue of multiple sourcing is also higher than that of importing only from Norway. However, we know the cost function is convex with $C'(0) < C'(S^2_{n,h})$—firms will import positive amounts of salmon from other countries as long as $\frac{\tau_{n,h}}{\tau_o} > \frac{C'(0)}{C'(S^2_{n,h})}$. This implies a higher importing quantity of salmon in the multiple outsourcing scenario, for which, according to the elastic demand, the marginal revenue should be lower. Thus, our assumption of $S^1_{n,h} \leq S^2_{n,h}$ must be wrong, and $S^1_{n,h} > S^2_{n,h}$ is proven.

As a result, we could sign all three first-order conditions as follows:

$$\frac{\partial \pi^*_2 - \pi^*_1}{\partial F_o} < 0$$ (20)

$$\frac{\partial \pi^*_2 - \pi^*_1}{\partial \tau_{n,h}} > 0$$ (21)

$$\frac{\partial \pi^*_2 - \pi^*_1}{\partial T} > 0$$ (22)

The last two conditions suggest that a prolonged political tension, a higher $T$, or a rise in tariff-equivalent trade barrier $\tau_{n,h} - \tau_{n,l}$, would increase the profit gain resulting from sourcing from another country, which provides an incentive for firms to expand their sourcing countries and engage in import diversification. In this model, the tensions between Norway and China will raise the tariff equivalent of trade barriers $\tau_{n,h}$, which last for $T$ periods. Both factors in this lasting political tension can generate enough space to allow firms to change trading strategies. In other words, whether a firm implements import diversification depends on how severely the political tension raises the cost and how long
the tension lasts. Our finding of much larger trade responses for this long-term political tension is consistent with this theoretical result.

Intuitively, the only cost of using an import diversification strategy is the additional fixed cost to establish a new trading route. Once firms pay the fixed cost, they can reduce their average cost of production by using multiple inputs. This means that even after the political tensions, firms that have paid the fixed cost to establish another trading route do not have to incur that cost again, and some of them will continue to import from these new partners. This might explain our finding of the political hedging effect via the reduction in maximum share of fresh salmon imports from any country.

Finally, note that if we do not include fixed cost in the profit function, \( \pi_2 \geq \pi_1 \) will always hold, as long as \( \tau_o \) does not exceed \( \tau_{n,h} \) too much. As a result, the Norway exporters that once dominated the market could not retain that market share once China’s importers accessed salmon from other countries. Once implemented, the import diversification strategy permanently changed the trade pattern. In the aggregate data, we see that Norwegian salmon had not restored its share in China’s fresh salmon market even two years after the bilateral relationship normalized.

7 CONCLUSION

The political tensions between Norway and China following the award of the Nobel Peace Prize to Chinese dissident Liu Xiaobo resulted in a frozen bilateral relationship and an effective Norwegian fresh salmon sanction that lasted for over six years. Taking advantage of this long-term political sanction and leveraging firm-level data from all of China’s seafood importers from 2007 to 2015, we provide evidence that fresh salmon firms adapted their imports to this political sanction at both the intensive and extensive margin. Firms that imported fresh salmon before 2010 saw a dramatic 20% decline in fresh salmon imports; and, in contrast with previous findings, this effect is persistent rather than short-lived. We also find that as firms expanded trading routes and imports from countries other than Norway, they became more precautionary and lowered the maximum share of fresh salmon imports from any country, even if not Norway. Furthermore, unlike the findings
in most consumer boycotts studies, we find that both politically influenced firms, such as China’s state-owned enterprises, and privately owned enterprises adjusted their trading behavior and diversified their trade portfolios. Our heterogeneity analysis also suggests that China’s dramatic decrease in Norwegian fresh salmon imports were driven by large import reductions in firms with large import value and those with higher seafood import share.

There are several limitations to our analysis. First, we cannot pinpoint the month of the importing trips, thus our annual data cannot uncover the dynamic and immediate responses following major events that may have further deteriorated or improved Norway-China relations. Second, our customs database contains a wealth of information on firms’ import prices and quantities; however, it does not contain many firm characteristics, such as number of employees. We augment customs data with an auxiliary firm-level database that identifies firm ownership structure through database name searches using Tianyacha, a commercial Chinese firm database. We were able to match most, but not all, firms. We also use the value of firms’ total imports as proxies for firm size. Finally, our data ends in 2015, which is before the normalization of China-Norway political relations, and we are unable to examine the persistence of these extensive- and intensive-margin effects after the six-year-long political tensions. We provide some suggestive evidence using aggregate monthly trade data that firms do not return to the pre-sanction import portfolio dominated by Norway.

Our paper has important implications in understanding the consequences of politically motivated trade policies. Our results show that the political sanctions on Norwegian fresh salmon imports led to a persistent shift in the fresh salmon market where competitors, such as the Faroe Islands, Chile, and the United Kingdom captured Norway’s market share. This transition is costly for fresh salmon importers—they experienced an average loss of 3.75 million CNY following the sanction as compared to unaffected control firms\textsuperscript{6}. The

\textsuperscript{6}For this calculation, we re-estimate equation (1) but assume all the time indicators equal to 1 if firms import goods after 2010. We use the log of import value of Norwegian fresh salmon or fresh salmon from any other source country as the dependent variable for the treatment group. We multiply the relevant coefficient
persistent loss of Norway exports and the political hedging effect revealed through the lower maximum share of imports reveal that a significant degree of the loss due to this disruption is permanent. Finally, our heterogeneity analysis shows that this sanction hurts smaller firms more due to their lack of resources to develop other trading routes.

Our paper suggests several fruitful avenues for future research. This is especially meaningful for the current world as political risks are rising globally. First, our findings of persistent trade responses to political sanctions contrast much of the previous literature, which calls for more analysis of consequential political disruptions of trade relationships, such as the ongoing U.S.-China trade war, as opposed to short-lived events like consumer boycotts. Second, due to data limitations, we cannot assess how firms’ profits were impacted due to China’s political sanction. With more detailed firm-level data, we could understand more of the mechanisms behind the behaviors of fresh salmon firms during China’s salmon sanction. Finally, it will also be worthwhile to examine how exporters from Norway to Chile coped with this significant trade disruption.

\[\text{by the average fresh salmon import value before 2010 to get the average value reduction in Norwegian fresh salmon imports and average value gain in fresh salmon import from any other source country. We calculate the average loss by subtracting the average gain in fresh salmon import from any other source country from the average value reduction in Norwegian fresh salmon imports.}\]
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Jacobsen, S. and B. Blanchard (2016). Norway, China normalize ties after No-


# TABLES

## Table 1. Summary Statistics of China’s Seafood Importers

<table>
<thead>
<tr>
<th>Category</th>
<th>Obs</th>
<th>Mean</th>
<th>S.D.</th>
<th>Median</th>
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<td>After 2010</td>
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<tr>
<td>No. of Import Source Countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before 2010</td>
<td>424</td>
<td>2.50</td>
<td>2.26</td>
<td>1</td>
</tr>
<tr>
<td>After 2010</td>
<td>295</td>
<td>2.16</td>
<td>1.78</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Import Share for Any Source Country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before 2010</td>
<td>424</td>
<td>.83</td>
<td>.22</td>
<td>1</td>
</tr>
<tr>
<td>After 2010</td>
<td>295</td>
<td>.85</td>
<td>.20</td>
<td>1</td>
</tr>
</tbody>
</table>

_Notes:_ Table 1 presents the observation, means, standard deviations and medians. The upper panel presents raw summary statistics for the sample of 66 firms importing fresh salmon before 2010. The lower panel presents raw summary statistics for the sample of 199 firms importing American shrimp, Indonesian squid, and Japanese other aquatic products. Our study period is from 2007 to 2015.
<table>
<thead>
<tr>
<th></th>
<th>(1) Import Value</th>
<th>(2) Import Quantity</th>
<th>(3) Import Value (Only Import from Norway)</th>
<th>(4) Import Value (Other Importers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years before event</td>
<td>-0.115</td>
<td>-0.128</td>
<td>-0.099</td>
<td>-0.064</td>
</tr>
<tr>
<td></td>
<td>(0.161)</td>
<td>(0.188)</td>
<td>(0.151)</td>
<td>(0.170)</td>
</tr>
<tr>
<td>2 years before event</td>
<td>-0.015</td>
<td>0.054</td>
<td>-0.040</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(0.120)</td>
<td>(0.153)</td>
<td>(0.115)</td>
<td>(0.128)</td>
</tr>
<tr>
<td>1 year before event</td>
<td>-0.063</td>
<td>-0.018</td>
<td>-0.112</td>
<td>0.054</td>
</tr>
<tr>
<td></td>
<td>(0.155)</td>
<td>(0.177)</td>
<td>(0.140)</td>
<td>(0.172)</td>
</tr>
<tr>
<td>year of event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year after event</td>
<td>-0.109</td>
<td>-0.086</td>
<td>-0.261**</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>(0.104)</td>
<td>(0.107)</td>
<td>(0.107)</td>
<td>(0.096)</td>
</tr>
<tr>
<td>2 years after event</td>
<td>-0.258**</td>
<td>-0.223*</td>
<td>-0.263**</td>
<td>-0.190</td>
</tr>
<tr>
<td></td>
<td>(0.109)</td>
<td>(0.119)</td>
<td>(0.105)</td>
<td>(0.118)</td>
</tr>
<tr>
<td>3 years after event</td>
<td>-0.329***</td>
<td>-0.274**</td>
<td>-0.317**</td>
<td>-0.254**</td>
</tr>
<tr>
<td></td>
<td>(0.117)</td>
<td>(0.122)</td>
<td>(0.125)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>4 years after event</td>
<td>-0.247**</td>
<td>-0.190</td>
<td>-0.210**</td>
<td>-0.182</td>
</tr>
<tr>
<td></td>
<td>(0.122)</td>
<td>(0.136)</td>
<td>(0.103)</td>
<td>(0.141)</td>
</tr>
<tr>
<td>5 years after event</td>
<td>-0.265**</td>
<td>-0.252*</td>
<td>-0.270**</td>
<td>-0.192</td>
</tr>
<tr>
<td></td>
<td>(0.121)</td>
<td>(0.131)</td>
<td>(0.107)</td>
<td>(0.137)</td>
</tr>
</tbody>
</table>

| Observations         | 5,496           | 5,496               | 3,602                                    | 3,822                             |
| N (Firms)            | 271             | 271                 | 236                                      | 240                               |
| Firm FE              | Yes             | Yes                 | Yes                                      | Yes                               |
| Country FE           | Yes             | Yes                 | Yes                                      | Yes                               |
| PortXYear FE         | Yes             | Yes                 | Yes                                      | Yes                               |
| Adjusted $R^2$       | .97             | .93                 | .97                                      | .97                               |

Notes: Table 2 presents our event study estimators from equations (1) three years before to five years after China’s Norwegian salmon sanction. Standard errors are clustered by firms. Regressions (1)–(4) include firm fixed effects, country and port-by-year fixed effects, except where otherwise noted. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).
Table 3. Heterogeneous Impacts of China’s 2010 Salmon Sanction

<table>
<thead>
<tr>
<th></th>
<th>(1) Seafood Imports &gt; 50% of Total Imports</th>
<th>(2) Firms Imports Above Average</th>
<th>(3) State-owned Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3 years before event</strong></td>
<td>-0.356***</td>
<td>-0.324***</td>
<td>0.121</td>
</tr>
<tr>
<td></td>
<td>(0.102)</td>
<td>(0.116)</td>
<td>(0.167)</td>
</tr>
<tr>
<td><strong>2 years before event</strong></td>
<td>-0.284***</td>
<td>-0.163</td>
<td>0.098</td>
</tr>
<tr>
<td></td>
<td>(0.084)</td>
<td>(0.106)</td>
<td>(0.134)</td>
</tr>
<tr>
<td><strong>1 year before event</strong></td>
<td>-0.176*</td>
<td>-0.175</td>
<td>0.098</td>
</tr>
<tr>
<td></td>
<td>(0.105)</td>
<td>(0.122)</td>
<td>(0.084)</td>
</tr>
<tr>
<td><strong>1 year after event</strong></td>
<td>-0.074</td>
<td>-0.063</td>
<td>-0.006</td>
</tr>
<tr>
<td></td>
<td>(0.085)</td>
<td>(0.114)</td>
<td>(0.117)</td>
</tr>
<tr>
<td><strong>2 years after event</strong></td>
<td>-0.266***</td>
<td>-0.333***</td>
<td>-0.019</td>
</tr>
<tr>
<td></td>
<td>(0.080)</td>
<td>(0.085)</td>
<td>(0.111)</td>
</tr>
<tr>
<td><strong>3 years after event</strong></td>
<td>-0.252***</td>
<td>-0.337***</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.089)</td>
<td>(0.100)</td>
<td>(0.112)</td>
</tr>
<tr>
<td><strong>4 years after event</strong></td>
<td>-0.241***</td>
<td>-0.323***</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.106)</td>
<td>(0.113)</td>
</tr>
<tr>
<td><strong>5 years after event</strong></td>
<td>-0.307***</td>
<td>-0.371***</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td>(0.087)</td>
<td>(0.098)</td>
<td>(0.112)</td>
</tr>
</tbody>
</table>

Observations 5,496 5,496 5,496  
N (Firms) 271 271 271  
Firm FE Yes Yes Yes  
Country FE Yes Yes Yes  
PortXYear FE Yes Yes Yes  
Adjusted $R^2$ .97 .97 .97

Notes: Table 3 presents our event study estimators from equation (5) three years before to five years after the Norwegian salmon sanction. Standard errors are clustered by firms. Regressions include firm fixed effects and port-by-year fixed effects, except where otherwise noted. See text for details. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).
FIGURES

Figure 1. Timeline of China-Norway Fresh Salmon Trade Disruptions (2010–2017)

Notes: Figure 1 plots the 2010–2017 monthly Norwegian fresh salmon import value and share obtained from UN Comtrade. Given UN Comtrade only provides annual data from 2013 to 2015, we evenly distribute the annual imports to each month for the 2013–2015 period.
Figure 2. Total Imports For Chinese Fresh and Frozen Salmon Importers (2007–2015)

(a) Total Value of China’s Fresh Salmon Imports

(b) Total Value of China’s Frozen Salmon Imports
Figure 3. Event Study Estimate Results of the Intensive-margin Impacts on Fresh Salmon Imports by Treated Firms

Notes: Figure 3 shows the results of event study estimates from equation (3), in which the dependent variables is import value or quantity for each firm. The dashed lines show the 95% confidence intervals. The control group is firms that imported American shrimp, Indonesian squid, and Japanese other aquatic products from 2007 to 2015. Figure 3c presents results using firms only importing fresh salmon from Norway before 2010 as treatment group. Figure 3d presents results using firms importing fresh salmon from Norway and/or other countries as treatment group.
Figure 4. Extensive-margin Impacts on Maximum Share Imported from Any Country

(a) All Treated firms

(b) Firms Only Import from Norway

(c) Firms Import from Norway and/or Other Countries
Figure 5. Extensive-margin Impacts on Fresh Salmon Import Share by Source Countries

(a) Norway

(b) Chile

(c) United Kingdom

(d) Faroe Islands
Figure 6. Extensive-margin Impacts on the Number of Trading Partners

(a) All Treated Firms

(b) Firms Only Import from Norway

(c) Firms Import from Norway and/or Other Countries
How do Firms Respond to Long-term Political Tensions?  
Evidence from China’s Food Importers

Appendices for Online Publication
Online Appendix A     ADDITIONAL EVIDENCE

Table A1. Summary Statistics, Fresh Salmon and Controls

<table>
<thead>
<tr>
<th></th>
<th>Seafood Share of All Imports</th>
<th>No. of Seafood Trading Routes</th>
<th>Transport by Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Salmon</td>
<td>.64</td>
<td>.63</td>
<td>5.3</td>
</tr>
<tr>
<td>All Control Groups</td>
<td>.7</td>
<td>.73</td>
<td>5.01</td>
</tr>
<tr>
<td>American Shrimp</td>
<td>.7</td>
<td>.7</td>
<td>5.74</td>
</tr>
<tr>
<td>Indonesia’s Squid</td>
<td>.67</td>
<td>.71</td>
<td>5.12</td>
</tr>
<tr>
<td>Japan’s Other Aquatics</td>
<td>.74</td>
<td>.76</td>
<td>5.72</td>
</tr>
</tbody>
</table>

Notes: Table A1 presents the firm characteristics value of treatment and alternative control groups in 2007 and value between 2007 and 2010.
Figure A1. Import Value Trend of Seafood Products

(a) Fresh Salmon (Treated Firms)
(b) Frozen Fishes (Control Groups)
(c) Aquatics (Control Groups)
(d) Other Alternative Aquatics (Control Groups)
Figure A2. Average Price Trends in Fresh Salmon Imports in Main Source Countries
Table B1. Extensive-margin Impacts on Maximum Share Imported from Any Country

<table>
<thead>
<tr>
<th></th>
<th>(1) All</th>
<th>(2) Firms Only Import from Norway</th>
<th>(3) Other Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years before event</td>
<td>0.043</td>
<td>0.025</td>
<td>0.054</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.037)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>2 years before event</td>
<td>0.004</td>
<td>-0.024</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.036)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>1 year before event</td>
<td>0.013</td>
<td>0.018</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.028)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>Year of event</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year after event</td>
<td>-0.139***</td>
<td>-0.094*</td>
<td>-0.179***</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.055)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>2 years after event</td>
<td>0.006</td>
<td>0.018</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.032)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>3 years after event</td>
<td>-0.141**</td>
<td>-0.222**</td>
<td>-0.096*</td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td>(0.109)</td>
<td>(0.053)</td>
</tr>
<tr>
<td>4 years after event</td>
<td>-0.157**</td>
<td>-0.156**</td>
<td>-0.164*</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.071)</td>
<td>(0.093)</td>
</tr>
<tr>
<td>5 years after event</td>
<td>-0.225***</td>
<td>-0.186**</td>
<td>-0.248***</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.084)</td>
<td>(0.076)</td>
</tr>
<tr>
<td>Observations</td>
<td>810</td>
<td>715</td>
<td>730</td>
</tr>
<tr>
<td>N (Firms)</td>
<td>175</td>
<td>155</td>
<td>153</td>
</tr>
<tr>
<td>Firm FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.4</td>
<td>.4</td>
<td>.39</td>
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</tbody>
</table>

Notes: Table B1 presents our event study estimators from equations (2) three years before to five years after China’s Norwegian salmon sanction. Standard errors are clustered by firms. Regressions (1)–(3) include firm fixed effects and year fixed effects, except where otherwise noted. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (**).
Table B2. Extensive-margin Impacts on the Number of Trading Partners

<table>
<thead>
<tr>
<th></th>
<th>(1) All</th>
<th>(2) Firms Only Import from Norway</th>
<th>(3) Other Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years before event</td>
<td>-1.169***</td>
<td>-0.954***</td>
<td>-1.297**</td>
</tr>
<tr>
<td></td>
<td>(0.400)</td>
<td>(0.346)</td>
<td>(0.538)</td>
</tr>
<tr>
<td>2 years before event</td>
<td>-0.256</td>
<td>-0.007</td>
<td>-0.411</td>
</tr>
<tr>
<td></td>
<td>(0.344)</td>
<td>(0.328)</td>
<td>(0.430)</td>
</tr>
<tr>
<td>1 year before event</td>
<td>-0.453</td>
<td>-0.460*</td>
<td>-0.413</td>
</tr>
<tr>
<td></td>
<td>(0.280)</td>
<td>(0.240)</td>
<td>(0.390)</td>
</tr>
<tr>
<td>year of event</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year after event</td>
<td>0.732**</td>
<td>0.478*</td>
<td>0.942**</td>
</tr>
<tr>
<td></td>
<td>(0.282)</td>
<td>(0.270)</td>
<td>(0.410)</td>
</tr>
<tr>
<td>2 years after event</td>
<td>0.375</td>
<td>0.579</td>
<td>0.346</td>
</tr>
<tr>
<td></td>
<td>(0.389)</td>
<td>(0.720)</td>
<td>(0.437)</td>
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<tr>
<td>3 years after event</td>
<td>0.947**</td>
<td>0.997</td>
<td>0.940**</td>
</tr>
<tr>
<td></td>
<td>(0.367)</td>
<td>(0.668)</td>
<td>(0.370)</td>
</tr>
<tr>
<td>4 years after event</td>
<td>0.965**</td>
<td>1.372**</td>
<td>0.769*</td>
</tr>
<tr>
<td></td>
<td>(0.407)</td>
<td>(0.674)</td>
<td>(0.435)</td>
</tr>
<tr>
<td>5 years after event</td>
<td>1.123*</td>
<td>0.755</td>
<td>1.316</td>
</tr>
<tr>
<td></td>
<td>(0.638)</td>
<td>(0.605)</td>
<td>(0.810)</td>
</tr>
<tr>
<td>Observations</td>
<td>810</td>
<td>715</td>
<td>730</td>
</tr>
<tr>
<td>N (Firms)</td>
<td>175</td>
<td>155</td>
<td>153</td>
</tr>
<tr>
<td>Firm FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.48</td>
<td>.48</td>
<td>.48</td>
</tr>
</tbody>
</table>

Notes: Table B2 presents our event study estimators from equations (4) three years before to five years after China’s Norwegian salmon sanction. Standard errors are clustered by firms. Regressions (1)–(3) include firm fixed effects and year fixed effects, except where otherwise noted. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (**).
Figure B1. Placebo Tests of the Sanction’s Impacts

(a) Treatment: American Frozen Cod

(b) Treatment: Norwegian Frozen Cod