Disasters, Social Commitment, and Supply Chain Dynamics

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Abstract

This study examines whether customers' social commitment helps sustain transactional relationships after disasters, promoting economic recovery. Utilizing the 2011 Japanese earthquake as an exogenous shock and container-level import data, we find that customers with low social commitment cut 24% of suppliers and reduced 30% of containers from Japan after the disaster compared to high-commitment customers. The effects are robust to other two major disasters in 2010s. Low-commitment customers also decreased imports from other high earthquake-risk countries by 10%, while imports from low-risk countries increased by 13%. High social commitment customers stayed with Japanese suppliers despite a 1.8 percentage point lower return on assets and 5.5 percentage point lower asset turnover, suggesting a lack of operational flexibility. The effects are concentrated in severely impacted regions and product categories. The findings provide insights into how corporate social responsibility shapes production networks and firm resilience to disasters.

Keywords: Disaster; Corporate social responsibility; Firm resilience; Supply chain; Switching cost
JEL classification: G32; L14; M14

1. Introduction

Disasters not only destroy lives and properties but also destroy the transactional relationships of focal firms (Carvalho et al. 2021). Due to switching costs, the loss of transactional relationships could be permanent and potentially hurt the long-term recovery of affected areas (Acemoglu and Tahbaz-Salehi 2024). That is why disaster-intensive regions generally stay poor, affecting a non-trivial population (Carleton and Hsiang 2016; Oh and Oetzel 2022). Therefore, it is meaningful to understand how to sustain the transactional relationships under disruption shock to facilitate economic recovery and protect the welfare of the vulnerable community.

Unfortunately, it is economically irrational to force customers to stay with disrupted suppliers at the cost of sacrificing their production and operation - unless the switching cost is even higher. Usual switching costs, such as relationship-specific investment or common ownership (Arrow 1975; Klemperer 1995), may be too special or costly for most suppliers to adopt to build disaster resilience. However, a less documented "quasi-switching cost," social commitment, may have universal applicability and play an important role.

In this study, we examine whether customer's social commitment indeed sustains their transactional relationship with the disaster-affected regions and estimate its impact on the resilience of both suppliers and customers. Utilizing the exogenous shock of the most severe disasters in the 2010s - 2011 Japanese Earthquake - and container-level import data, we find that firms with low social commitment are more likely to reduce imports from Japan after the earthquake, namely, 24% suppliers and 30% containers. Similar effects can be found in two other significant disasters in the 2010s – the 2013 Typhoon Haiyan in the Philippines and the 2018 Sulawesi Earthquake in Indonesia.

In response to the earthquake shock, low social commitment customers reduced imports from Japan by 30% and imports from other countries with high earthquake risks by 10% after 2011. We also find that these customers increase their imports by 13% from countries with low earthquake risks and countries with industrial capabilities similar to Japan, i.e., Germany and China.

High social commitment firms stay with Japanese suppliers while suffering financial costs leading to lower accounting performance. We find that after 2011, high social commitment customers, on average, have a 1.8 percentage point lower return on assets (ROA) and 5.5 percentage points lower asset turnover compared with the ratios of low social commitment peers. We do not find statistically different gross margins between high and low social commitment firms. These findings suggest that firms with low social commitment benefit mainly from increased sales rather than higher profitability by switching their suppliers. It strengthens our argument that low-commitment customers are likelier to switch suppliers because switching suppliers help restore production more quickly but should have no benefit in increasing customers' bargaining power against suppliers.

Further tests on transitory shock confirm that low-commitment customers had 4.4 percent higher sales growth than their high-commitment peers in 2011 but no significant difference in the following years. We also tested transitory shock on trade credit and non-operational expenses (partially capturing corporate donation) and found no significant differences between high and low social commitment customers. This indicates that the cost source is more likely due to social commitment's constraint on switching customers to restore operation.

We provide comprehensive supporting evidence to strengthen the causality of our main findings. First, concerns about social commitment measurement doubt that the social score captures a mix of factors. For example, generally, large and profitable firms have higher CSR scores (Awaysheh et al. 2020). Then, the effect we found may be caused by how large and small firms respond to disasters. However, our main findings are robust to various measurements of a firm's social commitment, including specific measures such as commitment to engage with stakeholders and focus on reputation with suppliers, as well as summarized measures such as overall score on firms' commitment to the community surrounding it, and overall score on the social aspect. Moreover, we matched our sample firms to let the in-sample high- and low-social commitment

customers be drawn from the same distribution regarding all control variables, and the findings are robust.

Second, a challenge to our interpretation of the results is that the breakup of transactional relationships may not start with customers. When disasters limit suppliers' capacity, they often prioritize large customers. This can lead smaller customers to look for alternatives. We show that even after matching high and low social commitment customers by size, the effects remain significant. All firms in our sample are large customers, as the Thomson Reuters ESG database only includes large US-listed firms. Moreover, since suppliers are unlikely to decide supply priorities based on a customer's ownership structure, we conduct cross-sectional analysis and find that low social commitment customers leaving Japanese suppliers is only significant among firms with high transient ownership. However, this is not the case for firms with lower transient ownership. All these three pieces of evidence support our argument that these customers initiate the breakup.

Third, there is concern that the effects are caused by high- and low-social commitment customers' different trends of demands instead of different responses to earthquakes. One possibility is that since Japan is a developed country, suppliers generally comply with CSR standards more. Therefore, it is natural for customers with high social commitment to choose Japanese suppliers. Another possibility is that in the 2010s, there was a growing awareness of CSR, so high social commitment customers have stronger product market demand and transmit that demand to their suppliers. Both possibilities can lead to the effects we find. However, we confirm that the effect size correlates with the earthquake's severity. The effects are larger in severely destroyed prefectures than in other Japanese prefectures. Moreover, by more explicitly identifying the category of goods imported, we find low social commitment customers only increase non-earthquake countries' imports for goods imported from Japan pre-earthquake ("treated category"). In contrast, the import source of non-treated category goods does not change significantly. Both evidence support the idea that earthquakes cause the effect.

This study contributes to the literature on corporate social responsibility along several dimensions. First, we provide novel evidence on how corporate social responsibility shapes production networks. Previous research in accounting, finance and economics focuses on documenting how socially responsible customers actively choose suppliers on their CSR performance (Guo, Lee, and Swinney 2016; Kalkanci and Plambeck 2020; Dai, Liang, and Ng 2021; She 2022; Bisetti, She, and Zaldokas 2023) and the consequences of such supply chain requirements (Guedhami et al. 2022; Distelhorst and Shin 2023; Baik et al. 2024). In contrast, our study finds that socially responsible customers are passively bound by their commitments when choosing suppliers, potentially hurting their operational flexibility and financial performance. Social commitment works as a switching cost under adverse shock. Our findings suggest an unintended consequence of social commitment in some events, and such unintended consequence has not been documented in prior literature. Indeed, such a cost makes social commitment a more valuable and respectable promise.

Second, our paper adds to the understanding of corporate social responsibility and its impact on inequality. Existing literature has documented active efforts such as impact investing (Boulongne, Durand, and Flammer 2024), social movement (Luo and Zhang 2022), and technology adoption (Bao, Huang, and Lin 2024) can help disadvantage groups. Our paper shows that socially committed customers tend to stay with disrupted suppliers in vulnerable regions, even at a cost from product market. This behavior represents a more passive form of engagement and shows that passive engagement such as promise or commitment can also help reduce inequality.

Our paper also speaks to the literature on how firms learn and adapt to crises. Previous literature shows after crises, firms reduce capital investment (Andersen et al. 2012; Flammer and Ioannou 2021), increase borrowing (Brown, Gustafson, and Ivanov 2021), shift to safer financial assets (Ge and Weisbach 2021), and learn knowledge of disaster preparation (Oetzel and Oh 2021). Our study shows that customers shift their supply chain in response to disasters, and the effects are determined by social commitment level: low-commitment customers not only leave the disaster country but

also countries with similar risk, while high-commitment customers increase support for the hit region. We novelly document that socially responsible customers increase suppliers' resilience but may weaken their own resilience by maintaining their promises.

The rest of the paper is organized as follows. Section 2 introduces the institutional background. Section 3 describes the research design. Section 4, 5 and 6 present the empirical findings on supply chain resilience, spillover effects and operating efficiency, respectively. Section 7 shows the robustness checks and section 8 concludes the paper.

2. Institutional Background

2.1. Disasters

In this paper, we leverage the fact that disasters induce exogenous shocks on the supply chain to study how U.S. customers' social commitment impacts their supply chain decisions. Inspiring by previous research (Carvalho et al. 2021), we mainly study the effects under the scenario of the 2011 Japanese Earthquake for two reasons.

First, why do we study international trade? Previous studies have used Compustat Segment data to study supply chain disruption caused by natural disasters within the United States (Barrot and Sauvagnat 2016). Such data only covers a firm's major trading partners and has many missing in the transaction volume. There is also no information on the exact products supplied. We rely on Panjiva data, which records the number of containers imported from each specific supplier with information on particular goods imported, regardless of their size, and thus provide more comprehensive coverage. Including small suppliers in the study is meaningful since they are more vulnerable. Moreover, studying the disruption of international input-output linkages raises fewer concerns about confounding effects than studying the domestic ones.

Second, among many foreign disasters, why do we focus on Japanese shock? This is because Japanese firms are frequent trading partners of U.S. firms, which means there is a sufficient number of suppliers and import records with large variations to observe. This unique advantage gives us higher statistical power in estimating the effects. Many

severe disasters in less developed countries like Haiti, Pakistan, Iran, and Nepal do not have import/export data to make statistical inferences.[1] However, this does not mean that Japan's case is special and has no implications for other places. If high social commitment customers indeed help vulnerable suppliers, then the governments of those less developed countries can treat those customers well to help build economic resilience towards disaster.

To have external validity, we also show that two other severe disasters in trade-frequent countries – the 2015 Typhoon Haiyan in the Philippines and the 2018 Sulawesi Earthquake in Indonesia – have qualitative and quantitatively similar results to the Japanese earthquake. However, the statistical powers are weaker due to the smaller sample size and fewer variations. We introduce the three disasters in the following subsections.

2.2. The 2011 Japanese Earthquake

On March 11th, 2011, a magnitude 9.0 earthquake, the largest in Japan's history and the fifth largest in the world since 1900, struck the northeast Pacific coast of Japan, known as the Great East Japan Earthquake (hereafter referred to as the earthquake). The earthquake had three major impacts on northeastern Japan: (1) the main shock and aftershocks, which directly caused most of the subsequent material damage; (2) the resulting tsunami, which submerged 561 square kilometers of the northeast coastline; and (3) the meltdown of the Fukushima Daiichi nuclear power plant, which forced 99,000 residents to evacuate in Fukushima Prefecture. 404,934 buildings across 22 prefectures either fully or partially collapsed (Fire and Disaster Management Agency 2019). Despite international humanitarian assistance, Japan's recovery took a significant amount of time.[2] According to Carvalho et al. (2021), Japan's industrial production did not fully recover to pre-earthquake levels until 12 months later.

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[1] See: Wikipedia – Lists of 21st Century Earthquakes

[2] By September 15, 2011, Japan had received aid from 163 countries and regions, as well as 43 international organizations. The total amount of donations to the affected areas reached ¥520 billion, and the number of people involved in the disaster recovery efforts reached 930,000 by March 2012. The

The Japan earthquake and its aftermath severely disrupted global supply chains (Todo, Nakajima, and Matous 2015; Hendricks, Jacobs, and Singhal 2020; Carvalho et al. 2021). As the world's third largest economy, Japan is an important supplier of parts and equipment for major industries such as computers, electronics, and automobiles (Lohr 2011). Being one of the most vital international trading distribution centers, all of Japan's ports were briefly shut down after the earthquake, causing significant disruptions. Additionally, due to the shutdown of several nuclear plants in northeastern Japan, including the notable Fukushima Daiichi, and conventional power plants, rolling blackouts were implemented throughout March 2011. In the summer of the same year, an energy conservation ordinance was imposed, requiring customers in the Kanto and Tohoku regions to reduce electricity consumption by 15%. Lastly, the transport network in Japan also faced severe damages, with many sections of the Tōhoku Expressway remaining closed to the general public until March 24, 2011.

The business media described the Great Japan earthquake as the worst supply chain disruption on record and a catastrophic 'black swan' event for global supply chains. More than 6,000 factories incorporated in six primarily impacted prefectures were affected, with about 75 percent of them reporting damages (Todo, Nakajima, and Matous 2015). Wu (2024) finds firms with higher ex ante supply chain risk exposure have worse operating and financial performance. Key industries such as the automotive, electronics, and semiconductor industries were disrupted. The disruption of the Japan earthquake on the international supply chain has been the subject of much academic research. Cavallo, Cavallo, and Rigobon (2014) find that product availability of supermarkets in Japan fell 17 per cent in 18 days after the earthquake, with a great amount of goods remained out of stock for about 6 months. Carvalho et al. (2021) document that the damage caused by the disaster propagated to both upstream and downstream supply chains, affecting the direct and indirect suppliers and customers of the disaster-stricken firms. The average market reaction is significantly negative for

source of statistics is: "Recovery from Great East Japan Earthquake – Ministry of Foreign Affairs of Japan". Ministry of Foreign Affairs of Japan. Retrieved April 13, 2016

companies that are not directly affected by the Japanese earthquake but have Japanese suppliers during the earthquake (Hendricks, Jacobs, and Singhal 2020).

3. Research Design

3.1. Data and Sample

We begin our sample construction by examining the S&P Global Panjiva supply chain database. This database includes detailed information on the near-universe of U.S. firms' import volumes, measured by the number of containers, since 2007. It is worth mentioning that the import data covered by Panjiva are not limited to maritime transport; they also include the import of goods by land and air (but do not include the import of services). Panjiva provides a link between the Panjiva company ID and the Capital IQ company ID, which helps us filter out publicly listed firms and gather data from other databases. We identified 4,106 U.S.-listed firms with import records in Panjiva. Among them, 944 have imported from Japan between 2007 and 2021.

Next, we match each firm's corporate social scores from the Refinitiv ESG database (formerly known as ASSET4). We used the most updated rating available before the earthquake to assess the overall level of corporate social commitment. After merging with the Refinitiv ESG data, only 364 firms remained. This reduction is because, in the late 2000s, ESG ratings were not as prevalent as they were in the 2020s, and only large firms were covered by the rating agencies.

We then merge quarterly financial data from Compustat. We exclude observations from the finance and utilities sectors since they do not have regular demands for importing goods, leaving 304 firms in our sample. To ensure that our sample firms were exposed to the supply chain disruption shock during the 2011 earthquake, we required firms to have import records from Japan in 2010.

The sample period for our analysis extends from the first quarter of 2008 to the last quarter of 2015, encompassing three years before and five years after the earthquake. We do not include 2007 in our sample due to the incomplete coverage of Panjiva data in its inaugural year. For firms without import records in a specific quarter,

we fill the import intensity with zero if this is a quarter after the firm's first appearance in the Panjiva database.

Our final sample comprises 5,378 firm-quarter observations and includes 182 U.S.-listed firms with Japanese suppliers in 2010. The sample is primarily constrained by the availability of social scores in early 2010. On average, each firm imports 167 containers from 18 suppliers worldwide each quarter. Among them, around 1 supplier and 6 containers are from Japan.

3.2. Research Methodology

We proceed to estimate the following Poisson regression model using firm-quarter level panel data to avoid biased estimates of the treatment effect:

$$Y_{i,t} = \alpha + \beta_1 LowSocial_i \times Post_t + \gamma X_{i,t} + \delta_i + \delta_{j,t} + \varepsilon_{i,t} \qquad (1)$$

Where i, t, and j index firm, quarter, and industry, respectively. The main dependent variables are the total number of containers imported from Japan (*Num. JP Containers*) and the total number of Japanese suppliers the firm traded with (*Num. JP Suppliers*) in a quarter. We adopt the Poisson model to fit the count data.

The variable *Post* is assigned a value of one if the start of the quarter is behind the earthquake (March 11, 2011) and zero otherwise. *Low Social* is assigned a value of one if the firm has below-median social rating scores before the earthquake and zero otherwise.

We control the firm's worldwide import intensity in the same quarter (*Total Containers* and *Total Suppliers*) to capture the firm's overall reliance on international trade. Additionally, we include the following factors to control for firm-level characteristics related to trading activities: firm size (*Size*), measured as the natural logarithm of total assets; cash ratio (*Cash*), calculated as cash and short-term investments scaled by total assets; financial leverage (*Leverage*); sales growth ratio in one quarter (*Sales Growth*); *ROA*, which represents total income before extraordinary items divided by total assets; and market-to-book ratio (*MTB*).

Furthermore, we incorporate firm fixed effects δ_i and industry-by-quarter fixed effects $\delta_{j,t}$ (at two-digit SIC code level) in the regression to account for variations in importing activities resulting from time-invariant firm factors and time-varying industry factors, respectively. All continuous variables have been winsorized at the 1 percent level to mitigate the influence of outliers. Table 1 provides the summary statistics of the panel data analysis.

4. Supply Chain Resilience

4.1. Main Results

In this section, we analyze whether there is a direct correlation between corporate social commitment and import switching. We present a time-series trend of import switching based on social commitment level. Figure 1 illustrates the dynamic effect of imports from Japan. Panel A demonstrates that after March 2011, customers with high social commitment, on average, significantly increased their number of Japanese suppliers compared to those with low social commitment. Panel B shows customers with low social commitment significantly dropped the share of containers imported from Japan after the earthquake. In contrast, customers with high social commitment maintained a stable share of imports from Japan. These univariate time-series differences suggest that corporate social commitment may influence supply chain decisions after a disaster-led disruption.

We then conduct a difference-in-differences analysis with equation 1. Table 2 presents the relationships between customers' social commitment and import switching. In columns 1 and 2, the dependent variable is the total number of Japanese suppliers a firm has each quarter. In columns 3 and 4, the dependent variable is the total number of containers imported from Japanese prefectures each quarter. The *Post * Low Social* coefficient is significantly negative at the 1% level in all columns. The economic meaning is that ceteris paribus, low social commitment customers, compared to their high commitment peers, decreased their Japanese suppliers and containers imported

from Japan by 24% and 30% more during the post-earthquake period.[3] These results confirm that foreign customers with fewer social commitments are more inclined to abandon Japanese suppliers after the earthquake than their high social commitment counterparts.

Firms with high and low social commitment may have different import preferences, so they may not be comparable. We verify the parallel trend assumption by analyzing the dynamic effects. Table 3 presents the results, with columns 1 to 4 representing the same model specification as in Table 2. Using year 2010 as the benchmark (the year before the earthquake), the results show that there are no differences in Japanese import intensity between high and low social commitment customers. The differences in import decreases have only been significant since the earthquake year. Therefore, no evidence supports the claim that our research design violates the parallel trend assumption. According to the multivariate analysis (columns 2 and 4), the decreases in Japanese import intensity were most concentrated in 2011, and the effects diminished over time.

Another concern is that high- and low-social commitment firms are not comparable, regardless of whether the design satisfies the parallel trend assumption. We also acknowledge that high- and low-social commitment firms are indeed different, as tabulated in Table 4 Panel A. High-social firms are larger, have higher leverage, and have slower sales growth, consistent with the existing literature (Awaysheh et al. 2020). The differences between these traits may lead to a different response toward supply chain disruption and cause the effects we find. We adopt the propensity score matching (PSM) approach to rule out such a possibility. We match our sample firms on a one-to-one basis to let the in-sample high- and low-social commitment customers be drawn from the same distribution regarding all control variables. The matched sample, including 51 firms in each group, is balanced in all firm-level characteristics, as shown

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[3] The translation between Poisson regression coefficients and economic magnitude is, for example: $e^{-0.273} - 1 = -24\%$ (Table 1 column 2).

in Table 4 Panel A. Using a matched sample to perform the same regression specification as Table 2, our findings remain robust, as shown in Table 4 Panel B.

4.2. Social Commitment

The baseline research aims to evaluate the impact of corporate social commitment on supply chain relationships, particularly in the context of crisis response. However, the study faces a significant challenge concerning the accuracy of the social commitment metrics used. Our ex-ante social commitment measure encompasses broad metrics of corporate social performances and may capture some information irrelevant to supply chain commitments.

To mitigate this issue and enhance the precision of the analysis, we construct alternative metrics that more closely align with the essence of supply chain commitments. These alternative metrics are derived from the Refinitiv Environmental, Social, and Governance (ESG) database, which provides a set of three distinct social performance measures: (1) *Stakeholder Engagement*: This binary metric assigns a value of one to firms that have established policies aimed at safeguarding the interests of their stakeholders, and a value of zero to those without such policies; (2) *Community Reputation with Suppliers/Contractors*: This measure evaluates whether a company has implemented policies that demonstrate a concern for its reputation among supply chain stakeholders; and (3) *Community Score*: This score reflects the extent to which a firm is actively involved in the welfare of the communities it operates within. According to Christensen, Serafeim, and Sikochi (2022), input metrics (policies) are less disagreed among rating agencies, therefore the alternative social commitment measurement should not be largely biased. The findings, as detailed in Table 5 of the research, reveal that these alternative measures yield consistent outcomes. Specifically, the results corroborate the findings presented in Table 2, which indicated that foreign customers with a lower degree of social commitment tended to reduce their reliance on Japanese suppliers and the volume of containers imported following the earthquake disaster.

The consistency across all measures—both the main and alternative ones—suggests that the potential measurement error associated with the social commitment variable does not pose a significant risk to the integrity of the research conclusions. The results are both qualitatively and quantitatively in agreement, even when the main measure is not tabulated. This robustness check lends credibility to the study's assertion that the measurement error concerning social commitment is unlikely to undermine the validity of the observed findings. The research thus provides a reliable analysis of how corporate social commitment influences supply chain dynamics in the aftermath of a crisis.

4.3. Earthquake Severity

One major concern that may weaken the causal interpretation of our findings is that the effects are driven by some factors unrelated to the earthquake. For example, Japan is a developed country, so suppliers may generally comply with CSR standards more. Based on the findings of existing literature (Dai, Liang, and Ng 2021; Bisetti, She, and Zaldokas 2023), socially responsible customers choose socially responsible suppliers, which leads to a difference in the intensity of Japanese imports between high-social customers.

Another alternative explanation is that socially responsible customers benefit from the growing awareness of corporate social responsibility in product markets in the 2010s; therefore, they have stronger demand than low social commitment firms. Such strong demand translates into high demand for all of their suppliers, thus resulting in a larger number of suppliers and containers.

These two alternative explanations are easily falsified. First, the dynamic effects (Table 3, columns 2 and 4) show that the effect has no difference before 2011, is concentrated in 2011, and diminishes after 2011. Both explanations are inconsistent with this dynamic, which should have persistent or increasing differences instead of decreasing differences. Second, we show in the robustness test that the import intensity is higher for high social commitment customers, and the import share from Japan is

higher, rejecting the explanation that the overall demand increase of high social commitment firms causes the effect.

To further validate that the effect is caused by earthquake instead of other factors, we specifically test whether the effect is stronger if the supplier is in more severely destroyed prefectures, exploiting the geolocation variations in supplier location and earthquake impact, following Carvalho et al. (2021), who find the effects of the disaster through the Japanese supply chains diminished in intensity for indirect suppliers and customers that were distant from the epicenter of the shock. Therefore, if foreign customers switch imports from Japan due to the earthquake, such an effect should be more pronounced for importing from prefectures where the damage is more severe.

To obtain the cross-sectional variations of upstream seismic intensity, we refer to the seismic intensity scale of the Japan Meteorological Observatory, which classifies the intensity of Japan's prefectures into seven levels. We recognize prefectures of level 6-, level 6+, and level 7 as severe prefectures.[4] According to the observation of JMA, prefectures level 5 and below are located in the central and west of Honshu Island, which is distant from the epicenter.

In Table 6, Panel A, we present the subgroup regression results. The dependent variable is the import intensity from non-severely affected prefectures in columns 1 and 3 and severely destroyed prefectures in columns 2 and 4. *Post * Low Social* coefficients are -0.261 and -0.295 for the non-severe prefecture import and -0.736 and -1.155 for the severe prefecture import. Translating into economic magnitude, low social commitment customers reduce 25% more containers from non-severe prefectures than high social commitment counterparts, while such effect is 68% for severe prefectures.

We acknowledge that the coefficient estimates for severe prefectures (columns 2 and 4) are not statistically significant due to the limited sample size. To test whether the coefficients of two subgroups are statistically different, we adopt a bootstrapping approach. Specifically, 500 bootstrap samples were drawn from the full sample. In

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[4] Prefectures with intensity 6 and 7: Miyagi, Fukushima, Ibaraki, Tochigi Iwate, Gunma, Saitama, Chiba (source: https://www.data.jma.go.jp/svd/eqdb/data/shindo/index.html#20110311144618)

Panel B and Panel C of Table 6, we present the kernel density estimates, which provide a visual representation of the distribution of the mean and standard deviation of 500 bootstrap coefficients. The vertical dashed line represents the original point estimate. Panel B reports the coefficients of the Japanese supplier amount regression model and panel C reports container amount regression model. Both figures demonstrate that the absolute value of the coefficient is statistically significantly larger for the severe prefecture group.

This evidence supports a causal interpretation between the earthquake disruption and supply adjustments and highlights that suppliers in the most vulnerable areas are also at the highest risk of being abandoned. The actual harm should be greater than our estimate of country-wise average effects.

4.4 Transient Ownership

One challenge to our interpretation of empirical results is that the breakup of transactional relationships may not start with customers. When disasters limit suppliers' capacity, they often prioritize large customers. These large customers usually have better social responsibility performance. As a result, smaller customers may need to find other sources of supplies.

First, we show that even after matching high and low social commitment customers by size and other traits, the treatment effects remain statistically significant. This is discussed in Section 4.1 and Table 4. Second, while our sample includes firms of varying sizes and supply chain power, all are considered large customers from the suppliers' viewpoint. This is because the Thomson Reuters ESG database only covers large US-listed firms from the early 2010s. These points suggest that the breakup of relationships is not initiated by disrupted suppliers.

Next, we design a cross-sectional test to explore the driven factor of supply chain decisions further. Institutional investors act as important monitors of corporate actions through the power of large ownership and large voting blocks. Transient institutional investors focus more on short-term financial performance (Bushee 1998, 2001).

Transient investors are characterized by high portfolio turnover and extensive diversification, which reflect their short-term investment focus, driven by the potential for immediate returns rather than long-term capital growth or dividend income. Higher transient ownership can exacerbate management myopic behaviors as responses to transient ownership preference (Bushee 1998; Matsumoto 2002). Therefore, firms with higher transient institutional ownership may find it harder to withhold relationship with risky and disrupted suppliers.

It is unlikely that suppliers prioritize their supply based on the customer's ownership structure. Therefore, if we find that customers with different transient ownership have varying treatment effects, it will support our argument that suppliers do not initiate changes in supply chain relationships.

We conduct a subsample analysis using transient ownership data from Bushee's website.[5] Bushee (1998) use factor analysis and cluster analysis to classify institutional investors into groups based on their past portfolio diversification, portfolio turnover, and trading sensitivity to current earnings. Transient institutional investors have the highest turnover, highest use of momentum strategies and relatively higher diversification. The firm level data of institutional ownership are acquired from Refinitiv 13F database. We merge the 13F data with institutional classifications of Bushee (1998) and calculate the percentage of transient ownership d by total shares held by institutional investors at the end of each fiscal year. Then we divide the sample into two groups by sample median of the percentage transient ownership.

The results are shown in Table 7. As predicted, the impact of low social commitment customers abandoning Japanese suppliers is prominent among firms with high transient ownership. This is seen in columns 1 and 3. However, this effect is statistically insignificant for firms with lower transient ownership, shown in columns 2 and 4. This result supports our argument that low social commitment customers initiate

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5 The data of institutional investor classifications are available via Professor Brian Bushee's website: https://accounting-faculty.wharton.upenn.edu/bushee/

the breakup of transactional relationships with disrupted suppliers, not the other way around.

4.5. External Validity

The last challenge to our research design is that our finding only applies to the 2011 Japan Earthquake and has no general implications. To show the external validity of our findings, we further extend our research design to other major disasters to show that our findings are not isolated incidents. A suitable shock for our research design should have an observable impact on disrupting the supply chain and should have sufficient trade records with U.S.-listed firms in the Panjiva database. To avoid cherry-picking the disasters, we refer to the deadliest earthquakes and typhoons in the 2010s.[6] We iterate our test on the deadliest disasters that satisfy the data requirement in the 2010s, i.e., 2013 Typhoon Haiyan (the deadliest typhoon in 2010s) and the 2018 Sulawesi Earthquake (the fourth deadliest earthquake in 2010s). We do not include other severe disasters because the first and third deadliest earthquakes are the 2010 Haiti earthquake and the 2015 Nepal earthquake, which has too few trade records with U.S.-listed firms. The second deadliest earthquake in the 2010s was the 2011 Japan Earthquake, which we have already tested.

Typhoon Haiyan devastated large portions of the Philippines on November 6, 2013. It was the most powerful tropical cyclone that has struck the Philippines ever recorded. With maximum sustained winds at landfall measuring 195 miles (314 km) per hour, Haiyan was among the most intense tropical cyclones to land. The devastation was colossal, affecting over 14 million people, damaging or destroying 1.1 million houses, and pushing approximately 2.3 million people into poverty.[7] We construct the sample in the same way as our main sample, covering the period from December 2008 to September 2018, i.e., five calendar years ahead and five calendar years after.

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[6] Refer to: Deadliest typhoon from Wikipedia and Deadliest earthquake from Wikipedia. We look at the disasters in 2010s because our Panjiva database coverage is from 2007 to 2021.

[7] See: Typhoon Haiyan: Facts, FAQs, and how to help

Sulawesi Earthquake struck Central Sulawesi of Indonesia on September 28, 2018, and caused the largest major soil liquefaction. This magnitude 7.5 earthquake caused significant destruction across the region, including a phenomenon known as soil liquefaction, which turned the ground into a fluid-like state, leading to massive mudflows. The earthquake and subsequent tsunami resulted in the deaths of an estimated 4,340 people, making it the deadliest earthquake in the country since 2006. The tsunami waves, reaching up to 10.7 meters in height, caused widespread damage, particularly in Palu and Donggala. The disaster affected an estimated 2.4 million people, highlighting the vulnerability of coastal communities to seismic events (Lum and Margesson 2014). We construct the sample from September 2013 to June 2021, i.e., five calendar years before and three calendar years after (our Panjiva database coverage ends in 2021).

The results are shown in Table 8 Panel A. Using alternative shocks of supply chain disruption, we find qualitatively and quantitatively similar estimations to our findings on the Japan earthquake. Although the coefficient estimates for the effects on the extensive margin (number of suppliers) are not statistically significant, the coefficients are all negative with t-stats smaller than -1. It is also intuitive that adjusting the intensity of supply (number of containers) is easier than adjusting the supplier list. The relationship between social commitments and supply chain adjustment can be extended to other natural disaster shocks.

In Table 8 Panel B, we also show that the results are robust using stacked difference-in-differences design. We stacked the sample of all three disasters together and estimate average treatment effects on supply from disrupted countries. Parallel trend assumptions are satisfied as shown in columns 2 and 4. All results are qualitatively and quantitatively similar to our baseline results in Table 2 and 3.

5. Spillover Effects
5.1. Aggregate Spillover

Having established the finding that low social commitment customers abandon vulnerable suppliers, a natural follow-up question is where the supplies go. Some anecdotal evidence shows there is indeed some relocation of supply from Japan to Singapore or Germany.[8] If the earthquake indeed causes the relocation, it is conjectured that customers are becoming more aware of the earthquake risks on supply chain disruption. Then, customers should generally reduce the supply from countries with high earthquake risk and increase the supply from countries with low earthquake risk.

We identify high earthquake-risk countries from the Global Seismic Risk Map (Silva et al. 2023). Regions with more than half of the area under risky areas are marked as *Earthquake Countries*. These are mostly regions located in the fracture zone, including Japan, Indonesia, Philippines, Mexico, Chile, Pakistan, Turkey, Iran, Myanmar, Bangladesh, and Sri Lanka, as well as other countries without sizable import records. We exclude Japan from the construction since we are examining the spillover effect. All other countries are classified as *Non-earthquake Countries*.

As shown in Table 9 Panel A, we find that for those customers with imports from *Earthquake Countries* before the Japanese earthquake, low social commitment customers have more decrease in both the number of suppliers (-6.2%, t=-1.68) and containers (-9%, t=-1.39) than high social commitment counterparts after the Japan earthquake. The coefficients are only marginally significant statistically. For *Non-earthquake Countries*, low social commitment customers have an increase in suppliers (9.5%, t=4.77) and containers (13.4%, t=4.02) higher than high social commitment customers. These results indicate that there are stronger relocation effects for low social commitment customers, reducing supplies from Japan and other earthquake countries and increasing supplies from non-earthquake countries. The empirical findings are consistent with our conjecture that, after the Japan earthquake, customers became more aware of earthquake risk when making supply chain decisions. They also support our main finding that low social commitment customers have higher treatment effects.

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[8] See: "More Japanese Firms Relocating to Singapore" (https://bit.ly/3MYTaIF).

Another intuition on supply relocation is that the new suppliers should have a similar supply as what was previously provided by Japanese suppliers. We perform tests on changes in imports from China and Germany. China is the largest economy in East Asia and the fourth largest export country in the world in 2011. It provides a large variety of manufacturing goods. Germany and Japan are recognized for their high-tech industries, with leading exports in cars and electronic devices from Japan and machinery from Germany. Besides, the majority of landscapes of both countries are distant from earthquake zones. Therefore, China and Germany should highly represent alternative import sources U.S. customers could switch to. As shown in Table 9 Panel B, we empirically find that low social commitment customers increased imports from Germany and China significantly after the Japan earthquake compared to high social commitment peers. The increase is especially pronounced for China as the number of suppliers traded significantly increased after the earthquake. Given the competitiveness of the manufacturing industries of these two countries, the switch could probably be permanent.

5.2. Category-level Spillover

In the prior analysis, we measure import changes at the aggregated supplier firm level and container level. This cannot rule out that there are some factors unrelated to earthquakes happening in non-earthquake countries that appeal to low social commitment customers. For example, some non-earthquake countries have low CSR standards and thus attract low CSR customers to form supply chain relationships. We use the "Harmonized System (HS) Codes" in Panjiva to identify the import categories of each firm to falsify the alternative explanation.[9] If a category is imported from Japan before the earthquake, it will be classified as a "Treated Category" for that customer. Other categories are classified as "Non-treated Categories." If the spillover effects are caused by some factors unrelated to the earthquake, we should observe positive

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[9] HS code is a standard classification standard adopted by custom worldwide. See: Harmonized System (HS) Codes (trade.gov)

treatment effects for all imports from non-earthquake countries, regardless of whether the Japan earthquake affected the category.

In Table 10, columns 1 to 4, we present that, for the treated category, the treatment effects for import from Japan are negative, and positive for imports from non-earthquake countries, consistent with all previous findings. For columns 5 and 6, we show that the low social commitment customers do not respond differently from high social commitment customers for non-treated categories in non-earthquake countries. This is because customers do not import these non-treated categories from Japan before the earthquake, so there is no demand for relocation, and then there should be no difference between high and low social commitment customers. This finding rules out the explanation that the increased imports from non-earthquake countries are due to factors unrelated to the Japan earthquake.

To conclude, in this section, we find that the Japan earthquake propagated disruption risks vertically within firm supply-chain linkages and horizontally to other suppliers of similar catastrophic risks. Foreign customers with lower social commitments would likely switch imports to non-earthquake zones. Product compatibility is also an important factor that determines the spillover effects.

6. Operating Efficiency

After documenting effects of social commitment on supply chain salience, we further investigate the financial consequences of this effect. Socially irresponsible companies may manage earnings and real activities in order to achieve economic objectives at the cost of stakeholders (Kim, Park, and Wier 2012; Hoi, Wu, and Zhang 2013). If there is no benefit to switching suppliers after an earthquake, then low social commitment customers should not switch, even though they do not have a commitment constraint on abandoning vulnerable suppliers. We estimate the model (1) using annual financial data for our sample firms from 2008 to 2015.

The primary goal of running a for-profit firm is to generate profits. Therefore, we first examine the difference in return on assets (ROA). Column 1 of Table 11 Panel A

shows that after the earthquake, low social commitment customers, on average, have 1.8 percentage points higher ROA than their high social commitment peers after the earthquake. Further breaking down the ROA into asset turnover and profit margin, we find that the ROA increase is attributed to the rise in sales instead of profit margin. The asset turnover of low social commitment customers increases by 5.5 percentage points compared with high social commitment peers, with no significant difference in profit margin. These results indicate that low social commitment customers benefit from switching suppliers flexibly and thus resume production sooner. The holding-up concern is an important determinant of supply chain contracts (Costello 2013), and should strongly increase after the earthquake. Intuitively, switching suppliers should not benefit the profit margin; otherwise, profit-maximizing customers should already be with low-cost suppliers before the earthquake. Besides, since firms loss potential revenues by engaging in socially desired commitments, they may become more sensitive to supplier pricing (Arya and Mittendorf 2015), therefore it is not likely to observe significant differences in profit margin.

To further examine whether the benefit of product market sales is transitory or long-lasting, we estimate the dynamic effects and show the results in Figure 2. The effect persistently accumulated after the earthquake. In 2015, the difference in asset turnover between low and high-social commitment firms grew to around 10 percentage points. Our results show that customers who resume production faster gain long-term benefits on the product market way beyond the transitory supply chain disruption period. Customers stick to social commitments generate positive externalities to upstream suppliers at the cost of shareholders.

Apart from the long-term effects, we examine several other types of transitory shock that may weaken the financial performance of high social commitment customers. The sales growth of low social commitment customers is 4.4 percentage points higher in 2011 but not significantly different in the post-earthquake period, as shown in Panel B of Table 11. The Japanese industry production took 12 months to recover to the pre-

earthquake level (Carvalho et al. 2021). Therefore, it is reasonable that the high social commitment group mainly suffered from disruption in 2011.

High trade credit granted to suppliers or charitable donations may also reduce the profitability of high social commitment firms. However, as shown in columns 2 and 3 of Table 11 Panel B, the accounts payable turnover ratio and non-operating income do not vary significantly in the earthquake year or post period, suggesting that the source of profit difference mainly stems from the ability to switch suppliers and resuming production swiftly, instead of other channels.

7. Robustness

We perform several robustness checks to ensure our results are not subject to certain specifications.

Our main dependent variables in previous analyses are the number of suppliers and containers rather than the percentage share. The main reason for such research design is that the Panjiva database cannot capture all of a client's suppliers (due to missing data records, the inability to capture domestic supply, and certain forms of imports not being included in Panjiva data); therefore it is impossible to estimate the denominator (total suppliers or containers) accurately. We calculate the share of Japanese suppliers/containers over the total number reported in Panjiva and use them as dependent variables in the model (1). The results, as reported in Panel A of Table 12, remain consistent with our main findings. Customers with low social commitment decreased Japanese suppliers by 19% and containers by 30% on average after the earthquake.

Secondly, we replace our firm-quarter data with a firm-year-level sample. Annual data provides a more comprehensive view of firm performance, smoothing out short-term fluctuations and noises associated with short-term events or seasonal effects. Our firm-year panel includes 1,397 observations. The results, presented in Panel B of Table 12, remain qualitatively and quantitatively similar.

Finally, we cross-check the results using different sources of supplier data. FactSet Revere database collects supplier information from public disclosures such as news articles, annual reports, corporate announcements, etc. We construct the sample similarly to the process described in Section 3.1. Since FactSet Revere does not provide information on container or transaction intensity, we only examine the changes in Japanese supplier amounts. Panel C of Table 12 shows that customers with low social commitment reduced the number of Japanese suppliers by 20% more and increase 7.5% more suppliers from non-earthquake country than their high social commitment peers. The results are similar to the findings using the Panjiva dataset for both direction and magnitude.

8. Conclusion

This study presents a novel discovery that customers with low social commitment are significantly more inclined to abandon their suppliers when those suppliers are struck by disasters, opting instead to switch to alternative suppliers who present lower disaster risks. This strategic flexibility allows such customers to resume production operations at a swifter pace, subsequently leading to an increase in their product market sales. Our robustness checks, which include alternative dependent variables, different supply chain data sources, and varied data frequencies, confirm the reliability of our findings. More crucially, this relationship is not confined to the 2011 Japanese earthquake alone but is also evident in other catastrophic events, such as Typhoon Haiyan in 2013 and the Sulawesi earthquake in 2018.

The implications of our findings extend across various domains, offering valuable insights for academia, industry practitioners, and policymakers.

For the academic community, this study provides novel insights into the complex dynamics of corporate social responsibility (CSR) within supply chains. Although extensive existing literature suggests that promote CSR can boost market performance (Naughton, Wang, and Yeung 2019) and ultimately enhance shareholders' value, either directly or indirectly (Ferrell, Liang, and Renneboog 2016; Lins, Servaes, and Tamayo

2017; Ding et al. 2021), our findings emphasizes that social commitment functions as a type of switching cost under conditions of supply chain disruption. Customers with high social commitment are effectively bound by their ethical obligations, compelling them to continue supporting vulnerable suppliers rather than abandoning them for more immediately advantageous options. This challenges traditional perspectives on CSR and highlights the influence of ethical considerations on business continuity and supplier relationships during crises.

For industry professionals, our research has significant implications for strategic decision-making processes. Firms should carefully consider the interaction between their social commitments and the disaster risk profiles of potential suppliers when forming purchasing decisions. A high social commitment could entail financial costs if the firms also engage with suppliers in high-risk regions due to greater vulnerability during disasters. On the other hand, suppliers situated in areas prone to natural disasters can benefit from associating with high social commitment customers, as such partnerships can serve as a form of resilience or insurance against the impacts of natural calamities. This insight encourages firms to weigh the ethical dimensions of their supply chain strategies alongside traditional risk management practices, promoting a more holistic approach to supplier selection.

For policymakers, the study suggests that foreign firms that are socially responsible can provide critical support to buffer against disaster risks. This potential benefit underscores the value of attracting and welcoming such firms, which could prove to be instrumental in enhancing national and regional resilience to natural disasters. Consequently, it might be prudent for policymakers to offer more attractive deals and incentives to these socially responsible firms to encourage their investment and presence in regions prone to natural disasters. By doing so, policymakers can not only enhance disaster preparedness and response mechanisms but also foster a more resilient and ethically robust business environment.

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Appendix. Variable Definition

This table lists the definition of each variable we used in our analysis and their sources.

Variable	Definition	Source
Num. Total Suppliers	Total number of suppliers	Panjiva
Num. JP Suppliers (All Prefectures)	Total number of Japanese suppliers	Panjiva
Num. JP Suppliers (Severe Prefectures)	Total number of Japanese suppliers from prefectures with seismic intensity rate above 6-	Panjiva
Num. Total Containers	Total number of containers imported	Panjiva
Num. JP Containers (All Prefectures)	Total number of containers imported from Japan	Panjiva
Num. JP Containers (Severe Prefectures)	Total number of Japanese containers imported from prefectures with seismic intensity rate above 6-	Panjiva
Low Social	Indicator equal to 1 if the social performance of a firm is below sample median.	Refinitiv ESG
Size	Natural logarithms of total asset	Compustat
Cash	Ratio of cash and cash equivalents to total asset	Compustat
Leverage	Short term debt and debt in current liability scaled by total asset	Compustat
Sales Growth	Quarterly changes in total sales	Compustat
ROA	Return on total asset	Compustat
Market-to-Book	Market value to book value ratio	Compustat
Asset Turnover	Total sales scaled by average total asset	Compustat
Gross Margin	One minus the ratio of cost of goods sold scaled to total sales	Compustat
Payable Turnover	Total cost of goods sold scaled by average accounts payable	Compustat
Nonoperating Income (Expense)	Total Nonoperating Income (Expense) scaled by total asset	Compustat
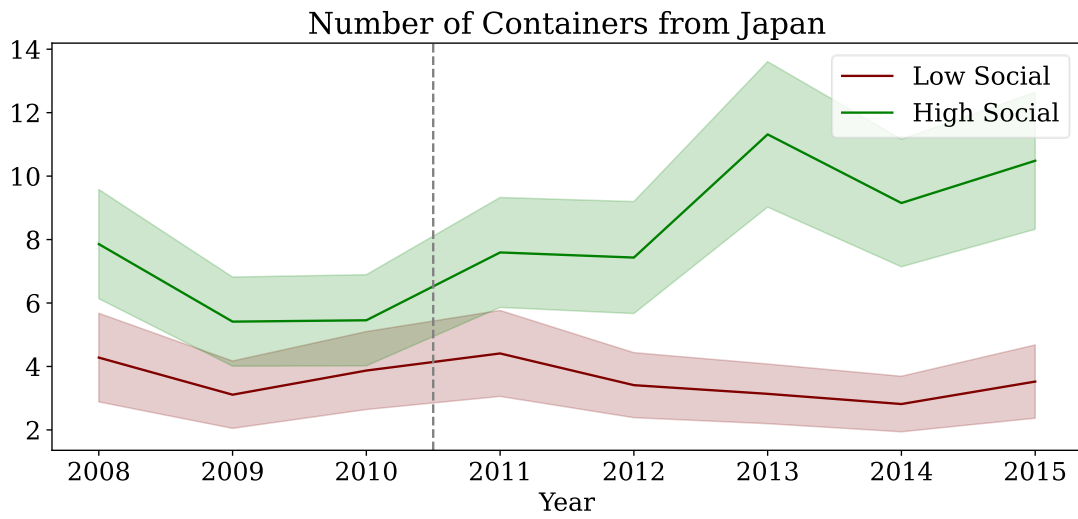
Panel A
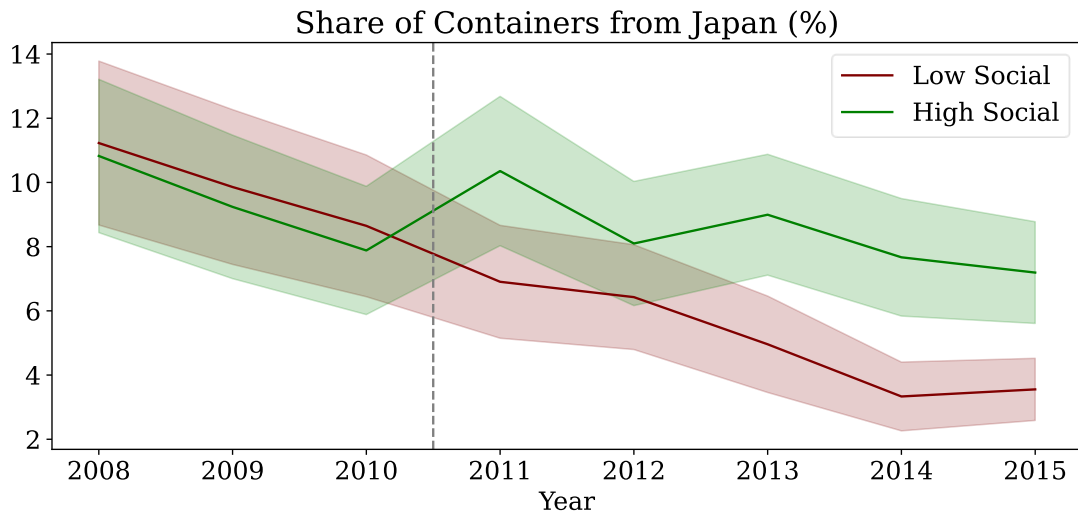
Panel B

Figure 1. Dynamic Effect of Import from Japan

This figure illustrates the time trend of import switching for firms with high social commitments compared to those with low social commitments, covering the period from 2008 to 2015. The y-axis indicates the number of containers imported from Japan, as shown in Panel A, and the percentage of containers imported from Japan relative to the total number of containers imported in Panel B.
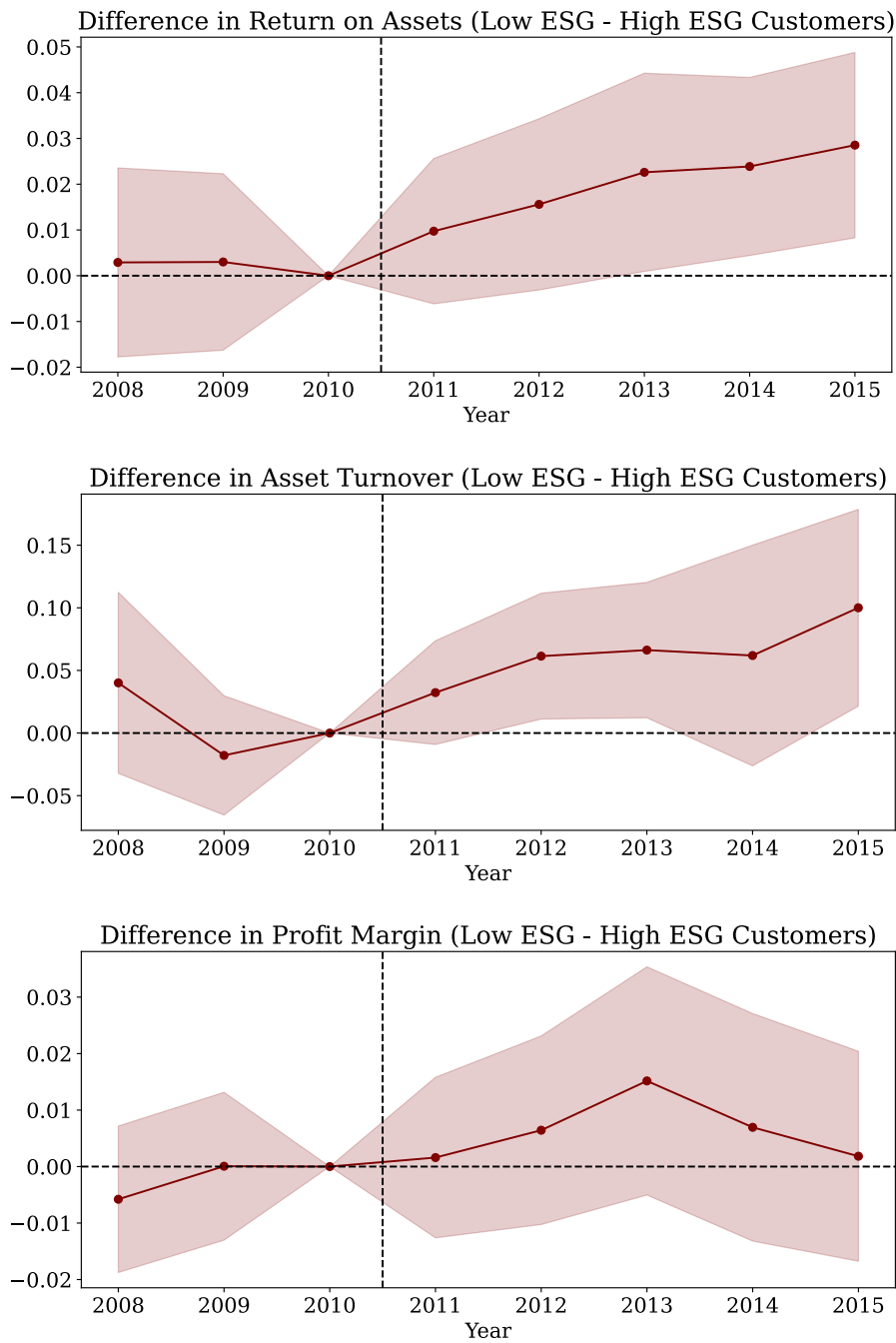
Figure 2. Profitability

This figure presents the difference in time trend of profitability, measured by ROA, asset turnover ratio, and profit margin, for firms with low social commitments relative to firms with high social commitments. The asset turnover ratio is calculated as total sales divided by the average total assets. The sample period is from 2008 to 2015.

Table 1. Summary Statistics

This table reports the summary statistics of variables incorporated in the baseline regression. The variables are defined in the Appendix. All variables are summarized at the firm-quarter level and winsorized at the 1 percent level.

Variable	Num. Obs.	Mean	Std. Dev.	10th	Median	90th
Num. Total Suppliers	5,378	18.232	27.254	0	9	45
Num. JP Suppliers (All Prefectures)	5,378	0.823	1.335	0	0	2
Num. JP Suppliers (Severe Prefectures)	5,378	0.035	0.185	0	0	0
Num. Total Containers	5,378	166.594	372.591	0	43	398
Num. JP Containers (All Prefectures)	5,378	6.312	16.056	0	0	18
Num. JP Containers (Severe Prefectures)	5,378	0.089	0.532	0	0	0
Low Social	5,378	0.492	0.500	0	0	1
Size	5,378	8.983	1.422	7.291	8.744	11.192
Cash	5,378	0.159	0.125	0.030	0.125	0.339
Leverage	5,378	0.213	0.154	0.002	0.199	0.422
Sales Growth	5,378	0.062	0.187	-0.134	0.059	0.254
ROA	5,378	0.155	0.074	0.080	0.143	0.250
Market-to-Book	5,378	3.352	3.194	1.217	2.665	6.316

Table 2. Baseline

This table presents Poisson regression results of the relationships between customers' social commitment and import switching. The dependent variables are the number of suppliers in Japan and number of containers imported from Japan. *Post* equals 1 if the start of the quarter is behind the earthquake and zero otherwise. *Low Social* is equal to one if the firm has below-median social rating scores before the earthquake and zero otherwise. All regressions include firm and industry-by-time fixed effects, and robust standard errors are clustered at industry (two-digit SIC code level) by time level. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

	Num. JP Suppliers		Num. JP Containers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.323***	-0.273***	-0.533***	-0.352***
	(-5.89)	(-4.88)	(-5.45)	(-3.97)
Size		-0.107		-0.048
		(-1.32)		(-0.35)
Cash		0.527*		0.452
		(1.72)		(0.96)
Leverage		0.420*		0.010
		(1.74)		(0.02)
Sales Growth		0.294**		0.208
		(2.33)		(1.00)
ROA		-0.920*		-1.728**
		(-1.85)		(-2.18)
Market-to-Book		0.001		-0.028***
		(0.15)		(-3.27)
Total Containers		-0.000***		0.000*
		(-3.04)		(1.88)
Total Suppliers		0.021***		0.014***
		(8.70)		(4.92)
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	5,378	5,378	5,378	5,378
Pseudo R2	0.405	0.427	0.742	0.770
# Singletons	707	707	707	707
# Clusters	514	514	514	514

Table 3. Dynamic

This table presents the dynamic treatment effect of the baseline sample from 2008 to 201. The dependent variables are the number of suppliers in Japan and number of containers imported from Japan. We use the year 2010 as the benchmark. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

	Num. JP Suppliers		Num. JP Containers	
	(1)	(2)	(3)	(4)
2008 * Low Social	0.088	0.057	-0.139	-0.142
	(0.86)	(0.52)	(-0.78)	(-0.82)
2009 * Low Social	0.157	0.081	-0.092	-0.006
	(1.46)	(0.74)	(-0.49)	(-0.04)
2010 * Low Social	Reference	Reference	Reference	Reference
2011 * Low Social	-0.308***	-0.316***	-0.320*	-0.404**
	(-2.72)	(-2.72)	(-1.95)	(-2.55)
2012 * Low Social	-0.131	-0.206**	-0.469**	-0.585***
	(-1.33)	(-2.14)	(-2.35)	(-3.14)
2013 * Low Social	-0.244**	-0.225**	-0.831***	-0.576***
	(-2.38)	(-2.20)	(-3.43)	(-3.30)
2014 * Low Social	-0.320***	-0.285**	-0.765***	-0.328**
	(-3.08)	(-2.38)	(-4.45)	(-2.11)
2015 * Low Social	-0.209**	-0.084	-0.684***	-0.134
	(-2.12)	(-0.72)	(-3.63)	(-0.68)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	5,378	5,378	5,378	5,378
Pseudo R2	0.405	0.427	0.743	0.771
# Singletons	707	707	707	707
# Clusters	514	514	514	514

Table 4. Matching High and Low Social Customers

Panel A presents the balance test of all firm-level characteristics we controlled before and after adopting the main sample's propensity score matching (PSM) approach. Panel B reports the baseline Poisson regression results using a one-to-one matched sample. The matched sample includes 51 firms in each group. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Panel A. Balance Test

	Unmatched Sample		Matched Sample	
	High Social	Low Social	High Social	Low Social
Number of Firms	100	103	51	51
Size	9.498	-1.311***	8.781	0.070
		(-7.39)		(0.33)
Cash	0.167	0.013	0.153	0.001
		(0.70)		(0.03)
Leverage	0.221	-0.067***	0.195	0.029
		(-3.32)		(1.06)
Sale Growth	0.131	0.063**	0.144	-0.005
		(2.32)		(-0.16)
ROA	0.168	-0.004	0.161	-0.002
		(-0.34)		(-0.13)
Market-to-Book	3.367	-0.190	3.096	0.122
		(-0.42)		(0.26)
Total Containers	212.530	-66.608	189.020	-46.667
		(-1.14)		(-0.59)
Total Suppliers	18.679	-4.737	14.868	3.269
		(-1.23)		(0.60)

Panel B. Matched Sample Regression

	Num. JP Suppliers		Num. JP Containers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.424***	-0.396***	-0.974***	-0.867***
	(-3.86)	(-3.91)	(-6.24)	(-7.03)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	2,499	2,499	2,499	2,499
Pseudo R2	0.362	0.395	0.748	0.786
# Singletons	753	753	753	753
# Clusters	416	416	416	416

Table 5. Supply Chain Commitment

This table presents the Poisson regression results of whether import from Japan changes using alternative measurement of firm social commitments: (1) *Stakeholder Engagement* is equal to one if firms have established policies aimed at safeguarding the interests of their stakeholders, and a value of zero to those without such policies; (2) *Community Reputation with Suppliers/Contractors* equals to one if a company has implemented policies that demonstrate a concern for its reputation among supply chain stakeholders; and (3) *Community Score* measures whether a firm is actively involved in the welfare of the communities it operates within. *Low Social* equals one if the used alternative metrics of social commitment score is below the sample median, and zero otherwise. All control variables, as presented in Table 2, are included. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Score =	Stakeholder Engagement		Community Reputation with Suppliers		Community Score		Social Scandals (Reversed)	
	Num. JP Suppliers	Num. JP Containers	Num. JP Suppliers	Num. JP Containers	Num. JP Suppliers	Num. JP Containers	Num. JP Suppliers	Num. JP Containers
	(1)	(2)	(3)	(4)	(5)	(6)	(9)	(10)
Post * Low Score	-0.258***	-0.595***	-0.086	-0.289***	-0.192***	-0.267***	-0.332***	-0.247**
	(-4.12)	(-5.37)	(-1.27)	(-2.61)	(-3.61)	(-3.23)	(-4.92)	(-2.40)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. Obs.	5,378	5,378	5,378	5,378	5,378	5,378	4,296	4,296
Pseudo R2	0.427	0.773	0.426	0.770	0.426	0.770	0.428	0.770
# Singletons	707	707	707	707	707	707	723	723
# Clusters	514	514	514	514	514	514	456	456

Table 6. Internal validity: Disaster severity

Panel A presents Poisson regression results of sub-group analysis of imports from severely impacted prefectures and non-severely impacted prefectures. The dependent variable is the import from non-severely affected prefectures in columns 1 and 3 and severely destroyed prefectures in columns 2 and 4. Firm and industry-by-time fixed effects are included in all regressions, and robust standard errors are clustered at the industry-by-time level. Panels B and C report the kernel density estimates of the distribution of the mean and standard deviation of 500 bootstrap coefficients bootstrapping coefficients. The vertical dashed line represents the original point estimate. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Panel A. Regression

	Num. JP Suppliers		Num. JP Containers	
	Non-severe Prefectures	Severe Prefectures	Non-severe Prefectures	Severe Prefectures
	(1)	(2)	(3)	(4)
Post * Low Social	-0.261***	-0.736	-0.295***	-1.155
	(-4.40)	(-1.09)	(-3.20)	(-1.57)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	5,289	662	5,289	662
Pseudo R2	0.421	0.245	0.769	0.458
# Singletons	796	5,423	796	5,423
# Clusters	514	111	514	111
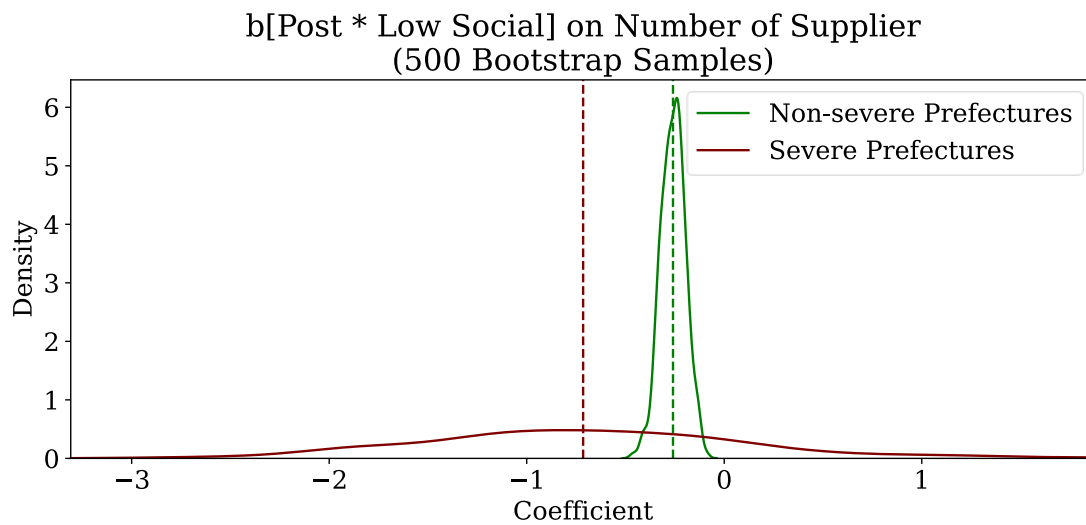
Panel B. Bootstrap Coefficients - Number of Suppliers
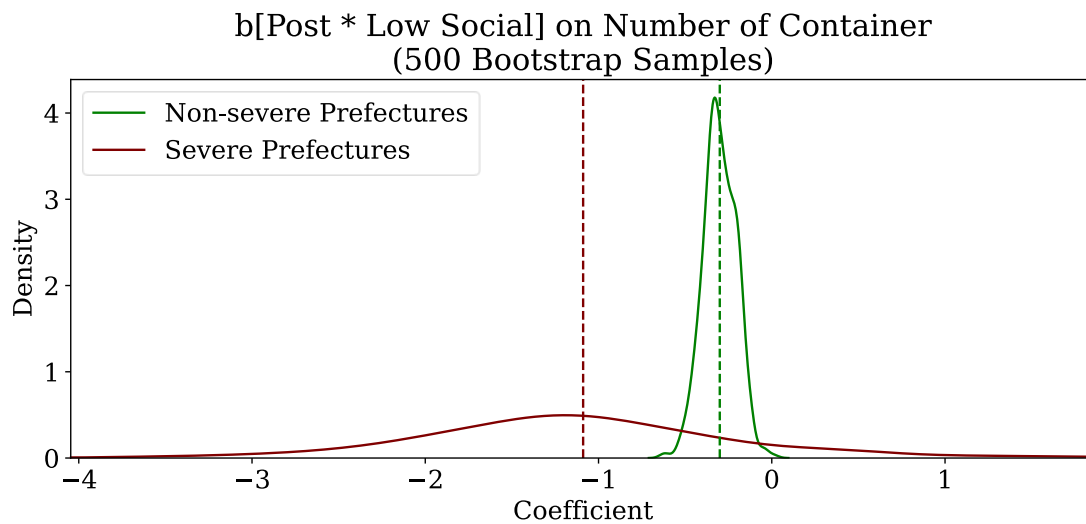
Panel C. Bootstrap Coefficients - Number of Containers

Table 7. Internal validity: Role of transient ownership

This table presents the cross-sectional analysis of transient institutional investor on firm import changes. The dependent variables are the number of suppliers in Japan and number of containers imported from Japan. *Post* equals 1 if the start of the quarter is behind the earthquake and zero otherwise. *Low Social* is equal to one if the firm has below-median social rating scores before the earthquake and zero otherwise. All regressions include firm and industry-by-time fixed effects, and robust standard errors are clustered at industry (two-digit SIC code level) by time level. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

| | Num. Supplier | | Num. Container | |
| Transient investor | High | Low | High | Low |
	(1)	(2)	(3)	(4)
Post * Low Social	-0.449***	-0.039	-0.550***	0.233
	(-3.89)	(-0.34)	(-2.79)	(1.31)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	1,638	1,564	1,638	1,564
Pseudo R2	0.441	0.411	0.818	0.791
# Singletons	67	711	674	711
# Clusters	271	236	271	236

Table 8. External Validity: Other disasters

This table presents the effect of corporate social commitment on import changes after two alternative natural disaster disruptions: the 2013 Typhoon Haiyan and the 2018 Sulawesi Earthquake. Panel A shows the estimation for each disaster alone. In columns 1 and 2, the dependent variables are the Philippine supplier and container amount from the Philippines and the sample period is from 2008 to 2018. In columns 3 and 4, the dependent variables are Indonesian suppliers and containers and the sample period is from 2013 to 2021. Panel B shows the stacked DID results for three disasters together. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Panel A. Baseline

	2013 Typhoon Haiyan (Philippines)		2018 Sulawesi Earthquake (Indonesia)	
	Num. Supplier	Num. Container	Num. Supplier	Num. Container
	(1)	(2)	(3)	(4)
Post * Low Social	-0.158	-0.709***	-0.124	-0.473***
	(-1.41)	(-3.68)	(-1.19)	(-3.17)
Size	0.575***	0.462***	0.178	0.136
	(5.30)	(2.87)	(1.55)	(0.78)
Cash	1.255**	3.134***	-0.213	0.252
	(2.34)	(4.46)	(-0.47)	(0.44)
Leverage	0.573	2.264***	0.136	-0.171
	(1.26)	(3.32)	(0.57)	(-0.47)
Sales Growth	-0.020	-0.561*	-0.942***	-0.123
	(-0.08)	(-1.65)	(-4.26)	(-0.36)
ROA	4.396***	8.845***	3.067***	2.852***
	(4.34)	(5.98)	(4.22)	(2.65)
Market-to-Book	-0.029	-0.136***	0.021*	0.037**
	(-1.24)	(-5.03)	(1.88)	(2.13)
Total Containers	0.000**	0.000***	0.000***	0.000***
	(2.12)	(4.60)	(3.93)	(7.60)
Total Suppliers	0.011***	0.010***	0.012***	0.011***
	(8.29)	(5.07)	(15.07)	(8.87)
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	3,290	3,290	3,409	3,409
Pseudo R2	0.434	0.770	0.694	0.903
# Singletons	1,002	1,002	887	887
# Clusters	555	555	485	485

Panel B. Stacked DID

	Num. JP Suppliers		Num. JP Containers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.207***		-0.403***	
	(-4.33)		(-5.50)	
Pre 4 Year * Low Social		-0.027		0.079
		(-0.27)		(0.65)
Pre 3 Year * Low Social		0.111		-0.071
		(1.44)		(-0.68)
Pre 2 Year * Low Social		-0.049		-0.089
		(-0.61)		(-0.79)
Pre 1 Year * Low Social		Reference		Reference
Event Year * Low Social		-0.184**		-0.316***
		(-2.38)		(-3.19)
Post 1 Year * Low Social		-0.154*		-0.517***
		(-1.89)		(-4.13)
Post 2 Year * Low Social		-0.198**		-0.511***
		(-2.24)		(-3.81)
Post 3 Year * Low Social		-0.257***		-0.478***
		(-2.86)		(-3.93)
Controls	Yes	Yes	Yes	Yes
Event-Firm FE	Yes	Yes	Yes	Yes
Event-Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	9,959	9,959	9,959	9,959
Pseudo R2	0.442	0.475	0.759	0.807
# Singletons	2,542	2,542	2,542	2,542
# Clusters	1,311	1,311	1,311	1,311

Table 9. Spillover

In Panel A, we test whether foreign customers reduce the supply from countries with high earthquake risk and increase the supply from countries with low earthquake risk. The dependent variables are supplier numbers and imported container numbers from Earthquake Countries in columns 1 and 2 and from Non-Earthquake Countries in columns 3 and 4. Panel B presents whether the sample firms with lower social commitments increased imports from Japan's competitor countries, namely Germany and China, after the earthquake. columns 1 and 2 report import changes from Germany, and columns 3 and 4 from China. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Panel A. Aggregated

	Earthquake Countries (excl. Japan)		Non-Earthquake Countries	
	Num. Supplier	Num. Container	Num. Supplier	Num. Container
	(1)	(2)	(3)	(4)
Post * Low Social	-0.064*	-0.095	0.091***	0.126***
	(-1.68)	(-1.39)	(4.77)	(4.02)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	10,283	10,283	12,697	12,709
Pseudo R2	0.687	0.869	0.817	0.930
# Singletons	433	433	281	269
# Clusters	931	931	1,126	1,126

Panel B. Japan Competitors

	Germany		China	
	Num. Supplier	Num. Container	Num. Supplier	Num. Container
	(1)	(2)	(3)	(4)
Post * Low Social	0.076	0.397***	0.194***	0.199***
	(1.28)	(3.98)	(6.73)	(3.51)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	8,208	8,208	11,405	11,405
Pseudo R2	0.423	0.716	0.800	0.914
# Singletons	4,770	4,770	1,573	1,573
# Clusters	708	708	1,017	1,017

Table 10. Category-level Spillover

This table reports whether the effects come from product categories originally imported from Japan before the earthquake or all product categories. We use the "Harmonized System (HS) Codes" in Panjiva to identify the import categories of each firm. An HS category imported from Japan before the earthquake is classified as a "Treated Category" for that customer. Other categories are classified as "Non-treated Categories." The number of suppliers and containers is aggregated by categories for each firm. The dependent variables are supplier and container amounts of Treated Categories from Japan in columns 1 and 2 and from Non-Earthquake Countries as defined in Table 8 in columns 3 and 4. In columns 5 and 6, the dependent variables are supplier and container amounts of Non-treated Category from Non-Earthquake Countries. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

	Japan (Treated Category)		Non-Earthquake Countries (Treated Category)		Non-Earthquake Countries (Non-treated Category)	
	Num. Supplier	Num. Container	Num. Supplier	Num. Container	Num. Supplier	Num. Container
	(1)	(2)	(3)	(4)	(5)	(6)
Post * Low Social	-0.231***	-0.364***	0.063	0.218***	0.015	0.057
	(-3.64)	(-4.23)	(1.59)	(3.33)	(0.50)	(1.09)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-HS Code FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Num. Obs.	5,024	5,024	5,195	5,195	20,206	20,2006
Pseudo R2	0.246	0.603	0.693	0.883	0.560	0.823
# Singletons	404	404	233	233	583	583
# Clusters	454	454	502	502	819	819

Table 11. Effects on Firm Performance

This table presents the relationship between corporate social commitments and changes in firm financial performance after the earthquake. In Panel A, the financial metrics include ROA in column 1, asset turnover ratio in column 2, and profit margin in column 3. In Panel B, we further include the interaction of the earthquake year indicator and the low social commitment indicator *Year 2011 * Low Social* to differentiate the transitory shock from the long-term effect. The dependent variables are *Sales Growth* in column 1, *Payable Turnover* ratio in column 2, and the ratio of non-operating income (expense) to total assets in column 3. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

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Panel A. Operating Efficiency

	ROA	Asset Turnover	Profit Margin
	(1)	(2)	(3)
Post * Low Social	0.018***	0.055**	0.008
	(2.89)	(2.07)	(1.25)
Size	-0.036***	-0.280***	0.005
	(-4.75)	(-6.14)	(0.43)
Cash	0.008	-0.318**	0.048**
	(0.21)	(-2.44)	(2.22)
Leverage	-0.134***	-0.251**	-0.014
	(-4.75)	(-2.10)	(-0.44)
Sales Growth	0.097***	0.190***	0.027*
	(6.62)	(4.15)	(1.94)
Market-to-Book	0.004***	0.005	0.002***
	(4.79)	(1.63)	(2.72)
Total Containers	0.000	0.000	0.000
	(0.40)	(1.48)	(0.88)
Total Suppliers	0.000	-0.000	-0.000
	(0.13)	(-1.16)	(-0.25)
Firm FE	Yes	Yes	Yes
Industry by Year FE	Yes	Yes	Yes
Num. Obs.	1,395	1,395	1,395
Adjusted R2	0.805	0.936	0.973
# Singletons	79	79	79
# Clusters	162	162	162

Panel B. Transitory Shock

	Sales Growth	Payable Turnover	Nonoperating Income (Expense)
	(1)	(2)	(3)
Year 2011 * Low Social	0.044*	-0.132	-0.000
	(1.80)	(-0.61)	(-0.08)
Post * Low Social	-0.016	-0.122	-0.003
	(-0.83)	(-0.46)	(-0.35)
Size	0.197***	-1.096*	-0.013
	(7.97)	(-1.90)	(-0.82)
Cash	-0.114	0.633	0.069
	(-0.91)	(0.43)	(1.59)
Leverage	0.127*	1.092	0.057
	(1.67)	(0.63)	(1.41)
Sales Growth		-1.047*	0.029
		(-1.80)	(1.53)
ROA	1.487***	5.983**	-0.175
	(8.25)	(2.15)	(-1.61)
Market-to-Book	0.004**	-0.031	-0.001
	(2.24)	(-1.07)	(-0.94)
Total Containers	-0.000	-0.000	-0.000
	(-0.36)	(-0.39)	(-0.69)
Total Suppliers	0.000	-0.000	-0.000
	(0.78)	(-0.12)	(-0.49)
Firm FE	Yes	Yes	Yes
Industry by Year FE	Yes	Yes	Yes
Num. Obs.	1,395	1,395	1,395
Adjusted R2	0.492	0.859	0.510
# Singletons	79	79	79
# Clusters	162	162	162

Table 12. Robustness

This table reports the robustness tests of baseline results. In Panel A, we present OLS regression where the dependent variables are the percentage of total Japanese suppliers (containers from Japan) relative to total suppliers (containers) in a fiscal quarter. All model specifications are the same as in Table 2. In Panel B, we present the Poisson regression results of the relationships between customers' social commitment and import switching by replacing firm-quarter data with a firm-year-level sample. We use the supplier amounts calculated from the Revere FactSet database in Panel C to cross-check the baseline results. Columns 1 and 2 report results of Japanese supplier changes. Columns 3 and 4 report the changes in suppliers from non-earthquake countries. All model specifications are the same as Table 2. ***, **, and * denote two-tailed significance at the 1%, 5%, and 10% levels.

Panel A. Share of Supplier/Container

	Pct. JP Suppliers		Pct. JP Containers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.173*	-0.192**	-0.330***	-0.307***
	(-1.70)	(-1.98)	(-3.05)	(-3.01)
Size		-0.051		-0.028
		(-0.35)		(-0.16)
Cash		1.421**		1.355*
		(2.08)		(1.76)
Leverage		0.687		0.361
		(1.59)		(0.74)
Sales Growth		0.172		-0.158
		(0.65)		(-0.49)
ROA		-1.176		-1.661*
		(-1.49)		(-1.66)
Market-to-Book		0.013		0.009
		(1.49)		(1.38)
Total Containers		0.000**		0.001*
		(2.30)		(1.82)
Total Suppliers		-0.005*		0.001
		(-1.92)		(0.22)
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	4,754	4,754	4,774	4,774
Pseudo R2	0.228	0.229	0.312	0.314
# Singletons	577	577	585	585
# Clusters	509	509	509	509

Panel B. Yearly Panel

	Num. JP Suppliers		Num. JP Containers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.317***	-0.283***	-0.489***	-0.359***
	(-4.65)	(-4.08)	(-3.28)	(-2.67)
Size		-0.088		-0.045
		(-0.73)		(-0.26)
Cash		0.472		0.589
		(1.06)		(0.80)
Leverage		0.374		-0.047
		(1.14)		(-0.08)
Sales Growth		0.396**		0.250
		(2.54)		(0.90)
ROA		-0.655		-1.394
		(-1.07)		(-1.26)
Market-to-Book		0.002		-0.025**
		(0.12)		(-2.28)
Total Containers		-0.001**		-0.000
		(-2.48)		(-0.06)
Total Suppliers		0.025***		0.020***
		(5.66)		(3.02)
Firm FE	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes
Num. Obs.	1,397	1,397	1,397	1,397
Pseudo R2	0.419	0.438	0.773	0.796
# Singletons	125	125	125	125
# Clusters	145	145	145	145

Panel C. Revere Dataset

	Num. JP Suppliers		Num. Non-Earthquake Countries Suppliers	
	(1)	(2)	(3)	(4)
Post * Low Social	-0.194**	-0.220**	0.168***	0.072***
	(-2.28)	(-2.13)	(6.48)	(3.17)
Size		-0.212**		0.328***
		(-2.25)		(9.20)
Cash		-0.860**		-0.632***
		(-1.99)		(-6.35)
Leverage		0.468		-0.340***
		(1.37)		(-4.42)
Sales Growth		0.539***		-0.226***
		(2.79)		(-5.22)
ROA		0.964		0.115
		(1.11)		(0.63)
Market-to-Book		0.013		-0.003
		(0.89)		(-1.35)
Total Containers		-0.000***		-0.000***
		(-2.77)		(-2.60)
Total Suppliers		0.005*		0.001**
		(1.95)		(2.02)
Firm FE	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes
Num. Obs.	2,321	2,321	4,775	4,775
Pseudo R2	0.414	0.417	0.852	0.855
# Singletons	2,752	2,752	298	298
# Clusters	267	267	586	586